



The Trusted Choice for Machine Safety



TURNKEY MACHINE

SAFEGUARDING SOLUTIONS

1-800-922-7533 | www.rockfordsystems.com



DELIVERING EXPERT MACHINE SAFETY SOLUTIONS

WHY SAFEGUARD?

According to Occupational Safety and Health Administration (OSHA) statistics, nearly 18,000 workers in metal fabricating plants suffer non-fatal injuries annually in the United States. Even with strict machine and operator safety regulations in place, unguarded hazardous machinery remains a major source of fatalities, amputations and other traumatic injuries in manufacturing plants. A recent survey showed an alarming 50 percent or more of metal fabricating machinery in the United States are not in compliance with the critical safety requirements for guarding outlined by OSHA and the American National Standards Institute (ANSI).

Whether driven by the law, social responsibility or the need for a positive return on investment (ROI), most organizations embark on a quest to make their workplaces safe. The business case for machine safeguarding is solid. By comparing the installation cost of safeguarding over the productive life of a machine versus the direct and indirect costs of even a single accident, it becomes clear that safeguarding makes sound business sense and should be a cornerstone of an organization's safety goals and objectives.

Since 1971, the Fortune 500 and many of North America's largest manufacturers have depended upon Rockford Systems for customized machine safeguarding solutions to bring their operations into compliance with today's OSHA regulations and ANSI/RIA/NFPA standards to ensure they are prepared for tomorrow's safety challenges.

Machine Guarding (1910.212) was the tenth most-frequently cited OSHA violation in 2020

Enforcement Citations:

1,313

Proposed Penalties:

\$12,451,739

50% or more of metal fabricating machinery in the U.S. do not comply with the critical safety requirements for guarding outlined by OSHA and ANSI



Workers who operate and maintain machinery suffer approximately 18,000 amputations, lacerations, crushing injuries, abrasions, and more than 800 deaths per year *

OUR DIFFERENCE

Rockford Systems has the applications expertise to solve any organization's most complex machine safety challenges. Our machine safety solutions are high-quality, flexible and trusted by industry.

Turnkey Machine Safety Solutions

Rockford Systems offers safeguarding training, on-site risk and machine safeguarding assessments, annual press safety inspections, pre-acquisition audits, customized engineered solutions, over 10,000 safeguarding products, quality installation and post-sale support. This turnkey solution allows customers the convenience of one-stop shopping for all of their machine safety needs, as well as provides peace-of-mind working with a globally trusted safety partner such as Rockford Systems.

RSXpress

RSXpress, a proprietary assessment tool, integrates Rockford System's surveying expertise with a cloud-based digital platform, allowing the company to generate safeguarding proposals up to 50 percent faster than legacy methods. RSXpress is designed to meet the needs of today's "always on" plant safety and operations managers and to deliver the timely, high-quality service experience that they expect in the digital age.

ROCKFORD SYSTEMS CAN HELP

Rockford Systems helps business large and small address industrial machine safety challenges and removes the burden of managing inspections, conducting assessments and overseeing standards compliance through our trusted turnkey solutions.

* <https://www.osha.gov/SLTC/machineguarding/index.html>

**REDUCING RISK.
IMPROVING SAFETY
PROTECTING WORKERS**

**MACHINE
SAFETY
SOLUTIONS**



Training and Education

Recommended For

EH&S, Production/ Operations/ Maintenance, and Risk Management roles that need safeguarding training

Description

Seminars and webinars that teach people how to safeguard industrial machinery to be in compliance with OSHA regulations and ANSI/RIA/NFPA standards

Output / Result

Safeguarding Seminar Certificate

Machine Risk Assessment

Recommended For

Organizations with new and/or relocated metal working machines that need hazard identification and risk scoring

Description

Identifies the task and associated hazards on machinery
Scores the risk level using the ANSI B11.0-2015 safety standard methods

Output / Result

Hazard Analysis Report

Machine Safeguarding Assessment

Recommended For

Organizations with new, old, refurbished and/or relocated metal working machines that need safeguarding solutions and associated costs

Description

Identifies the task and associated hazards on machinery
Recommends safeguarding solutions using the current OSHA regulations and ANSI/RIA/NFPA standards (or Corporate Standards where applicable)

Output / Result

Machine Safeguarding Assessment & Proposal

Engineered Integration Solutions

Recommended For

Included in Machine Safeguarding Proposal

Description

Delivers customized engineered and automated safety device interfaces or specialized controls for machines

Output / Result

Customized build-to-spec solutions

THAT'S WHAT MAKES ROCKFORD SYSTEMS THE TRUSTED CHOICE FOR INDUSTRIAL MACHINE SAFETY



Over 10,000 Safeguarding Products

Recommended For

Included in Machine Safeguarding Proposal

Description

Ensures that industrial machines are fully safeguarded to OSHA regulations and ANSI/RIA/NFPA standards

Includes shields, guards, presence sensing devices, controls, disconnects, starters, covers and more for all metal working machines

Output / Result

Compliant safeguarding solutions designed to reduce risk and improve worker safety

Expert Installation Services

Recommended For

Included in Machine Safeguarding Proposal

Description

OSHA and NFPA trained installers safely integrate safeguarding products into sophisticated machine controls and train operators on proper use

Output / Result

Quality Installation

Technical Support and In-Field Support

Recommended For

Included with all purchases and installations

Description

Every purchase is backed by a professional, highly-trained team of Technical Support Advisers
In-Field Service Technicians are available for more complex troubleshooting and repairs

Output / Result

Post purchase support via phone, fax, online or onsite

Ongoing Compliance Validation

Recommended For

Organizations who have completed a guarding installation that seek ongoing compliance validation

Description

Ensures that safeguarding products are in place, working at optimal performance, and operators are using safeguarding solutions as designed and trained

Output / Result

Peace of mind inspection report, compliance with OSHA regulations and ANSI/RIA/NFPA standards



The Trusted Choice for Machine Safety



SAFETY SHIELDS

FOR CUTTING AND TURNING MACHINES

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INTRODUCTION

There are basic safety requirements for safeguarding cutting and turning machines. These basic safety requirements include safeguarding, controls, disconnects, starters, covers, and other considerations. We have explained the basic safety requirements below and have arranged this catalog so you can make your safeguarding choices quickly and easily.

1. **SAFEGUARDING:** When safeguarding the point-of-operation on a cutting or turning machine, shields (barriers) can be installed between the hazard and the operator. These shields can deflect chips, sparks, and coolant that are generated at the point-of-operation.
2. **CONTROLS:** Most cutting and turning machines are directly driven by a motor. When the motor is turned on, the tool or workpiece rotates causing a point-of-operation hazard. When the motor is turned off, the tool or workpiece coasts to a stop and the hazard is eliminated. The basic requirement for controls is that all cutting and turning machines must have an emergency-stop device located within reach of the operator. Some of the motor stop/start operator stations offered in this catalog are equipped with an emergency-stop push button to meet this requirement. These emergency stop buttons can also be supplied separately.
3. **DISCONNECTS:** All cutting and turning machines must have a disconnecting means to shut off all pneumatic, electrical, and hydraulic power sources coming to the machine. It must be capable of being locked only in the off position to comply with OSHA 1910.305 (j)(4), applicable ANSI standards, and OSHA 29 CFR 1910.147 (lockout/tagout).
4. **STARTERS:** All cutting and turning machines must have a starter that will automatically drop out when the control voltage is lost to the machine. To restart the machine when power is restored, someone must start the motor with some type of overt action, for example, pressing the start push button. This prevents the machine from automatically restarting when the voltage is restored.
5. **COVERS:** All cutting and turning machines must have the mechanical power-transmission apparatuses covered (guarded) if below a 7' level from the floor or working platform. This includes motor shafts, belts, pulleys, chains, sprockets, gears, etc.
6. **OTHER CONSIDERATIONS:** Other auxiliary safeguarding equipment may be required to make cutting and turning machines as safe as possible.

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INTRODUCTION

OSHA PUBLICATIONS

When safeguarding cutting and turning machines, the general requirements that apply to these types of machines are in OSHA (Occupational Safety and Health Administration) Title 29 of the Code of Federal Regulations (CFR). These publications can be acquired by contacting:

U.S. Government Printing Office
P.O. Box 371954
Pittsburgh, PA 15250-7954
(202) 512-1800 • <http://bookstore.gpo.gov>

The following is a list:

7. An Act—Public Law 91-596, 91st Congress, S. 2193, December 29, 1970, Duties, Section 5(a)(1)(2)(b)
8. OSHA 29 CFR sections that an employer (user) must comply with include:
 - 1910.211 Definitions
 - 1910.212 General requirements for all machines
 - 1910.213 Woodworking machinery requirements
 - 1910.215 Abrasive wheel machinery
 - 1910.219 Mechanical power-transmission apparatus
9. OSHA 29 CFR 1910.147 The control of hazardous energy (lockout/tagout).
10. OSHA 29 CFR 1910.301-1910.399 Electrical

The basic OSHA standard, 29 CFR 1910.212, states that any machine that creates a hazard must be safeguarded to protect the operator and other employees. OSHA can also cite violations using other standards such as the ANSI (American National Standards Institute) B11 series.

ANSI Publications

B11–2008 General Safety Requirements
Common to ANSI B11 Machines
B11.6* Lathes
B11.9* Grinding Machines
B11.19* Performance Criteria for Safeguarding
B11.23* Machining Centers and CNC Milling, Drilling, and Boring Machines
B11.24 Transfer Machines
B11.TR1 Ergonomic Guidelines
B11.TR3* Risk Assessment and Risk Reduction
B15.1 Mechanical Power Transmission Apparatus
01.1* Woodworking Machinery
*ANSI Standards for Cutting and Turning Machines

These standards can be purchased by contacting:

ANSI (American National Standards Institute, Inc.)
25 West 43rd Street, 4th Floor
New York, New York 10036
(212) 642-4900 • www.ansi.org

Other Publications

1. NFPA 79, Electrical Standard for Industrial Machinery
2. NEC (National Electrical Code) Handbook
3. NEMA (National Electrical Manufacturers Association)
4. Robotics Industry Association (RIA)

For additional safety information and assistance in devising, implementing or revising your safety program, please contact the machine manufacturer, your state and local safety councils, insurance carriers, national trade associations, and your state's occupational safety and health administration.

The shields (barriers) offered in this catalog are usually installed on drilling machines, lathes, milling machines, grinding machines, band saws, belt sanders, and disc sanders. Many of the shields can be used on other types of equipment including woodworking machines and robotics. Most of these shields are intended to deflect chips (swarf), sparks, splashing coolant, or lubricant away from the operator and other employees in the machine area. Shields provide visibility to the point-of-operation. Although these shields provide some degree of guarding for the operator, they cannot be considered guards. When using these shields, and before any of the shields illustrated in this catalog are moved from their normally applied position, power must always be turned off. In some cases, more than one type of shield per machine may be necessary to provide protection. For example, on lathes, a chuck shield may be required along with a cross shield where the tool comes into contact with the workpiece. This catalog offers several different types of shields. When considering shielding for your machines, be sure to choose the shield that fits your machining applications and still maintains current levels of productivity.

INTRODUCTION

DRILLING MACHINES

As with other cutting machines, the operator must be shielded from the rotating chuck and swarf that is produced by the drill bit. A wide variety of shields can be attached to the machine and used to protect this area. The ANSI standard for drilling machines is ANSI B11.8.

LATHES

There are three main safety considerations for lathes (engine, turret, etc.). One is the rotating chuck that could catch the operator's clothing, jewelry, hair, or hand and pull it into the machine. The second is the hazardous flying chips and splashing coolant that are generated at the point-of-operation (where the tool contacts the workpiece being machined). To protect these areas, two shields can be applied—one around a portion of the chuck and the other at the point-of-operation. Larger sliding shields can protect both areas, providing the workpiece is not too long. The third is the rotating transmission components that must be covered to prevent entanglement. The ANSI standard for lathes is ANSI B11.6.

MILLING MACHINES

The main safety consideration for milling machines is the swarf that is generated at the point-of-operation. Another safety concern is the tool cutter, which could catch operator's clothing, jewelry, hair, or any other part of the body. Usually on smaller mills, the operator and other employees in the machine area are protected by shields. These shields can be applied around the perimeter of the table or bed area or close to the cutter, depending on the size of the workpiece and the application. On larger milling machines, operators are sometimes protected by location; however, when working close to a cutting tool, operators must be protected from swarf. The ANSI standard for milling machines is ANSI B11.8.

GRINDING MACHINES

Shields are usually applied to grinding machines to protect the operator from chips (swarf), sparks, splashing coolant, or lubricant. Other safety concerns for grinders are the adjustment of the work rests and the adjustable tongues or ends of the peripheral members at the top of each wheel. Work rests shall be kept adjusted closely to the wheel with a maximum opening of 1/8". The distance between the wheel periphery and the adjustable tongue or the end of the peripheral member at the top shall never exceed 1/4". Grinding machines are covered by OSHA in 29 CFR 1910.215. The ANSI standards for grinding machines are B11.9 and B7.1.

BAND AND TABLE SAWS

Shields are applied to band saws and table saws to protect the operator from flying chips, splinters, and dust. As with other cutting machines, care must be taken around the moving blade of the machine. Avoid wearing loose clothing and jewelry; properly restrain long hair. Band saws and table saws for woodworking are covered by OSHA in 29 CFR 1910.212 and 1910.213. The ANSI standard for metal sawing machines is ANSI B11.10.

DISC/BELT SANDERS/GRINDERS

Shields can be applied to disc/belt sanders/grinders to protect the operator from flying chips, splinters, and dust. As with other machines with rotating parts, care must be taken around the point-of-operation. Avoid wearing loose clothing and jewelry; properly restrain long hair. Disc and belt sanders for woodworking are covered by OSHA in 29 CFR 1910.212 and 1910.213. The ANSI standards for grinding machines are B11.9 and B7.1.

LOCKOUT/TAGOUT

As stated in OSHA 29 CFR 1910.147 The control of hazardous energy (lockout/tagout): "(a)(1)(i) This standard covers energizing or start-up of the machines or equipment, or release of stored energy could cause injury to employees. This standard establishes minimum performance requirements for the control of such hazardous energy."

1. Unplug the machine and use an electrical plug lockout or use a disconnect switch with padlocks, lockouts, and tags.
2. Disconnect and ensure that all power sources are locked and tagged out.
3. Stored electrical energy must be bled to obtain zero energy state.
4. Use a volt meter to make sure all circuits are dead.

ELECTRICAL REQUIREMENTS NFPA 79, ELECTRICAL STANDARD FOR INDUSTRIAL MACHINERY

INCOMING SUPPLY CIRCUIT CONDUCTOR TERMINATIONS

Under 5.1.1, it states that "where practicable, the electrical equipment of a machine shall be connected to a single power supply circuit."

SUPPLY CIRCUIT DISCONNECTING (ISOLATING) MEANS

In 5.3.1.1, it states that a supply circuit disconnecting means shall be provided for each incoming supply circuit to a machine. According to 5.3.1.1.1, each disconnecting means shall be legibly marked to indicate its purpose. Under 5.3.1.3, "The supply circuit disconnecting means other than attachment plugs and receptacles shall be mounted within the control enclosure or immediately adjacent thereto. Exception: Externally mounted supply circuit disconnecting means, whether interlocked or not interlocked with the control enclosure, supplying machines totaling 2hp or less shall be permitted to be mounted up to 6m (20ft) away from the

INTRODUCTION

enclosure providing that the disconnecting means is in sight from and readily accessible to the operator.” Under 5.3.3, the disconnecting means shall be provided with permanent means for locking in the off position only (for other than attachment plugs). In accordance with 5.3.4.1, “The center of the grip of the operating handle of the disconnecting means, when in its highest position, shall not be more than 2.0 m (6ft 7in) above the floor. A permanent operating platform, readily accessible by means of a permanent stair or ladder, shall be considered as the floor for the purpose of this requirement.” According to 5.3.2 (6), the supply circuit disconnecting means can be an attachment plug and receptacle (plug/socket combination) for cord connection to motor loads totaling 2hp or less.

CONTROL CIRCUIT SUPPLY, VOLTAGE, AND PROTECTION

In 9.1.1.1, it states that “Control transformers shall be used for supplying the control circuits.” According to 9.1.1.3, “Transformers shall not be required if the supply voltage does not exceed 120volts ac.” In accordance with 9.1.2.1, “The ac voltage for control circuits shall not exceed 120 volts, ac single phase.” According to 9.1.3, control circuits shall be provided with overcurrent protection.

OVERLOAD PROTECTION OF MOTORS

According to 7.3.1, “Overload devices shall be provided to protect each motor, motor controller, and branch-circuit conductor against excessive heating due to motor overloads or failure to start.”

STOP FUNCTIONS

According to 9.2.2, “The three categories of stop functions shall be as follows:

- (1) Category 0 is an uncontrolled stop by immediately removing power to the machine actuators.
- (2) Category 1 is a controlled stop with power to the machine actuators available to achieve the stop then remove power when the stop is achieved.
- (3) Category 2 is a controlled stop with power left available to the machine actuators.”

In 9.2.5.3.1, it states that “Each machine shall be equipped with a Category 0 stop.” According to 9.2.5.3.2, “Category 0, Category 1, and/or Category 2 stops shall be provided where indicated by an analysis of the risk assessment and the functional requirements of the machine. Category 0 and Category 1 stops shall be operational regardless of operating modes, and Category 0 shall take priority. Stop function shall operate by de-energizing that relevant circuit and shall override related start functions.”

EMERGENCY STOP FUNCTIONS

In accordance with 9.2.5.4.1, emergency stop functions shall be designed to be initiated by a single human action. In addition to the requirements for stop, 9.2.5.4.1.1 states that “the emergency stop shall have the following requirements:

- (1) It shall override all other functions and operations in all modes.
- (2) Power to the machine actuators, which causes a hazardous condition(s), shall be removed as quickly as possible without creating other hazards (e.g., by the provision of mechanical means of stopping requiring no external power, by reverse current braking for a Category 1 stop).
- (3) The reset of the command shall not restart the machinery but only permit restarting.”

In 9.2.5.4.1.2, it states that “Where required, provisions to connect additional emergency stop devices shall be provided.” According to 9.2.5.4.1.3, “The emergency stop shall function as either a Category 0 or a Category 1 stop. The choice of the category of the emergency stop shall be determined by the risk assessment of the machine.” In accordance with 9.2.5.4.1.4, “Where a Category 0 or Category 1 stop is used for the emergency stop function, it shall have a circuitry design (including sensors, logic, and actuators) according to the relevant risk as required by Section 4.1 and 9.4.1. Final removal of power to the machine actuators shall be ensured and shall be by means of electromechanical components. Where relays are used to accomplish a Category 0 emergency stop function, they shall be non-retentive relays.

Exception: Drivers, or solid state output devices, designed for safety related functions shall be allowed to be the final switching element, when designed according to relevant safety standards.”

DEVICES FOR STOP AND EMERGENCY STOP

In accordance with 10.7.1.1, “Stop and emergency stop pushbuttons shall be continuously operable and readily accessible.” According to 10.7.1.2, “Stop or emergency stop pushbuttons shall be located at each operator control station and at other locations where emergency stop is required.”

In 10.7.2.1, it states that “The types of devices for emergency stop shall include, but are not limited to, the following:

- (1) Pushbutton-operated switches
- (2) Pull-cord-operated switches
- (3) Foot-operated switches without a mechanical guard
- (4) Push-bar-operated switches
- (5) Rod-operated switches”

According to 10.7.2.2, “Pushbutton-type devices for emergency stop shall be of the self-latching type and shall have direct opening operation.” In accordance with 10.7.2.3, “Emergency stop switches shall not be flat switches or graphic representations based on software applications.” For restoration of normal function after emergency switching off, 10.8.3 says that “It shall not be possible to restore an emergency switching off circuit until the emergency switching off circuit has been manually reset.” According to 10.7.3, “Actuators of emergency stop devices shall be colored RED. The background immediately around pushbuttons and disconnect switch actuators used as emergency stop devices shall be

INTRODUCTION

colored YELLOW. The actuator of a pushbutton-operated device shall be of the palm or mushroom-head type and shall effect an emergency stop when depressed. The RED/YELLOW color combination shall be reserved exclusively for emergency stop applications.

Exception: The RED/YELLOW color combination shall be permitted for emergency stop actuators in accordance with 10.8.4.”

Under 10.8.5, “Where the supply disconnecting means is to be locally operated for emergency switching off, it shall be readily accessible and shall meet the color requirements of 10.8.4.1.” According to 10.8.4.1, “Actuators of emergency switching off devices shall be colored RED. The background immediately around the device actuator shall be permitted to be colored YELLOW.”

PUSHBUTTON ACTUATORS

According to 10.2.1, “Pushbutton actuators used to initiate a stop function shall be of the extended operator or mushroom-head type.” As stated in 10.2.2.1, “The preferred color of start or on shall be GREEN, except that BLACK, WHITE, or GRAY shall be permitted. RED shall not be used for start or on.” In 10.2.2.2, it states that “the preferred color for stop or off shall be RED, except that BLACK, WHITE, or GRAY shall be permitted. GREEN shall not be used for stop or off.” According to 10.2.2.6, “Pushbuttons that cause movement when pressed and stop movement when they are released (e.g., jogging) shall be BLACK, WHITE, GRAY, or BLUE, with a preference for BLACK.” In accordance with 10.2.3.1, “A legend shall be provided for each operator interface device to identify its function and shall be located so that it can be easily read by the machine operator from the normal operator position. The legends shall be durable and suitable for the operating environment.”

START DEVICES

According to 10.6, “Actuators used to initiate a start function or the movement of machine elements (e.g., slides, spindles, carriers) shall be constructed and mounted to minimize inadvertent operation.” Protection Against Supply Interruption or Voltage Reduction and Subsequent Restoration Under 7.5.1, “Where a supply interruption or a voltage reduction can cause a hazardous condition or damage to the machine or to the work in progress, undervoltage protection shall be provided (e.g., to switch off the machine) at a predetermined voltage level.” For restarting, 7.5.3 states that “Upon restoration of the voltage or upon switching on the incoming supply, automatic or unintentional restarting of the machine shall be prevented when such a restart causes a hazardous condition.”

PROTECTIVE INTERLOCKS

In 9.3.6, it states that “Where doors or guards have interlocked switches used in circuits with safety related functions, the interlocking devices shall be listed, have either positive (direct) opening operation, or provide similar reliability and prevent the operation of the equipment when the doors or guards are open (difficult to defeat or bypass).” Under 9.3.1, “The reclosing or resetting of an interlocking safeguard shall not initiate machine motion or operation that results in a hazardous condition.”

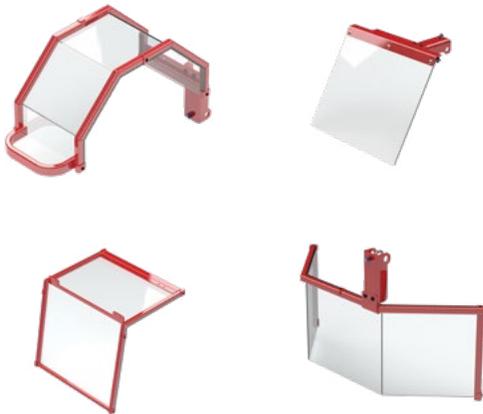
CREATING A SAFER WORK ENVIRONMENT

Rockford Systems LLC, a leader in machine safeguarding solutions, introduces PROTECTOR™ Series Shields. This highly innovative and patent-pending product line improves the safety and productivity of operators working with dangerous machinery.

CUSTOMER-DRIVEN SOLUTIONS

With over 50 years of industrial safety experience, Rockford Systems has integrated over 25,000 machine safeguarding solutions and collaborated extensively with Environmental Safety & Health (EHS) leaders, supervisors, operators and maintenance personnel across a variety of industries. We leveraged this wealth of knowledge and applications expertise into the design and production of our newest innovation:

PROTECTOR™ SERIES SHIELDS



SOLVING COMMON PROBLEMS

PROBLEM:

- » Equipment operators complain that safeguarding shields limit visibility because of reflectivity or obstruction and nearby clip-on lamps get too hot.

SOLUTION:

- » PROTECTOR Series Shields are manufactured with scratch-resistant polycarbonate and incorporate cool, bright LED lighting into the shield frame to yield superior **visibility of the work area**.

PROBLEM:

- » Supervisors report that safeguarding shields can be bypassed when shields get pushed out of the way or are tampered with, thereby making the machines unsafe to operate.

SOLUTION:

- » PROTECTOR Series Shields are offered in both non-interlocked and interlocked versions, the latter of which disengages power and **prevents a machine start-up when the shield is not closed**.
- » PROTECTOR Series Shields feature a tamper-resistant interlock enclosure and available redundant safety monitoring. The safety relay monitors the interlock switch for failure, **providing a notification if the interlock has been removed or is not functioning correctly**.

PROBLEM:

- » EHS professionals need to maximize safety while minimizing expenses, thereby generating a positive return on investment (ROI).

SOLUTION:

- » PROTECTOR Series Shields are modular in design and easily configurable to tailor a custom fit for any machine application, thereby optimizing employee safety and generating a positive ROI.

A PATENT-PENDING, HIGH-QUALITY, HIGHLY-FEATURED LINE OF ROBUST MACHINE SAFEGUARDING SHIELDS THAT MAXIMIZE SAFETY, IMPROVE PRODUCTIVITY AND REDUCE RISK.

PROTECTOR™ SERIES FEATURES & BENEFITS

ROBUST CONSTRUCTION

PROTECTOR Series Shields are constructed of 14-gauge powder-coated steel and 3/16" shock-proof and oil-resistant polycarbonate, creating an extremely tough, rigid and durable safety shield to protect operators from flying debris, lubricants, coolants and swarf. All components carry a CE, UL and CSA certification and shields feature a limited one-year warranty. A full line of replacement polycarbonate shields is available to keep shields operating at peak efficiency.

MODULAR DESIGN

PROTECTOR Series Shields are modular in design so that shield shape, size, mount, arm, offset, lighting, interlocking and safety monitoring can

be configured to provide the best solution for even the toughest machine guarding challenge. Available with various mounting options, these high-quality shields allow for reversal to address opposite-hand mounting scenarios when necessary. All shields are vertically and horizontally adjustable to clear varying work setups and table heights.

Rockford Systems configured the most popular shields for milling and drilling machines, lathes and grinders, which represent over 95 percent of all safeguarding applications. However, for those unusual applications or hard-to-guard machines, PROTECTOR Series Shields can be configured into over 60,000 modular combinations to ensure a precise, customized fit to improve worker safety.

Shield Options:



Octagonal Shield



Curved Shield



3 Sided Shield



2 Sided Shield



Flat Shield



Dual Flat Shield



Octagonal Shield without Handle

Arm Options:



Single Pivot 3 Arms



Double Pivot 3 Arms



Single Pivot 2 Arms



Double Pivot 2 Arms



Direct Mount

Mount Options:



Left Mount



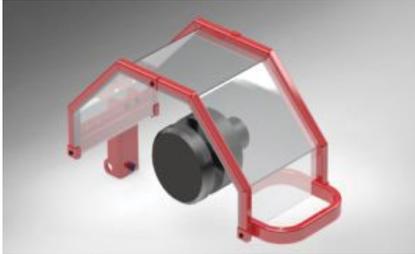
Center Mount



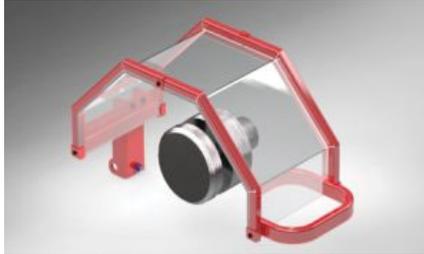
Right Mount

WORKSPACE SAFETY LIGHTING

PROTECTOR Series Shields can include color-changing LED lighting nested into the frame of the shield to **illuminate the work area during machine operation**. The LED light strip is integrated into the shield frame and each strip packs 262 Lumens of light per linear foot. For example, the PROTECTOR 28" octagonal or circular shield provides 2180 Lumens, compared to a typical clip-on work lamp that provides only 800 Lumens. Operators will appreciate the non-reflective, true-color rendering white light illuminating their work area. When the shield is moved out of the safe work position, **white LEDs switch off and red LEDs switch on, thereby providing visual indication that the shield is in the open position**. All LED lighting has been manufactured to exacting IEC IP65 outdoor/wet location standards to withstand coolant and lubricant splashes.



Lathe Chuck without Illumination



Lathe Chuck Illuminated with *WHITE LEDs* in "run" position



Lathe Chuck Illuminated with *RED LEDs* in "stop" position

SAFETY INTERLOCKS & MONITORING

PROTECTOR Series Shields can be upgraded with a safety interlock switch or switches, dependent upon application. **Interlocking shields exceed OSHA regulations and ANSI standards and are considered a best safety practice.**

Shield interlocks shut off or disengage power and prevent machine start-up when the guard is not closed, thereby increasing operator safety and preventing operating bypassing. All safety-rated interlock switches are mounted in a tamper-resistant NEMA 4 housing, comply with the IEC/EN 60947 safety standard and carry IEC IP66/67 device ratings. Additional motor starter or anti-restart devices may be required when incorporating interlocking devices into the PROTECTOR Series Shields in order to ensure safe and compliant operation.

To achieve a Category 2 rating, a safety monitoring relay can be added as a redundant level of security, monitoring the integrity of the interlocking feature so that a removed or failed safety interlock will not permit unsafe operation of the machine.



Interlock



Non-Interlock

MADE IN THE USA

In recent months, it has become clear that complex international supply chains are not resilient to the immediate sourcing needs of organizations. PROTECTOR Series Shields are manufactured by Rockford Systems LLC in Rockford, Illinois, USA. **All shields are shipped within 2-3 weeks of order.**

CONTACT US

Our team is always ready to help customers, discuss their unique applications, and solve their machine safety problems. Call 1-800-922-7533 or visit www.rockfordsystems.com.

POPULAR CONFIGURED PROTECTOR™ SERIES SHIELDS

MILLING MACHINES



RSSC2LL202L163



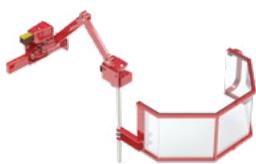
RSSD4LL202L163



RSSD4LL000L183



RSSD5LL202L163



RSSD6LL202L163



RSSE3LL202L163

LATHES



RSSD3LL000L103

DRILLING MACHINES



RSSC1LL161L103



RSSD2LL000L123



RSSD2LL000L143



RSSD2LL000L183

GRINDERS



RSSA4LL161L042



RSSF3LC000LD73

CUSTOMIZABLE PROTECTOR™ SERIES SHIELDS

To create a PROTECTOR Series Shield, determine the 14-digit configured part number by following directions 1 - 6 and use the information in the **PART NUMBERING SYSTEM CHART** (see next page).

- 1 – The first 3 characters will always be RSS (Rockford Systems Shields)
- 2 – The first 3 digits will determine the type and size of the shield and LED lighting option
- 3 – Digit 4 will determine the shield mount
- 4 – The next 4 digits will determine the shield arm type, pivot, reach and interlock option
- 5 – The next 2 digits will determine the shield offset
- 6 – The last digit will determine with enclosure (interface type), depending upon the LED and interlock options selected:

If you have selected no LED, then you should select “No Enclosure” (0)

If you have selected LED and no interlock, then you should select “Lighted – Non-Interlocked Enclosure” (1)

If you have selected LED and interlock, then you should select “Lighted – Interlocked Enclosure” (2)

If you have selected LED and interlock and monitoring, then you should select “Lighted – Interlocked & Monitored Enclosure” (3)

LED Lighting?	Interlock?	Monitored?	Group 6 Option
NO	NO	NO	0
YES	NO	NO	1
NO	YES	NO	0
YES	YES	NO	2
YES	YES	YES	3

PART NUMBER EXAMPLE

RSSA1LL000X101 – Shield, Flat, 7” x 6” w/LED, Left Mount, Direct Mount w/o Interlock, 10” Offset, Lighted – Non-Interlocked Enclosure

PROTECTOR™ SERIES SHIELDS PART NUMBERING CHART

Reference the catalog or website for dimensional drawings for all shields shown below.

SYSTEM TYPE PRODUCT CATEGORY
 RSS — Rockford Systems Shields

SHIELDS

ENCLOSURE

0	No Enclosure
1	Lighted – Non-Interlocked Enclosure
2	Lighted – Interlocked Enclosure
3	Lighted – Interlocked & Monitored Enclosure

OFFSET

00	No Offset
04	4" Offset
10	10" Offset
12	12" Offset
14	14" Offset
16	16" Offset
18	18" Offset
20	20" Offset
22	22" Offset
24	24" Offset
D7	7" Dual Offset

ARM

000X	Direct Mount w/o Interlock
000L	Direct Mount w Interlock
161X	Articulating, Single Head Pivot, 2 Arms, 16" Reach w/o Interlock
161L	Articulating, Single Head Pivot, 2 Arms, 16" Reach w/ Interlock
161Y	Articulating, Single Base Pivot, 2 Arms, 16" Reach w/o Interlock
161M	Articulating, Single Base Pivot, 2 Arms, 16" Reach w/ Interlock
162X	Articulating, Double Pivot, 2 Arms, 16" Reach w/o Interlock
162L	Articulating, Double Pivot, 2 Arms, 16" Reach w/ Interlock
201X	Articulating, Single Head Pivot, 2 Arms, 20" Reach w/o Interlock
201L	Articulating, Single Head Pivot, 2 Arms, 20" Reach w/ Interlock
201Y	Articulating, Single Base Pivot, 2 Arms, 20" Reach w/o Interlock
201M	Articulating, Single Base Pivot, 2 Arms, 20" Reach w/ Interlock
202X	Articulating, Double Pivot, 2 Arms, 20" Reach w/o Interlock
202L	Articulating, Double Pivot, 2 Arms, 20" Reach w/ Interlock
241X	Articulating, Single Head Pivot, 2 Arms, 24" Reach w/o Interlock
241L	Articulating, Single Head Pivot, 2 Arms, 24" Reach w/ Interlock
241Y	Articulating, Single Base Pivot, 2 Arms, 24" Reach w/o Interlock
241M	Articulating, Single Base Pivot, 2 Arms, 24" Reach w/ Interlock
242X	Articulating, Double Pivot, 2 Arms, 24" Reach w/o Interlock
242L	Articulating, Double Pivot, 2 Arms, 24" Reach w/ Interlock
361X	Articulating, Single Head Pivot, 3 Arms, 36" Reach w/o Interlock
361L	Articulating, Single Head Pivot, 3 Arms, 36" Reach w/ Interlock
361Y	Articulating, Single Base Pivot, 3 Arms, 36" Reach w/o Interlock
361M	Articulating, Single Base Pivot, 3 Arms, 36" Reach w/ Interlock
362X	Articulating, Double Pivot, 3 Arms, 36" Reach w/o Interlock
362L	Articulating, Double Pivot, 3 Arms, 36" Reach w/ Interlock

MOUNT

L	Left Mount
R	Right Mount
C	Center

SHIELD TYPES:

- Flat Shield:** A1X Flat, 7" x 6"; A1L Flat, 7" x 6" w/LED; A2X Flat, 9" x 8"; A2L Flat, 9" x 8" w/ LED; A3X Flat, 14" x 12"; A3L Flat, 14" x 12" w/LED; A4X Flat, 16" x 14"; A4L Flat, 16" x 14" w/LED
- 2 Sided Shield:** B1X 2 Sided, 14" x 12" x 12"; B1L 2 Sided, 14" x 12" x 12" w/LED; B2X 2 Sided, 16" x 14" x 12"; B2L 2 Sided, 16" x 14" x 12" w/LED; B3X 2 Sided, 6" x 6" x 6"; B3L 2 Sided, 6" x 6" x 6" w/LED
- 3 Sided Shield:** C1X 3 Sided, 8" x 6" x 2"; C1L 3 Sided, 8" x 6" x 2" w/LED; C2X 3 Sided, 24" x 9" x 6.5"; C2L 3 Sided, 24" x 9" x 6.5" w/LED; C3X 3 Sided, 28" x 12" x 8"; C3L 3 Sided, 28" x 12" x 8" w/LED; C4X 3 Sided, 16" x 8" x 5"; C4L 3 Sided, 16" x 8" x 5" w/LED
- Octagonal Shield:** D1X Octagonal, 6" x 8"; D1L Octagonal, 6" x 8" w/LED; D2X Octagonal, 9" x 8"; D2L Octagonal, 9" x 8" w/LED; D3X Octagonal, 12" x 8"; D3L Octagonal, 12" x 8" w/LED; D4X Octagonal, 16" x 8"; D4L Octagonal, 16" x 8" w/LED; D5X Octagonal, 20" x 10"; D5L Octagonal, 20" x 10" w/LED; D6X Octagonal, 24" x 10"; D6L Octagonal, 24" x 10" w/LED; D7X Octagonal, 28" x 10"; D7L Octagonal, 28" x 10" w/LED
- Curved Shield:** E1X Curved, 12" x 8"; E1L Curved, 12" x 8" w/LED; E2X Curved, 16" x 8"; E2L Curved, 16" x 8" w/LED; E3X Curved, 20" x 10"; E3L Curved, 20" x 10" w/LED; E4X Curved, 24" x 10"; E4L Curved, 24" x 10" w/LED; E5X Curved, 28" x 10"; E5L Curved, 28" x 10" w/LED
- Dual Flat Shield:** F1X Flat, Dual, 7" x 6"; F1L Flat, Dual, 7" x 6" w/LED; F2X Flat, Dual, 9" x 8"; F2L Flat, Dual, 9" x 8" w/LED; F3X Flat, Dual, 14" x 12"; F3L Flat, Dual, 14" x 12" w/LED; F4X Flat, Dual, 16" x 14"; F4L Flat, Dual, 16" x 14" w/LED
- Octagonal Shield without Handle:** G1X Octagonal w/o Handle, 6" x 8"; G1L Octagonal w/o Handle, 6" x 8" w/LED; G2X Octagonal w/o Handle, 9" x 8"; G2L Octagonal w/o Handle, 9" x 8" w/LED; G3X Octagonal w/o Handle, 12" x 8"; G3L Octagonal w/o Handle, 12" x 8" w/LED; G4X Octagonal w/o Handle, 16" x 8"; G4L Octagonal w/o Handle, 16" x 8" w/LED; G5X Octagonal w/o Handle, 20" x 10"; G5L Octagonal w/o Handle, 20" x 10" w/LED; G6X Octagonal w/o Handle, 24" x 10"; G6L Octagonal w/o Handle, 24" x 10" w/LED; G7X Octagonal w/o Handle, 28" x 10"; G7L Octagonal w/o Handle, 28" x 10" w/LED

ARM TYPES:

- Direct Mount:** 000X, 000L
- Single Pivot 2 Arms:** 161X, 161L, 161Y, 161M
- Double Pivot 2 Arms:** 162X, 162L, 201X, 201L, 201Y, 201M, 202X, 202L
- Single Pivot 3 Arms:** 241X, 241L, 241Y, 241M
- Double Pivot 3 Arms:** 242X, 242L, 361X, 361L, 361Y, 361M, 362X, 362L

MOUNT TYPES: L (Left Mount), R (Right Mount), C (Center)

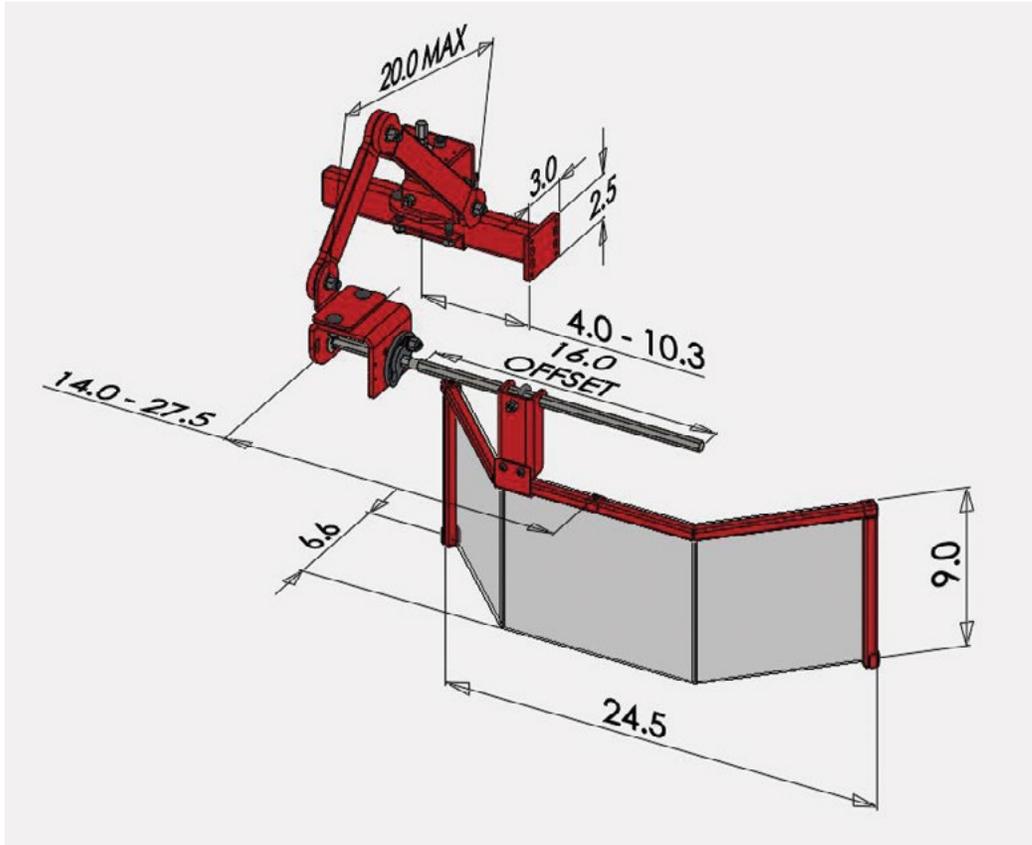
ENCLOSURE TYPES: Interlocked, Non-Interlocked

OFFSET TYPES: Offset

SAFETY SHIELD FOR LARGE MILLS

3-Sided Shield, 24" x 9" x 6.5", Left Mount, Articulating, Double Pivot, 2 Arms, 20" Reach, 16" Offset

Other Sizes Available

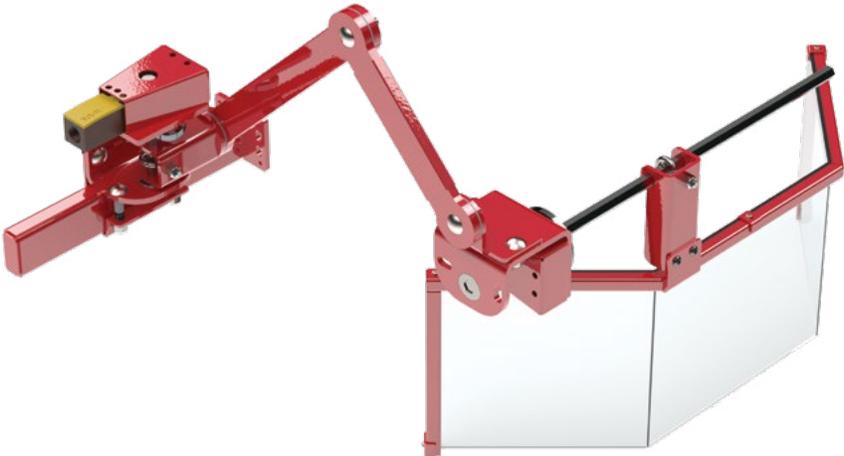


	Basic	LED	Interlock	Interlock + LED	Ultimate
Part Number	RSSC2XL202X160	RSSC2LL202X161	RSSC2XL202L160	RSSC2LL202L162	RSSC2LL202L163
Shield	3 Sided				
Mount	Left	Left	Left	Left	Left
Arm	Articulating, Double Pivot, 2 Arms				
Offset	16"	16"	16"	16"	16"
LED	No	Yes	No	Yes	Yes
Interlock	No	No	Yes	Yes	Yes
Monitoring	No	No	No	No	Yes
Weight	22 lb	27 lb	23 lb	28 lb	29 lb
CAT	CAT 1	CAT 1	CAT 1	CAT 1	CAT 2

SAFETY SHIELD FOR LARGE MILLS



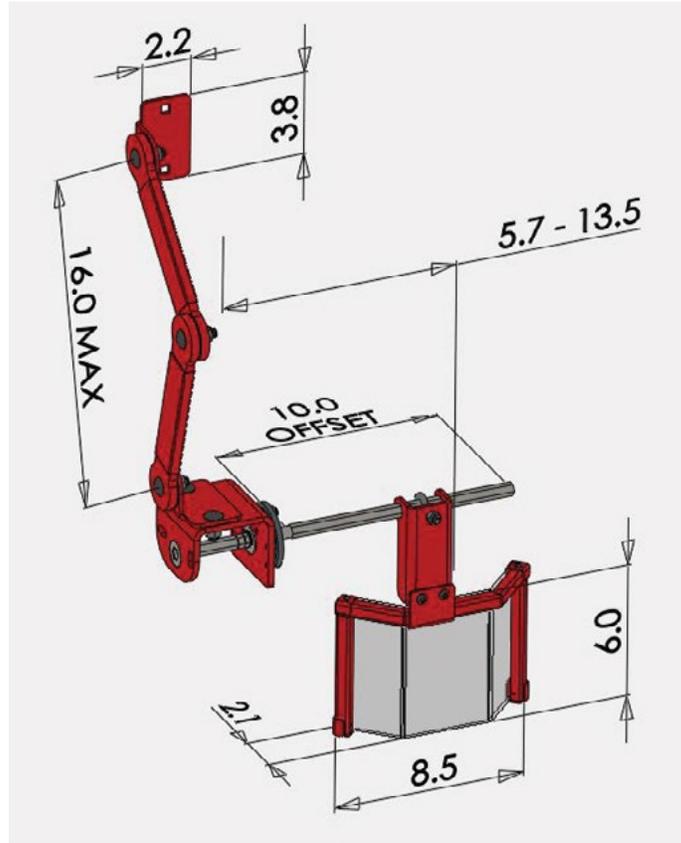
RSSC2XL202X160 | RSSC2LL202X161



RSSC2XL202L160 | RSSC2LL202L162 | RSSC2LL202L163

SAFETY SHIELD FOR SMALL DRILLS

3 Sided Shield, 8" x 6" x 2", Left Mount, Articulating, Single Pivot, 2 Arms, 16" Reach, 10" Offset



	Basic	LED	Interlock	Interlock + LED	Ultimate
Part Number	RSSC1XL161X100	RSSC1LL161X101	RSSC1XL161L100	RSSC1LL161L102	RSSC1LL161L103
Shield	3 Sided 8" x 6" x 2"				
Mount	Left	Left	Left	Left	Left
Arm	Articulating, Single Pivot, 2 Arms, 16" Reach				
Offset	10"	10"	10"	10"	10"
LED	No	Yes	No	Yes	Yes
Interlock	No	No	Yes	Yes	Yes
Monitoring	No	No	No	No	Yes
Weight	11 lb	16 lb	12 lb	17 lb	18 lb
CAT	CAT 1	CAT 1	CAT 1	CAT 1	CAT 2

SAFETY SHIELD FOR SMALL DRILLS



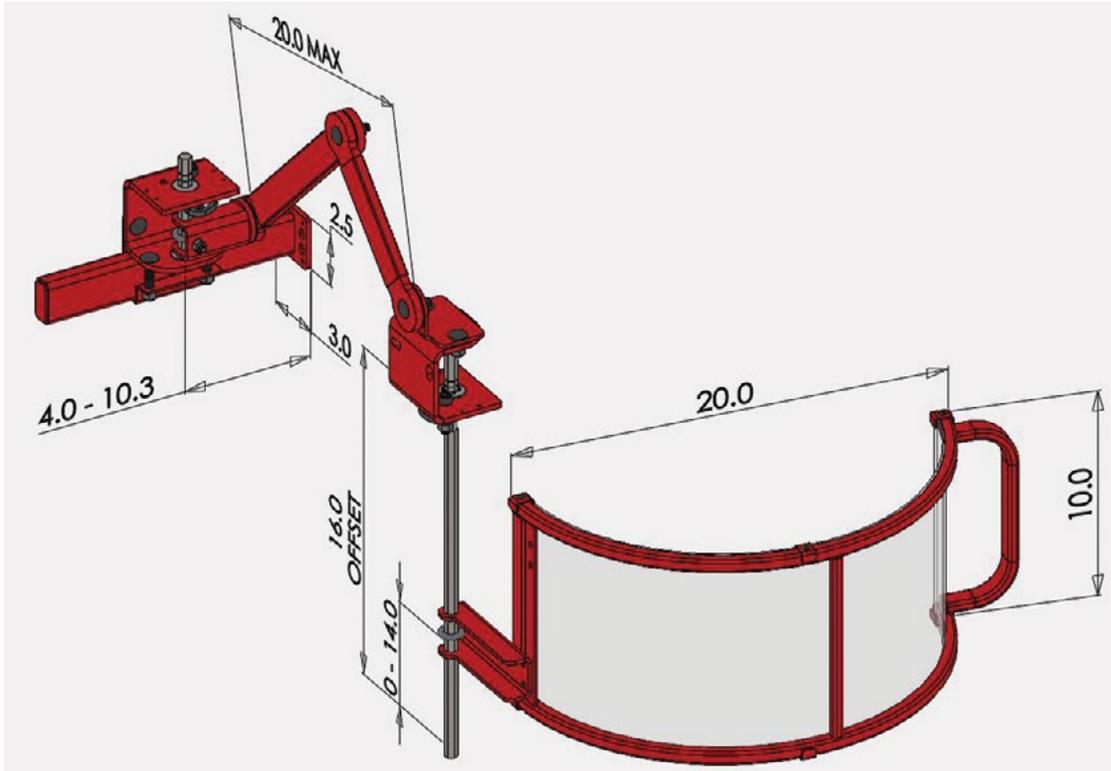
RSC1XL161X100 | RSC1LL161X101



RSC1XL161L100 | RSC1LL161L102 | RSC1LL161L103

SAFETY SHIELD FOR LARGE MILLS AND LATHES

Curved Shield, 20" x 10", Left Mount, Articulating, Double Pivot, 2 Arms, 20" Reach, 16" Offset



	Basic	LED	Interlock	Interlock + LED	Ultimate
Part Number	RSSE3XL202X160	RSSE3LL202X161	RSSE3LL202X161	RSSE3LL202L162	RSSE3LL202L163
Shield	Curved 20" x 10"				
Mount	Left	Left	Left	Left	Left
Arm	Articulating, Double Pivot, 2 Arms, 20" Reach				
Offset	16"	16"	16"	16"	16"
LED	No	Yes	No	Yes	Yes
Interlock	No	No	Yes	Yes	Yes
Monitoring	No	No	No	No	Yes
Weight	23 lb	28 lb	24 lb	29 lb	30 lb
CAT	CAT 1	CAT 1	CAT 1	CAT 1	CAT 2

SAFETY SHIELD FOR LARGE MILLS AND LATHES



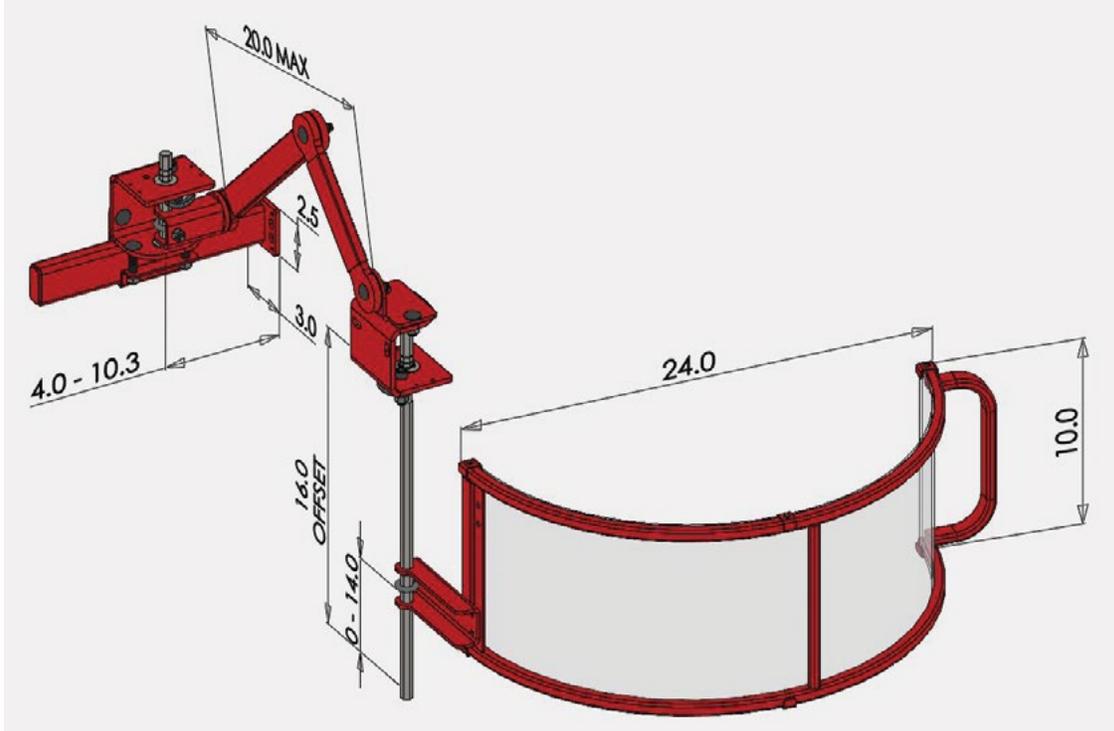
RSSE3XL202X160 | RSSE3LL202X161



RSSE3LL202X161 | RSSE3LL202L162 | RSSE3LL202L163

SAFETY SHIELD FOR EXTRA LARGE MILLS AND LATHES

Curved Shield, 24" x 10", Left Mount, Articulating, Double Pivot, 2 Arms, 20" Reach, 16" Offset



	Basic	LED	Interlock	Interlock + LED	Ultimate
Part Number	RSSE4XL202X160	RSSE4LL202X161	RSSE4XL202L160	RSSE4LL202L162	RSSE4LL202L163
Shield	Curved 24" x 10"				
Mount	Left	Left	Left	Left	Left
Arm	Articulating, Double Pivot, 2 Arms, 20" Reach				
Offset	16"	16"	16"	16"	16"
LED	No	Yes	No	Yes	Yes
Interlock	No	No	Yes	Yes	Yes
Monitoring	No	No	No	No	Yes
Weight	24 lb	29 lb	25 lb	30 lb	31 lb
CAT	CAT 1	CAT 1	CAT 1	CAT 1	CAT 2

SAFETY SHIELD FOR EXTRA LARGE MILLS AND LATHES



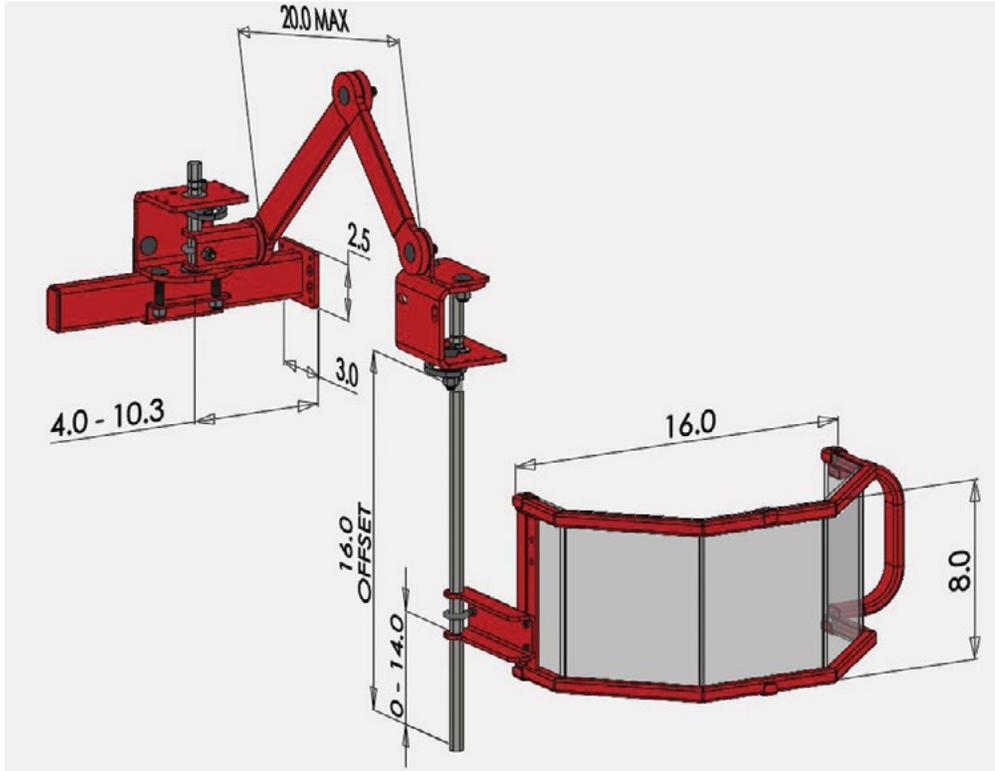
RSSE4XL202X160 | RSSE4LL202X161



RSSE4XL202L160 | RSSE4LL202L162 | RSSE4LL202L163

SAFETY SHIELD FOR MEDIUM TO LARGE MILLS AND LATHES

Octagonal Shield, 16" x 8", Left Mount, Articulating, Double Pivot, 2 Arms, 20" Reach, 16" Offset



	Basic	LED	Interlock	Interlock + LED	Ultimate
Part Number	RSSD4XL202X160	RSSD4LL202X161	RSSD4XL202L160	RSSD4LL202L162	RSSD4LL202L163
Shield	Octagonal 16" x 8"				
Mount	Left	Left	Left	Left	Left
Arm	Articulating, Double Pivot, 2 Arms, 20" Reach				
Offset	16"	16"	16"	16"	16"
LED	No	Yes	No	Yes	Yes
Interlock	No	No	Yes	Yes	Yes
Monitoring	No	No	No	No	Yes
Weight	22 lb	27 lb	23 lb	28 lb	29 lb
CAT	CAT 1	CAT 1	CAT 1	CAT 1	CAT 2

SAFETY SHIELD FOR MEDIUM TO LARGE MILLS AND LATHES



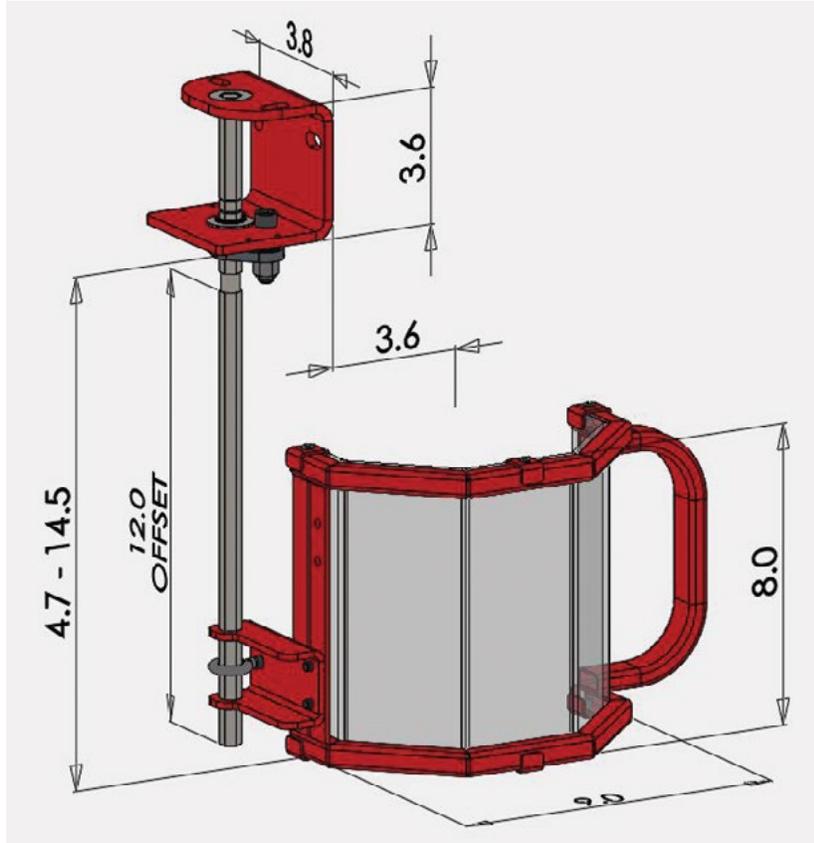
RSSD4XL202X160 | RSSD4LL202X161



RSSD4XL202L160 | RSSD4LL202L162 | RSSD4LL202L163

SAFETY SHIELD FOR SMALL TO MEDIUM MILLS AND DRILLS

Octagonal Shield, 9" x 8", Left Mount, Direct Mount, 12" Offset



	Basic	LED	Interlock	Interlock + LED	Ultimate
Part Number	RSSD2XL000X120	RSSD2LL000X121	RSSD2LL000L120	RSSD2LL000L122	RSSD2LL000L123
Shield	Octagonal 9" x 8"				
Mount	Left	Left	Left	Left	Left
Arm	Direct Mount				
Offset	12"	12"	12"	12"	12"
LED	No	Yes	No	Yes	Yes
Interlock	No	No	Yes	Yes	Yes
Monitoring	No	No	No	No	Yes
Weight	8 lb	13 lb	9 lb	14 lb	15 lb
CAT	CAT 1	CAT 1	CAT 1	CAT 1	CAT 2

SAFETY SHIELD FOR SMALL TO MEDIUM MILLS AND DRILLS



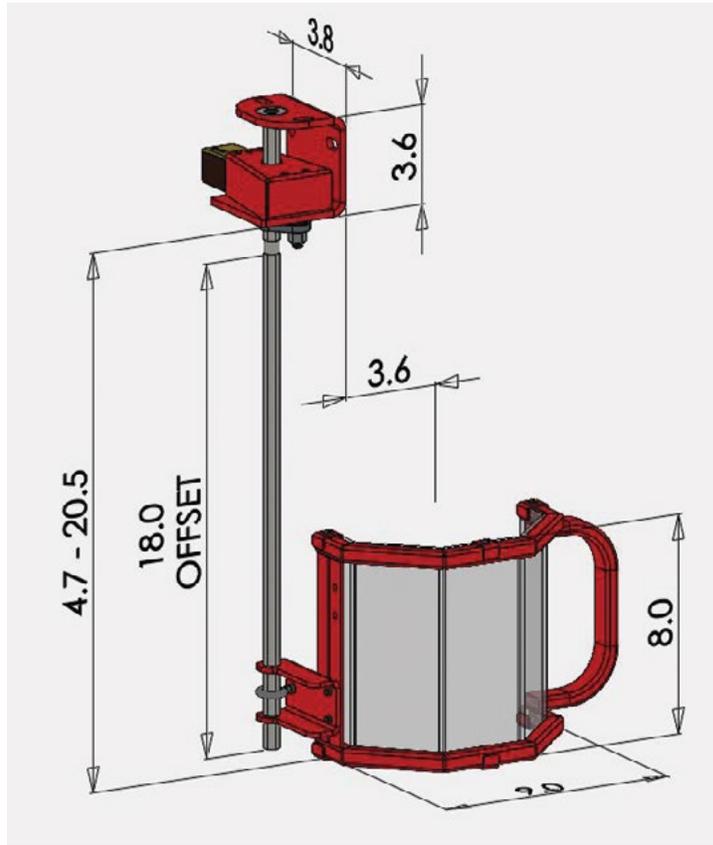
RSSD2XL000X120 | RSSD2LL000X121



RSSD2LL000L120 | RSSD2LL000L122 | RSSD2LL000L123

SAFETY SHIELD FOR SMALL TO MEDIUM MILLS AND DRILLS

Octagonal Shield, 9" x 8", Left Mount, Direct Mount, 18" Offset



	Basic	LED	Interlock	Interlock + LED	Ultimate
Part Number	RSSD2XL000L180	RSSD2LL000X181	RSSD2XL000L180	RSSD2LL000L182	RSSD2LL000L183
Shield	Octagonal 9" x 8"				
Mount	Left	Left	Left	Left	Left
Arm	Direct Mount				
Offset	18"	18"	18"	18"	18"
LED	No	Yes	No	Yes	Yes
Interlock	No	No	Yes	Yes	Yes
Monitoring	No	No	No	No	Yes
Weight	9 lb	14 lb	10 lb	15 lb	16 lb
CAT	CAT 1	CAT 1	CAT 1	CAT 1	CAT 2

SAFETY SHIELD FOR SMALL TO MEDIUM MILLS AND DRILLS



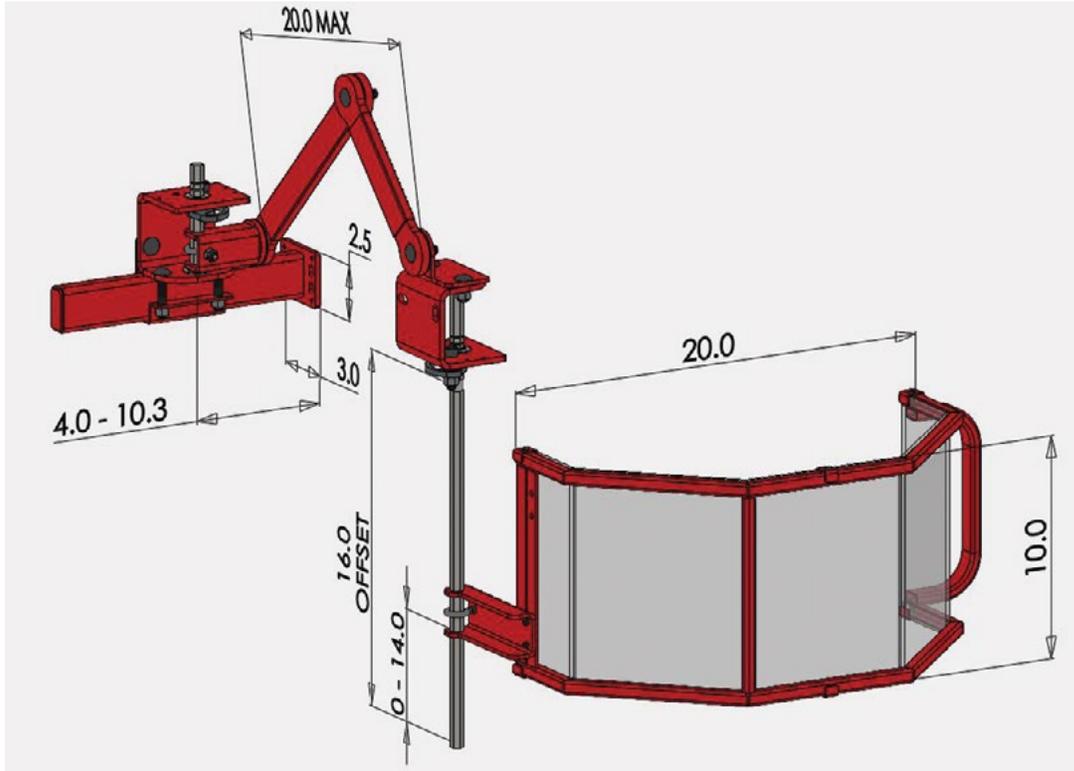
RSSD2XL000L180 | RSSD2LL000X181



RSSD2XL000L180 | RSSD2LL000L182 | RSSD2LL000L183

SAFETY SHIELD FOR LARGE MILLS AND DRILLS

Octagonal Shield, 20" x 10", Left Mount, Articulating, Double Pivot, 2 Arms, 20" Reach, 16" Offset



	Basic	LED	Interlock	Interlock + LED	Ultimate
Part Number	RSSD5XL202X160	RSSD5LL202X161	RSSD5XL202L160	RSSD5LL202L162	RSSD5LL202L163
Shield	Octagonal 20" x 10"				
Mount	Left	Left	Left	Left	Left
Arm	Articulating, Double Pivot, 2 Arms, 20" Reach				
Offset	16"	16"	16"	16"	16"
LED	No	Yes	No	Yes	Yes
Interlock	No	No	Yes	Yes	Yes
Monitoring	No	No	No	No	Yes
Weight	24 lb	29 lb	25 lb	30 lb	31 lb
CAT	CAT 1	CAT 1	CAT 1	CAT 1	CAT 2

SAFETY SHIELD FOR LARGE MILLS AND DRILLS



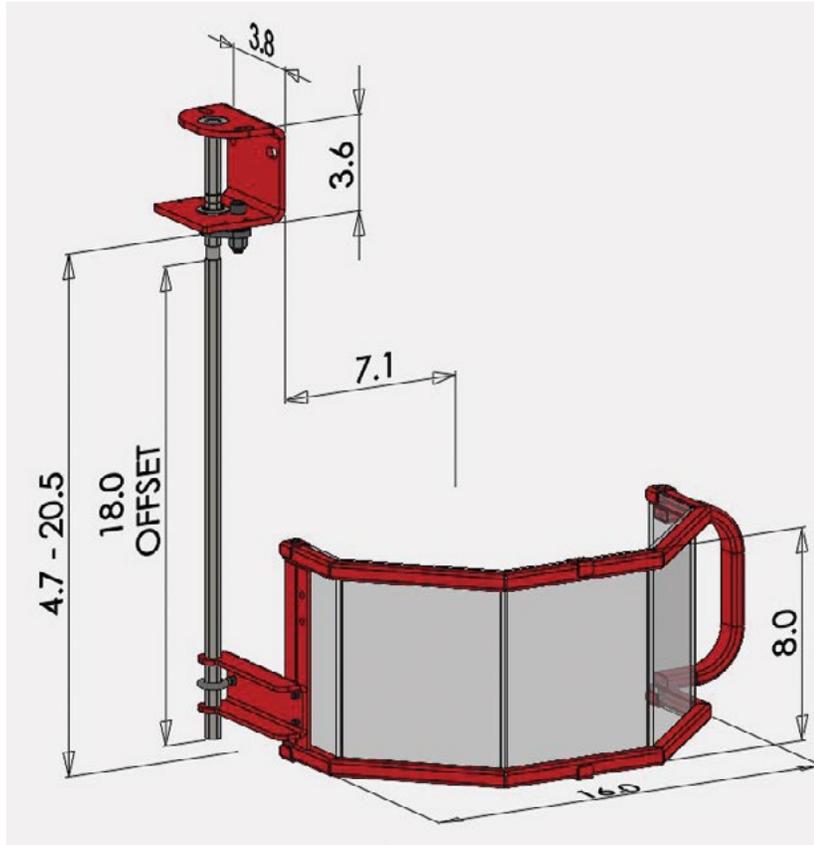
RSSD5XL202X160 | RSSD5LL202X16



RSSD5XL202L160 | RSSD5LL202L162 | RSSD5LL202L163

SAFETY SHIELD FOR MEDIUM TO LARGE MILLS

Octagonal Shield, 16" x 8", Left Mount, Direct Mount, 18" Offset



	Basic	LED	Interlock	Interlock + LED	Ultimate
Part Number	RSSD4XL000X180	RSSD4LL000X181	RSSD4XL000L180	RSSD4LL000L182	RSSD4LL000L183
Shield	Octagonal 16" x 18"				
Mount	Left	Left	Left	Left	Left
Arm	Direct Mount				
Offset	18"	18"	18"	18"	18"
LED	No	Yes	No	Yes	Yes
Interlock	No	No	Yes	Yes	Yes
Monitoring	No	No	No	No	Yes
Weight	10 lb	15 lb	11 lb	16 lb	17 lb
CAT	CAT 1	CAT 1	CAT 1	CAT 1	CAT 2

SAFETY SHIELD FOR MEDIUM TO LARGE MILLS



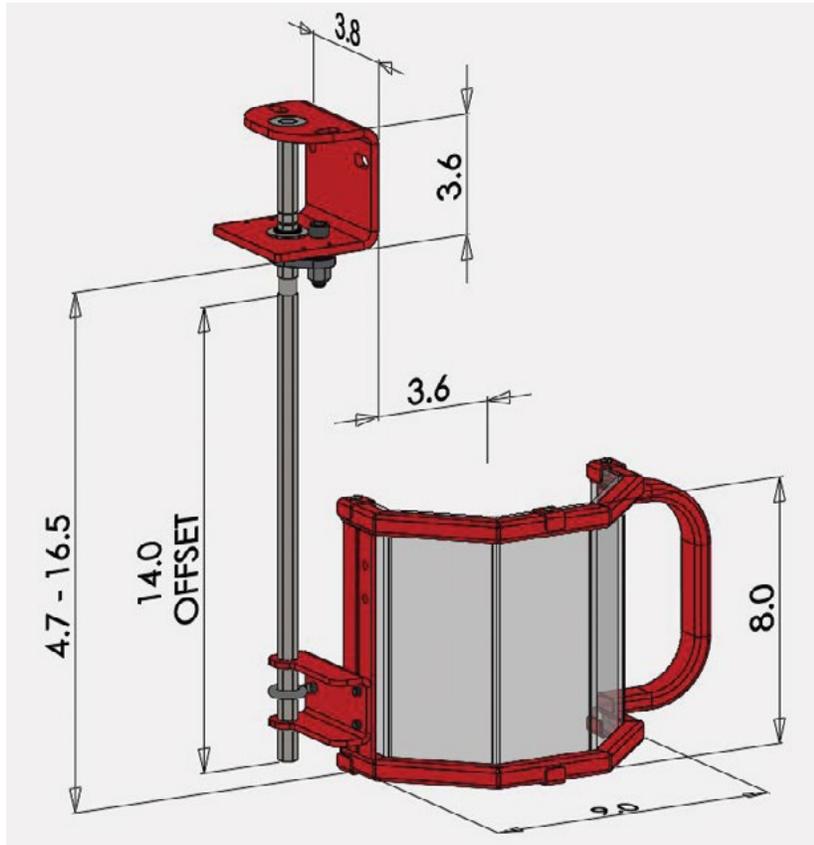
RSSD4XL000X180 | RSSD4LL000X181



RSSD4XL000L180 | RSSD4LL000L182 | RSSD4LL000L183

SAFETY SHIELD FOR SMALL TO MEDIUM DRILLS

Octagonal Shield, 9" x 8", Left Mount, Direct Mount, 14" Offset



	Basic	LED	Interlock	Interlock + LED	Ultimate
Part Number	RSSD2XL000X140	RSSD2LL000X141	RSSD2XL000L140	RSSD2LL000L142	RSSD2LL000L143
Shield	Octagonal 9" x 8"				
Mount	Left	Left	Left	Left	Left
Arm	Direct Mount				
Offset	14"	14"	14"	14"	14"
LED	No	Yes	No	Yes	Yes
Interlock	No	No	Yes	Yes	Yes
Monitoring	No	No	No	No	Yes
Weight	8 lb	13 lb	9 lb	14 lb	15 lb
CAT	CAT 1	CAT 1	CAT 1	CAT 1	CAT 2

SAFETY SHIELD FOR SMALL TO MEDIUM DRILLS



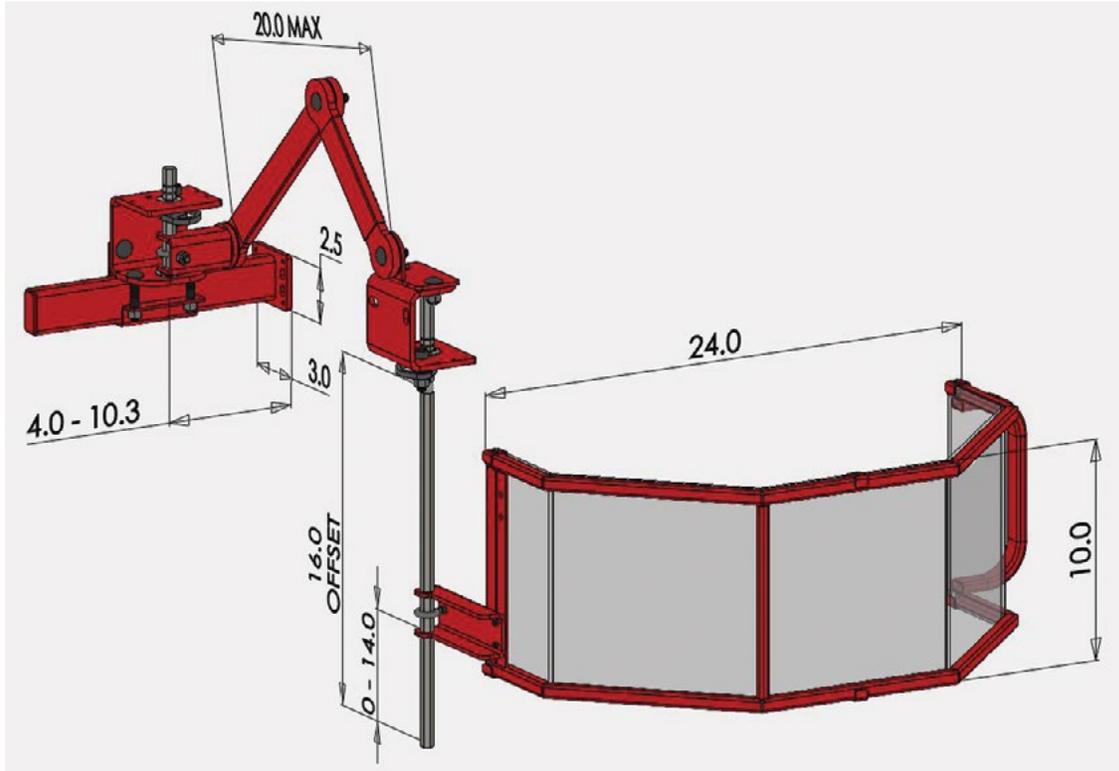
RSSD2XL000X140 | RSSD2LL000X141



RSSD2XL000L140 | RSSD2LL000L142 | RSSD2LL000L143

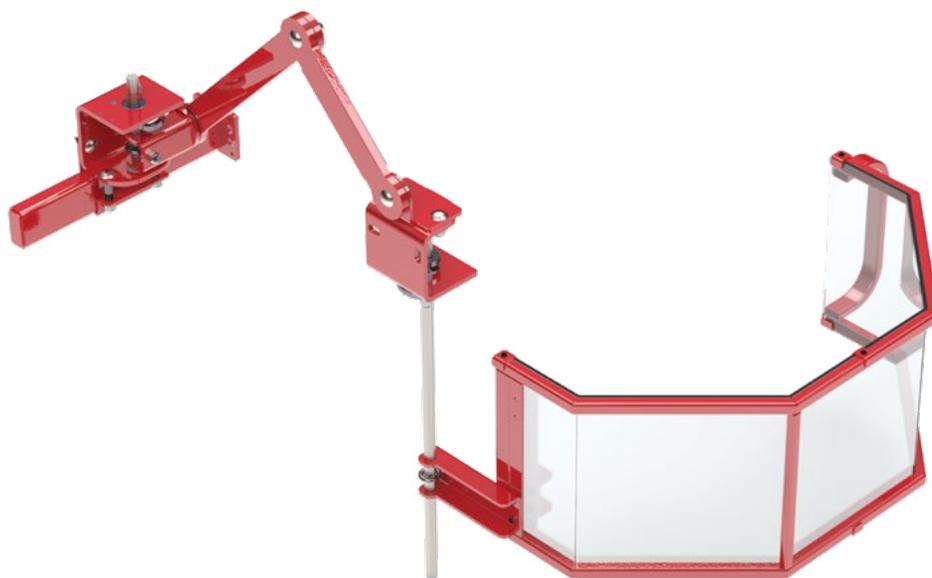
SAFETY SHIELD FOR EXTRA LARGE MILLS AND LATHES

Octagonal Shield, 24" x 10", Left Mount, Articulating, Double Pivot, 2 Arms, 20" Reach, 16" Offset

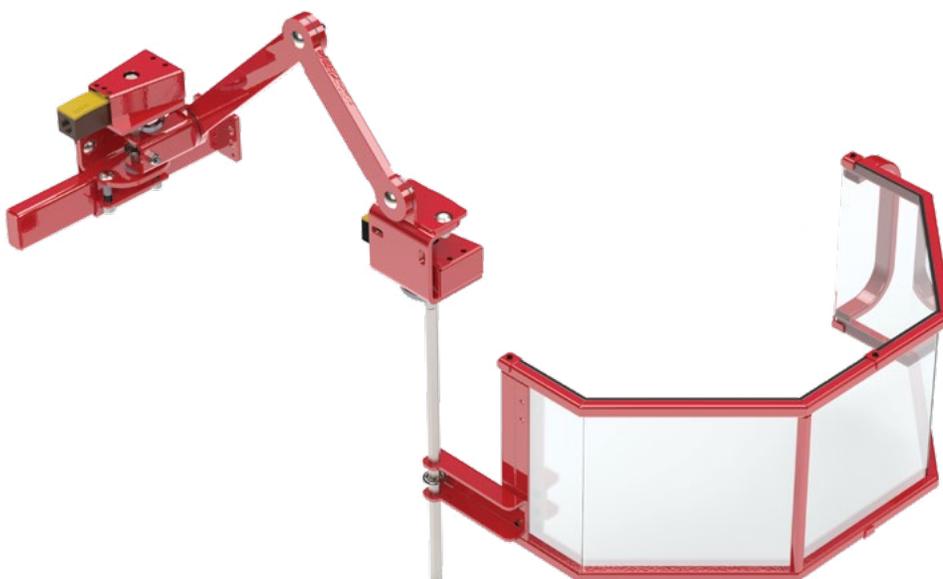


	Basic	LED	Interlock	Interlock + LED	Ultimate
Part Number	RSSD6XL202X160	RSSD6LL202X161	RSSD6XL202L160	RSSD6LL202L162	RSSD6LL202L163
Shield	Octagonal 24" x 10"				
Mount	Left	Left	Left	Left	Left
Arm	Articulating, Double Pivot, 2 Arms, 20" Reach				
Offset	16"	16"	16"	16"	16"
LED	No	Yes	No	Yes	Yes
Interlock	No	No	Yes	Yes	Yes
Monitoring	No	No	No	No	Yes
Weight	26 lb	31 lb	27 lb	32 lb	33 lb
CAT	CAT 1	CAT 1	CAT 1	CAT 1	CAT 2

SAFETY SHIELD FOR EXTRA LARGE MILLS AND LATHES



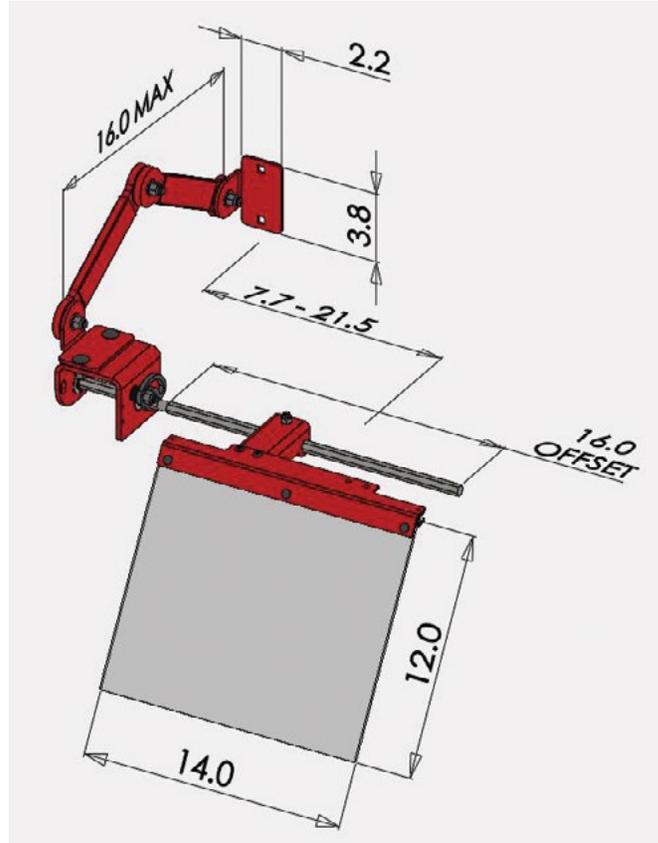
RSSD6XL202X160 | RSSD6LL202X161



RSSD6XL202L160 | RSSD6LL202L162 | RSSD6LL202L163

SAFETY SHIELD FOR MEDIUM GRINDERS AND HORIZONTAL SLIDE MILLS

Flat Shield, 14" x 12", Left Mount, Articulating, Single Pivot, 2 Arms, 16" Reach, 16" Offset



	Basic	LED	Interlock	Interlock + LED	Ultimate
Part Number	RSSA3XL161X160	RSSA3LL161X161	RSSA3XL161L160	RSSA3LL161L162	RSSA3LL161L163
Shield	Flat 14" x 12"				
Mount	Left	Left	Left	Left	Left
Arm	Articulating, Single Pivot, 2 Arms, 16" Reach				
Offset	16"	16"	16"	16"	16"
LED	No	Yes	No	Yes	Yes
Interlock	No	No	Yes	Yes	Yes
Monitoring	No	No	No	No	Yes
Weight	13 lb	18 lb	14 lb	19 lb	20 lb
CAT	CAT 1	CAT 1	CAT 1	CAT 1	CAT 2

SAFETY SHIELD FOR MEDIUM GRINDERS AND HORIZONTAL SLIDE MILLS



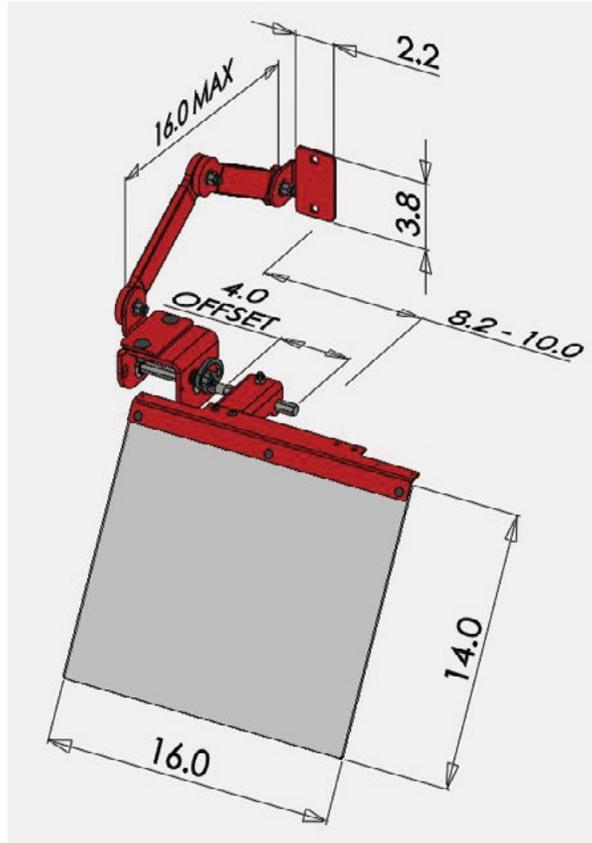
RSSA3XL161X160 | RSSA3LL161X161



RSSA3XL161L160 | RSSA3LL161L162 | RSSA3LL161L163

SAFETY SHIELD FOR MEDIUM TO LARGE GRINDERS AND HORIZONTAL SLIDE MILLS

Shield, 16" x 14", Left Mount, Articulating, Single Pivot, 2 Arms, 16" Reach, 4" Offset

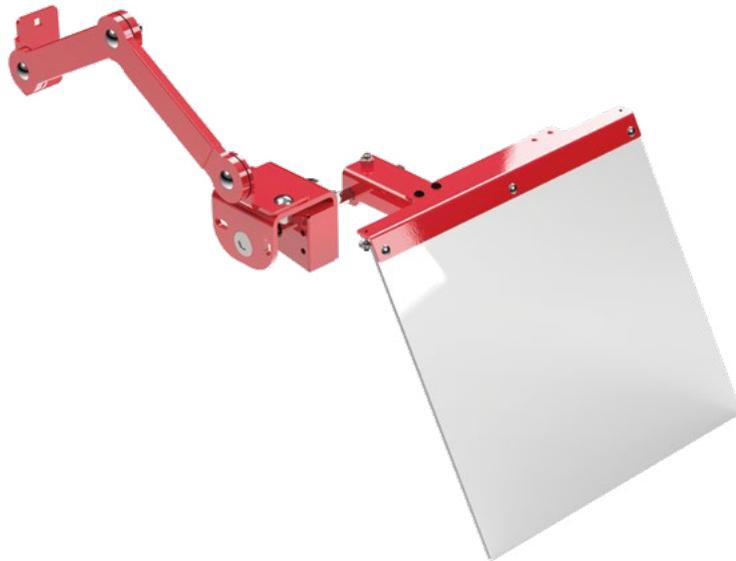


	Basic	LED	Interlock	Interlock + LED	Ultimate
Part Number	RSSA4XL161X040	RSSA4LL161X041	RSSA4XL161L040	RSSA4LL161L042	RSSA4LL161L043
Shield	Flat 16" x 14"				
Mount	Left	Left	Left	Left	Left
Arm	Articulating, Single Pivot, 2 Arms, 16" Reach				
Offset	16"	16"	16"	16"	16"
LED	No	Yes	No	Yes	Yes
Interlock	No	No	Yes	Yes	Yes
Monitoring	No	No	No	No	Yes
Weight	13 lb	18 lb	14 lb	19 lb	20 lb
CAT	CAT 1	CAT 1	CAT 1	CAT 1	CAT 2

SAFETY SHIELD FOR MEDIUM TO LARGE GRINDERS AND HORIZONTAL SLIDE MILLS



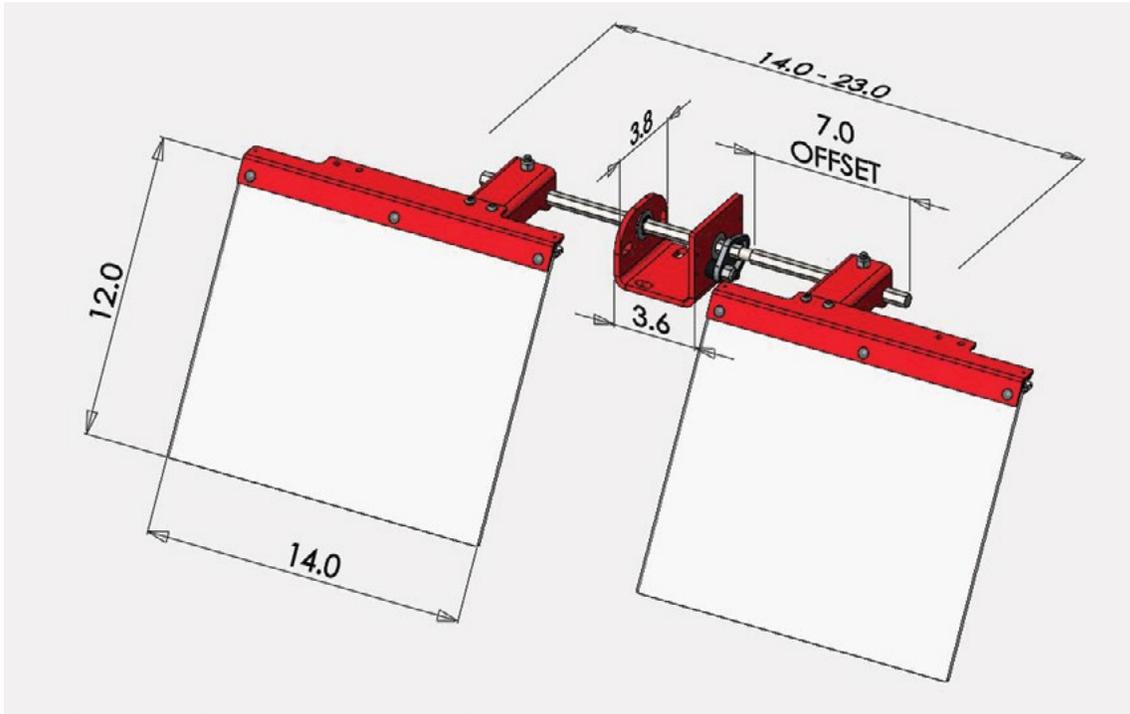
RSSA4XL161X040 | RSSA4LL161X041



RSSA4XL161L040 | RSSA4LL161L042 | RSSA4LL161L043

SAFETY SHIELD FOR MEDIUM GRINDERS

Double Flat Shield, 14" x 7", Center Direct Mount



	Basic	LED	Interlock	Interlock + LED	Ultimate
Part Number	RSSA3XL000XD70	RSSA3LL000XD71	RSSA3XL000LD70	RSSA3LL000LD72	RSSA3LL000LD73
Shield	Double Flat 14" x 7"				
Mount	Center	Center	Center	Center	Center
Arm	Direct Mount				
Offset	7"	7"	7"	7"	7"
LED	No	Yes	No	Yes	Yes
Interlock	No	No	Yes	Yes	Yes
Monitoring	No	No	No	No	Yes
Weight	13 lb	18 lb	14 lb	19 lb	20 lb
CAT	CAT 1	CAT 1	CAT 1	CAT 1	CAT 2

SAFETY SHIELD FOR MEDIUM GRINDERS

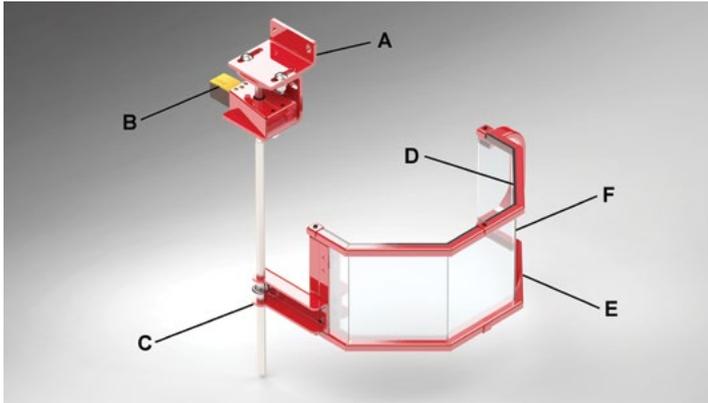


RSSA3XL000XD70 | RSSA3LL000XD71



RSSA3XL000LD70 | RSSA3LL000LD72 | RSSA3LL000LD73

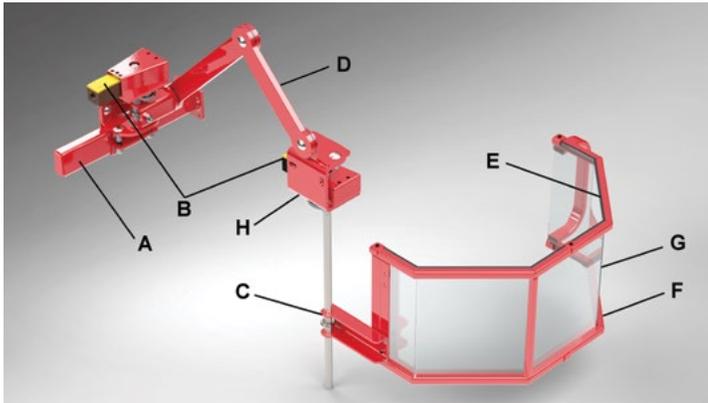
SHIELDS FOR DRILLS



Available in a variety of sizes, shapes and customizable options, Protector Shields for drills protect the operator from direct frontal contact with rotating spindle parts, flying debris and coolants/lubricants.

- A – 1/4" steel mounting/pivot bracket with ball bearings – vertical or horizontal mounting – 120° rotation
- B – Safety-rated microswitch (optional) mounted in tamper-resistant steel enclosures – 1 NO, 1 NC contacts
- C – Adjustable shield-mounting clamp in 7GA steel – allows for radial and axial position adjustment
- D – Available built-in LED lighting – lights your work, indicates available Interlock status
- E – Heavy 14GA steel formed and welded shield frame with durable powder coat finish
- F – 3/16" thick polycarbonate shock-proof & oil-resistant shield

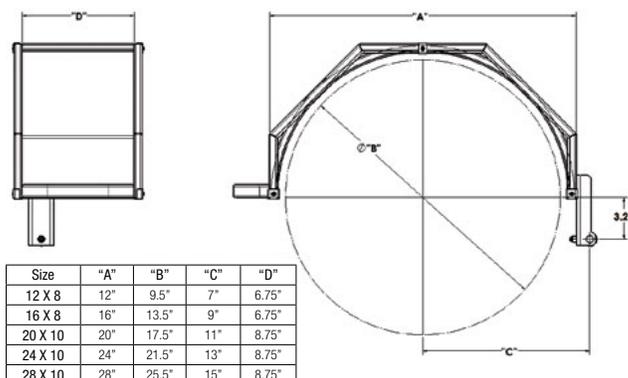
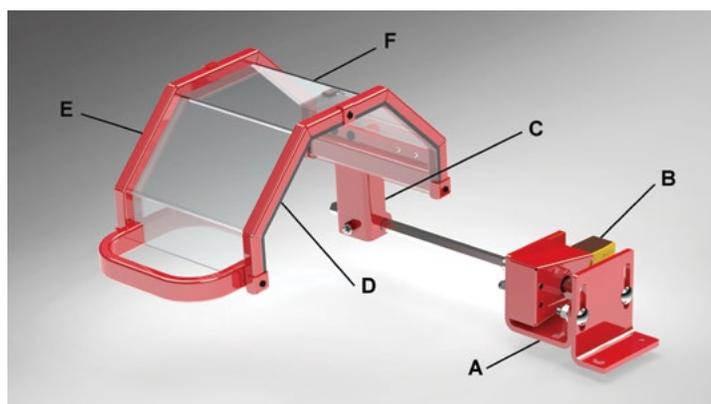
SHIELDS FOR MILLS



Available in a variety of sizes, shapes and customizable options, Protector Shields for mills protect the operator from direct frontal contact with rotating spindle parts, flying debris and coolants/lubricants.

- A – Sturdy, tubular steel mounting post with leveling taps– provides 8" of adjustment
- B – Safety-rated microswitches (optional) mounted in tamper-resistant steel enclosures – 1 NO, 1 NC contacts
- C – Adjustable shield-mounting clamp in 7GA steel – allows for radial and axial position adjustment
- D – Tubular steel Articulating arms with anti-slip discs – 2 & 3 segments available for a reach of 16"-36"
- E – Available built-in LED lighting – lights your work, indicates available Interlock status
- F – Heavy 14GA steel formed and welded shield frame with durable powder coat finish
- G – 3/16" thick polycarbonate shock-proof & oil-resistant shield
- H – 1/4" steel pivot/switch bracket with ball bearings – vertical or horizontal mounting – 120° rotation

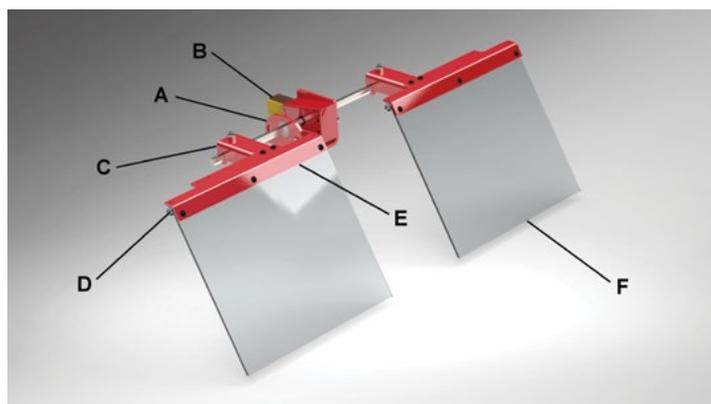
SHIELDS FOR LATHES



Available in a variety of sizes, shapes and customizable options, Protector Shields for lathes prevents the operator from direct contact with rotating chuck and helps in containing the lubricant/collant and working swarfs.

- A – 1/4" steel mounting/pivot bracket with ball bearings – vertical or horizontal mounting – 120° rotation
- B – Safety-rated microswitch (optional) mounted in tamper-resistant steel enclosures – 1 NO, 1 NC contacts
- C – Adjustable shield-mounting clamp in 7GA steel – allows for radial and axial position adjustment
- D – Available built-in LED lighting – lights your work, indicates available Interlock status
- E – Heavy 14GA steel formed and welded shield frame with durable powder coat finish
- F – 3/16" thick polycarbonate shock-proof & oil-resistant shield

SHIELDS FOR GRINDERS



Available in a variety of sizes, shapes and customizable options, Protector Shields for grinders prevents the operator from the projection of sparks and emery.

- A – 1/4" steel mounting/pivot bracket with ball bearings – vertical or horizontal mounting – 120° rotation
- B – Safety-rated microswitch (optional) mounted in tamper-resistant steel enclosures – 1 NO, 1 NC contacts
- C – Adjustable shield-mounting clamps in 7GA steel – allow for radial and axial position adjustment
- D – Available built-in LED lighting – light your work, indicate available Interlock status
- E – Heavy 10GA steel formed top frames with durable powder coat finish
- F – 3/16" thick polycarbonate shock-proof & oil-resistant shields

PROTECTOR™

SERIES SHIELDS

TECHNICAL SPECIFICATIONS

LIGHTED JBOX – RELAY

Ratings	
Assembly NEMA	Type 1, 2, 3R
Assembly Ambient Storage/Transport Range - Min	Minimum: -25 C
Assembly Ambient Storage/Transport Range - Max	Maximum: -55 C
Assembly Ambient Working Range - Min	Minimum: -25 C
Assembly Ambient Working Range - Max	Maximize: 70 C
Enclosure Mounting Type	Molded Mounting Feet
LED Voltage	24VDC
LED Lumens - Red	19 Lm./ft.
LED Lumens - White	262 Lm./ft.
LED Wattage - Red	3.29/ft.
LED Wattage - White	4.67/ft.
LED Chips Count	36/ft.
LED Environment	Outdoor / Wet Location / IP65
Power Supply Output Power	60W
Power Supply Output Voltage	24VDC
Power Supply Output Current	2.5A
Power Supply Input Voltage	85 - 305V
	Universal Input 110/230vac
Safety Output Voltage / Amperage	30-250 vac/VDC @ 6A

REGULATIONS & CERTIFICATIONS	
CCC084 - TERMINAL	CSA, UL94 - V0, IEC 60947-7-1
CCC086 - GROUND TERMINAL	CSA, UL94 - V0, IEC 60947-7-2
CCY055 - DIN RAIL	acc. to EN 60715, IEC / EN
CCY117 - END STOP	UL 94 - V2
CCY118 - END PLATE	UL 94 - V0
FYS028 - CORD GRIP	UL/CSA
KCM047 - ENCLOSURE	UL 50/50E, CSA 94.1/94.2, CSA C22.2 No.85, CSA C22.2 No.40, UL 94V-0, UL 746C
RYL152 - POWER SUPPLY	EN 60335, IT AV EN/UL/IEC 62368-1
RFC157FP - SAFETY RELAY	EN50205 EN61810-1; TUV SUD; UL/c-UL File No. E55996; UL508 CSA C22.2 No.14
LEDRXXXX - LED STRIP	UL Listed 2108

PROTECTOR™

SERIES SHIELDS

TECHNICAL SPECIFICATIONS

LIGHTED JBOX – TOGGLED

Ratings	
Assembly NEMA	Type 1, 2, 3R
Assembly Ambient Storage/Transport Range - Min	Minimum: -25 C
Assembly Ambient Storage/Transport Range - Max	Maximum: -55 C
Assembly Ambient Working Range - Min	Minimum: -25 C
Assembly Ambient Working Range - Max	Maximize: 70 C
Enclosure Mounting Type	Molded Mounting Feet
LED Voltage	24VDC
LED Lumens - Red	19 Lm./ft.
LED Lumens - White	262 Lm./ft.
LED Wattage - Red	3.29/ft.
LED Wattage - White	4.67/ft.
LED Chips Count	36/ft.
LED Environment	Outdoor / Wet Location / IP65
Power Supply Output Power	60W
Power Supply Output Voltage	24VDC
Power Supply Output Current	2.5A
Power Supply Input Voltage	85 - 305V
	Universal Input 110/230vac

REGULATIONS & CERTIFICATIONS	
CCC084 - TERMINAL	CSA, UL94 - V0, IEC 60947-7-1
CCC086 - GROUND TERMINAL	CSA, UL94 - V0, IEC 60947-7-2
CCY055 - DIN RAIL	acc. to EN 60715, IEC / EN
CCY117 - END STOP	UL 94 - V2
CCY118 - END PLATE	UL 94 - V0
FYS028 - CORD GRIP	UL/CSA
KCM047 - ENCLOSURE	UL 50/50E, CSA 94.1/94.2, CSA C22.2 No.85, CSA C22.2 No.40, UL 94V-0, UL 746C
RYL152 - POWER SUPPLY	EN 60335, IT AV EN/UL/IEC 62368-1
TSSPST - TOGGLE SWITCH	IEC/EN 60947-5-1/IEC/EN 60947-5-1; UL 508; CAN/CSA-C22.2 No. 14-18 and No. 94.2-15; EC marking
LEDRWXXX - LED STRIP	UL Listed 2108

PROTECTOR™

SERIES SHIELDS

TECHNICAL SPECIFICATIONS

LIGHTED JBOX – MONITORED

Ratings	
Assembly NEMA	Type 1, 2, 3R
Assembly Ambient Storage/Transport Range - Min	Minimum: -25 C
Assembly Ambient Storage/Transport Range - Max	Maximum: 55 C
Assembly Ambient Working Range - Min	Minimum: -25 C
Assembly Ambient Working Range - Max	Maximize: 70 C
Enclosure Mounting Type	Molded Mounting Feet
LED Voltage	24VDC
LED Lumens - Red	19 Lm./ft.
LED Lumens - White	262 Lm./ft.
LED Wattage - Red	3.29/ft.
LED Wattage - White	4.67/ft.
LED Chips Count	36/ft.
LED Environment	Outdoor / Wet Location / IP65
Power Supply Output Power	60W
Power Supply Output Voltage	24VDC
Power Supply Output Current	2.5A
Power Supply Input Voltage	85 - 305V
	Universal Input 110/230vac
Safety Output Voltage / Amperage	17-250 vac/VDC @ 8A

REGULATIONS & CERTIFICATIONS	
CCC084 - TERMINAL	CSA, UL94 - V0, IEC 60947-7-1
CCC086 - GROUND TERMINAL	CSA, UL94 - V0, IEC 60947-7-2
CCY055 - DIN RAIL	acc. to EN 60715, IEC / EN
CCY117 - END STOP	UL 94 - V2
CCY118 - END PLATE	UL 94 - V0
FYS028 - CORD GRIP	UL/CSA
KCM047 - ENCLOSURE	UL 50/50E, CSA 94.1/94.2, CSA C22.2 No.85, CSA C22.2 No.40, UL 94V-0, UL 746C
RYL152 - POWER SUPPLY	EN 60335, IT AV EN/UL/IEC 62368-1
RFT159 - MONITORING RELAY	EN/IEC 60947-5-1, EN/IEC 60204-1, EN/ISO 13850, EN 1088/ISO 14119, UL, BG, CSA
LEDRXXXX - LED STRIP	UL Listed 2108

TERMS AND CONDITIONS OF SALE PRICES

A. Prices specified include no federal, state, local, use, occupational, foreign, or other tax. Taxes, if applicable, will be added to the invoice. Unless otherwise stated, all prices are in U.S. dollars.

B. The prices include our regular packaging only. Any special packaging requested by the customer, including special protection for export shipment, will be at the customer's expense, and the cost of such special packaging shall be in addition to the prices quoted.

PAYMENT TERMS: Net in 30 days for equipment and net in 10 days for installation, service, and machine safeguarding assessments (with approved credit). Machine safeguarding seminar fees are due at the time of service. A 1½% monthly service charge (18% a year) will be added to past-due accounts.

CREDIT POLICY: Customers with established credit may purchase for immediate processing of orders. Customers not previously established with us or suitably rated by D&B must apply for open-account status. Orders received without suitable credit information must be prepaid in full before shipment. MasterCard, Visa, and American Express credit cards are accepted.

MINIMUM ORDER: Our minimum order is \$25.00. Orders received for less than \$25.00 will be subject to a service charge to bring the total to \$25.00.

CANCELLATION FEE: Orders that are canceled prior to shipment may be subject to a cancellation fee if the products are nonstock, custom, special, or built to order.

SHIPPING AND HANDLING: Parcels are normally shipped prepaid via our carrier of choice with the charges added to the invoice, but they can also be sent collect or via consignee billing against the customer's account. Truck shipments are normally shipped collect, but they can also be shipped prepaid with the charges added to the invoice via our carrier of choice. A handling charge will be added to all invoices except for customer-pickup orders.

INSURANCE: All shipments are insured for the standard amount provided by the carrier. Additional insurance may be purchased at the customer's expense.

RISK OF LOSS: Unless otherwise agreed upon, all equipment will be shipped FOB shipping point. Title and risk of loss will pass to the customer upon delivery to the carrier at the point of shipment. Transportation will be at the customer's risk and expense, and any claim for loss or damage in transit must be made directly against the carrier.

RETURNED MERCHANDISE: Returned merchandise must be authorized by Rockford Systems in advance, at which time an RMA (return materials authorization) number will be issued. No returned merchandise will be accepted unless accompanied by an RMA number and this RMA number plainly identified on the outside of the shipping container. Material returned without this RMA number will be refused by our receiving department. All returned shipments must be prepaid. The minimum restocking charge will be 25% for any material not found to be defective. Such merchandise must be in original condition and unused in order to qualify for credit. Custom, special, or built-to-order items may not qualify for any credit; however, they may be returned for modification, if needed, which may be at an additional cost. No returns for credit will be considered more than 30 days from the date of shipment.

LIMITED WARRANTY: Rockford Systems, LLC, warrants that this product will be free from defects in material and workmanship for a period of 12 months from the date of shipment thereof.

PROTECTOR™ SERIES SHIELDS

ROCKFORD SYSTEMS LLC'S OBLIGATION UNDER THIS WARRANTY IS EXPRESSLY AND EXCLUSIVELY LIMITED to, at the sole discretion of Rockford Systems, LLC, providing a refund or credit for the amount paid for such Product or repairing or replacing such products, in each case solely for Products which are returned to it with-in the warranty period with shipping charges prepaid and which are found by Rockford Systems, LLC to be defective upon examination. This warranty will not apply to products damaged in natural disasters, including, but not limited to, earthquakes, fires and floods, or any product which will have been subject to misuse, negligence, accident, restriction, or use not in accordance with Rockford Systems, LLC's instructions or which will have been altered or repaired by persons other than the authorized agent or employees of Rockford Systems, LLC. Rockford Systems, LLC's warranties as to any component part is expressly limited to that of the manufacturer of the component part. This warranty only extends to the original Customer and can-not be transferred or assigned.

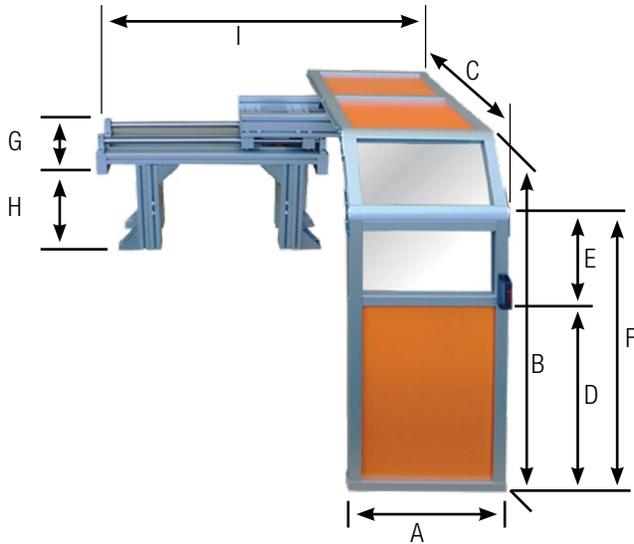
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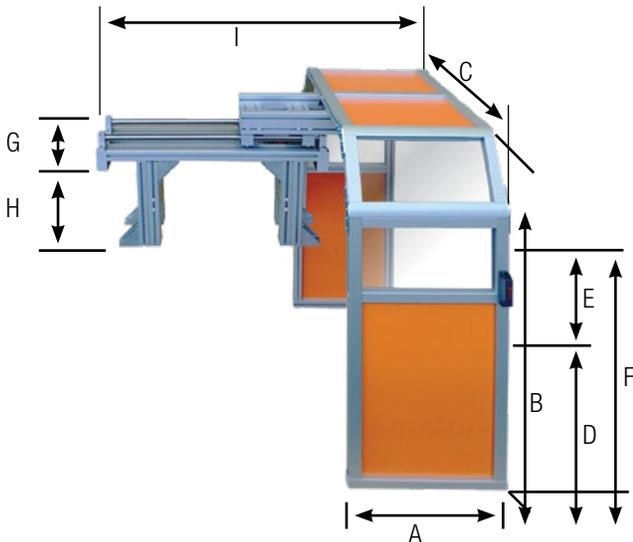
Convention on Contracts for the International Sale of Goods. Any provision which is prohibited or unenforceable in any jurisdiction shall, as to such jurisdiction, be ineffective to the extent of such prohibition or unenforceability of such provision in any other jurisdiction.

ELECTRICALLY INTERLOCKED LATHE CHUCK SHIELDS



Ordering Information

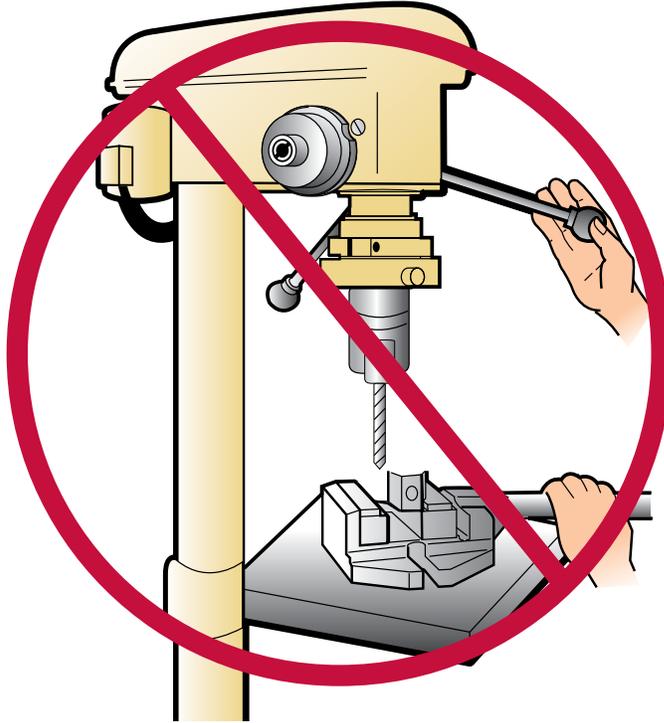
PART NO.	A	B	C	D	E	F	G	H	I
PTO 21/080	21.65" (550 mm)	39.37" (1,000 mm)	39.37" (1,000 mm)	20.39" (518 mm)	11.10" (282 mm)	31.49" (800 mm)	11.81" (300 mm)	15.35"-23.22" (390-590 mm)	36.61"-58.66" (930-1,490 mm)
PTO 21/120	21.65" (550 mm)	59.05" (1,500 mm)	55.11" (1,400 mm)	36.14" (918 mm)	11.10" (282 mm)	47.24" (1,200 mm)	11.81" (300 mm)	15.35"-23.22" (390-590 mm)	36.61"-58.66" (930-1,490 mm)



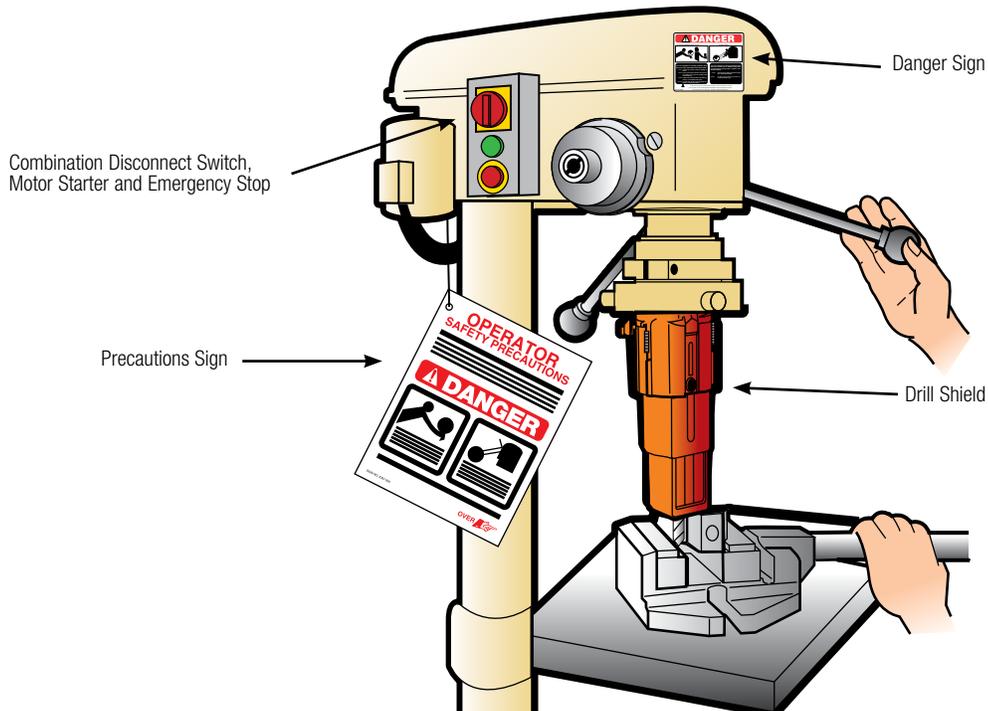
Ordering Information

PART NO.	A	B	C	D	E	F	G	H	I
PTO 22/080	21.65" (550 mm)	39.37" (1,000 mm)	39.37" (1,000 mm)	20.39" (518 mm)	11.10" (282 mm)	31.49" (800 mm)	11.81" (300 mm)	15.35"-23.22" (390-590 mm)	36.61"-58.66" (930-1,490 mm)
PTO 22/120	21.65" (550 mm)	59.05" (1,500 mm)	55.11" (1,400 mm)	36.14" (918 mm)	11.10" (282 mm)	47.24" (1,200 mm)	11.81" (300 mm)	15.35"-23.22" (390-590 mm)	36.61"-58.66" (930-1,490 mm)

UNGUARDED DRILL PRESS



SAFEGUARDED DRILL PRESS



SAFETY ON DRILL PRESSES



SAFETY CHIP SHIELDS
(PAGE 53)



**HEAVY-DUTY ALUMINUM
DRILL PRESS SHIELDS**
(PAGE 54)



www.rockfordsystems.com/online/safeguarding/drill-press-chuck-keys.cfm

DRILL PRESS CHUCK KEYS
(PAGE 54)



**RIGID-ARM
MAGNETIC-BASE SHIELDS**
(PAGE 78)



**FLEXIBLE SPRING-STEEL
ARM SHIELDS**
(PAGES 82-85)



**UNIVERSAL BALL &
SOCKET SHIELDS**
(PAGES 79-81)



**ON/OFF MAGNETIC-BASE
SHIELDS**
(PAGE 86)



ADJUSTABLE SLIDE SHIELDS
(PAGE 77)



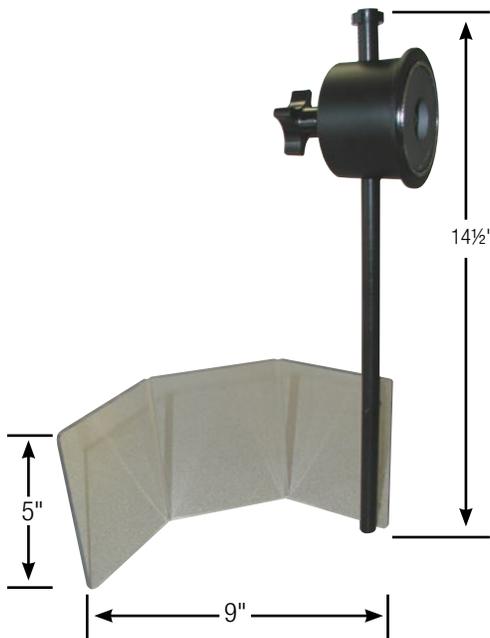
**DISCONNECT SWITCHES, MOTOR
STARTERS & ACCESSORIES**
(PAGES 89)

SAFETY CHIP SHIELDS

These sturdy safety chip shields provide protection from flying chips, coolant, and rotating parts. They are usually applied to small drill presses, milling machines, etc., and can be magnetically or permanently mounted.

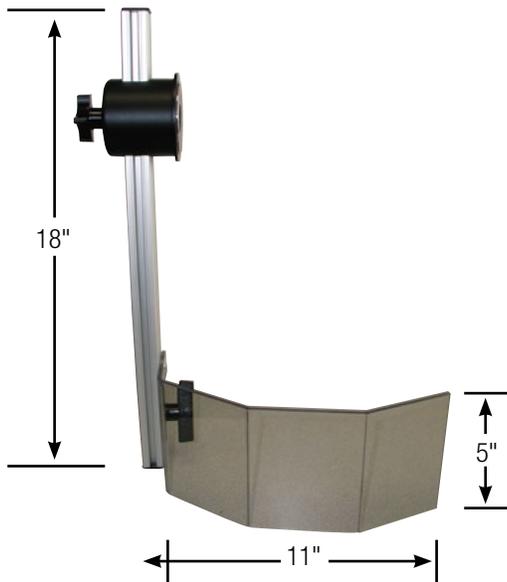
The shield can be attached to any smooth ferrous surface on the machine by an 80-lb pull, 3/4" diameter magnetic base. If a smooth, ferrous surface is not available, a 3/4" x 5/4" mounting plate is also furnished with each shield.

The impact-resistant, 3/16"-thick clear polycarbonate shield provides visibility to the point of operation. It adjusts and locks in any vertical position.



Ordering Information

PART NO.	DESCRIPTION
KYL001	5" x 9" Shield With 1/2" Diameter Black PVC Arm 14 1/2" High
KYM001	5" x 9" Replacement Shield Only



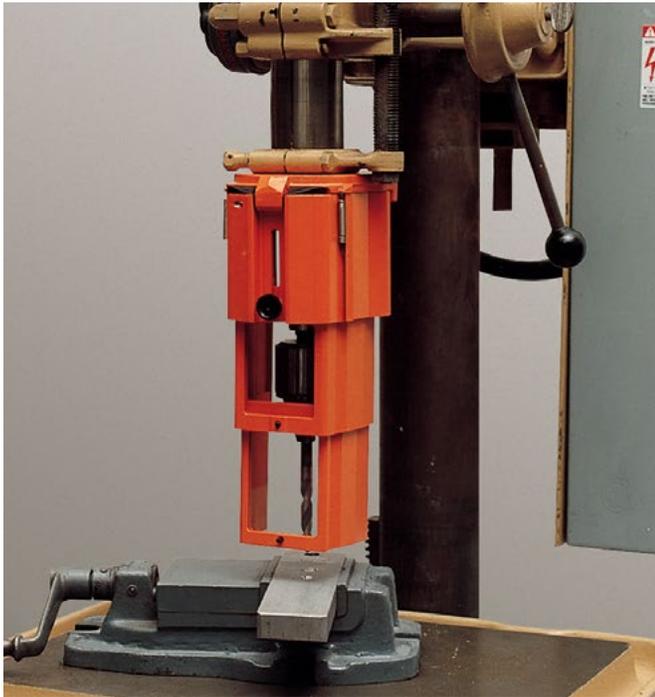
Ordering Information

PART NO.	DESCRIPTION
KYL055	5" x 11" Shield With 1" Square Extruded Aluminum Arm 18" High
KYL044	5" x 11" Replacement Shield Only



3/4" x 5/4" Mounting Plate Furnished With Each Type of Shield For Mounting to a Rough, Nonferrous Surface

HEAVY-DUTY ALUMINUM DRILL PRESS SHIELDS



3-tier shield shown in machining position.

These cast-aluminum drill press shields are furnished with a standard $1\frac{3}{4}$ " bore. The **user can bore this shield to a size up to $3\frac{1}{2}$ "** for attaching to the quill of a machine.

This shield is available in 2-tier or 3-tier models which provides 3" to 6" travel of the drill press.

The top of the holder attaches to the quill of the drill press. The shields are open in the back. The bottom section has a clear panel for visibility.

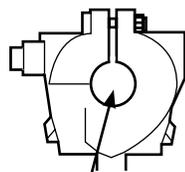
For changing chucks or drill bits, the 2- or 3-tier section can be swung forward and upward out of the way. Also available are shields with a side hinge that swing to the left side.

Ordering Information

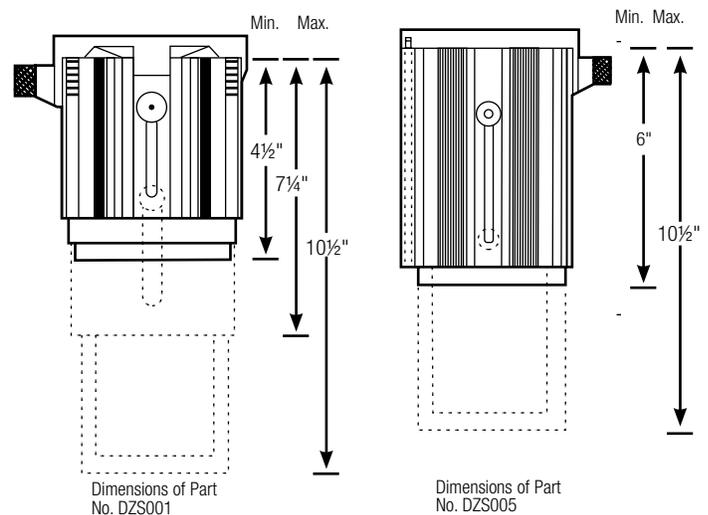
PART NO.	DESCRIPTION
DZS001	3-Tier Front Hinge $4\frac{1}{2}$ " Min; $10\frac{1}{2}$ " Max; 6" Stroke; Max Chuck Diameter $2\frac{1}{2}$ "
DZS003	2-Tier Front Hinge $4\frac{5}{16}$ " Min; 7" Max; $2\frac{1}{16}$ " Stroke; Max Chuck Diameter $2\frac{3}{4}$ "
DZS004	2-Tier Front Hinge 6" Min; $10\frac{1}{2}$ " Max; $4\frac{1}{2}$ " Stroke; Max Chuck Diameter $2\frac{3}{4}$ "
DZS005	2-Tier Side Hinge 6" Min; $10\frac{1}{2}$ " Max; $4\frac{1}{2}$ " Stroke; Max Chuck Diameter $2\frac{3}{4}$ "
DZS006	3-Tier Side Hinge $4\frac{1}{2}$ " Min; $10\frac{1}{2}$ " Max; 6" Stroke; Max Chuck Diameter $2\frac{1}{2}$ "
DZS002	Replacement Polycarbonate Window



Front hinge shield shown open for tool change.



$1\frac{3}{4}$ " diameter;
User to Bore to Size up to $3\frac{1}{2}$ "

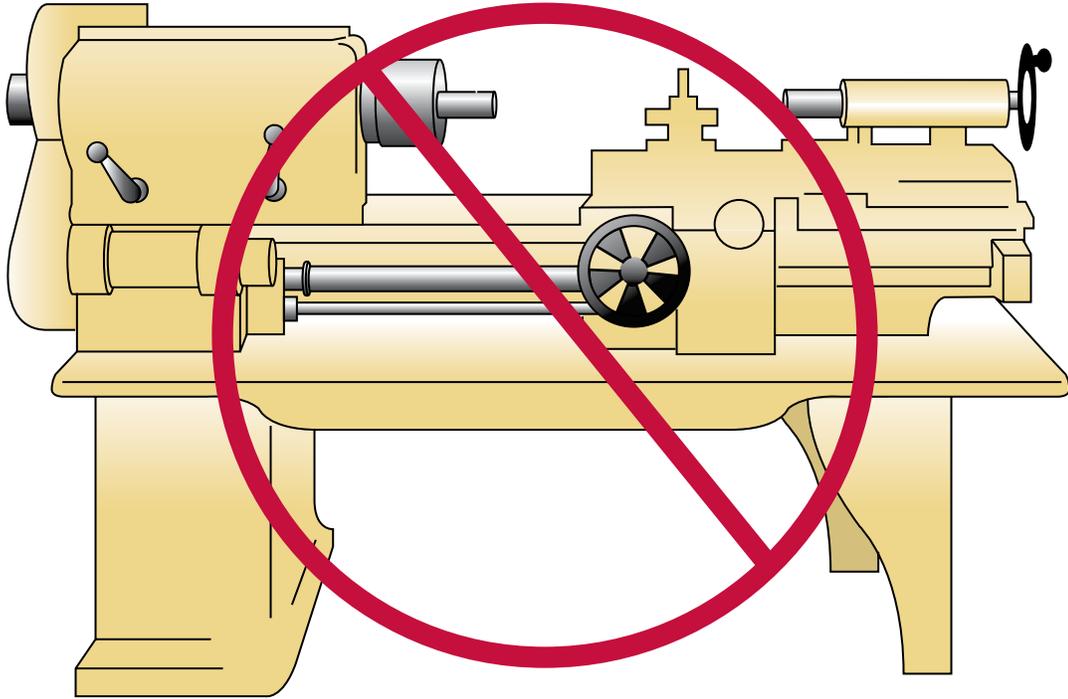


SPRING-LOADED/SELF-EJECTING DRILL PRESS CHUCK KEYS

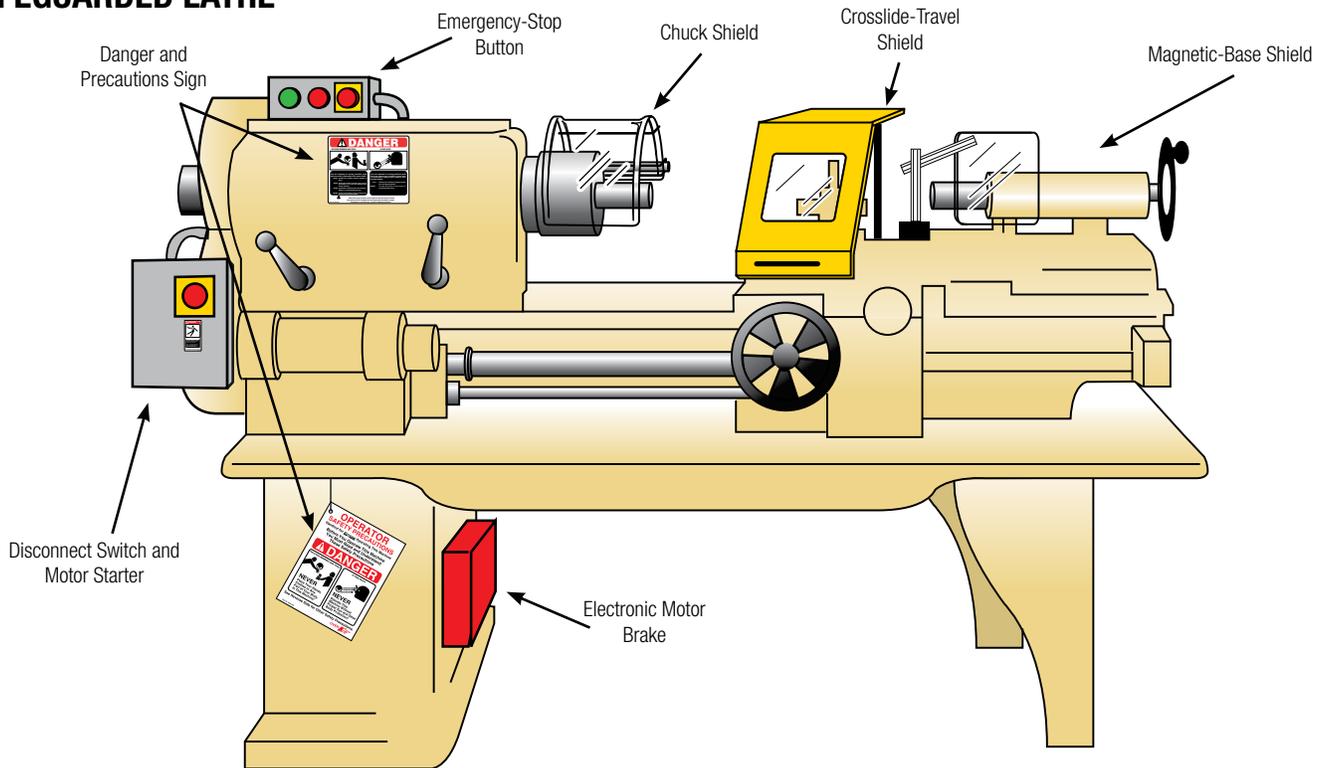


Spring-loaded/self-ejecting drill press chuck keys are available to fit a wide variety of chucks. Visit www.rockfordsystems.com/keys

UNGUARDED LATHE



SAFEGUARDED LATHE



SAFETY ON LATHES



SLIDING LATHE SHIELDS
(PAGE 59)



**CROSSLIDE-TRAVEL
LATHE SHIELDS**
(PAGE 59)



**SMALL STEEL LATHE
CHUCK SHIELDS**
(PAGE 60)



**LARGE STEEL LATHE
CHUCK SHIELDS**
(PAGE 60)



**RIGID-ARM
MAGNETIC-BASE SHIELDS**
(PAGE 78)



**UNIVERSAL BALL &
SOCKET SHIELDS**
(PAGES 79-81)



**FLEXIBLE SPRING-
STEEL ARM SHIELDS**
(PAGES 82-85)



**ON/OFF MAGNETIC-BASE
SHIELDS** (PAGE 86)



LATHE CHUCK WRENCHES
(PAGES 61-62)



**DISCONNECT SWITCHES, MOTOR
STARTERS & ACCESSORIES**
(PAGES 89)

SAFETY SHIELDS FOR LATHES, TRANSPARENT CHUCK

LXS Series Lathe Chuck Shields are **Marked for Discontinuation** until inventory is depleted. Replacement transparent shields will be supported and supplied through January 1, 2024 or until inventory is depleted.

The LXS Series Shield will be replaced with The Protector™ Series Shields.

The Protector™ Series Shields are offered as curved, octagonal, interlocked, and interlocked and lighted forms.

LXS300 — 10" Diameter

**Marked for Discontinuation*



LXS400 — 14" Diameter

**Marked for Discontinuation*



Replacement Options Below

Replacement Options Below

Basic Protector:



RSSD3XR000X120

- » Octagonal, 12" x 8"
- » Right Mount
- » Direct Mount w/o Interlock
- » 12" Offset
- » No Enclosure



RSSE1XR000X120

- » Curved, 12" x 8"
- » Right Mount
- » Direct Mount w/o Interlock
- » 12" Offset
- » No Enclosure



RSSD4XR000X120

- » Octagonal, 16" x 8"
- » Right Mount
- » Direct Mount w/o Interlock
- » 12" Offset
- » No Enclosure



RSSE2XR000X120

- » Curved, 16" x 8"
- » Right Mount
- » Direct Mount w/o Interlock
- » 12" Offset
- » No Enclosure

Interlocked Protector:



RSSD3XR000L120

- » Octagonal, 12" x 8"
- » Right Mount
- » Direct Mount w/Interlock
- » 12" Offset
- » No Enclosure



RSSE1XR000L120

- » Curved, 12" x 8"
- » Right Mount
- » Direct Mount w/Interlock
- » 12" Offset
- » No Enclosure



RSSD4XR000L120

- » Octagonal, 16" x 8"
- » Right Mount
- » Direct Mount w/Interlock
- » 12" Offset
- » No Enclosure



RSSE2XR000L120

- » Curved, 16" x 8"
- » Right Mount
- » Direct Mount w/Interlock
- » 12" Offset
- » No Enclosure

Interlocked + LED Protector:



RSSD3LR000L122

- » Octagonal, 12" x 8" w/LED
- » Right Mount
- » Direct Mount w/Interlock
- » 12" Offset
- » Lighted – Interlocked Enclosure



RSSE1LR000L122

- » Curved, 12" x 8" w/LED
- » Right Mount
- » Direct Mount w/Interlock
- » 12" Offset
- » Lighted – Interlocked Enclosure



RSSD4LR000L122

- » Octagonal, 16" x 8" w/LED
- » Right Mount
- » Direct Mount w/Interlock
- » 12" Offset
- » Lighted – Interlocked Enclosure



RSSE2LR000L122

- » Curved, 16" x 8" w/LED
- » Right Mount
- » Direct Mount w/Interlock
- » 12" Offset
- » Lighted – Interlocked Enclosure

LXS500 — 18" Diameter

**Marked for Discontinuation*



LXS600 — 24" Diameter

**Marked for Discontinuation*



LXS700 — 28" Diameter

**Out of Stock*



Replacement Options Below

Replacement Options Below

Replacement Options Below

Basic Protector:



RSSD5XR000X120

- » Octagonal, 20" x 10"
- » Right Mount
- » Direct Mount w/o Interlock
- » 12" Offset
- » No Enclosure

RSSE3XR000X120

- » Curved, 20" x 10"
- » Right Mount
- » Direct Mount w/o Interlock
- » 12" Offset
- » No Enclosure

RSSD6XR000X120

- » Octagonal, 24" x 10"
- » Right Mount
- » Direct Mount w/o Interlock
- » 12" Offset
- » No Enclosure

RSSE4XR000X120

- » Curved, 24" x 10"
- » Right Mount
- » Direct Mount w/o Interlock
- » 12" Offset
- » No Enclosure

RSSD7XR000X120

- » Octagonal, 28" x 10"
- » Right Mount
- » Direct Mount w/o Interlock
- » 12" Offset
- » No Enclosure

RSSE5XR000X120

- » Curved, 28" x 10"
- » Right Mount
- » Direct Mount w/o Interlock
- » 12" Offset
- » No Enclosure

Interlocked Protector:



RSSD5XR000L120

- » Octagonal, 20" x 10"
- » Right Mount
- » Direct Mount w/Interlock
- » 12" Offset
- » No Enclosure

RSSE3XR000L120

- » Curved, 20" x 10"
- » Right Mount
- » Direct Mount w/Interlock
- » 12" Offset
- » No Enclosure

RSSD6XR000L120

- » Octagonal, 24" x 10"
- » Right Mount
- » Direct Mount w/Interlock
- » 12" Offset
- » No Enclosure

RSSE4XR000L120

- » Curved, 24" x 10"
- » Right Mount
- » Direct Mount w/Interlock
- » 12" Offset
- » No Enclosure

RSSD7XR000L120

- » Octagonal, 28" x 10"
- » Right Mount
- » Direct Mount w/Interlock
- » 12" Offset
- » No Enclosure

RSSE5XR000L120

- » Curved, 28" x 10"
- » Right Mount
- » Direct Mount w/Interlock
- » 12" Offset
- » No Enclosure

Interlocked + LED Protector:



RSSD5LR000L122

- » Octagonal, 20" x 10" w/LED
- » Right Mount
- » Direct Mount w/Interlock
- » 12" Offset
- » Lighted – Interlocked Enclosure

RSSE3LR000L122

- » Curved, 20" x 10" w/LED
- » Right Mount
- » Direct Mount w/Interlock
- » 12" Offset
- » Lighted – Interlocked Enclosure

RSSD6LR000L122

- » Octagonal, 24" x 10" w/LED
- » Right Mount
- » Direct Mount w/Interlock
- » 12" Offset
- » Lighted – Interlocked Enclosure

RSSE4LR000L122

- » Curved, 24" x 10" w/LED
- » Right Mount
- » Direct Mount w/Interlock
- » 12" Offset
- » Lighted – Interlocked Enclosure

RSSD7LR000L122

- » Octagonal, 28" x 10" w/LED
- » Right Mount
- » Direct Mount w/Interlock
- » 12" Offset
- » Lighted – Interlocked Enclosure

RSSE5LR000L122

- » Curved, 28" x 10" w/LED
- » Right Mount
- » Direct Mount w/Interlock
- » 12" Offset
- » Lighted – Interlocked Enclosure

SMALL STEEL LATHE CHUCK SHIELDS

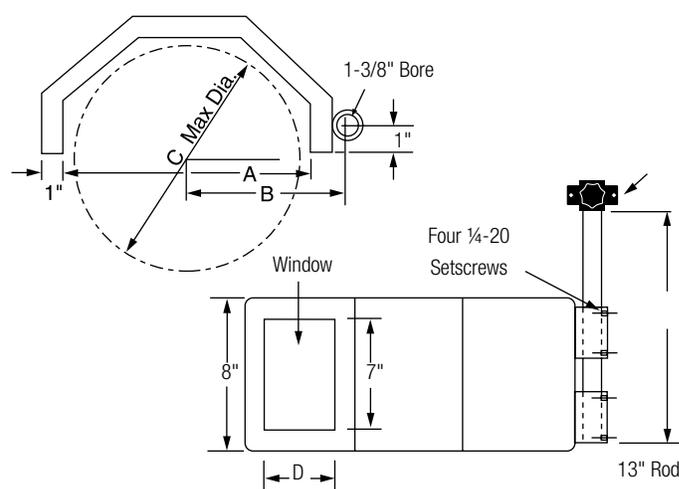


Shield in position. Machine is ready for machining workpiece.

These sturdily constructed steel chuck shields are fabricated of 18-gauge steel with reinforced sides and can be used on smaller lathes that have up to 18½" diameter chucks.

Each shield is furnished with a 1" x 13" mounting rod which can be cut to length if required. This mounting rod is fastened to the headstock of the lathe. The mounting rod is also used to hinge the entire shield. The shield can be lifted and swung up for quick and easy access to the chuck and the part being machined. This shield includes a high-impact-resistant polycarbonate window which permits visibility into the point of operation. Various types of mounting brackets are available and are sold separately.

DIMENSIONS



Ordering Information

PART NO.	A	B	C	D	REPLACEMENT POLYCARBONATE WINDOW
TPS300	12"	7½"	11"	4¾"	TPW003
TPS400	15½"	9¼"	14½"	6¼"	TPW004
TPS500	19¼"	11½"	18¼"	8"	TPW005

LARGE STEEL LATHE CHUCK SHIELDS



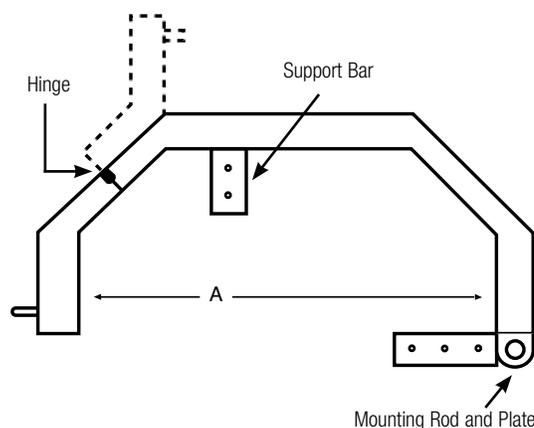
The hinged portion can swing up for workpiece changes.

These fabricated 18-gauge steel chuck shields with reinforced sides can be used on large lathes that have chucks up to 47" in diameter. They are double hinged for access to the chuck, workpiece, and tool. The front hinged portion can be swung up for workpiece changes, and the entire shield can be hinged back for changing chucks.

Each shield is furnished with a mounting rod, plate and support bar for mounting the shield to the face of the headstock. The rear mounting bracket hinges the entire shield, and the side mounting bracket supports the shield in its normal operating position.

Ordering Information

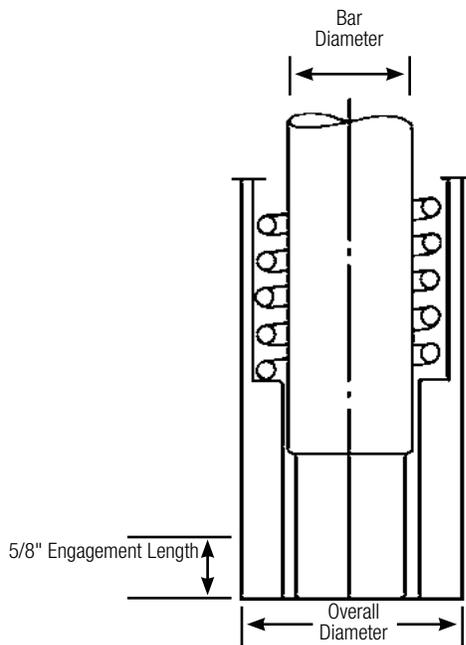
PART NO.	DIMENSION A
TPS600	24"
TPS800	32"
TPS100	40"
TPS120	47½"



STANDARD SIZE LATHE CHUCK WRENCHES

One of the most common accidents on lathes or other machines involves a chuck wrench or key which is thrown from the chuck. This happens when someone forgets to remove the wrench from the chuck before the machine is turned on.

The spring-loaded or self-ejecting chuck wrenches can be used on lathes or other machines equipped with manually adjusted chucks. The spring-loaded sleeve ejects the wrench from the chuck after each use. These wrenches are engineered and designed to provide proper loads for self-removal of the wrench weight.



Adjusting the chuck using a spring-loaded chuck wrench.

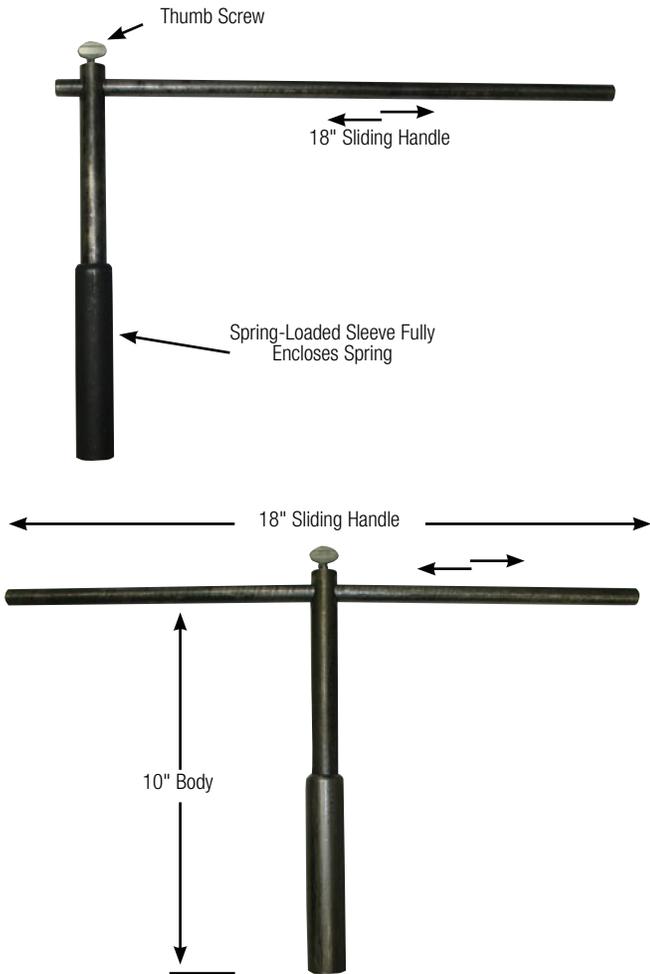
ALL PARTS BLACK OXIDE COATED

Ordering Information

PART NO.	NOMINAL SIZE	ACTUAL SIZE	BAR DIAMETER	OVERALL DIAMETER	HANDLE LENGTH
CWSM0281S	9/32" SQ	.271"	3/4"	1.050"	5 1/2"
CWSM0312S	5/16" SQ	.303"	3/4"	1.050"	5 1/2"
CWSM0375S	3/8" SQ	.365"	3/4"	1.050"	5 1/2"
CWSM0438S	7/16" SQ	.427"	3/4"	1.050"	5 1/2"
CWSM0500S	1/2" SQ	.490"	3/4"	1.050"	5 1/2"
CWSM0563S	9/16" SQ	.552"	15/16"	1.315"	9 1/2"
CWSM0625S	5/8" SQ	.615"	15/16"	1.315"	9 1/2"
CWSM0688S	11/16" SQ	.678"	15/16"	1.315"	9 1/2"
CWSM0750S	3/4" SQ	.740"	15/16"	1.315"	9 1/2"
CWHM0500S	1/2" HEX	.490"	3/4"	1.050"	5 1/2"
CWHM0625S	5/8" HEX	.615"	3/4"	1.050"	9 1/2"
CWHM0750S	3/4" HEX	.740"	15/16"	1.315"	9 1/2"



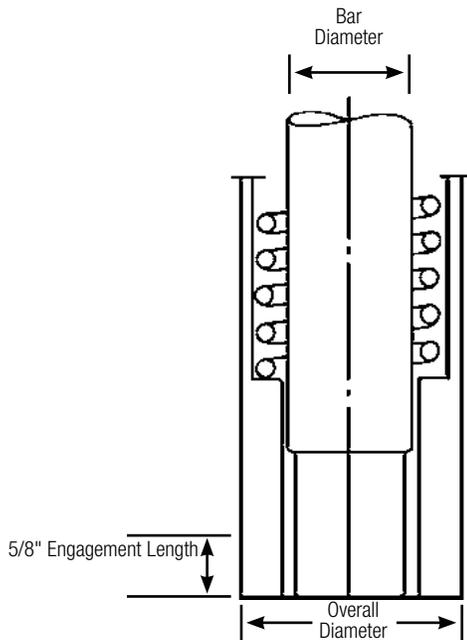
LONGER LATHE CHUCK WRENCHES



Adjusting the chuck using a long-handled spring-loaded chuck wrench.

ALL PARTS BLACK OXIDE COATED

The 18" handle can be slid into position and locked in place with the thumb screw.



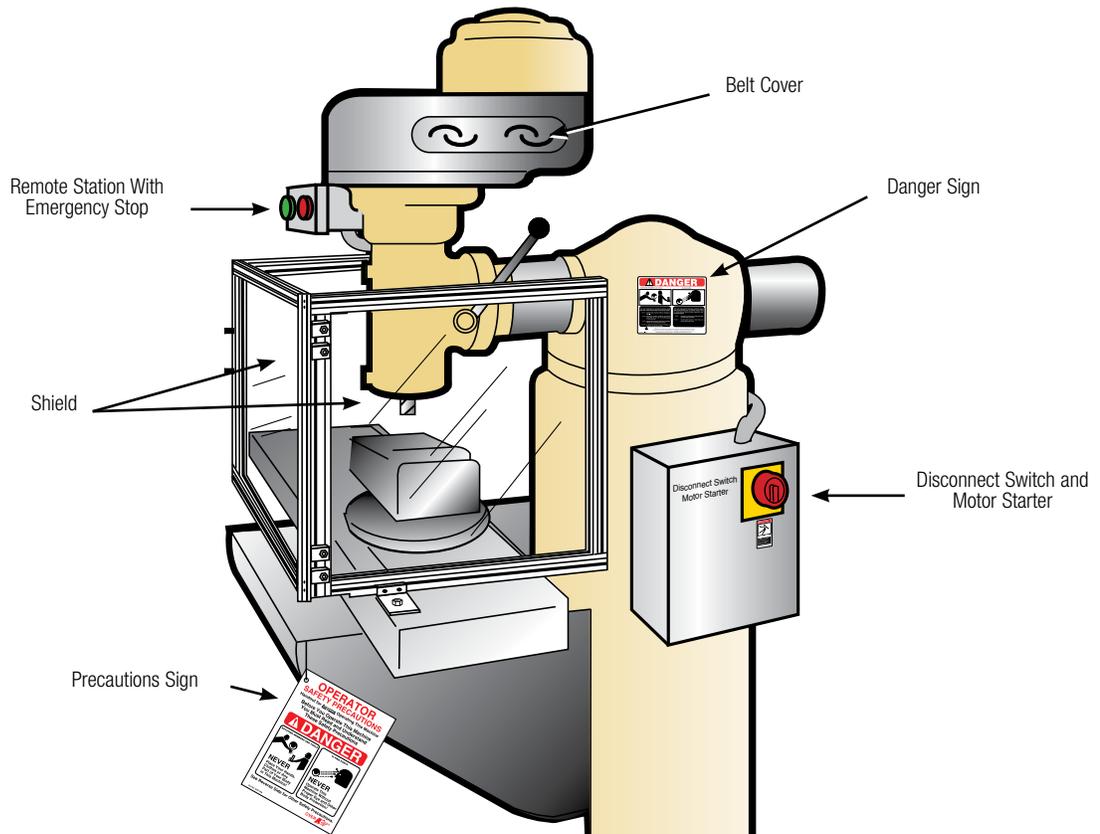
Ordering Information

PART NO.	NOMINAL SIZE	ACTUAL SIZE	BAR DIAMETER	OVERALL DIAMETER
CWSM0281L	5/32" SQ	.271"	3/4"	1.050"
CWSM0312L	5/16" SQ	.303"	3/4"	1.050"
CWSM0375L	3/8" SQ	.365"	3/4"	1.050"
CWSM0438L	7/16" SQ	.427"	3/4"	1.050"
CWSM0500L	1/2" SQ	.490"	3/4"	1.050"
CWSM0563L	9/16" SQ	.552"	15/16"	1.315"
CWSM0625L	5/8" SQ	.615"	15/16"	1.315"
CWSM0688L	11/16" SQ	.678"	15/16"	1.315"
CWSM0750L	3/4" SQ	.740"	15/16"	1.315"
CWHM0500L	1/2" HEX	.490"	3/4"	1.050"
CWHM0625L	5/8" HEX	.615"	3/4"	1.050"
CWHM0750L	3/4" HEX	.740"	15/16"	1.315"

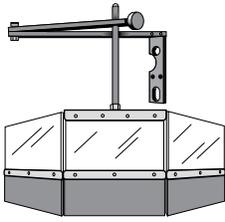
UNGUARDED MILLING MACHINE



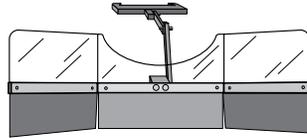
SAFEGUARDED MILLING MACHINE



SAFETY ON MILLING MACHINES



BRIDGEPORT MILLING MACHINE SHIELDS—FRONT (PAGE 65)



BRIDGEPORT MILLING MACHINE SHIELDS—REAR (PAGE 66)



SLIDE AND SWING-ASIDE SHIELDS (PAGES 67-68)



RIGID-ARM MAGNETIC-BASE SHIELDS (PAGE 78)



FLEXIBLE SPRING-STEEL ARM SHIELDS (PAGES 82-85)



UNIVERSAL BALL & SOCKET SHIELDS (PAGES 79-81)



ON/OFF MAGNETIC-BASE SHIELDS (PAGE 86)



ADJUSTABLE SLIDE SHIELDS (PAGE 77)



MILLING MACHINE BELT COVERS (PAGE 69)



DRAW BAR COVER
see www.rockfordsystems.com



ELECTRICAL INTERLOCK ASSEMBLY (PAGE 69)



BRIDGEPORT MILLING MACHINE CONTROLS (PAGE 66)



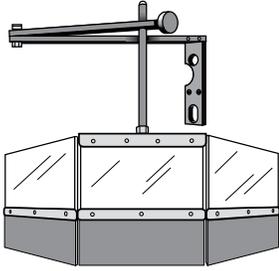
DISCONNECT SWITCHES, MOTOR STARTERS & ACCESSORIES (PAGES 89)

SAFETY SHIELDS FOR MILLING MACHINES

The Bridgeport Milling Machine Chip Shields (KYL019 and KYL059) are **Marked for Discontinuation** until inventory is depleted. Replacement shields will be supported and supplied through January 1, 2024 or until inventory is depleted.

KYL019

**Marked for Discontinuation*



Replacement Options

24" Basic Protector:



RSSC2XL361Y240
SINGLE PIVOT

- » 3 Sided
- » 24" x 9" x 6.5"
- » Left Mount
- » Articulating
- » 3 Arms
- » 36" Reach w/o Interlock
- » 24" Offset
- » No Enclosure



RSSC2XL362X240
DOUBLE PIVOT

- » 3 Sided
- » 24" x 9" x 6.5"
- » Left Mount
- » Articulating
- » 3 Arms
- » 36" Reach w/o Interlock
- » 24" Offset
- » No Enclosure

24" Lighted Protector:



RSSC2LL361Y241
SINGLE PIVOT

- » 3 Sided
- » 24" x 9" x 6.5" w/LED
- » Left Mount
- » Articulating
- » 3 Arms
- » 36" Reach w/o Interlock
- » 24" Offset
- » Lighted – Non-Interlocked Enclosure

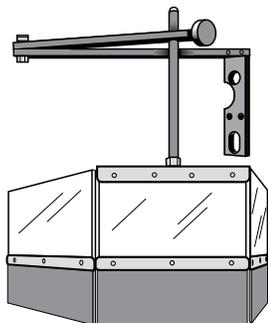


RSSC2LL362X241
DOUBLE PIVOT

- » 3 Sided
- » 24" x 9" x 6.5" w/LED
- » Left Mount
- » Articulating
- » 3 Arms
- » 36" Reach w/o Interlock
- » 24" Offset
- » Lighted – Non-Interlocked Enclosure

KYL059

**Marked for Discontinuation*



Replacement Options

24" Basic Protector:



RSSD6XL361Y160
SINGLE PIVOT

- » Octagonal
- » 24" x 10"
- » Left Mount
- » Articulating
- » 3 Arms
- » 36" Reach w/o Interlock
- » 16" Offset
- » No Enclosure



RSSD6XL362X160
DOUBLE PIVOT

- » Octagonal
- » 24" x 10"
- » Left Mount
- » Articulating
- » 3 Arms
- » 36" Reach w/o Interlock
- » 16" Offset
- » No Enclosure

24" Lighted Protector:



RSSD6LL361Y161
SINGLE PIVOT

- » Octagonal
- » 24" x 10" w/LED
- » Left Mount
- » Articulating
- » 3 Arms
- » 36" Reach w/o Interlock
- » 16" Offset
- » Lighted – Non Interlocked Enclosure



RSSD6LL362X161
DOUBLE PIVOT

- » Octagonal
- » 24" x 10" w/LED
- » Left Mount
- » Articulating
- » 3 Arms
- » 36" Reach w/o Interlock
- » 16" Offset
- » Lighted – Non Interlocked Enclosure

28" Basic Protector:



RSSD7XL361Y160
SINGLE PIVOT

- » Octagonal
- » 28" x 10"
- » Left Mount
- » Articulating
- » 3 Arms
- » 36" Reach w/o Interlock
- » 16" Offset
- » No Enclosure



RSSD7XL362X160
DOUBLE PIVOT

- » Octagonal
- » 28" x 10"
- » Left Mount
- » Articulating
- » 3 Arms
- » 36" Reach w/o Interlock
- » 16" Offset
- » No Enclosure

28" Lighted Protector:



RSSD7LL361Y161
SINGLE PIVOT

- » Octagonal
- » 28" x 10" w/LED
- » Left Mount
- » Articulating
- » 3 Arms
- » 36" Reach w/o Interlock
- » 16" Offset
- » Lighted – Non Interlocked Enclosure



RSSD7LL362X161
DOUBLE PIVOT

- » Octagonal
- » 28" x 10" w/LED
- » Left Mount
- » Articulating
- » 3 Arms
- » 36" Reach w/o Interlock
- » 16" Offset
- » Lighted – Non Interlocked Enclosure

These shields (KYL019 and KYL059) will be replaced with The Protector™ Series Shields. The Protector™ Series Shields (24" or 28" size) are offered as octagonal, 3 sided, single pivot, double pivot, interlocked, and interlocked and lighted forms. *Basic Protector shown/pictured for all shield variations below.*

24" Interlocked Protector:



RSSC2XL361M240
SINGLE PIVOT

- » 3 Sided
- » 24" x 9" x 6.5"
- » Left Mount
- » Articulating
- » 3 Arms
- » 36" Reach w/Interlock
- » 24" Offset
- » No Enclosure



RSSC2XL362L240
DOUBLE PIVOT

- » 3 Sided
- » 24" x 9" x 6.5"
- » Left Mount
- » Articulating
- » 3 Arms
- » 36" Reach w/Interlock
- » 24" Offset
- » No Enclosure

24" Interlocked + LED Protector:



RSSC2LL361M242
SINGLE PIVOT

- » 3 Sided
- » 24" x 9" x 6.5" w/LED
- » Left Mount
- » Articulating
- » 3 Arms
- » 36" Reach w/Interlock
- » 24" Offset
- » Lighted – Interlocked Enclosure



RSSC2LL362L242
DOUBLE PIVOT

- » 3 Sided
- » 24" x 9" x 6.5" w/LED
- » Left Mount
- » Articulating
- » 3 Arms
- » 36" Reach w/Interlock
- » 24" Offset
- » Lighted – Interlocked Enclosure

24" Interlocked + Monitored + LED Protector:



RSSC2LL361M243
SINGLE PIVOT

- » 3 Sided
- » 24" x 9" x 6.5" w/LED
- » Left Mount
- » Articulating
- » 3 Arms
- » 36" Reach w/Interlock
- » 24" Offset
- » Lighted – Interlocked & Monitored Enclosure



RSSC2LL362L243
DOUBLE PIVOT

- » 3 Sided
- » 24" x 9" x 6.5" w/LED
- » Left Mount
- » Articulating
- » 3 Arms
- » 36" Reach w/Interlock
- » 24" Offset
- » Lighted – Interlocked & Monitored Enclosure

24" Interlocked Protector:



RSSD6XL361M160
SINGLE PIVOT

- » Octagonal
- » 24" x 10"
- » Left Mount
- » Articulating
- » 3 Arms
- » 36" Reach w/Interlock
- » 16" Offset
- » No Enclosure



RSSD6XL362L160
DOUBLE PIVOT

- » Octagonal
- » 24" x 10"
- » Left Mount
- » Articulating
- » 3 Arms
- » 36" Reach w/Interlock
- » 16" Offset
- » No Enclosure

24" Interlocked + LED Protector:



RSSD6LL361M162
SINGLE PIVOT

- » Octagonal
- » 24" x 10" w/LED
- » Left Mount
- » Articulating
- » 3 Arms
- » 36" Reach w/Interlock
- » 16" Offset
- » Lighted – Interlocked Enclosure



RSSD6LL362L162
DOUBLE PIVOT

- » Octagonal
- » 24" x 10" w/LED
- » Left Mount
- » Articulating
- » 3 Arms
- » 36" Reach w/Interlock
- » 16" Offset
- » Lighted – Interlocked Enclosure

24" Interlocked + Monitored + LED Protector:



RSSD6LL361M163
SINGLE PIVOT

- » Octagonal
- » 24" x 10" w/LED
- » Left Mount
- » Articulating
- » 3 Arms
- » 36" Reach w/Interlock
- » 16" Offset
- » Lighted – Interlocked & Monitored Enclosure



RSSD6LL362L163
DOUBLE PIVOT

- » Octagonal
- » 24" x 10" w/LED
- » Left Mount
- » Articulating
- » 3 Arms
- » 36" Reach w/Interlock
- » 16" Offset
- » Lighted – Interlocked & Monitored Enclosure

28" Interlocked Protector:



RSSD7XL361M160
SINGLE PIVOT

- » Octagonal
- » 28" x 10"
- » Left Mount
- » Articulating
- » 3 Arms
- » 36" Reach w/Interlock
- » 16" Offset
- » No Enclosure



RSSD7XL362L160
DOUBLE PIVOT

- » Octagonal
- » 28" x 10"
- » Left Mount
- » Articulating
- » 3 Arms
- » 36" Reach w/Interlock
- » 16" Offset
- » No Enclosure

28" Interlocked + LED Protector:



RSSD7LL361M162
SINGLE PIVOT

- » Octagonal
- » 28" x 10" w/LED
- » Left Mount
- » Articulating
- » 3 Arms
- » 36" Reach w/Interlock
- » 16" Offset
- » Lighted – Interlocked Enclosure



RSSD7LL362L162
DOUBLE PIVOT

- » Octagonal
- » 28" x 10" w/LED
- » Left Mount
- » Articulating
- » 3 Arms
- » 36" Reach w/Interlock
- » 16" Offset
- » Lighted – Interlocked Enclosure

28" Interlocked + Monitored + LED Protector:



RSSD7LL361M163
SINGLE PIVOT

- » Octagonal
- » 28" x 10" w/LED
- » Left Mount
- » Articulating
- » 3 Arms
- » 36" Reach w/Interlock
- » 16" Offset
- » Lighted – Interlocked & Monitored Enclosure



RSSD7LL362L163
DOUBLE PIVOT

- » Octagonal
- » 28" x 10" w/LED
- » Left Mount
- » Articulating
- » 3 Arms
- » 36" Reach w/Interlock
- » 16" Offset
- » Lighted – Interlocked & Monitored Enclosure

CHIP SHIELDS FOR BRIDGEPORT MILLING MACHINES

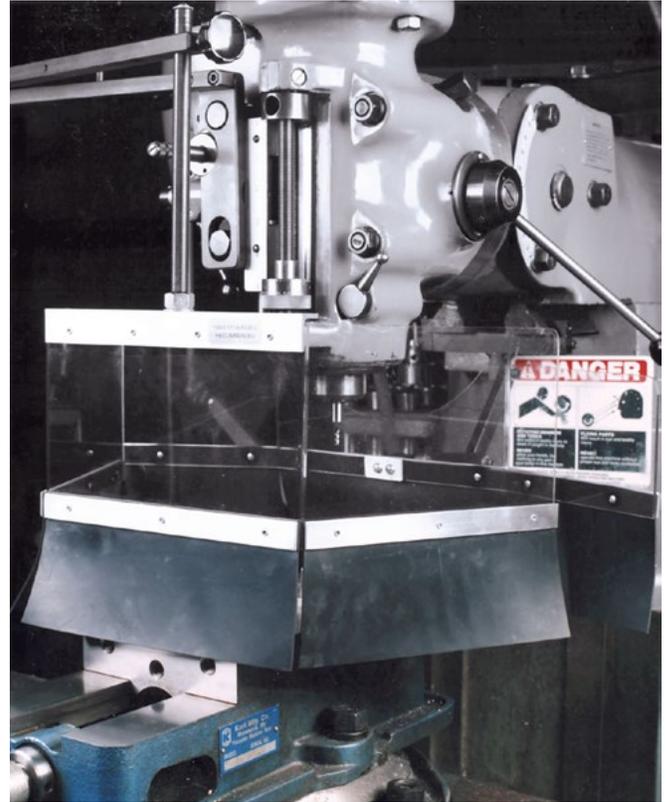
These specially designed, quality-constructed shields are ideal for Bridgeport milling machines. They place a barrier between flying chips (swarf), sparks, coolant from the machine, and the operators or other employees in the area. They can be easily moved in or out of position to provide quick tool and part changes.

These shields are quick and easy to install. They attach directly to existing head machine bolts so no additional drilling or tapping is required.

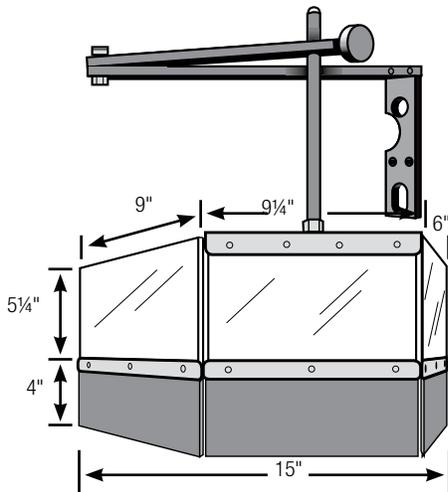
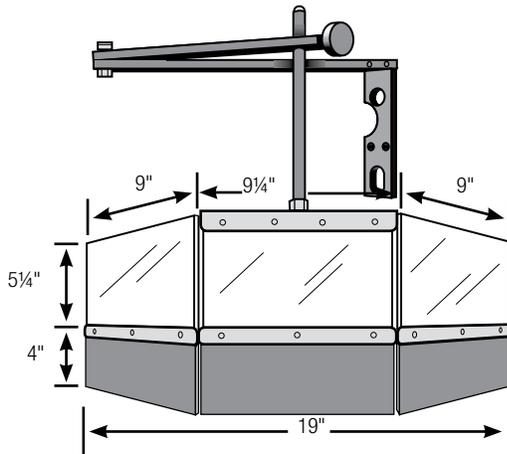
These shields are constructed of high-impact-resistant polycarbonate material. Attached at the bottom of each section of the shield is durable, flexible neoprene material to keep flying chips and swarf contained as the bed moves up and down.

FRONT SHIELDS

The front shield is mounted on a heavy-duty universal steel arm which is used to swing it back into the exact position it was before tool or workpiece changes. The arm is 29" long and has an adjusting knob for raising and lowering the shield. The shield itself can also be used to hold a print.



KYL019 front chip shield.



Ordering Information

PART NO.	DESCRIPTION
KYL019	9 1/4" H x 19" W Front Shield With Two 45° Bends
KYL065	9 1/4" x 19" Front Replacement Shield Only

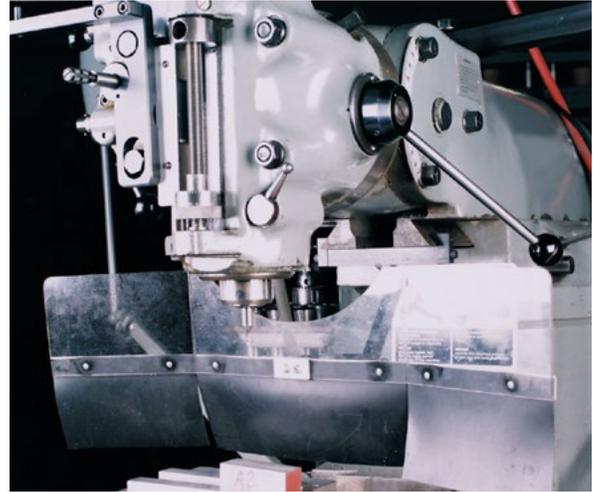
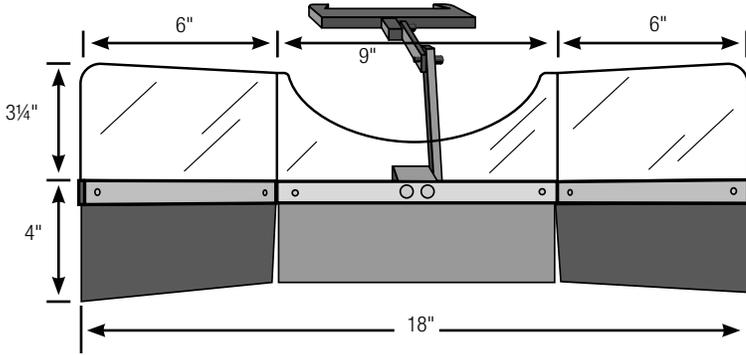
Ordering Information

PART NO.	DESCRIPTION
KYL059	9 1/4" H x 15" W Front Shield With One 45° Bend and One 90° Bend

CHIP SHIELDS FOR BRIDGEPORT MILLING MACHINES (CONTINUED)

REAR SHIELD

A rear shield is also available to protect the back area of the milling machine. This shield is easy to install and mounts directly onto the machine frame with a setscrew to hold it in place.



Rear shield only (front shield not shown).

Ordering Information

PART NO.	DESCRIPTION
KYL020	7 1/4" H x 18" W Rear Shield With Two 45° Bends
KYL065	7 1/4" x 18" Rear Replacement Shield Only

BRIDGEPORT VERTICAL MILLING MACHINE CONTROLS

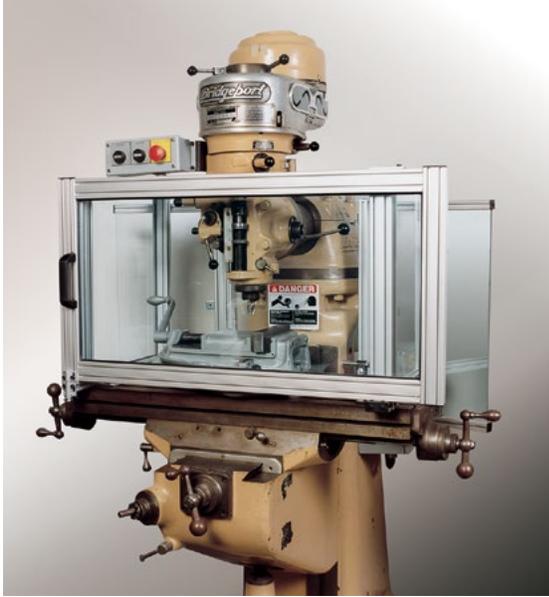
This control is designed for Bridgeport vertical milling machines that have a table motor. Each milling machine control is housed in a NEMA 12 enclosure that includes a disconnect switch, reversing magnetic main drive motor starter, a control relay for the table motor, and a 100 VA transformer that is generically numbered and wired to terminals. A remote station provides the operator controls consisting of a self-latching red emergency-stop palm button, an illuminated green table motor reset push button, and a main motor reverse/off/forward selector switch. These Bridgeport vertical milling machine controls are available for machines with 208, 230 or 460 VAC and 1 to 5 HP.



Ordering Information

PART NO.	DESCRIPTION
BVM2081	For 1HP, 208-VAC Machine
BVM2081Z5	For 1.5HP, 208-VAC Machine
BVM2082	For 2HP, 208-VAC Machine
BVM2301	For 1 HP, 230-VAC Machines
BVM23015	For 1.5 HP, 230-VAC Machines
BVM2302	For 2 HP, 230-VAC Machines
BVM2303	For 3 HP, 230-VAC Machines
BVM4601	For 1 HP, 460-VAC Machines
BVM46015	For 1.5 HP, 460-VAC Machines
BVM4602	For 2 HP, 460-VAC Machines
BVM4603	For 3 HP, 460-VAC Machines
BVM4605	For 5HP, 460-VAC Machine

SLIDE AND SWING-ASIDE SHIELDS



Part No. SSA000 with door closed.



Part No. SSA000 with door open.

INTRODUCTION

These shields protect operators when machining either small workpieces or large castings that sometimes overhang the milling machine table. At the same time, they can provide immediate and complete access to the workpiece or casting being machined by sliding or swinging aside the door(s), as illustrated.

THE SHIELD

The transparent portion of the shield is constructed of impact-resistant polycarbonate. The frame of the shield is made of 1" x 2" extruded aluminum. The shield has front sliding panel(s) and two side fixed panels. The side panels are attached at both ends of the table.

These assemblies can be mounted or removed in a matter of minutes by using two locking T-bolts with nuts.

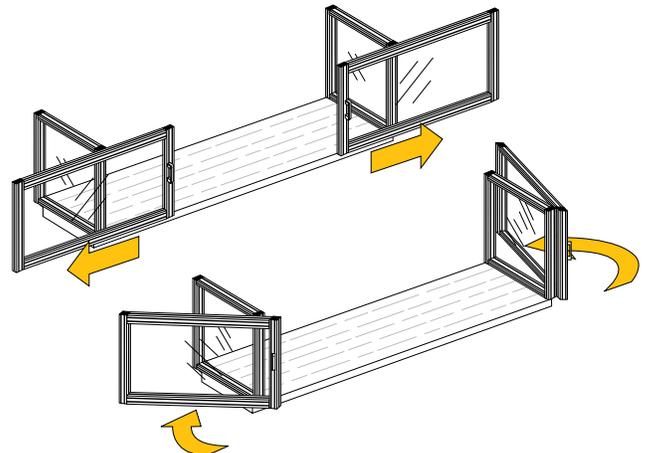
Each of the front panels can slide to the right or left and swing aside on their own axis out of the way (see drawings).

The advantage of the slide and swing-aside movement is that you can obtain immediate access to the whole length of the table for loading and unloading large workpieces. Although the panels slide aside, they will not take up any more room than the actual length of the table itself, because the sliding and swing-aside action takes place in one movement by simply lifting a latch.

THE SHIELD CONSTRUCTION

The parallel sliding bars enable the shield to be adjusted to the distance required from the front of the table to the shield. The adjustment on these bars caters to castings or large components which overhang the table. This adjustment is achieved by loosening the two socket cap screws at either end of the table. This permits the complete shield assembly to be moved backwards or forwards to the position required.

A safety latch is provided where the two front panels or the front and side panels come together which holds the panels in place. The latch has to be released manually prior to opening the panels.



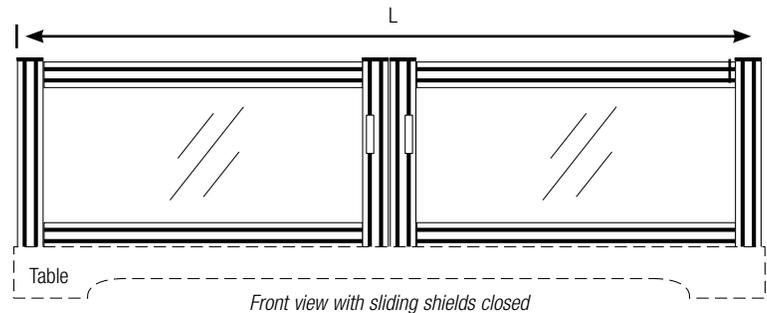
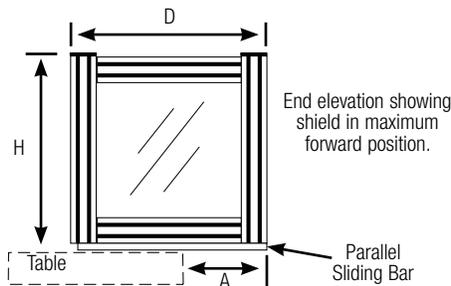
The unique construction allows the front panels to slide and swing aside exposing the entire table.

SLIDE AND SWING-ASIDE SHIELDS (CONTINUED)

There are three sizes of shields available which cover table sizes up to a maximum length of 76". On bed-type milling machines, where the table length is well in excess of 76", it is still possible to use the SSA300 shield. In many instances, only part of the maximum length of the table is used. If this is the case, the SSA300 shield would be suitable as long as the longitudinal traverse used does not exceed the maximum length of the shield. For a table length of less than 36", the SSA000 shield may be used.

These shields have been generously designed to give protection to the operator; this will be noted in dimension H, which gives the height of the shields. Special height panels are available upon request.

The standard shield does not provide protection on the back of the table. The rear shields (below) are used to minimize coolant splash and flying chips that may fly out of the back of the machine.



Ordering Information

PART NO.	L-LENGTH OF TABLE WORK SURFACE	H HEIGHT	D DEPTH	A MAXIMUM ADJUSTMENT
SSA000*	24"-36"	20"	20"	13"
SSA200**	36"-56"	20"	20"	13"
SSA300**	56"-76"	20"	20"	13"

*Has one sliding and swing front door

**Has two sliding and swing front panels.

REAR SHIELD ASSEMBLIES

These shield assemblies can be used to protect personnel from swarf and chips at the rear of the table on both sides of the machine column. They can be used on milling machines or other equipment that require these types of shields. The two ¼"-thick polycarbonate panels are mounted to the frame of the machine with mounts (see photo). Each panel has extruded aluminum framing to hold the polycarbonate in place. The mounts are also attached to this frame. The assembly is available in two sizes and includes two shields, one set of mounts, and connectors. Special sizes are available upon request.

Ordering Information

PART NO.	DESCRIPTION
SSA420	24" x 24" Rear Shields With Mounts (Set)
SSA430	24" x 36" Rear Shields With Mounts (Set)



Rear shield assembly on left side of machine column.

MILLING MACHINE BELT COVER

OSHA requires under 29 CFR 1910.219 that all mechanical power-transmission apparatuses on machinery that create a hazard be covered if below a 7-foot level from the floor or working platform. The sheaves and belts on milling machines must be covered to meet this requirement.

These unique patented belt covers are made of durable cast aluminum. The hinged covers are sold in pairs for the right and left sides and are permanently attached to the machine. Spindle speed changes are done quickly and efficiently by simply pulling down the belt cover.

This belt cover is made for Bridgeport model J.

Ordering Information

Part No.	Description
KYL021J	Model J Belt Cover With Hinges—11" W x 2 ³ / ₈ " H x 3/8" Thick



Cover closed.



Cover open on model J Bridgeport milling machine.

ELECTRICAL INTERLOCK ASSEMBLY

MAGNETIC SAFETY SWITCH AND BRACKET ASSEMBLY PART NO. FKT876

Additional operator safety can be provided by the installation of this magnetic safety switch and bracket assembly.

INTERLOCK SWITCH SPECIFICATIONS

- Contacts..... 1 NO
- Operating Temperature..... 14° to 149° F (-10° to 65° C)
- Rated Current 2 A, fuse externally 1.6 A quick acting
- Rated Voltage 250 VAC
- Cable 13 ft of prewired 2-conductor flexible cable

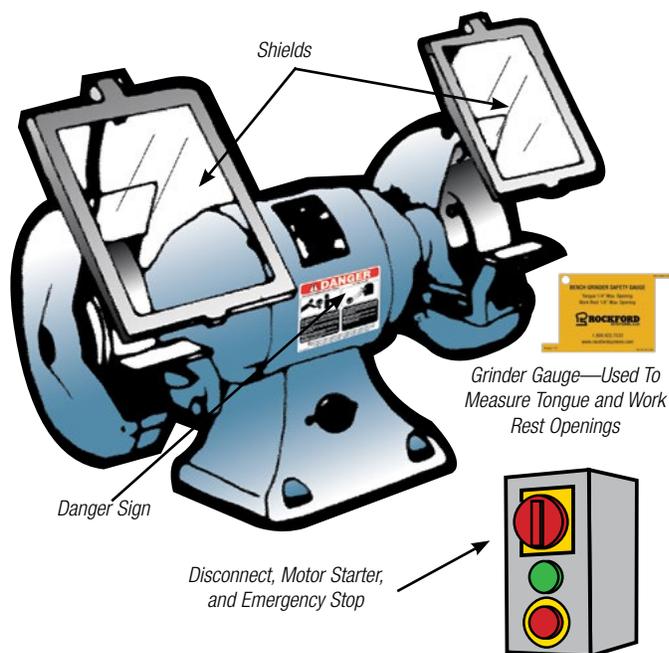


(Mounted on inside of front panels.)

UNGUARDED GRINDER



SAFEGUARDED GRINDER



SAFETY ON BENCH GRINDERS



RIGID-ARM MAGNETIC-BASE SHIELDS
(PAGE 78)



DOUBLE-WHEEL FLEXIBLE-ARM SHIELDS
(PAGE 71)



SINGLE-WHEEL FLEXIBLE-ARM SHIELDS
(PAGE 71)



STANDARD-MOUNT GRINDER SHIELDS
(PAGE 72)



UNIVERSAL BALL & SOCKET SHIELDS
(PAGES 79-81)



HEAVY-DUTY SINGLE BUFFER SHIELDS
(PAGE 72)



BENCH GRINDER SAFETY GAUGE
(PAGE 73)



DISCONNECT SWITCHES, MOTOR STARTERS, AND ACCESSORIES
(PAGES 89)

DOUBLE- AND SINGLE-WHEEL FLEXIBLE-ARM GRINDER SHIELDS



Double-Wheel Grinder Shield

Bench grinder shields are designed to minimize the debris and hazards associated with bench grinders and buffers. Both double- and single-wheel grinder shields are available.

The double-wheel grinder shield provides protection for both wheels of the grinder with one continuous shield. The durable shield is made of clear, 3/16"-thick polycarbonate and measures 18" x 6". A special shield bracket adds stability to the top of the shield.

The single-wheel grinder shield is made of clear, 3/16"-thick polycarbonate and measures 6" x 6". This sturdy, impact-resistant shield is designed for use when a single wheel needs safeguarding.

The flexible spring-steel arms come in three lengths: 12", 18" and 24".

MOUNTING OPTIONS

There are two mounting options for the double- and single-wheel grinder shields.

- Direct-mount base—attaches directly to the grinder table or pedestal
- Magnetic base—3" diameter magnet

If an adequate flat, smooth, ferrous mounting surface is not available, an optional steel mounting plate is available that can be permanently attached to the machine to hold the magnetic base.



*Part No. FKT1106
Steel Mounting Plate*

DOUBLE-WHEEL GRINDER SHIELDS— 18" X 6" FLAT SHIELD

PART NO.	DESCRIPTION
KYL183	12" Direct-Mount Flexible Spring-Steel Arm
KYL184	18" Direct-Mount Flexible Spring-Steel Arm
KYL186	12" Magnetic-Mount Flexible Spring-Steel Arm
KYL187	18" Magnetic-Mount Flexible Spring-Steel Arm
KYL177	18" x 6" Flat Replacement Shield Only
FKT1072	Flat Mounting Bracket for 18" x 6" Shield
FKT1106	3½" x 4¾" Steel Mounting Plate for Magnetic Base

SINGLE-WHEEL GRINDER SHIELDS— 6" X 6" FLAT SHIELD

PART NO.	DESCRIPTION
KYL178	18" Direct-Mount Flexible Spring-Steel Arm
KYL180	12" Magnetic-Mount Flexible Spring-Steel Arm
KYL181	18" Magnetic-Mount Flexible Spring-Steel Arm
KYL176	6" x 6" Flat Replacement Shield Only
FKT1106	3½" x 4¾" Steel Mounting Plate for Magnetic Base



Single-Wheel Grinder Shield

STANDARD-MOUNT GRINDER SHIELDS

These grinder shields are available in various sizes for protection from the swarf of bench or pedestal grinders. The frames are constructed of reinforced fiber nylon or heavy cast aluminum. Each shield is furnished with a threaded support rod. The transparent shield is high-impact-resistant polycarbonate to minimize scratching and provide durability.



Ordering Information

PART NO.	DESCRIPTION (EACH SOLD SEPARATELY)	REPLACEMENT POLYCARBONATE WINDOW
GWG201	6 ^{3/4} " H x 5 ^{3/4} " W Shield—Nylon Frame	GWW001
GWG202	8 ^{1/2} " H x 6" W Shield—Nylon Frame	GWW002
GWG203	12 ^{3/4} " H x 12" W Shield—Aluminum Frame	GWW003

HEAVY-DUTY SINGLE BUFFER SHIELDS

These buffer shields are available in various sizes for protection from the swarf of bench or pedestal grinders. The frames are constructed of reinforced fiber nylon or heavy cast aluminum. Each shield is furnished with a threaded support rod. The transparent shield is high-impact-resistant polycarbonate to minimize scratching and provide durability.

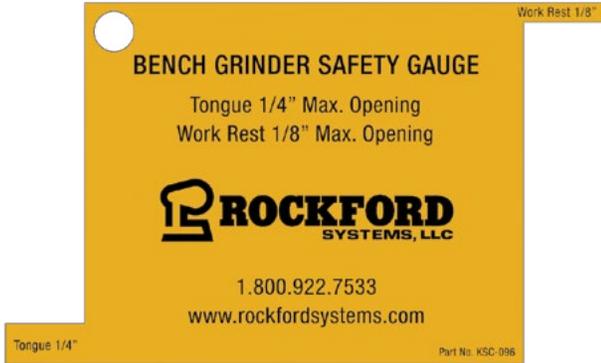
Ordering Information

PART NO.	A	B
PMA02/112	6.3" (160 mm)	5.71" (145 mm)
PMA02/216	7.87" (200 mm)	7.28" (185 mm)



¹ 1.18" (30 mm) ² 0.98" (25 mm)

BENCH GRINDER SAFETY GAUGE—PART NO. KSC096



Front



Back

The bench grinder safety gauge is laser-cut, Grade 5052 aluminum with H32 hardness. The safety yellow, durable powder-coated gauge has silk-screened text and graphics. It measures 2¾" wide by 2¼" high by .1000" thick and has a ¼" hole for attachment to the bench grinder.

OSHA 29 CFR 1910.215 specifies that work rests must be kept adjusted closely to the wheel with a maximum opening of 1/8" to prevent the workpiece from being jammed between the wheel and the rest. OSHA also states that the distance between the grinding wheel and the adjustable tongue must never exceed ¼".



Bench Grinder Safety Gauge with Tether



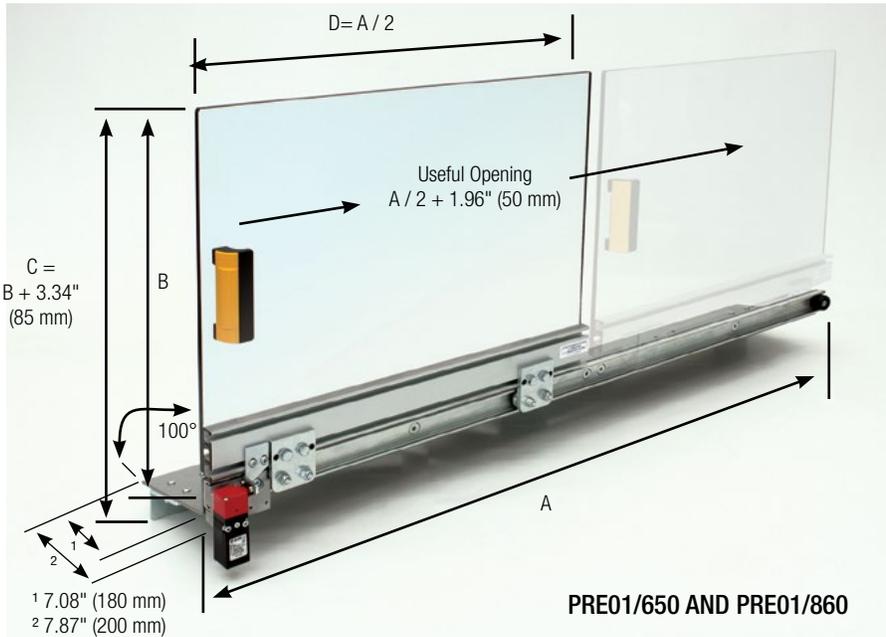
Checking tongue opening.



Checking work rest opening.

The bench grinder gauge includes an 18" long plastic-coated, 18-8 stainless steel tether that is riveted to the gauge on one end and open to screw (hex head 1/2" long drilling screw #10 included) into a machine stand on the other, allowing you to keep your grinder gauge next to your bench grinder all the times and prevent it from getting lost or stolen.

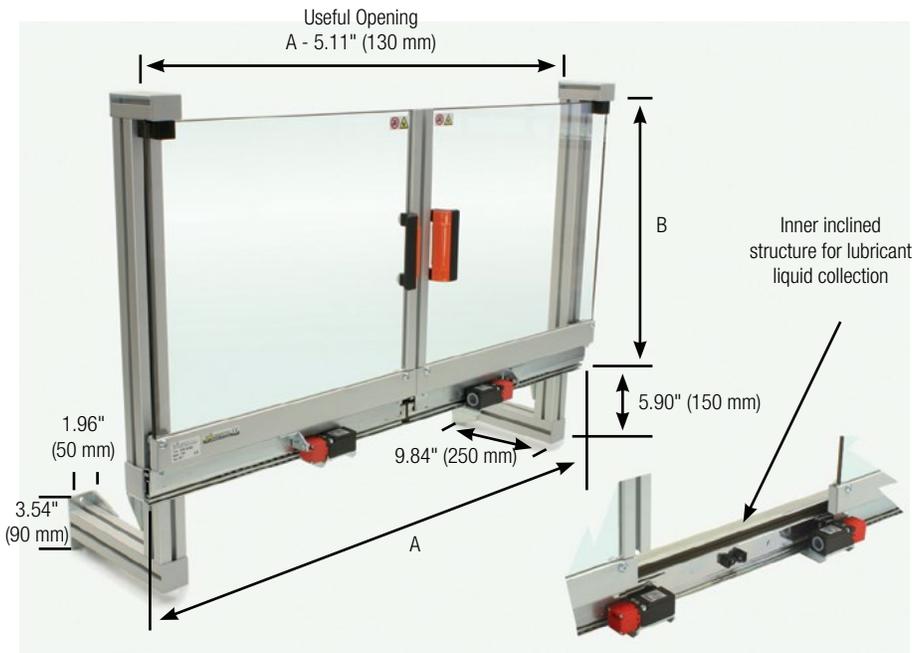
ELECTRICALLY INTERLOCKED SURFACE GRINDER SHIELDS



Ordering Information

PART NO.	A	B
PRE01/650	47.24" (1,200 mm)	19.68" (500 mm)
PRE01/860	62.99" (1,600 mm)	23.62" (600 mm)

Note: May be purchased without safety microswitch



Ordering Information

PART NO.	A	B
PRE10/550	39.37" (1,000 mm)	20.07" (510 mm)
PRE10/655	47.24" (1,200 mm)	22.04" (560 mm)
PRE10/860	62.99" (1,600 mm)	25.98" (660 mm)

Note: May be purchased without safety microswitch

BAND SAW SHIELD ASSEMBLIES

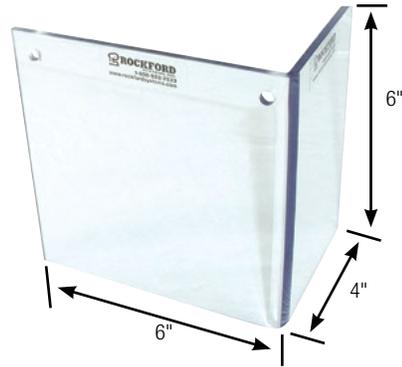
These high-quality band saw shields place a barrier between an operator and flying debris generated at the point of operation. The transparent, L-shaped portion of the band saw shield is constructed of high-impact-resistant, 3/16" - thick clear polycarbonate.

Flexible spring-steel arms come in standard lengths of 12", 18", and 24" for attaching the shield.

The band saw shield assemblies are offered with a direct-mount base that is attached directly to the band saw. Mounting hardware is included.



DIMENSIONS



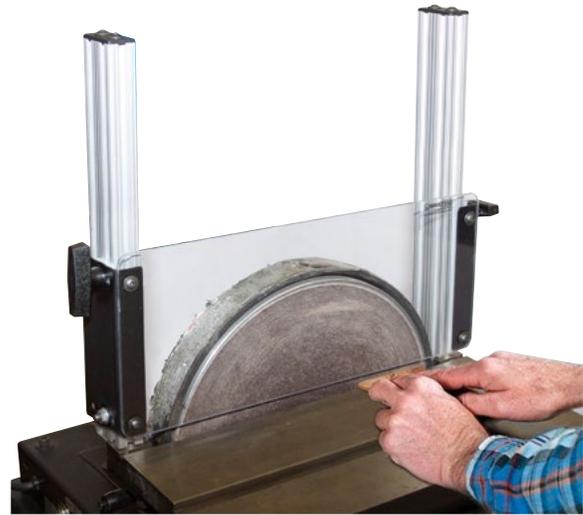
Ordering Information

PART NO.	DESCRIPTION
KYL189	12" Direct-Mount Arm With 6" H x 6" W L-Shaped Shield (4" D)
KYL190	18" Direct-Mount Arm With 6" H x 6" W L-Shaped Shield (4" D)
KYL175	6" x 6" L-Shaped Replacement Shield Only

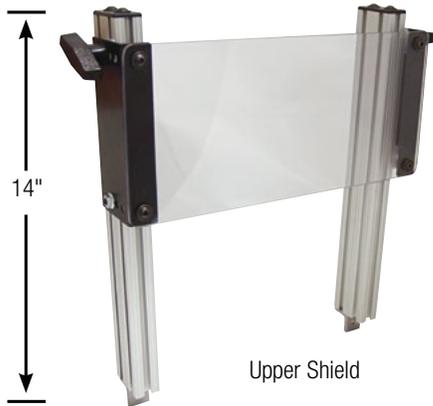
DISC AND BELT SANDER SHIELD ASSEMBLIES

These high-quality, adjustable disc and belt sander shields place a barrier between an operator and flying debris generated at the point of operation. They fasten directly to the machine using 1" x 2" extruded aluminum with mounting hardware included. The transparent portion of the shield is constructed of high-impact-resistant, 3/16"-thick clear polycarbonate. Easy vertical adjustment of the shields is achieved simply by loosening and tightening the black knobs.

These shields can also be used on a combination belt sander & disc sander.



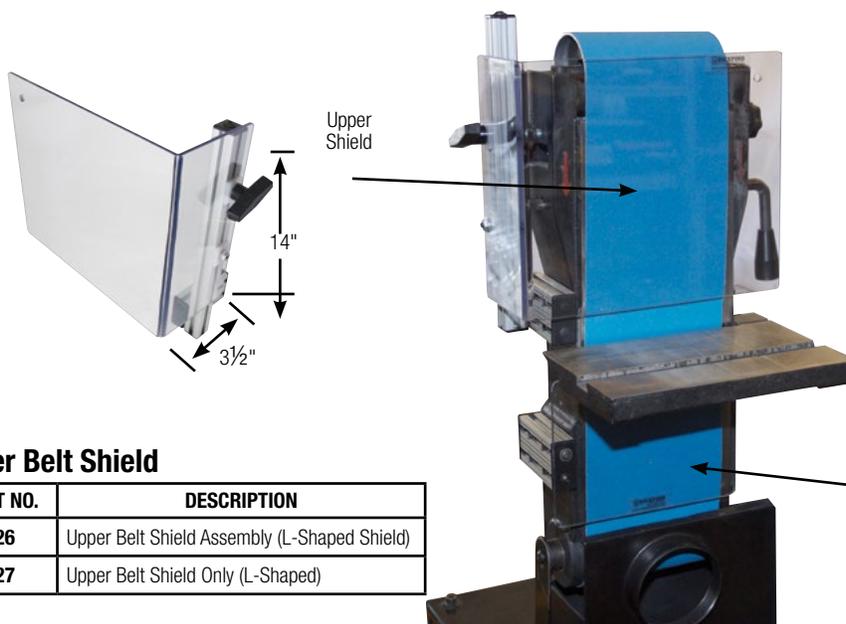
Disc sander shield assembly.



Disc Sander Shield

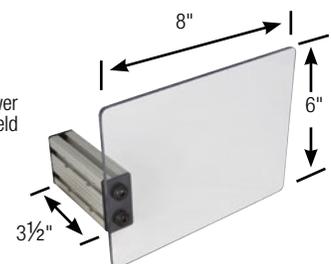
PART NO.	DESCRIPTION	REPLACEMENT SHIELD
KYL228	9" Disc Sander Shield Assembly (6" x 13" Shield)	KYL229
KYL230	12" Disc Sander Shield Assembly (7" x 16" Shield)	KYL231
KYL232	16" Disc Sander Shield Assembly (9" x 20" Shield)	KYL233
KYL234	20" Disc Sander Shield Assembly (11" x 24" Shield)	KYL235
KYL236	24" Disc Sander Shield Assembly (13" x 28" Shield)	KYL237

BELT SANDER SHIELD ASSEMBLIES



Lower Belt Shield

PART NO.	DESCRIPTION
KYL224	Lower Belt Shield Assembly (6" x 8" Shield)
KYL225	Lower Belt Shield Only (6" x 8")



Upper Belt Shield

PART NO.	DESCRIPTION
KYL226	Upper Belt Shield Assembly (L-Shaped Shield)
KYL227	Upper Belt Shield Only (L-Shaped)

Belt sander shield assembly.

ADJUSTABLE SLIDE SHIELDS

These high-quality adjustable slide shields can be used on drills, mills, saws, or special machine applications. The transparent portion of these shields is constructed of durable, clear 3/16"-thick polycarbonate. The shield places a barrier between an operator and the flying chips (swarf), sparks, and coolant generated at the point of operation.

These shields can be mounted vertically or horizontally on the flat surface of any machine. The transparent portion of the shield attaches to the mounting brackets and offers a slide adjustment of 3½". Two standard size shields with 30° sides are available: 7¾" x 11" and 9½" x 19". Contact Rockford Systems for other shield sizes or longer adjustments.

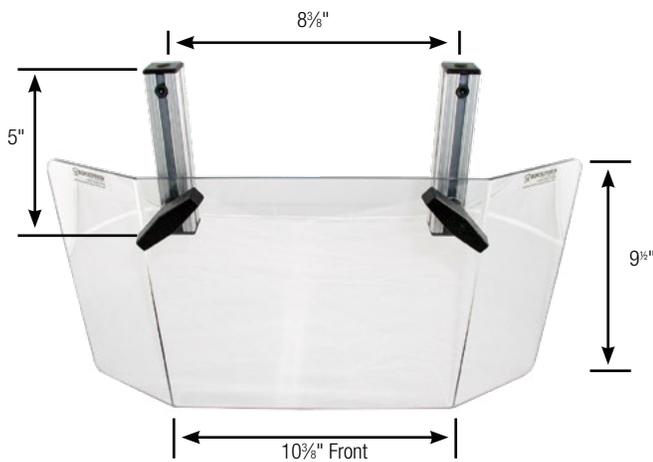


Adjustable slide shield on front column of machine.



Adjustable Slide Shield—7" Front

PART NO.	DESCRIPTION
KYL192	Adjustable Slide Shield With 30° Angle and 7" Front
KYL012	Replacement Shield—7" Front



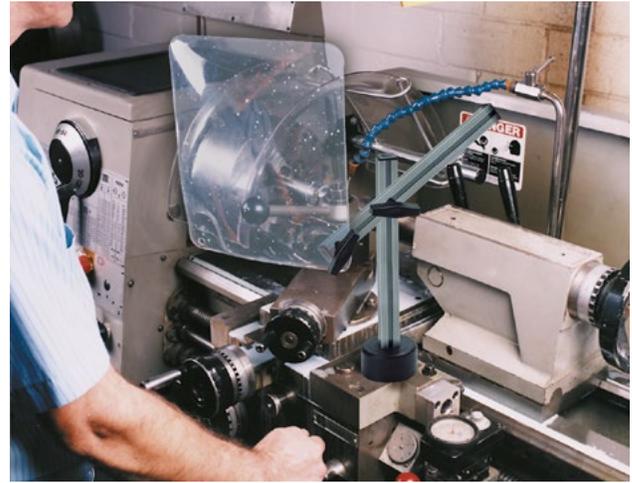
Adjustable Slide Shield—10¾" Front

PART NO.	DESCRIPTION
KYL193	Adjustable Slide Shield With 30° Angle and 10¾" Front
KYL017	Replacement Shield—10¾" Front

RIGID-ARM MAGNETIC-BASE SHIELDS



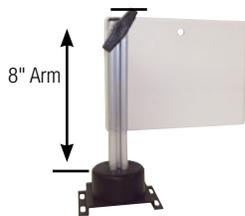
Magnetic-base flat shield shown on a lathe



Magnetic-base concave shield shown on a lathe

These rugged magnetic-base shields can be used on lathes, small milling machines, drills, grinders, band saws, etc. These shields can be attached to any ferrous surface on the machine by an 80-lb pull magnetic base. If a flat, smooth, ferrous surface is not available, a mounting plate (3½" x 4-5/8") is also furnished. Large polypropylene plastic handles are used for easy positioning and locking.

The transparent portion of the chip shield is constructed of high-impact-resistant, 3/16"-thick clear polycarbonate material. It is furnished with a circular base which measures 3¼" in diameter. An 8" aluminum base extrusion is provided and attaches to the magnetic base. Also available is a 12" extruded-aluminum arm extension. This arm can be cut to a shorter length if required for your application.



PART NO.	DESCRIPTION	REPLACEMENT SHIELD ONLY
CBS1C1	Base With 6" x 8" Flat Shield	CSAA3
CBS2C1	Base With 10" x 12" Flat Shield	CSAA5
CBS3C1	Base With 14" x 16" Flat Shield	CSAA7

PART NO.	DESCRIPTION	REPLACEMENT SHIELD ONLY
CBS1C1B	6" x 8" Flat Shield With 12" Arm Extension	CSAA3
CBS2C1B	10" x 12" Flat Shield With 12" Arm Extension	CSAA5
CBS3C1B	14" x 16" Flat Shield With 12" Arm Extension	CSAA7

PART NO.	DESCRIPTION	REPLACEMENT SHIELD ONLY
CBS6C1	Base With 8" x 10" Concave Shield	CSAD2
CBS7C1	Base With 10" x 12" Concave Shield	CSAD3

PART NO.	DESCRIPTION	REPLACEMENT SHIELD ONLY
CBS6C1B	8" x 10" Concave Shield With 12" Arm Extension	CSAD2
CBS7C1B	10" x 12" Concave Shield With 12" Arm Extension	CSAD3

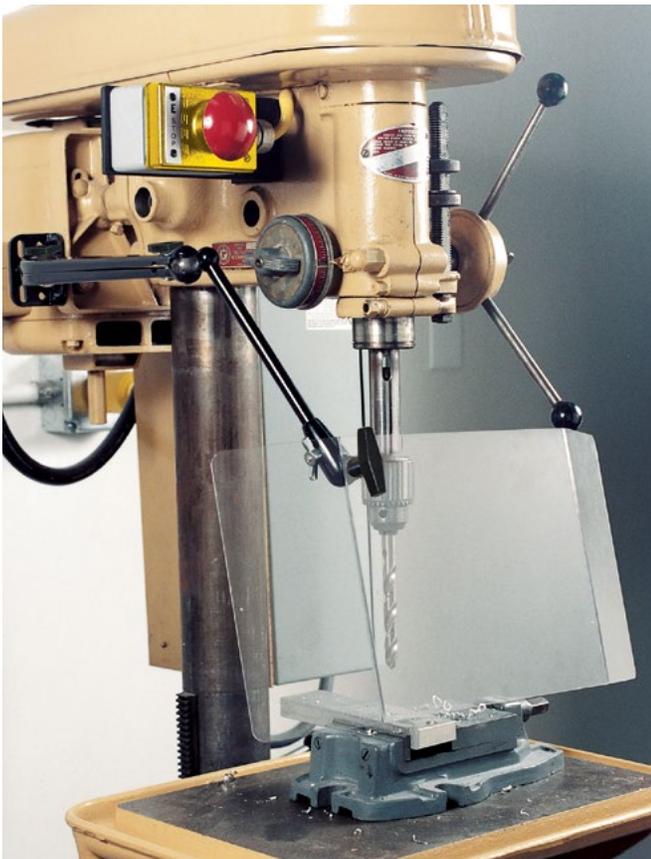
UNIVERSAL BALL & SOCKET SHIELDS

A variety of these quality-constructed, very versatile shields are available. They are ideal for mills, drills, lathes, grinders, band saws, or similar equipment including woodworking machines. The shield places a barrier between operators or other employees in the area and the flying chips (swarf), sparks, and coolant generated from the tool. These shields are furnished with heavy universal steel ball-and-socket arms to provide simple movement and adjustment. Large polypropylene plastic handles are used for positioning and locking. Arms mount easily to the frame or column of the machine and include standard mounting hardware.

The shields offered are made of high-impact-resistant 3/16"-thick clear polycarbonate, selected for its toughness under impact to protect the operator. Each shield, except for the flat shield, has a hole in the left and right corners so the arm can be conveniently mounted on either side of the machine. Special size shields are available upon request.



Universal ball & socket shield on a milling machine.



Universal ball & socket shield shown on a drill press.



Universal ball & socket shield shown on a band saw.

UNIVERSAL BALL & SOCKET SHIELDS (CONTINUED)

All Steel Pivot Balls Are Hardened For Longevity



PART NO.	DESCRIPTION
KYL104	6" x 8" Flat Shield With 21" Universal Arm
KYL105	6" x 8" Flat Shield With 31" Universal Arm
KYL106	6" x 8" Flat Shield With 44" Universal Arm
CSAA3	6" x 8" Flat Replacement Shield Only
CYF016	Clamp Kit for Attaching to Table or Ledge



PART NO.	DESCRIPTION
KYL107	10" x 12" Flat Shield With 21" Universal Arm
KYL108	10" x 12" Flat Shield With 31" Universal Arm
KYL109	10" x 12" Flat Shield With 44" Universal Arm
CSAA5	10" x 12" Flat Replacement Shield Only
CYF016	Clamp Kit for Attaching to Table or Ledge



PART NO.	DESCRIPTION
KYL110	30° Angle Shield 8" H (7" Front) With 21" Universal Arm
KYL111	30° Angle Shield 8" H (7" Front) With 31" Universal Arm
KYL112	30° Angle Shield 8" H (7" Front) With 44" Universal Arm
KYL012	30° Angle 8" H (7" Front) Replacement Shield Only
CYF016	Clamp Kit for Attaching to Table or Ledge



PART NO.	DESCRIPTION
KYL113	30° Angle Shield 9 ¹ / ₂ " H (10 ³ / ₈ " Front) With 21" Universal Arm
KYL114	30° Angle Shield 9 ¹ / ₂ " H (10 ³ / ₈ " Front) With 31" Universal Arm
KYL115	30° Angle Shield 9 ¹ / ₂ " H (10 ³ / ₈ " Front) With 44" Universal Arm
KYL017	30° Angle 9 ¹ / ₂ " H (10 ³ / ₈ " Front) Replacement Shield Only
CYF016	Clamp Kit for Attaching to Table or Ledge

UNIVERSAL BALL & SOCKET SHIELDS (CONTINUED)

THE 90° SIDE PREVENTS INTERFERENCE WITH A DRILL PRESS HANDLE



PART NO.	DESCRIPTION
KYL127	30° & 90° Angle Shield 9½" H (10 ³ / ₈ " Front) With 21" Universal Arm
KYL128	30° & 90° Angle Shield 9½" H (10 ³ / ₈ " Front) With 31" Universal Arm
KYL129	30° & 90° Angle Shield 9½" H (10 ³ / ₈ " Front) With 44" Universal Arm
KYL126	30° & 90° Angle 9½" H (10 ³ / ₈ " Front) Replacement Shield Only
CYF016	Clamp Kit for Attaching to Table or Ledge

PART NO.	DESCRIPTION
KYL116	90° Angle Shield 9½" H (11" Front) With 21" Universal Arm
KYL117	90° Angle Shield 9½" H (11" Front) With 31" Universal Arm
KYL118	90° Angle Shield 9½" H (11" Front) With 44" Universal Arm
KYL018	90° Angle 9½" H (11" Front) Replacement Shield Only
CYF016	Clamp Kit for Attaching to Table or Ledge

PART NO.	DESCRIPTION
KYL119	8" x 10" Concave Shield With 21" Universal Arm
KYL120	8" x 10" Concave Shield With 31" Universal Arm
KYL121	8" x 10" Concave Shield With 44" Universal Arm
CSAD2	8" x 10" Concave Replacement Shield Only
CYF016	Clamp Kit for Attaching to Table or Ledge

PART NO.	DESCRIPTION
KYL122	10" x 12" Concave Shield With 21" Universal Arm
KYL123	10" x 12" Concave Shield With 31" Universal Arm
KYL124	10" x 12" Concave Shield With 44" Universal Arm
CSAD3	10" x 12" Concave Replacement Shield Only
CYF016	Clamp Kit for Attaching to Table or Ledge



CYF016—Clamp kit attaches to table or ledge.

FLEXIBLE SPRING-STEEL ARM SHIELDS

These flexible arms are made of high-quality, heavy-duty $\frac{3}{4}$ "-diameter spring steel covered with vinyl to protect from grease, oil, and contaminants that could weaken their holding power. They offer virtually unlimited adjustment possibilities and long-term holding power.

The shield can be used on lathes, drill presses, milling machines, grinders, band saws, woodworking machines, and similar equipment. It places a barrier between an operator and flying chips (swarf), sparks, and splashing coolant generated at the point of operation. The transparent portion of these flexible-arm shields is constructed of high-impact-resistant, $\frac{3}{16}$ "-thick polycarbonate. Special shield sizes are available up to 12" x 12"; please call our sales department at 1-800-922-7533 for more information.

The flexible-arm shields have two mounting options: direct or magnetic. The direct-mount base can be fastened directly to a machine with two $\frac{1}{4}$ " fasteners (included). The magnetic base consists of a 3"-diameter magnet with **100-lb holding force**. If an adequate flat, smooth, ferrous mounting surface is not available, an optional steel mounting plate can be permanently attached to the machine to hold the magnetic base.



Flexible spring-steel arm shield on milling machine.



Flexible spring-steel arm shield on milling machine.



Flexible spring-steel arm shield on lathe.

FLEXIBLE SPRING-STEEL ARM SHIELDS (CONTINUED)

MADE OF 3/4"-DIAMETER VINYL-COVERED SPRING STEEL



PART NO.	DESCRIPTION
KYL096	6" x 8" Flat Shield and 12" Arm With Direct-Mount Base
KYL097	6" x 8" Flat Shield and 18" Arm With Direct-Mount Base
CSAA3	6" x 8" Flat Replacement Shield Only



PART NO.	DESCRIPTION
KYL100	6" x 8" Flat Shield and 12" Arm With Magnetic Base
KYL101	6" x 8" Flat Shield and 18" Arm With Magnetic Base
CSAA3	6" x 8" Flat Replacement Shield Only
FKT1106	Optional 3 1/2" x 4 5/8" Steel Mounting Plate (Fasteners Not Included)



PART NO.	DESCRIPTION
KYL098	10" x 12" Flat Shield and 12" Arm With Direct-Mount Base
KYL099	10" x 12" Flat Shield and 18" Arm With Direct-Mount Base
CSAA5	10" x 12" Flat Replacement Shield Only



← *Optional Mounting Plate*

PART NO.	DESCRIPTION
KYL102	10" x 12" Flat Shield and 12" Arm With Magnetic Base
KYL103	10" x 12" Flat Shield and 18" Arm With Magnetic Base
CSAA5	10" x 12" Flat Replacement Shield Only
FKT1106	Optional 3 1/2" x 4 5/2" Steel Mounting Plate (Fasteners Not Included)

FLEXIBLE SPRING-STEEL ARM SHIELDS (CONTINUED)



PART NO.	DESCRIPTION
KYL136	30° Angle Shield 8" H (7" Front) and 12" Arm With Direct-Mount Base
KYL137	30° Angle Shield 8" H (7" Front) and 18" Arm With Direct-Mount Base
KYL012	30° Angle 8" H (7" Front) Replacement Shield Only



PART NO.	DESCRIPTION
KYL139	30° Angle Shield 8" H (7" Front) and 12" Arm With Magnetic Base
KYL140	30° Angle Shield 8" H (7" Front) and 18" Arm With Magnetic Base
KYL012	30° Angle 8" H (7" Front) Replacement Shield Only
FKT1106	Optional 3 ¹ / ₂ " x 4 ⁵ / ₈ " Steel Mounting Plate (Fasteners Not Included)



PART NO.	DESCRIPTION
KYL142	30° Angle Shield 9 ¹ / ₂ " H (10 ³ / ₈ " Front) and 12" Arm With Direct-Mount Base
KYL143	30° Angle Shield 9 ¹ / ₂ " H (10 ³ / ₈ " Front) and 18" Arm With Direct-Mount Base
KYL017	30° Angle 9 ¹ / ₂ " H (10 ³ / ₈ " Front) Replacement Shield Only



PART NO.	DESCRIPTION
KYL145	30° Angle Shield 9 ¹ / ₂ " H (10 ³ / ₈ " Front) and 12" Arm With Magnetic Base
KYL146	30° Angle Shield 9 ¹ / ₂ " H (10 ³ / ₈ " Front) and 18" Arm With Magnetic Base
KYL017	30° Angle 9 ¹ / ₂ " H (10 ³ / ₈ " Front) Replacement Shield Only
FKT1106	Optional 3 ¹ / ₂ " x 4 ⁵ / ₈ " Steel Mounting Plate (Fasteners Not Included)



PART NO.	DESCRIPTION
KYL148	30° & 90° Angle Shield 9 ¹ / ₂ " H (10 ³ / ₈ " Front) and 12" Arm With Direct-Mount Base
KYL149	30° & 90° Angle Shield 9 ¹ / ₂ " H (10 ³ / ₈ " Front) and 18" Arm With Direct-Mount Base
KYL126	30° & 90° Angle 9 ¹ / ₂ " H (10 ³ / ₈ " Front) Replacement Shield Only



PART NO.	DESCRIPTION
KYL151	30° & 90° Angle Shield 9 ¹ / ₂ " H (10 ³ / ₈ " Front) and 12" Arm With Magnetic Base
KYL152	30° & 90° Angle Shield 9 ¹ / ₂ " H (10 ³ / ₈ " Front) and 18" Arm With Magnetic Base
KYL126	30° & 90° Angle 9 ¹ / ₂ " H (10 ³ / ₈ " Front) Replacement Shield Only
FKT1106	Optional 3 ¹ / ₂ " x 4 ⁵ / ₈ " Steel Mounting Plate (Fasteners Not Included)

FLEXIBLE SPRING-STEEL ARM SHIELDS (CONTINUED)



PART NO.	DESCRIPTION
KYL154	90° Angle Shield 9 ¹ / ₂ " H (11" Front) and 12" Arm With Direct-Mount Base
KYL155	90° Angle Shield 9 ¹ / ₂ " H (11" Front) and 18" Arm With Direct-Mount Base
KYL018	90° Angle 9 ¹ / ₂ " H (11" Front) Replacement Shield Only



PART NO.	DESCRIPTION
KYL157	90° Angle Shield 9 ¹ / ₂ " H (11" Front) and 12" Arm With Magnetic Base
KYL158	90° Angle Shield 9 ¹ / ₂ " H (11" Front) and 18" Arm With Magnetic Base
KYL018	90° Angle 9 ¹ / ₂ " H (11" Front) Replacement Shield Only
KYL1106	Optional 3 ¹ / ₂ " x 4 ⁵ / ₈ " Steel Mounting Plate (Fasteners Not Included)



PART NO.	DESCRIPTION
KYL160	8" x 10" Concave Shield and 12" Arm With Direct-Mount Base
KYL161	8" x 10" Concave Shield and 18" Arm With Direct-Mount Base
CSAD2	8" x 10" Concave Replacement Shield Only



PART NO.	DESCRIPTION
KYL163	8" x 10" Concave Shield and 12" Arm With Magnetic Base
KYL164	8" x 10" Concave Shield and 18" Arm With Magnetic Base
CSAD2	8" x 10" Concave Replacement Shield Only
FKT1106	Optional 3 ¹ / ₂ " x 4 ⁵ / ₈ " Steel Mounting Plate (Fasteners Not Included)



PART NO.	DESCRIPTION
KYL166	10" x 12" Concave Shield and 12" Arm With Direct-Mount Base
KYL167	10" x 12" Concave Shield and 18" Arm With Direct-Mount Base
CSAD3	10" x 12" Concave Replacement Shield Only



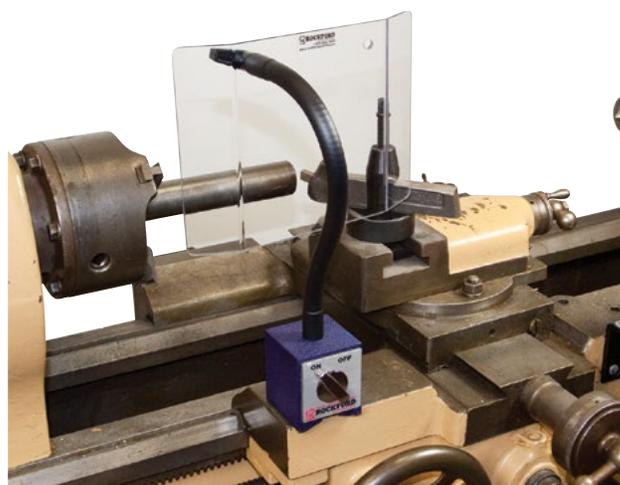
PART NO.	DESCRIPTION
KYL169	10" x 12" Concave Shield and 12" Arm With Magnetic Base
KYL170	10" x 12" Concave Shield and 18" Arm With Magnetic Base
CSAD3	10" x 12" Concave Replacement Shield Only
FKT1106	Optional 3 ¹ / ₂ " x 4 ⁵ / ₈ " Steel Mounting Plate (Fasteners Not Included)

ON/OFF MAGNETIC-BASE SHIELDS

These versatile on/off magnetic-base shields can be used on lathes, drills, mills, grinders, or any equipment that has a flat, ferrous mounting surface. The heavy-duty magnetic base is 2 $\frac{3}{4}$ " square with a V-groove and measures 3" high. The **200-lb holding force** keeps the shield in place when the magnet is on. If an adequate flat, smooth, ferrous mounting surface is not available, an optional steel mounting plate (Part No. FKT1106) can be used.

The 12", 18", and 24" flexible spring-steel arms are covered with vinyl to protect them from grease, oil, and contaminants that would weaken their holding power. They offer virtually unlimited adjustment possibilities and have long-term holding power.

The transparent portion of these shields is constructed of high-impact-resistant, 3/16"-thick clear polycarbonate. The shield places a barrier between an operator and the flying chips (swarf), sparks, and coolant generated at the point of operation. A variety of flat, angled, and concave shields are available.



On/Off magnetic-base shield on a lathe.



Optional Mounting Plate

Ordering Information

PART NO.	DESCRIPTION	REPLACEMENT SHIELD
KYL197	6" x 8" Flat Shield With 12" Arm	CSAA3
KYL198	6" x 8" Flat Shield With 18" Arm	CSAA3
KYL200	30° Angle Shield 7" Front With 12" Arm	KYL012
KYL201	30° Angle Shield 7" Front With 18" Arm	KYL012
KYL203	10" x 12" Flat Shield With 12" Arm	CSAA5
KYL204	10" x 12" Flat Shield With 18" Arm	CSAA5
KYL206	30° Angle Shield 10 $\frac{1}{8}$ " Front With 12" Arm	KYL017
KYL207	30° Angle Shield 10 $\frac{1}{8}$ " Front With 18" Arm	KYL017
KYL209	30° & 90° Angle Shield 10 $\frac{1}{8}$ " Front With 12" Arm	KYL126
KYL210	30° & 90° Angle Shield 10 $\frac{1}{8}$ " Front With 18" Arm	KYL126
KYL212	90° Angle Shield 11" Front With 12" Arm	KYL018
KYL213	90° Angle Shield 11" Front With 18" Arm	KYL018
KYL215	8" x 10" Concave Shield With 12" Arm	CSAD2
KYL216	8" x 10" Concave Shield With 18" Arm	CSAD2
KYL218	10" x 12" Concave Shield With 12" Arm	CSAD3
KYL219	10" x 12" Concave Shield With 18" Arm	CSAD3
FKT1106	Optional 3 $\frac{1}{2}$ " x 4 $\frac{1}{2}$ " Steel Mounting Plate (Fasteners Not Included)	

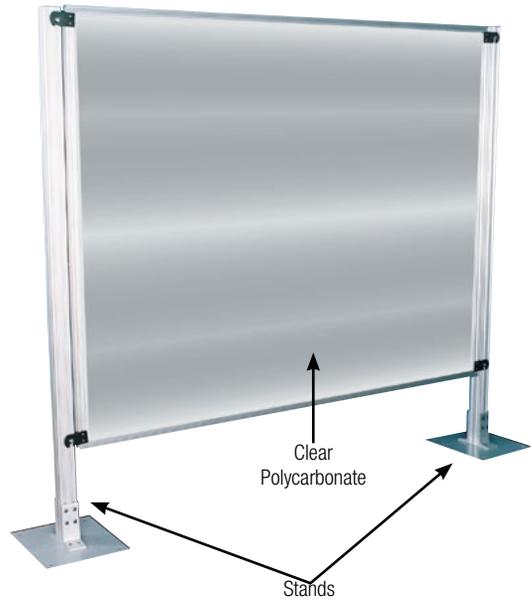
FREE-STANDING SHIELD ASSEMBLY



Free-standing shield used to protect the area around a milling machine from flying chips.

These shields can be used to protect the area between machines, the backside of machines, along aisles, etc.

These free-standing adjustable shield assemblies are available in a wide range of sizes. They are constructed of 3/16"-thick polycarbonate material surrounded by aluminum framing. The shield can easily be adjusted up or down on the stands. The stands are constructed of 2"-square extruded aluminum. Each base includes four holes for permanent mounting to the floor. Four standard sizes are available. Special size shield assemblies are available upon request.



Ordering Information

PART NO.	DESCRIPTION
KYL026	48" H x 48" L Shield Size
KYL027	48" H x 60" L Shield Size
KYL028	48" H x 72" L Shield Size
KYL029	48" H x 96" L Shield Size

LOCKOUTS



ELECTRICAL PLUG LOCKOUT

PART NO. KYM088

This lockout container can lockout plugs up to 3" wide and 5½" long with a maximum cord diameter of 1¼".

The lockout consists of a round container and two cover plates made of a durable and chemically resistant thermoplastic. The cover plates, when used singularly or combined, are locked to produce a universally fitting electrical plug lockout device.

This lockout is bright yellow so it can also serve as a visual warning to other plant personnel.

PLUG HUGGER—PART NO. KYM199

This device is ideal for frequently locked-out cords. It slides over the plug's blades and locks with a key. It can only be used on standard 125-V, 15A plugs (polarized or nonpolarized) with a hole on both blades.



LOCK-A-PLUGS



These lockout devices accommodate a large variety of electrical plugs. The large device (KYM987) also locks out necked-down pneumatic male fittings commonly attached to compressed air hoses. These devices accommodate up to four padlocks with 9/32" maximum shackle diameter.

PART NO. KYM984

For plugs up to 1½" wide, 1½" high, and 3" long with a maximum cord diameter of ½"

PART NO. KYM987

For plugs up to 3½" wide, 3½" high, and 6" long with a maximum cord diameter of ¾"

LOCKOUT HASPS

These lockout hasps are made from 12-gauge steel that is epoxy-coated for superior rust resistance and added dielectric strength. The yellow plastic coating on the lock area is for visibility. These devices accept up to six padlocks with 9/32" maximum shackle diameter.



PART NO. KYM988 1" Diameter Lockout Hasp

PART NO. KYM989 1½" Diameter Lockout Hasp

ELECTRICAL POWER CUTOFF SYSTEM (INTERLOCK)

This interlock assembly can be interfaced into the control system so when the plug is pulled, the machine or equipment becomes inoperable. It includes a two-prong plug, a 24" chain, a receptacle, and an electrical mounting box.



PART NO. KTS518

One-Contact Interlock System With 24" Chain

PART NO. KTS533

Two-Contact Interlock System With 24" Chain

PLUGOUT

PART NO. KYM983

This lockout container accepts lockout plugs up to 2¾" wide and 4¾" long with a maximum cord diameter of 2¾". It is constructed of high-impact, yellow UV-stabilized polymer. It has an easy to use two-step close and slide assembly. It allows the use of four individual padlocks (up to 3/8" shackle diameter). A lockout hasp can be used if more locks are required. An advantage to this plug lockout is that it can be stored on the cord when not in use. This device is 4¼" wide and 7¼" long.



TAGOUTS

These tagouts are 2-7/8" x 5½" x .055" thick, and made of a polyethylene material. They meet the requirements of OSHA 29 CFR 1910.147 for lockout/tagout. The reverse side of each tagout is the same.



PART NO.
KYM192

PART NO.
KYM193

PART NO.
KYM194

PART NO.
KYM195

PART NO.
KYM196

REVERSE
SIDE

LOCKOUT VALVES

SLIDE-OPERATED VALVE

This three-way valve is operated with the manual movement of a slide that opens and closes the valve. This valve shuts off air at the machine and then bleeds off downstream air. It can be locked only in the off position.



PART NO.	PORT SIZE	
	IN-OUT	
RCD113	1/2"	
RCD114	3/4"	

EEZ-ON VALVE

This valve shuts off air supply to the machine and bleeds downstream air when the valve is closed. When the valve is open, it gradually allows air into the air system to prevent damage to air components. It can be locked only in the off position. This valve is furnished with a muffler.



PART NO.	PORT SIZE	
	IN-OUT	EXHAUST
RCD121	1/2"	3/4"
RCD122	3/4"	3/4"

SINGLE-PHASE DISCONNECT SWITCH WITH MAGNETIC MOTOR STARTER AND SELF-LATCHING EMERGENCY-STOP BUTTON

This single-phase unit is designed for motors that have built-in overloads. Typical applications for these combinations include smaller crimping machines, grinders, drill presses, and all types of saws.

PART NO. CSS055 (115V, 1/2 HP MAX.)

The 115V, 15A disconnect switch and nonreversing magnetic motor starter are housed in a NEMA 12 enclosure. Enclosure size is 8" x 6" x 3 1/2". It includes a self-latching red emergency-stop palm button and a green motor control on push button. It can be used on machines with 115V power and is rated up to 1/2 HP maximum.

The disconnect switch has a rotary operating handle which is lockable in the off position only. This meets OSHA regulations and ANSI standards.

For machines with 230VAC single-phase motors, a transformer is required to reduce the control circuit voltage to 115VAC in order to comply with NFPA 79. See the RSD series disconnect switches, motor starters, and combinations on pages 93-94.



SINGLE-PHASE STARTER WITH SELF-LATCHING EMERGENCY-STOP BUTTON

PART NO. CSF082 (115VAC, 3/4 HP MAX.)

The 115VAC, 20A non-reversing magnetic motor starter, self-latching red emergency-stop palm button, green motor control on push button and red motor control off push button are housed in a NEMA 4 polycarbonate enclosure. Enclosure size is 5" x 5" x 4". It can be used for machines with 115VAC power and is rated up to 3/4 HP maximum at 115VAC. For machines with 230VAC single-phase motors, a transformer is required to reduce the control circuit voltage to 115VAC in order to comply with NFPA 79. See the RSD series disconnect switches, motor starters, and combinations on pages 92-93.



PART NO. CSF301 (115VAC, 2 HP MAX.)

The 115VAC, 30A non-reversing magnetic motor starter, self-latching red emergency-stop palm button, green motor control on push button and red motor control off push button are housed in a NEMA 12 enclosure. Enclosure size is 8" x 6" x 6". It can be used for machines with 115VAC power and is rated up to 2 HP maximum at 115VAC. For machines with 230VAC single-phase motors, a transformer is required to reduce the control circuit voltage to 115VAC in order to comply with NFPA 79. See the RSD series disconnect switches, motor starters, and combinations on pages 92-93.



ENCLOSED TRANSFORMERS

These transformers comply with OSHA regulations and ANSI standards and are available for use when the motor start/stop station is remotely located from the starter enclosure, and voltage to these buttons must be 115V or less. These transformers mount directly to the frame of the machine. If the existing motor starter operating coils are a higher voltage (208, 230, 460, 575 V), they must be replaced with a 115V coil when furnishing these transformers. A replaceable fuse is accessible from the outside of the transformer housing.



Ordering Information

PART NO.	DESCRIPTION
RSF021	100-VA, 230/460-V Primary and 115V Fused Secondary With a 1 A, 230-V Fuse
RSF030	150-VA, 230/460-V Primary and 115V Fused Secondary With a 1.5 A, 230-V Fuse

IEC FUSED DISCONNECT SWITCHES, MAGNETIC MOTOR STARTERS, AND COMBINATIONS

These three-phase disconnect/starters are housed in a NEMA 12 metal enclosure. The enclosure size will vary depending on the motor starter required. These units can be used on machines with 208, 230, 460, or 575 V. They are furnished with an overload relay and have operating coils of 115V, 60 Hz. The disconnect operating handle is lockable in the off position only. These combination units meet OSHA regulations, ANSI standards, and NFPA 79.

To obtain the part number of the motor starter required, please refer to the part numbering chart on the next page.

A remote station is required when using any **plain-door** starter. To obtain the part number of the remote operator station required, please refer to the part numbering chart on the page 94.



PART NO. RSD-1230-F



PART NO. VOS2100



PART NO. RSD-2210-P-1

Note: Please furnish the exact motor horsepower, voltage, and full-load amps when ordering any of the disconnects or starters on page 93. This information is usually on the motor nameplate. Voltage can be 208, 230, 460, or 575 V. If other sizes are required, please consult Rockford Systems.

SELECTING A DISCONNECT, STARTER, OR COMBINATION DISCONNECT/STARTER(S)

To determine the 9-digit configured part number for a disconnect, starter, or combination disconnect/starter(s) required, follow directions 1-7 below and use the information in the **PART NUMBERING SYSTEM CHART** below.

The first 3 digits for all disconnects, starters, or combination disconnect/starter(s) are RSD.

The 4th digit determines the size of the disconnect switch, if required. Zero (0) indicates no disconnect switch provided.

The 5th digit determines the type of the main motor starter and/or 2nd motor starter. Zero (0) indicates no starters.

The 6th digit determines the size of the main motor starter. Zero (0) indicates no main motor starter.

The 7th digit determines the size of the 2nd motor starter. Zero (0) indicates no 2nd motor starter.

The 8th digit (if required) determines the configuration and location of the operator controls.

The 9th digit determines if a transformer and/or wiring is required.

DISCONNECT AND STARTER(S) PART NUMBERING SYSTEM CHART																																																																																																																											
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DISCONNECT SWITCH SIZE (IEC) (PLUS MAXIMUM MAIN MOTOR FLA)			1	—Generally Numbered and Wired to Terminals —Includes Transformer																																																																																																																							
0	—No Disconnect Switch		2	—Generally Numbered and Wired to Terminals —Without Transformer																																																																																																																							
1	—30A CC Disconnect—1- to 17-FLA Total Motor Current		CONFIGURATION & OPERATOR LOCATION																																																																																																																								
2	—30A J Disconnect—1- to 20-FLA Total Motor Current		-	—Blank—No Specific Configuration																																																																																																																							
3	—60-A J Disconnect—21- to 40-FLA Total Motor Current		P	—All Operators Remote (Plain Door)																																																																																																																							
4	—100-A J Disconnect—41- to 66-FLA Total Motor Current		F	—All Motor Operators on Door of Enclosure																																																																																																																							
5	—200-A J Disconnect—67- to 133-FLA Total Motor Current		X	—F Configuration With E-Stop in Place of Single-Motor Stop																																																																																																																							
6	—400-A J Disconnect—134- to 266-FLA Total Motor Current		Y	—F Configuration With Addition of E-Stop																																																																																																																							
REVERSING/NONREVERSING MOTOR STARTER			2nd MOTOR STARTER SIZE																																																																																																																								
0	—No Starters		0	—No Main Motor Starter																																																																																																																							
1	—Nonreversing Main Motor Starter		<table border="1"> <thead> <tr> <th rowspan="2">IEC</th> <th colspan="6">Motor Horsepower Chart</th> </tr> <tr> <th colspan="3">1-Phase</th> <th colspan="3">3-Phase</th> </tr> <tr> <th></th> <th>115V</th> <th>230 V</th> <th>208 V</th> <th>230 V</th> <th>460 V</th> <th>575 V</th> </tr> </thead> <tbody> <tr><td>1</td><td>—12 A</td><td>1/2</td><td>1</td><td>2</td><td>3</td><td>7.5</td><td>7.5</td></tr> <tr><td>2</td><td>—18 A</td><td>3/4</td><td>2</td><td>5</td><td>10</td><td>10</td><td>10</td></tr> <tr><td>3</td><td>—25 A</td><td>2</td><td>3</td><td>5</td><td>7.5</td><td>15</td><td>15</td></tr> <tr><td>4</td><td>—32 A</td><td>2</td><td>5</td><td>7.5</td><td>10</td><td>20</td><td>20</td></tr> <tr><td>5</td><td>—40 A</td><td>3</td><td>7.5</td><td>10</td><td>10</td><td>30</td><td>30</td></tr> <tr><td>6</td><td>—50 A</td><td>3</td><td>10</td><td>15</td><td>15</td><td>30</td><td>40</td></tr> <tr><td>7</td><td>—65 A</td><td>5</td><td>10</td><td>20</td><td>20</td><td>50</td><td>50</td></tr> <tr><td>8</td><td>—80 A</td><td>7.5</td><td>15</td><td>25</td><td>30</td><td>60</td><td>75</td></tr> <tr><td>9</td><td>—95 A</td><td>7.5</td><td>20</td><td>30</td><td>30</td><td>60</td><td>75</td></tr> <tr><td>A</td><td>—115 A</td><td>10</td><td>25</td><td>30</td><td>40</td><td>75</td><td>100</td></tr> <tr><td>B</td><td>—185 A</td><td>15</td><td>30</td><td>50</td><td>60</td><td>125</td><td>150</td></tr> <tr><td>C</td><td>—265 A</td><td>—</td><td>—</td><td>75</td><td>100</td><td>200</td><td>200</td></tr> </tbody> </table>					IEC	Motor Horsepower Chart						1-Phase			3-Phase				115V	230 V	208 V	230 V	460 V	575 V	1	—12 A	1/2	1	2	3	7.5	7.5	2	—18 A	3/4	2	5	10	10	10	3	—25 A	2	3	5	7.5	15	15	4	—32 A	2	5	7.5	10	20	20	5	—40 A	3	7.5	10	10	30	30	6	—50 A	3	10	15	15	30	40	7	—65 A	5	10	20	20	50	50	8	—80 A	7.5	15	25	30	60	75	9	—95 A	7.5	20	30	30	60	75	A	—115 A	10	25	30	40	75	100	B	—185 A	15	30	50	60	125	150	C	—265 A	—	—	75	100	200	200
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Please see page 94 for an example of a disconnect and starter(s) part number.

SELECTING A REMOTE OPERATOR STATION

To determine the 8-digit configured part number for a remote operator station required, follow directions 1-3 below and use the information in the **PART NUMBERING SYSTEM CHART** below.

The first 3 digits determine the orientation of the remote operator station.

Digits 4 through 7 determine motor operators. Zero (0) indicates no operator(s).

The 8th digit (if required) determines the 2nd motor operators.

REMOTE OPERATOR STATION PART NUMBERING SYSTEM CHART	
XXX - XXXX - X	
<p>REMOTE OPERATOR STATION ORIENTATION</p> <p>HOS —Horizontal Operator Station VOS —Vertical Operator Station</p>	
<p>MAIN MOTOR START/STOP/E-STOP OPERATORS</p> <p>1 —Start/Stop Push Buttons 2 —Start/E-Stop Push Buttons 3 —Start/Stop/E-Stop Buttons 4 —E-Stop Button Only</p>	
<p>MAIN MOTOR FORWARD/REVERSE OPERATORS</p> <p>0 —No Forward/Reverse Operators 1 —Forward/Reverse Selector Switch* 2 —Forward/Reverse Push Buttons</p>	
<p>2nd MOTOR OPERATORS</p> <p>—Blank—No 2nd Motor 1 —Start/Stop Push Buttons 2 —Start/Stop Push Buttons & Forward/Reverse Selector Switch</p>	
<p>MAIN MOTOR JOG</p> <p>0 —No Jog 1 —Jog/Run Selector Switch</p>	
<p>MAIN MOTOR SPEED CHANGE</p> <p>0 —No Speed Change 1 —Fast/Slow Selector Switch 2 —Fast/Slow Push Buttons</p>	
<p>* Must be configured with a start push button</p>	

DISCONNECT AND STARTERS PART NUMBER EXAMPLE

1
2 3 4 5
6
7
RSD - 3521 - P - 1

The example shown above, RSD-3521-P-1, indicates that the enclosure containing the combination disconnect/starter(s) has a 60-A disconnect switch, a 18-A reversing main motor starter, and a 12-A nonreversing 2nd motor starter. All motor controls will be in a remote station. This disconnect/starter(s) will be generically numbered and wired to terminals and will include a transformer.

REMOTE OPERATOR PART NUMBER EXAMPLE

1
2
3
VOS - 3100 - 1

The example shown above, VOS3100-1, indicates that it is a vertical-oriented remote operator station which includes main motor start/stop/E-stop buttons, main motor forward/reverse selector switch, and start/stop push buttons for the 2nd motor starter.



REMOTE OPERATOR STATIONS

PART NO. HOS4000

This 4½" x 3½" x 3" station has a self-latching red emergency-stop palm button in a NEMA 12 metal enclosure. To reset this button, turn it to the right.



PART NO. HOS4000

PART NO. VOS2000

(FOR USE WITH NONREVERSING MOTOR STARTERS)

This 6¾" x 3½" x 3" station has a motor on push button and a self-latching red emergency-stop palm button in a NEMA 12 metal enclosure.



PART NO. VOS2000

PART NO. HOS4201

(FOR USE WITH REVERSING MOTOR STARTERS)

This 3½" x 10½" x 3" station has a motor jog/run selector switch, forward and reverse push buttons, and a self-latching emergency-stop palm button in a NEMA 12 metal enclosure.



PART NO. HOS4201

PART NO. VOS1000

(FOR USE WITH NONREVERSING MOTOR STARTERS)

This 6¾" x 3½" x 3" station has motor on and stop push buttons in a NEMA 12 metal enclosure.



PART NO. VOS1000

PART NO. HOS4200

(FOR USE WITH REVERSING MOTOR STARTERS)

This 3½" x 8¾" x 3" station has motor forward and reverse push buttons and a self-latching emergency-stop palm button in a NEMA 12 metal enclosure.



PART NO. HOS4200

PART NO. VOS1100

(FOR USE WITH REVERSING MOTOR STARTERS)

This 8¾" x 3½" x 3" station has motor on and stop push buttons and a motor forward/reverse selector switch in a NEMA 12 metal enclosure.



PART NO. VOS1100

PART NO. VOS2100

(FOR USE WITH REVERSING MOTOR STARTERS)

This 8¾" x 3½" x 3" station has a motor forward/reverse selector switch, a motor on push button, and a self-latching red emergency-stop palm button in a NEMA 12 metal enclosure.



PART NO. VOS2100

PART NO. PB5R00-01—

Self-Latching Emergency-Stop Mushroom-Head Push Button



PART NO. CTM506—

Yellow Emergency-Stop Nameplate (22.5 mm hole)



PART NO. CTC550—

Push/Pull to Release Emergency-Stop Push Button



PART NO. CTM548—

Yellow Emergency-Stop Nameplate (30 mm hole)



DANGER SIGNS AND LABELS

The signs offered in this catalog are .055" thick linear polyethylene. They are semi-rigid plastic and are capable of withstanding a temperature range of -60° to 130° F. They are resistant to tears and may be mounted with nails, rivets, screws, bolts, nylon lock-straps, double-face adhesive tape, etc. Each sign is protected from fading, chipping, scratching, weather extremes, physical abuse, grease, oil, moisture, chemicals and acids. These signs do not rust, dent, or corrode. They do not curl up or rip and are lightweight and easy to handle.

OPERATOR SAFETY PRECAUTIONS FOR METAL-CUTTING MACHINERY—8½" X 11" X .055" THICK

PART NO. KSC048—ENGLISH

PART NO. KSC048S—SPANISH

PART NO. KSC048F—FRENCH

OPERATOR SAFETY PRECAUTIONS
Handout for Anyone Operating This Machine

Before You Operate This Machine You Must Read and Understand These Safety Precautions

DANGER

ROTATING MEMBERS AND TOOLS

NEVER
Place Your Hands, Clothes or Any Part of Your Body in This Machine!

FLYING PARTS

NEVER
Operate This Machine Without Proper Eye and Other Body Protection!

See Reverse Side for Other Safety Precautions.

Part No. KSC048 **OVER**

KSC048 FRONT (ENGLISH)

Do Not Operate This Machine Until You Read and Understand the Following Safety Precautions.

- 1 **Never** operate this machine unless you understand that this machine is dangerous. Never place your hands or any part of your body in the machine which could result in loss of fingers, limbs or even death.
- 2 **Never** operate this machine without the use of a point-of-operation guard, shield, or safety device that will protect you from bodily injury.
- 3 **Always** wear safety glasses, face protection or both and any other personal protection equipment needed when operating this machine.
- 4 **Never** operate this machine with loose clothing, jewelry, or unrestrained hair styles that are hazardous to your own personal safety. When there are moving parts present such as cutters, chucks, and tables, pay particular attention to loose clothing and hair, neckties, finger rings, neckties, watch bands, etc.
- 5 **Always** use hand tools for feeding or retrieving material from the point of operation or any other hazardous part of the machine. Never reach through or into a hazardous area of a machine for any reason.
- 6 **Never** operate this machine unless you have been fully trained and have received and understood all operating instructions. Make sure you know how the machine works and how it is controlled.
- 7 **Never** operate this machine unless you are sure the safeguarding is adjusted properly and working correctly. If you are not sure, notify your supervisor.
- 8 **Never** operate this machine if it is not working properly or if you notice any unusual noise or change in the performance of the machine. Stop operating the machine immediately and advise your supervisor.
- 9 **Always** notify your supervisor immediately if you observe an unsafe practice or condition.
- 10 **Always** maintain an orderly work area. Pay particular attention to the storage of tools or parts that could be dislodged and cause a hazardous condition.
- 11 **Never** start the machine with the wrench in the chuck. The chuck wrench should be removed from the chuck immediately after using it or a spring-loaded chuck wrench should be used.
- 12 **Never** tamper with, alter, remove, or disable any component or safeguard on this machine.
- 13 **All employees** who adjust, position, or install safety equipment, devices, guards, or shields should follow instructions from the employer.
- 14 **Always** check the setup during each shift and between each job to ensure all safeguarding is working and the operation will be performed in a safe manner. Severe hazardous operating conditions may require more frequent checking.
- 15 **Be sure everyone** is clear of the machine before it is cycled, especially when multiple operators are present. Do not operate the machine unless you and every operator and helper are protected from injury by a guard or safety device.
- 16 **Always** stay alert (don't drink) and never operate the machine while under the influence of alcohol or any drug, including prescription medication.
- 17 **Maintenance and Set-Up Personnel:** Never work on this machine unless power is off and locked out, rotating members are at rest, and all energy (electrical, air, hydraulic, etc.) is at a zero state.
- 18 **Always** be prepared for an emergency situation. You should know how to stop and shut down the machine if required.
- 19 **Never** operate this machine unless all mechanical power-transmission apparatus covers (for shafts, gears, etc.) and auxiliary equipment are free from hazards.

* Point of Operation—"The location in the machine where the material or workpiece is positioned and work is performed." (ANSI B11.19)

NOTICE TO EMPLOYER: These Operator Safety Precautions must be given to all operators including set-up people, maintenance personnel, and supervisors of this machine. These precautions should also be hung on the machine readily accessible and visible to the operator. Additional precautions are available upon request.

IMPORTANT: If a language barrier or insufficient schooling prevents a person from reading and understanding these precautions, you should either translate this information or have it read or interpreted to the person. Make sure that it is understood. If Spanish or French safety precautions are required, please consult the factory.

THESE PRECAUTIONS MUST BE REVIEWED DAILY.

KSC048 BACK (ENGLISH)

PRECAUCIONES PARA LA SEGURIDAD DEL OPERADOR

Información Para Toda Persona Que Opere Esta Máquina

Antes de Operar Esta Máquina Usted Debe Leer y Comprender Estas Precauciones Para Su Seguridad

PELIGRO

PIEZAS Y HERRAMIENTAS GIRATORIAS

NUNCA
Ponga Las Manos, Ropa, ni Ninguna Parte de Su Cuerpo en Esta Máquina!

TROZOS QUE VUELAN

NUNCA
Opere esta Máquina Sin La Debida Protección Para los Ojos y Otras Partes del Cuerpo!

Ver Otras Precauciones Al Dorsó

Part No. KSC048S **LEER AL DORSO**

KSC048S FRONT (SPANISH)

No Opere Esta Máquina Hasta Haber Leído y Comprendido las Sigüientes Medidas de Precaución y Seguridad.

- 1 **Nunca** opere esta máquina hasta haber comprendido que es peligrosa. Nunca ponga las manos ni ninguna parte del cuerpo en esta máquina, pues podría perder dedos, miembros o hasta morir.
- 2 **Nunca** opere esta máquina sin usar la defensa, protección o dispositivo de seguridad correspondiente a ese "lugar de operación" en el cual se trabajará en todo momento con mucha atención.
- 3 **Siempre** use lentes de seguridad, protección para la cara, o ambos, así como cualquier otro equipo de protección y seguridad personal, cuando opere esta máquina.
- 4 **Nunca** use ropa suelta, joyas, ni el cabello suelto, pues pueden ser peligrosos a la seguridad personal. Cuando hay piezas en movimiento, tales como cortadores, sierras, mesas, presta especial atención a la ropa y cabellos sueltos, corbatas, anillos, collares, pulseras de reloj, etc.
- 5 **Siempre** use herramientas de mano para colocar o retirar material del lugar de trabajo, o cualquier otra parte peligrosa de la máquina. Si necesita utilizar algo no lo haga sobre ni a través de la máquina.
- 6 **Nunca** opere esta máquina a menos que haya sido completamente entrenado y haya recibido y entienda todas las instrucciones de operación. Asegúrese de haber cómo funciona la máquina y cómo es controlada.
- 7 **Nunca** opere esta máquina a menos que esté seguro que la protección está colocada correctamente y en perfecto funcionamiento. Si tiene dudas, llame a su supervisor.
- 8 **Nunca** opere esta máquina si no está funcionando correctamente o si alguna vez cualquier ajuste inusual o cambio en el funcionamiento de la misma. Suspender la operación inmediatamente y avise a su supervisor.
- 9 **Siempre** notifique inmediatamente a su supervisor si observa una acción o condición peligrosa.
- 10 **Siempre** mantenga ordenada la zona de trabajo. Especialmente, guarde las herramientas o piezas que pudieran volar y provocar una situación de peligro.
- 11 **Nunca** ponga la máquina en funcionamiento con la llave palé sujeta en el mandril. Se debe retirar del mandril la llave para manejar inmediatamente después de usarla, o de lo contrario, usar una llave para mandril con resorte.
- 12 **Nunca** usar ningún componente de esta máquina ni dispositivo de seguridad para apagar, ni tampoco atornillos, remaches o tornillos.
- 13 **Todos los Empleados** encargados de ajustar, operar, en posición o cambiar el equipo, dispositivos, defensas o protectores de seguridad deben seguir las instrucciones del empleador.
- 14 **Siempre** verificar la instalación durante cada turno y antes de trabajar y entre cada turno de que todos los dispositivos de seguridad estén en funcionamiento y que la condición de máquina de una manera segura. Cuando las condiciones de operación son inherentemente peligrosas, puede ser necesario verificar con más frecuencia.
- 15 **Asegúrese** de que todas las personas estén lejos de la máquina antes de comenzar el ciclo, especialmente cuando hay varios operadores presentes. No opere la máquina a menos que usted y todos los operadores que ayudarán estén protegidos contra lesiones por una defensa o dispositivo de seguridad.
- 16 **Siempre** esté alerta (no se emborrache) y nunca opere esta máquina bajo la influencia del alcohol, cualquier droga, incluyendo medicamentos recetados por el médico.
- 17 **Personal encargado del mantenimiento e instalación:** Nunca trabaje en esta máquina a menos que esté asegurado y atorado, que los componentes, defensas, estos, dispositivos y que todos los (eléctrica, aérea, hidráulica, etc.) estén en cero.
- 18 **Siempre** esté preparado para una situación de emergencia. Usted debe saber cómo detener y apagar la máquina si es necesario.
- 19 **Nunca** opere esta máquina a menos que todos los aparatos mecánicos de transmisión de energía (gears, engranajes, etc.) y equipo auxiliar, estén libres de riesgos.

* Lugar de Operación—"El lugar de la máquina-herramienta donde se coloca el material y se realiza el proceso." (ANSI B11.19)

NOTIFICACION AL EMPLEADOR: Se debe dar estas "Precauciones Para la Seguridad del Operador" a todos los operadores (incluyendo al personal que realiza la instalación, el mantenimiento y los supervisores) de esta máquina. Además, se debe colgar esta cartilla sobre la máquina, en lugar accesible y visible al operador. Si lo solicita, puede obtener cartillas adicionales.

IMPORTANTE: Cuando por desconocimiento del idioma o instrucción insuficiente una persona está impedida de leer y comprender el contenido de estas Precauciones Para la Seguridad del Operador, usted debe traducir esta información, o hacerla leer o interpretar para esa persona. Asegúrese de que la haya comprendido. Si requiere cartillas en inglés o en francés, sírvase consultar a la fábrica.

SE DEBE REVISAR ESTAS PRECAUCIONES DIARIAMENTE.

KSC048S BACK (SPANISH)

DANGER SIGNS AND LABELS

SHIELD SIGN—5" X 6" X .055" THICK



PART NO. KSC046—ENGLISH
PART NO. KSC046S—SPANISH
PART NO. KSC046F—FRENCH

GENERAL MACHINE SIGN—10" X 12" X .055" THICK



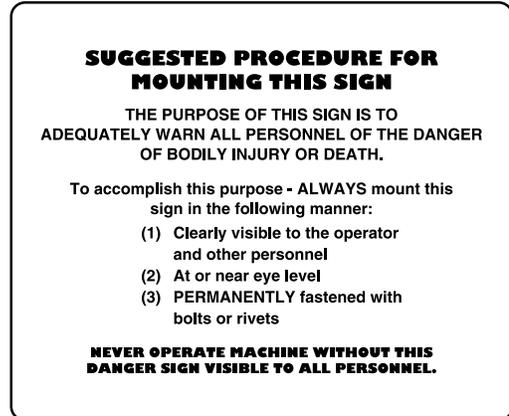
PART NO. KSC056—ENGLISH
PART NO. KSC056S—SPANISH
PART NO. KSC056F—FRENCH

SAW BLADE SIGN—5" X 6" X .055" THICK

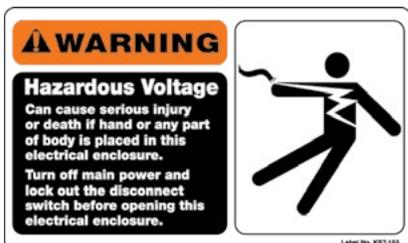


PART NO. KSC058—ENGLISH
PART NO. KSC058S—SPANISH
PART NO. KSC058F—FRENCH

REVERSE SIDE OF SIGNS

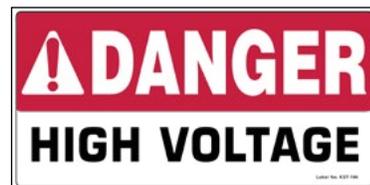


ELECTRICAL LABEL: WARNING—HAZARDOUS VOLTAGE



PART NO. KST152—2½" X 1½" X .002" THICK
PART NO. KST153—3" X 5" X .002" THICK

ELECTRICAL LABEL: DANGER—HIGH VOLTAGE



PART NO. KST194—2-7/8" X 5-7/8" X .003" THICK

OSHA STANDARDS

OSHA 29 CFR 1910.212 and a portion of 1910.219 are included in this catalog for use as a reference when determining safety requirements for bringing cutting and turning machines into compliance. Please note that 29 CFR 1910.147 (lockout/tagout) is not included here but it is an OSHA standard an employer must comply with for all machines and equipment.

29 CFR 1910.212 GENERAL REQUIREMENTS FOR ALL MACHINES

(a) Machine guarding — (1) Types of guarding. One or more methods of machine guarding shall be provided to protect the operator and other employees in the machine area from hazards such as those created by point of operation, ingoing nip points, rotating parts, flying chips and sparks. Examples of guarding methods are barrier guards, two-hand tripping devices, electronic safety devices, etc.

(2) General requirements for machine guards. Guards shall be affixed to the machine where possible and secured elsewhere if for any reason attachment to the machine is not possible. The guard shall be such that it does not offer an accident hazard in itself.

(3) Point of operation guarding. (i) Point of operation is the area on the machine where work is actually performed upon the material being processed.

(ii) The point of operation of machines whose operation exposes an employee to injury, shall be guarded. The guarding device shall be in conformity with any appropriate standards therefor; or, in the absence of applicable specific standards, shall be so designed and constructed as to prevent the operator from having any part of his body in the danger zone during the operating cycle.

(iii) Special hand tools for placing and removing material shall be such as to permit easy handling of material without the operator placing a hand in the danger zone. Such tools shall not be in lieu of other guarding required by this section, but can only be used to supplement protection provided.

(iv) The following are some of the machines which usually require point-of-operation guarding:

- (a) Guillotine cutters.
- (b) Shears.
- (c) Alligator shears.
- (d) Power presses.
- (e) Milling machines.
- (f) Power saws.
- (g) Jointers.
- (h) Portable power tools.
- (i) Forming rolls and calenders.

(4) Barrels, containers, and drums. Revolving drums, barrels and containers shall be guarded by an enclosure which is interlocked with the drive mechanism, so that the barrel, drum or container cannot revolve unless the guard enclosure is in place.

(5) Exposure of blades. When the periphery of the blades of a fan is less than seven (7) feet above the floor or working level, the blades shall be guarded. The guard shall have openings no larger than one-half (½) inch.

(b) Anchoring fixed machinery. Machines designed for a fixed location shall be securely anchored to prevent walking or moving.

29 CFR 1910.219 MECHANICAL POWER-TRANSMISSION APPARATUS

(b) Prime-mover guards—(1) Flywheels. Flywheels located so that any part is seven (7) feet or less above floor or platform shall be guarded in accordance with the requirements of this subparagraph:

(i) With an enclosure of sheet, perforated, or expanded metal, or woven wire;

(ii) With guard rails placed not less than fifteen (15) inches nor more than twenty (20) inches from rim. When flywheel extends into pit or is within 12 inches of floor, a standard toeboard shall also be provided;

(iii) When the upper rim of flywheel protrudes through a working floor, it shall be entirely enclosed or surrounded by a guardrail and toeboard.

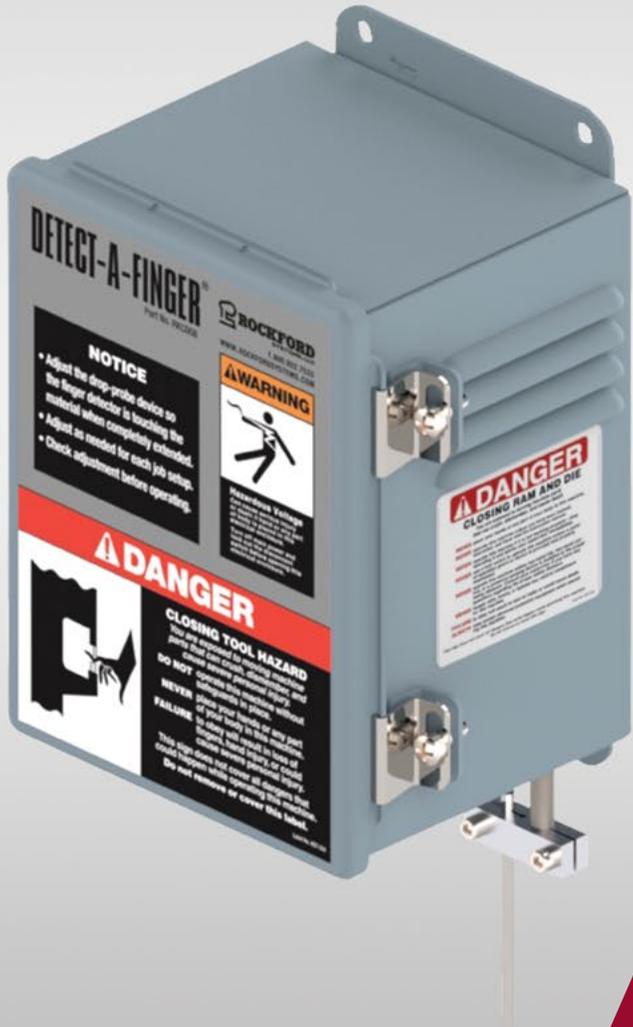
(iv) For flywheels with smooth rims five (5) feet or less in diameter, where the preceding methods cannot be applied, the following may be used: a disk attached to the flywheel in such manner as to cover the spokes of the wheel on the exposed side and present a smooth surface and edge, at the same time providing means for periodic inspection. An open space, not exceeding four (4) inches in width, may be left between the outside edge of the disk and the rim of the wheel if desired, to facilitate turning the wheel over. Where a disk is used, the keys or other dangerous projections not covered by disk shall be cut off or covered. This subdivision does not apply to flywheels with solid web centers.

(v) Adjustable guard to be used for starting engine or for running adjustment may be provided at the flywheel of gas or oil engines. A slot opening for jack bar will be permitted.

(vi) Wherever flywheels are above working areas, guards shall be installed having sufficient strength to hold the weight of the flywheel in the event of a shaft or wheel mounting failure.

Note: This is not the entire content of 29 CFR 1910.219.

This catalog does not cover all aspects of a safety program. There are many publications on the subject of safety. Please see page 5 for a listing of safety sources.



SAFEGUARDING DEVICES

FOR INDUSTRIAL MACHINES

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The applications described in this catalog are for instructional and informational purposes only; the photos in this catalog are for illustrative purposes only. They may not represent actual usage. This catalog has been carefully checked for accuracy and is thought to be fully consistent with the products described herein. However, Rockford Systems, LLC does not assume liability for the contents of this publication or for the use of any products described herein. Rockford Systems, LLC reserves the right to make changes to the products and documentation without further notice.

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PRESENCE-SENSING DEVICES



Stop-Time Measurement Device
(pp.5-6)

PRESENCE-SENSING DEVICES QUICK REFERENCE GUIDE SAFETY CATEGORY 3 PRODUCTS				
	ES-CURTAIN LIGHT CURTAIN pp. 12-16	PERIMETER LIGHT BEAM pp. 17-23	SYSTEM pp. 24-29	CONTACT TIME HISTORY
Point of Operation	X			
Parameter Entry/Edit	X	X	X	
Relocking				X
Cables	Up to 100' (30.4 m)	Up to 100' (30.4 m)	Up to 100' (30.4 m)	
Max Field of Coverage	750° (230° max)	90° (90° max)		
Sound/Warning	X			
Reverse Feed Blocking	X			
Feed Stopping/Reversed Acceleration	X			
Deadlock Capability	X			
Max Field of Coverage	25° (14 m) or 110° (20 m)		1 Beam	
Max Range	Up to 50' (15 m)	Up to 210' (64 m)	Up to 210' (64 m)	

AREA SCANNING DEVICES QUICK REFERENCE GUIDE SAFETY CATEGORY 3 PRODUCTS			
	S3000 STANDARD pp. 30-32	S3000 ADVANCED pp. 33-35	S3000 PROFESSIONAL pp. 36-39
Area	X	X	X
Relocking	X	X	X
Parameter Field - Max Range	27' (8 m)	237' (73 m)	27' (8 m)
Parameter Field - Min Range	100' (30 m)	100' (30 m)	100' (30 m)
Number of Zones	1	4	8
Scanning Angle	180°	180°	180°

Quick Reference Guide
(p.7)



Point-Of-Operation Light Curtain System
(pp.8-16)



Perimeter Light Beam System
(pp.17-19)



Swing-Away and Stationary Brackets
(pp.25-30)



Floor Stands, Mirrors, and Mirror Brackets
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PRESENCE-SENSING DEVICES

INTRODUCTION

Presence-sensing devices are available as infrared point-of-operation light curtains, infrared perimeter multiple light beam devices, infrared single-beam devices, or safety laser scanners. Light curtains used for point-of-operation safeguarding have close channel spacing to protect fingers and hands. Perimeter light curtains have wider channel spacing to detect larger parts of the body. Perimeter, multi-beam, and single-beam devices are designed specifically for perimeter safeguarding. Safety laser scanners are designed for area, access, and point-of-operation safeguarding.

There are many safety requirements that must be met before light curtains can be installed as point-of-operation safeguards. These requirements are located in OSHA 29 CFR 1910.217 and the ANSI B11-series safety standards for machine-tool safety. We have printed the following paragraphs for your convenience.

(c)(3)(i) Point-of-operation devices shall protect the operator by:

(a) Preventing and/or stopping normal stroking of the press if the operator's hands are inadvertently placed in the point of operation;

(c)(3)(iii) A presence sensing point-of-operation device shall protect the operator as provided in paragraph (c)(3)(i)(a) of this section, and shall be interlocked into the control circuit to prevent or stop slide motion if the operator's hand or other part of his body is within the sensing field of the device during the downstroke of the press slide.

(a) The devices may not be used on machines using full revolution clutches.

(b) The devices may not be used as a tripping means to initiate slide motion, except when used in total conformance with paragraph (h) of this section. (See OSHA safety standards for details.)

(c) The device shall be constructed so that a failure within the system does not prevent the normal stopping action from being applied to the press when required, but does prevent the initiation of a successive stroke until the failure is corrected. The failure shall be indicated by the system.

(d) Muting (bypassing of the protective function) of such device during the upstroke of the press slide is permitted for the purpose of parts ejection, circuit checking, and feeding.

(e) The safety distance (Ds) from the sensing field to the point of operation shall be greater than the distance determined by the following formula:

$D_s = 63 \text{ inches/second} \times T_s$ where:

D_s = minimum safety distance (inches);

63 inches/second = hand speed constant; and

T_s = stopping time of the press measured at approximately 90° position of crankshaft rotation (seconds).

(f) Guards shall be used to protect all areas of entry to the point of operation not protected by the presence-sensing device.

MINIMUM SAFETY DISTANCE

The minimum safety distance, which is one of the considerations listed, is defined in ANSI as the minimum distance from the light curtain's plane of light to the closest hazard or danger point where the operator could reach into the hazard.

This minimum safety distance is based on the stopping ability of the machine and a hand speed constant. When the minimum safety distance is calculated, several other factors must be taken into account which are not included in the OSHA formula. These factors include the total system response time including the light curtain, the minimum object sensitivity of the presence-sensing device, and the additional time for brake monitoring. The total system response time includes the stopping time of the machine under worse case conditions, response time of the control system, response time of the presence-sensing device as stated by the manufacturer, the response time of the interface, and, if applicable, additional time allowed for the brake monitor to compensate for variations in normal stopping time.

The depth penetration factor (Dpf), which is based on the light curtain's MOS (minimum object sensitivity), is part of the formula.

The following formula is used to compute the minimum safety distance (Ds) on mechanical power presses to meet the ANSI (American National Standards Institute) B11.1 standard for press safety:

$D_s = K (T_s + T_c + T_r + T_{spm}) + D_{pf}$ where:

K = 63 inches/second (hand speed constant)

T_s = Stop time of equipment measured at the final control element

T_c = Response time of the control system

T_r = Response time of the presence-sensing device and its interface

T_{spm} = Additional time allowed for the stopping performance monitor to compensate for variations in normal stopping time

D_{pf} = The added distance due to the depth penetration factor.

Note: If the channel blanking feature is used on light curtains, additional safety distance must be enforced based on the number of channels blanked.

The following is a list of safeguarding devices that could be applied using the above safety distance formula. For more details, see ANSI B11.1-2009.

1. Interlocked barrier guards
2. Two-hand control devices
3. Two-hand trip devices
4. Single control safeguarding devices
5. Electro-optical presence-sensing devices
6. RF (radio-frequency) presence-sensing devices
7. Safety mat devices
8. Safety edge device

PORTABLE STOP-TIME MEASUREMENT (STM) DEVICE



FEATURES

- Easy to use in the field
- Portable; battery-operated
- Readout in stopping time and safety distance
- Handy carrying case
- Easy programming
- Machine memory
- Preprogrammed light curtain response time and minimum object sensitivity
- Choice of hand-speed constant

The stop-time measurement (STM) device measures the time it takes a machine to stop after a signal is given. It is mainly used on reciprocating (stroking or cycling) machines, such as mechanical or hydraulic presses and press brakes. With optional accessories, it can also be used on machines that rotate, such as lathes, mills, and drills.

Industry uses this type of device to determine the stopping time of a machine before installing safeguarding devices such as a two-hand control or a presence-sensing device. The stopping time measured by the STM device during the hazardous portion of the cycle is used in the OSHA (Occupational Safety and Health Administration) or ANSI (American National Standards Institute) formulas to calculate the safety distance. The safety distance is then used to establish the location of the safeguarding device in relation to the nearest hazard. This device can also be used to periodically check the machine's stopping time to ensure that the current safety distance corresponds to the current condition of the machine's stopping ability.

SPECIFICATIONS:

Electronics

Display

Description.....	4 digit, 14 segment, 1/4" red LED
Stop Time	0-9999 milliseconds
Safety Distance	0-999.9 inches
Automatic Decimal	Yes
Lead Zero Blanking.....	Yes
Accuracy.....	±1%
Power Source	115VAC or internal battery
Battery Type.....	6 V, sealed lead acid
Operating Time.....	10 hours (full charge)
Recharge Time	8 hours
Battery Charger.....	Contained

Mechanical

Meter

Material	Aluminum with baked enamel finish
Dimensions	11" L x 7" D x 7" H
Weight	9 lb

Hand-Held Actuator

Material	Aluminum with baked enamel finish
Dimensions	4 1/2" dia. x 2" H
Weight	3 lb

Position/Velocity Transducer

Material	Aluminum with baked enamel finish
Dimensions	5 1/4" L x 2 3/4" D x 4 3/4" H
Weight	1.6 lb
Cable stroke.....	49"

PORTABLE STOP-TIME MEASUREMENT (STM) DEVICE

When using this STM device, the display gives both the stopping time of the machine in milliseconds (thousandths of a second), and the calculated safety distance in inches. The safety distance is based on the hand speed constant of 63 inches (1.6 meters) per second. For mechanical power presses, the OSHA formula multiplies the hand speed constant by the stopping time of the machine at 90° of crankshaft rotation. When using this formula, the reaction time of either ergonomic (capacitive) palm buttons or a presence-sensing device should be added to the stopping time to calculate the proper safety distance. Please refer to the formula found in the ANSI B11.1 standard for mechanical power presses.

This STM device is also used by federal and state OSHA compliance officers, insurance company loss-control engineers, and safety training personnel to determine if proper safety distances are being used for the existing safeguarding method.

The portable design makes the STM very easy to use. A programmed stop signal is provided, which releases or actuates a button or other operator-controlled device on the machine during the hazardous portion of the cycle. If a machine has a presence-sensing device, the plane of light can be interrupted with the furnished flag, which sends a signal to stop the machine.

This device consists of three major components:

1. The meter which is the processor containing the electronics and display.
2. The position/velocity transducer which detects motion and provides the programmed output signal to stop the machine.
3. The hand-held actuator which automatically releases or pushes a button or other device on the machine. It is also used to operate the flag when presence-sensing devices are used as the safeguarding method.

Other STM components provided with this device are the presence-sensing flag, cable extension set, legs, plunger extension, and instruction manual.



ORDERING INFORMATION

Part No. DCL100—Complete STM in a carrying case including meter, transducer, cable extension set, hand-held actuator, presence-sensing flag, legs, plunger extension, and instruction manual.

Optional Accessories

Part No. DCL101—Remote tachometer assembly (for reciprocating machines that stop beyond bottom or top, and for machines with relatively slow rotating or lineage motion)

Note: Requires DCL102 (see below)

Part No. DCL102—One NO manual start switch

FIELD OF COVERATE IN INCHES (mm)	A INCHES (mm)	B INCHES (mm)	C INCHES (mm)	D INCHES (mm)
12 (300)	11.8 (300)	14.6 (372)	16.0 (405)	13.7 (347)
18 (450)	17.7 (450)	20.6 (522)	21.9 (555)	19.6 (497)
24 (600)	23.6 (600)	26.4 (671)	27.7 (704)	25.4 (646)
30 (750)	29.5 (750)	32.3 (821)	33.6 (854)	31.3 (796)
35 (900)	35.4 (900)	38.2 (971)	39.5 (1004)	37.2 (946)
41 (1050)	41.3 (1050)	44.1 (1120)	45.4 (1153)	43.1 (1095)
47 (1200)	47.2 (1200)	50.0 (1270)	51.3 (1303)	49.0 (1245)
53 (1350)	53.1 (1350)	55.9 (1420)	57.2 (1453)	54.9 (1395)
59 (1500)	59.1 (1500)	61.8 (1569)	63.1 (1602)	60.8 (1544)
65 (1650)	65.0 (1650)	67.7 (1719)	69.0 (1752)	66.7 (1694)
71 (1800)	70.9 (1800)	73.6 (1869)	74.9 (1902)	72.6 (1844)

SELECTION GUIDE FOR POINT-OF-OPERATION AND PERIMETER (WORK-ENVELOPE) SAFEGUARDING

This chart has been put together to make selecting the proper safeguarding system for your application easy. Begin by determining the type of application that requires safeguarding. Choose the point-of-operation system, perimeter system, or area scanning device that fits your application. If at any time you have questions, please call us at 1-800-922-7533.

PRESENCE-SENSING DEVICES QUICK REFERENCE GUIDE SAFETY CATEGORY FOR 4 PRODUCTS			
	EZ-SCREEN LIGHT CURTAIN pp. 8-13	PERIMETER LIGHT BEAM pp. 15-17	CONTACT THE FACTORY
Point of Operation	X		
Perimeter	X	X	
Entry/Exit			X
Palletizing			X
Cables	Up to 100' (30.4 m)	Up to 100' (30.4 m)	
Max Field of Coverage	70.9" (1800 mm)	35" (900 mm)	
Fixed Blanking	X		
Remote Fixed Blanking	X		
Float Blanking/Reduced Resolution	X		
Cascade Capability	X		
Max Field of Coverage	.55" (14 mm) or 1.18" (30 mm)		
Max Range	Up to 59' (18 m)	Up to 230' (70 m)	

AREA SCANNING DEVICES QUICK REFERENCE GUIDE SAFETY CATEGORY 3 PRODUCTS			
	S3000 STANDARD pp. 21	S3000 ADVANCED pp. 21	S3000 PROFESSIONAL pp. 21
Area	X	X	X
Stationary	X	X	X
Protective Field – Max Range	23' (7 m)	23' (7m)	23' (7m)
Warning Field – Max Range	160' (49 m)	160' (49 m)	160' (49 m)
Number of Zones	1	4	8
Scanning Angle	190°	190°	190°

PROTECTOR™ SERIES LIGHT CURTAIN SYSTEMS

LIGHT CURTAIN SYSTEM FEATURES

NEW Protector™ Series Light Curtains safeguarding personnel near industrial machinery with the potential to cause injury. Protector Series Light Curtains feature bi-color alignment indicators, simplified resolution settings, automatic diagnostics, remote fixed blanking, and can be interconnected in a cascading configuration. Built for ease-of-use, they also provide for hassle-free installations that eliminate software, DIP switches, and expensive components from the process. Brackets and connecting cables are all included, as a kitted solution, for faster, more cost-effective light curtain installations. For those that do not need the full kit, individual emitters and receivers are also sold separately.

FASTER SET-UP, EASIER MAINTENANCE

Designed to reduce setup and maintenance time, Protector Series Light Curtains feature bright bi-color alignment indicators that run the length of the receiver window. In the event a sensor is not aligned properly or if the window requires cleaning, green lights will switch to red to instantly identify the problem area. Optional remote indicators can be purchased for long distance monitoring of light curtain status to further support safety and productivity goals.

DUAL-SCAN TECHNOLOGY

Protector Series Light Curtains employ dual-scan technology that makes its photodiodes highly immune to EMI, RFI, ambient light, weld flash and strobe lights that may compromise sensor performance. Damage from impact is greatly reduced by a design that recesses the unit's windows 5mm into the housing to prevent direct contact with the sensors. Emitters and receivers are both contained inside of 3mm thick industrial grade aluminum housings with durable metal end-caps.

CASCADING CAPABILITY

For those applications that require multi-sided protection where mirrors cannot be used, up to four Protector Series Light Curtain systems of any length, resolution, and beam number can be easily configured. Cascading Protector Series Light Curtains minimize wiring, while simplifying the safety circuit, resulting in lower Total Cost of Ownership.

CLEAN ROOM COMPATIBLE

Protector Series Light Curtains are also ideal for industries subject to frequent washdowns or water spray, such as food, beverage and pharmaceutical processing. They are rated IP65/IP67 so they offer total protection from low-pressure water jets and more substantial liquid ingress or immersion.

SIMPLIFIED ORDERING

Protector Series Light Curtain designs will accommodate more than 90% of all point-of-operation applications, coming in a choice of three common resolutions — 14mm (finger detection), 23mm (hand detection) and 40mm (body detection) — for each light curtain length. All three resolutions have a range of up to 12 meters (39 feet) coinciding with the needs of most manufacturing settings.



Emitter, receiver and optional mirror shown



PROTECTOR™ SERIES LIGHT CURTAIN SYSTEMS

Kits	Mirrors <i>*Sold Individually</i>	Replacements
SLLCP14-490P88-0312	RLCM21Z7 <i>MIRROR RLC 21.7"</i>	19.3" Coverage Height: SLLCE14-490-S-0112 SLLCR14-490-S-0212 » Resolution: 14 mm
SLLCP14-700P88-0313	RLCM32Z5 <i>MIRROR RLC 32.5"</i>	27.5" Coverage Height: SLLCE14-700-S-0113 SLLCR14-700-S-0213 » Resolution: 14 mm
SLLCP14-910P88-0314	RLCM38Z4 <i>MIRROR RLC 38.4"</i>	35.8" Coverage Height: SLLCE14-910-S-0114 SLLCR14-910-S-0214 » Resolution: 14 mm
SLLCP23-350P88-0301	RLCM18Z7 <i>MIRROR RLC 18.7"</i>	13.8" Coverage Height: SLLCE23-350-S-0101 SLLCR23-350-S-0201 » Resolution: 23 mm
SLLCP23-490P88-0302	RLCM21Z7 <i>MIRROR RLC 21.7"</i>	19.3" Coverage Height: SLLCE23-490-S-0102 SLLCR23-490-S-0202 » Resolution: 23 mm
SLLCP23-630P88-0303	RLCM26Z6 <i>MIRROR RLC 26.6"</i>	24.8" Coverage Height: SLLCE23-630-S-0103 SLLCR23-630-S-0203 » Resolution: 23 mm
SLLCP23-770P88-0304	RLCM32Z5 <i>MIRROR RLC 32.5"</i>	30.3" Coverage Height: SLLCE23-770-S-0104 SLLCR23-770-S-0204 » Resolution: 23 mm
SLLCP23-910P88-0305	RLCM38Z4 <i>MIRROR RLC 38.4"</i>	35.8" Coverage Height: SLLCE23-910-S-0105 SLLCR23-910-S-0205 » Resolution: 23 mm
SLLCP23-1120P88-0306	RLCM46Z3 <i>MIRROR RLC 46.3"</i>	44.1" Coverage Height: SLLCE23-1120-S-0106 SLLCR23-1120-S-0206 » Resolution: 23 mm
SLLCP23-1260P88-0307	RLCM55Z1 <i>MIRROR RLC 55.1"</i>	49.6" Coverage Height: SLLCE23-1260-S-0107 SLLCR23-1260-S-0207 » Resolution: 23 mm
SLLCP23-1400P88-0308	RLCM58Z1 <i>Mirror RLC 58.1"</i>	55.1" Coverage Height: SLLCE23-1400-S-0108 SLLCR23-1400-S-0208 » Resolution: 23 mm
SLLCP23-1540P88-0309	RLCM65Z9 <i>MIRROR RLC 65.9"</i>	60.6" Coverage Height: SLLCE23-1540-S-0109 SLLCR23-1540-S-0209 » Resolution: 23 mm
SLLCP23-1680P88-0310	RLCM68Z9 <i>MIRROR RLC 68.9"</i>	66.1" Coverage Height: SLLCE23-1680-S-0110 SLLCR23-1680-S-0210 » Resolution: 23 mm
SLLCP40-1820P88-0311	RLCM74Z8 <i>MIRROR RLC 74.8"</i>	71.7" Coverage Height: SLLCE40-1820-S-0111 SLLCR40-1820-S-0211 » Resolution: 40 mm

Light Curtain Kits include: light, light curtain, mounting brackets and 2 cables

Replacement Emitters & Receivers; NOT SOLD AS KITS

POINT-OF-OPERATION LIGHT CURTAIN SYSTEMS

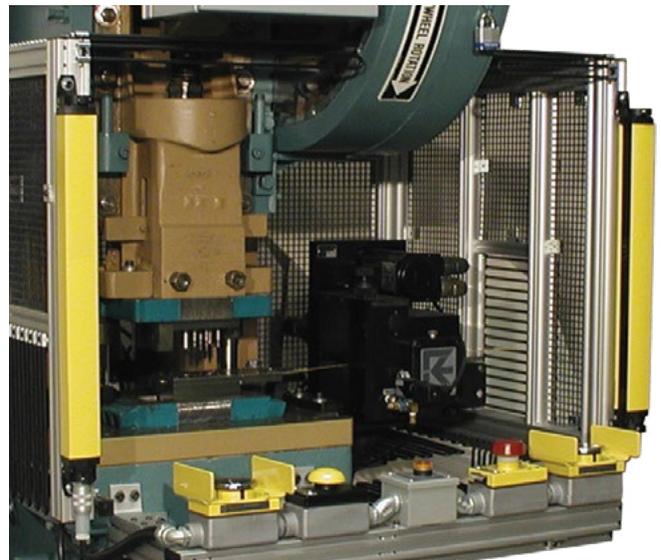
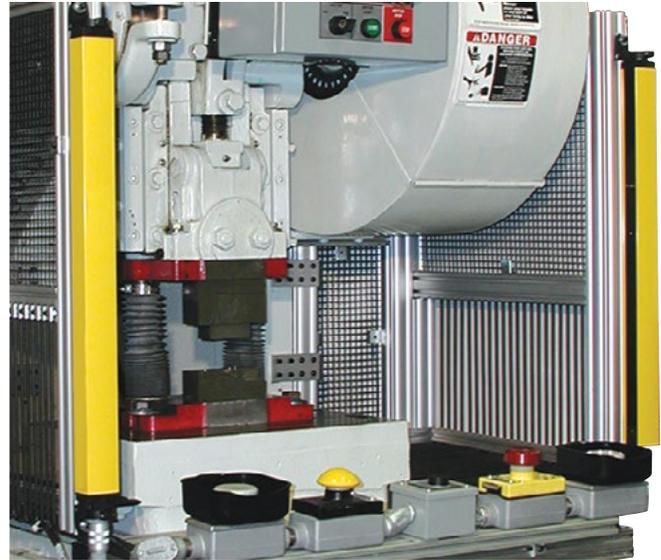
EZ-SCREEN LIGHT CURTAIN SYSTEM FEATURES

- Meets industry OSHA, ANSI, UL, IEC, and EN safety standards 14 and 30 mm resolutions
- Field of coverage from 11.8" to 70.9" (300 mm to 1800 mm)
- Scanning range up to 59' (18 m)
- 2 solid-state OSSD (output signal switching device) outputs—24-V PNP outputs
- Quick response times
- Strobe-light and weld-flash immunity
- Compact light bar housing—1.78" x 1.42" (45.2 x 36.0 mm)
- Transmitter and receiver cable lengths from 15' to 100' (4.5 to 30 m)
- 7-segment alignment and diagnostics display
- Two-piece design with external device monitoring (EDM)
- Cascading—up to 4 pairs and of different lengths

This photoelectric presence-sensing system (light curtain) is designed to meet safety standards for protecting operating personnel from point-of-operation machine hazards. The EZ-Screen system operates as a stand-alone system to be interfaced into an existing machine control, or a generic interface control is available (see page 14).

The EZ-Screen system consists of a transmitter and receiver. The transmitter consists of a series of LEDs (light-emitting diodes) which transmit modulated infrared light to the receiver unit. The receiver consists of a corresponding array of photo-diodes that are automatically synchronized with the transmitter LEDs. The EZ-Screen system can be mounted vertically, horizontally, or on any angle depending on the application. The only requirement is that the transmitter must align with the receiver when these units are installed. This system is also cascadable up to four systems. The cascadable pairs can be any length, any number of beams, or have different resolutions as long as each transmitter matches its own receiver.

The EZ-Screen presence-sensing system provides a protective, durable plane of light formed by the aligned transmitter and receiver cells. Any interruption of this plane of light by an object equal to or larger than the MOS (minimum object sensitivity) initiates an output signal to the machine control system. This output causes the machine to stop or does not allow a cycle until the blockage is removed.



EZ-SCREEN LIGHT CURTAIN SYSTEM FEATURES (CONTINUED)

The EZ-Screen system is designed in a way that if a component should fail, a total system shutdown results. This is achieved through redundant self-checking circuitry, which compares the actual system operation with that of a redundant setup. Upon detection of any deviation from the expected status, a shutdown condition occurs.

The plane-of-light portion of the system is formed by a series of high-quality individual optical lenses on every transmitter and receiver channel. This assures the optimal signal-to-noise ratio and allows operation in harsh, oily, and dirty environments. Individual channel lenses create a column of light between each of the active transmitter and receiver channels. The creation of a column of light between transmitter and receiver is called light collimation. Light collimation is necessary to ensure that the infrared light moves from the transmitter to the receiver in a controlled beam that maximizes its efficiency. Additionally, the lens on each receiver channel minimizes the possibility of the infrared light bouncing off shiny objects and fooling the receiver.

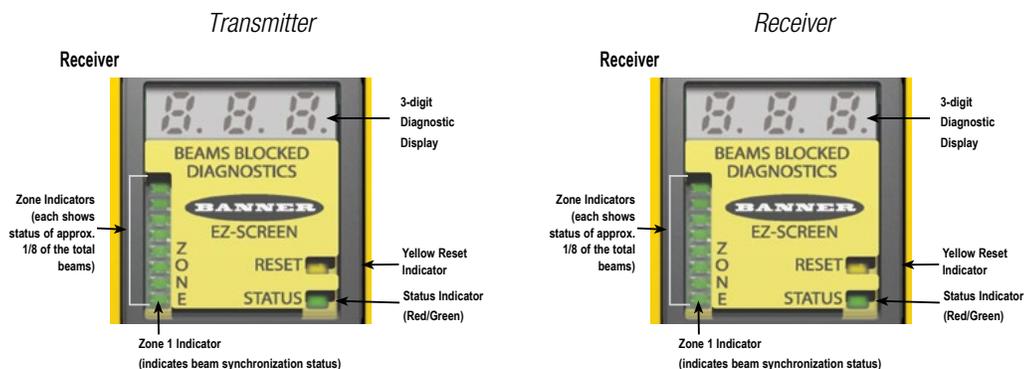
The light bars are equipped with status indicators—LEDs and a 7-segment display. These status indicators are helpful when aligning the light curtain and when determining the cause of an interruption in the EZ-Screen system. The LEDs illuminate and the display indicates alphanumeric error messages when a channel is interrupted, out of alignment, configured incorrectly, etc.

The EZ-Screen light curtain system modulates each of its LED light sources in a specially coded manner. This modulation virtually eliminates ambient light interference. The light curtain electronically sequences its individual LED transmitters and photo-transistor receivers at a fast rate that prevents any light interference between individual transmitter/receiver sections. This also provides maximum stability and ease of alignment.

STATUS INDICATOR LIGHTS

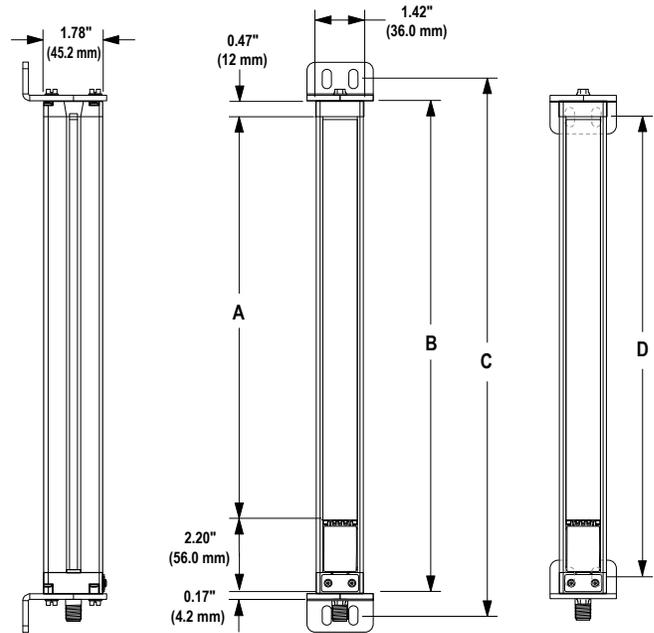
A variety of status indicator lights are clearly visible on the front panel of each transmitter and receiver. Red, green, and yellow lights display the operating status, configuration error codes, and blocked beams. A diagnostic display indicates alphanumeric error messages when a channel is interrupted, out of alignment, configured incorrectly, blocked, etc.

EZ-Screen Light Curtain System



DIMENSIONS FOR THE EZ-SCREEN LIGHT CURTAIN SYSTEM

FIELD OF COVERATE IN INCHES (mm)	A INCHES (mm)	B INCHES (mm)	C INCHES (mm)	D INCHES (mm)
12 (300)	11.8 (300)	14.6 (372)	16.0 (405)	13.7 (347)
18 (450)	17.7 (450)	20.6 (522)	21.9 (555)	19.6 (497)
24 (600)	23.6 (600)	26.4 (671)	27.7 (704)	25.4 (646)
30 (750)	29.5 (750)	32.3 (821)	33.6 (854)	31.3 (796)
35 (900)	35.4 (900)	38.2 (971)	39.5 (1004)	37.2 (946)
41 (1050)	41.3 (1050)	44.1 (1120)	45.4 (1153)	43.1 (1095)
47 (1200)	47.2 (1200)	50.0 (1270)	51.3 (1303)	49.0 (1245)
53 (1350)	53.1 (1350)	55.9 (1420)	57.2 (1453)	54.9 (1395)
59 (1500)	59.1 (1500)	61.8 (1569)	63.1 (1602)	60.8 (1544)
65 (1650)	65.0 (1650)	67.7 (1719)	69.0 (1752)	66.7 (1694)
71 (1800)	70.9 (1800)	73.6 (1869)	74.9 (1902)	72.6 (1844)



EZ-SCREEN RESPONSE TIMES

The response time of these light curtains varies depending on their size (see the chart below). The response time is the length of time that elapses between the interruption of the light beam and the output signal. Response time includes the reaction time of the output device(s) (i.e., relays), and is specified in milliseconds.

These light curtains are designed to meet UL and CSA standards and also have full PSDI (presence-sensing-device initiation) capability. This means that the light curtain can be used to start the cycle of the machine while at the same time it can be safeguarding the machine. For further information on PSDI, please see OSHA 29 CFR 1910.217 (h) and ANSI B11.1, B11.2, B11.3, and B11.19.

Transmitter/Receiver With .55" (14 mm) Minimum Object Sensitivity (Resolution)

FIELD OF COVERATE INCHES (mm)	NUMBER OF BEAMS	RESPONSE TIME
12 (300)	40	15 ms
18 (450)	60	19 ms
24 (600)	80	23 ms
30 (750)	100	27 ms
35 (900)	120	32 ms
41 (1050)	140	36 ms
47 (1200)	160	40 ms
53 (1350)	180	43 ms
59 (1500)	200	48 ms
65 (1650)	220	52 ms
71 (1800)	240	56 ms

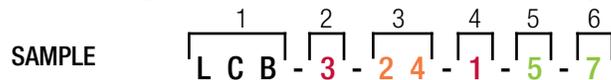
Transmitter/Receiver With 1.18" (30 mm) Minimum Object Sensitivity (Resolution)

FIELD OF COVERATE INCHES (mm)	NUMBER OF BEAMS	RESPONSE TIME
12 (300)	20	11 ms
18 (450)	30	13 ms
24 (600)	40	15 ms
30 (750)	50	17 ms
35 (900)	60	19 ms
41 (1050)	70	21 ms
47 (1200)	80	23 ms
53 (1350)	90	25 ms
59 (1500)	100	27 ms
65 (1650)	110	30 ms
71 (1800)	120	32 ms

SELECTING A NONCASCADING EZ-SCREEN LIGHT CURTAIN

To determine the 9-digit configured part number for a noncascading light curtain required, follow the directions and use the information in the **PART NUMBERING SYSTEM CHART** below.

1. The first 3 digits for all EZ-Screen light curtain pairs are LCB.
2. The 4th digit determines the MOS (minimum object sensitivity) and OPR (operating range).
3. The 5th and 6th digits determine the field of coverage.
4. The 7th digit determines the selection of remote keyed fixed blanking.
5. The 8th digit indicates the length of the transmitter cable.
6. The 9th digit indicates the length of the receiver cable (can be a different length from the transmitter cable).



The sample shown, Part No. LCB-3-24-1-5-7, is an EZ-Screen light curtain pair with 1.18" (30 mm) minimum object sensitivity, 1-59' (18 m) operating range, 23.6" (600 mm) field of coverage, remote fixed blanking, a 50' transmitter cable, and a 75' receiver cable.

NONCASCADING LIGHT CURTAIN PRESENCE-SENSING DEVICE SYSTEM																																																												
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REMOTE FIXED BLANKING SWITCH

A remote fixed blanking switch is provided when the remote fixed blanking switch option is chosen in the part numbering chart above. This remote blanking switch is used in place of the DIP switches on the receiver when frequent configuration of fixed blanking is needed. A 1' connection cable, two (2) mounting brackets, and two (2) keys are supplied with each remote switch.



SELECTING THE FIRST PAIR IN A CASCADING EZ-SCREEN LIGHT CURTAIN SYSTEM

To determine the 9-digit configured part number for the first pair in a cascading light curtain system, follow the directions and use the information in the **PART NUMBERING SYSTEM CHART** below.

1. The first 4 digits for the first pair in a cascading light curtain system are LCBC.
2. The 5th digit determines the MOS (minimum object sensitivity) and OPR (operating range).
3. The 6th and 7th digits determine the field of coverage.
4. The 8th digit determines the length of the transmitter cable. NOTE: This is required for the first pair of cascading light bar pairs only.
5. The 9th digit determines the length of the receiver cable (can be a different length from the transmitter cable). NOTE: This is required for the first pair of cascading light bar pairs only.

SAMPLE—FIRST IN CASCADE SYSTEM

1
2
3
4
5
L C B C - 3 - 1 8 - 1 - 2

The sample shown, Part No. LCBC-3-18-1-2, is the first pair in the cascading system. It has 1.18" (30 mm) minimum object sensitivity, 1-59' (18 m) operating range, 17.7" (450 mm) field of coverage, a 15' transmitter cable, and a 25' receiver cable.

CASCADING LIGHT CURTAIN PRESENCE-SENSING DEVICE SYSTEM																																																									
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<p>MOS (MINIMUM OBJECT SENSITIVITY) AND OPR (OPERATING RANGE)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th style="text-align: center;">MOS</th> <th style="text-align: center;">OPR</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">0.55" (14 mm)</td> <td style="text-align: center;">19.68' (6 m)</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">1.18" (30 mm)</td> <td style="text-align: center;">59' (18 m)</td> </tr> </tbody> </table> <p>LENGTH OF BARS</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr><td style="text-align: center;">12</td><td style="text-align: center;">11.8" (300 mm)</td></tr> <tr><td style="text-align: center;">18</td><td style="text-align: center;">17.7" (450 mm)</td></tr> <tr><td style="text-align: center;">24</td><td style="text-align: center;">23.6" (600 mm)</td></tr> <tr><td style="text-align: center;">30</td><td style="text-align: center;">29.5" (750 mm)</td></tr> <tr><td style="text-align: center;">35</td><td style="text-align: center;">35.4" (900 mm)</td></tr> <tr><td style="text-align: center;">41</td><td style="text-align: center;">41.3" (1050 mm)</td></tr> <tr><td style="text-align: center;">47</td><td style="text-align: center;">47.2" (1200 mm)</td></tr> <tr><td style="text-align: center;">53</td><td style="text-align: center;">53.1" (1350 mm)</td></tr> <tr><td style="text-align: center;">59</td><td style="text-align: center;">59" (1500 mm)</td></tr> <tr><td style="text-align: center;">65</td><td style="text-align: center;">65" (1650 mm)</td></tr> <tr><td style="text-align: center;">71</td><td style="text-align: center;">70.9" (1800 mm)</td></tr> </tbody> </table>		MOS	OPR	1	0.55" (14 mm)	19.68' (6 m)	3	1.18" (30 mm)	59' (18 m)	12	11.8" (300 mm)	18	17.7" (450 mm)	24	23.6" (600 mm)	30	29.5" (750 mm)	35	35.4" (900 mm)	41	41.3" (1050 mm)	47	47.2" (1200 mm)	53	53.1" (1350 mm)	59	59" (1500 mm)	65	65" (1650 mm)	71	70.9" (1800 mm)		<p>RECEIVER CABLE W/PLUG (REQUIRED FOR FIRST IN CASCADE ONLY)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr><td style="text-align: center;">0</td><td style="text-align: center;">No cable</td></tr> <tr><td style="text-align: center;">1</td><td style="text-align: center;">15' (4.5 m)</td></tr> <tr><td style="text-align: center;">2</td><td style="text-align: center;">25' (7.6 m)</td></tr> <tr><td style="text-align: center;">5</td><td style="text-align: center;">50' (15.2 m)</td></tr> <tr><td style="text-align: center;">7</td><td style="text-align: center;">75' (22.8 m)</td></tr> <tr><td style="text-align: center;">9</td><td style="text-align: center;">100' (30.4 m)</td></tr> </tbody> </table> <p>TRANSMITTER CABLE W/PLUG (REQUIRED FOR FIRST IN CASCADE ONLY)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr><td style="text-align: center;">0</td><td style="text-align: center;">No cable</td></tr> <tr><td style="text-align: center;">1</td><td style="text-align: center;">15' (4.5 m)</td></tr> <tr><td style="text-align: center;">2</td><td style="text-align: center;">25' (7.6 m)</td></tr> <tr><td style="text-align: center;">5</td><td style="text-align: center;">50' (15.2 m)</td></tr> <tr><td style="text-align: center;">7</td><td style="text-align: center;">75' (22.8 m)</td></tr> <tr><td style="text-align: center;">9</td><td style="text-align: center;">100' (30.4 m)</td></tr> </tbody> </table>	0	No cable	1	15' (4.5 m)	2	25' (7.6 m)	5	50' (15.2 m)	7	75' (22.8 m)	9	100' (30.4 m)	0	No cable	1	15' (4.5 m)	2	25' (7.6 m)	5	50' (15.2 m)	7	75' (22.8 m)	9	100' (30.4 m)
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Four (4) end mount swivel brackets are included with each light bar pair for mounting.

Two (2) additional center mounting brackets are included with each light bar pair with a field of coverage of 47 and up.

NOTE: Use the chart on the next page to configure an additional part number for each of the 2nd, 3rd, and/or 4th pair in the cascading system. A maximum of four (4) light bar pairs may be cascaded, and they can be of different lengths.

SELECTING THE 2ND, 3RD, AND/OR 4TH PAIR IN A CASCADING EZ-SCREEN LIGHT CURTAIN SYSTEM

To determine the 9-digit configured part number for the 2nd, 3rd, and/or 4th pair in a cascading light curtain system, follow the directions and use the information in the **PART NUMBERING SYSTEM CHART** below.

1. The first 4 digits for the 2nd, 3rd, and/or 4th pair in a cascading light curtain system are LCBC.
2. The 5th digit determines the MOS (minimum object sensitivity) and OPR (operating range).
3. The 6th and 7th digits determine the field of coverage.
4. The 8th digit determines the length of the connecting cables between the transmitters.
5. The 9th digit determines the length of the connecting cables between the receivers.

SAMPLE—SECOND IN CASCADE SYSTEM



The sample shown, Part No. LCBC-3-24-C-C, is the second pair in the cascading system. It has 1.18" (30 mm) minimum object sensitivity, 1-59' (18 m) operating range, 23.6" (600 mm) field of coverage, and a 3' transmitter connecting cable with a 3' receiver connecting cable.

CASCADING LIGHT CURTAIN PRESENCE-SENSING DEVICE SYSTEM		
LCBC - X - X X - X - X		
MOS (MINIMUM OBJECT SENSITIVITY) AND OPR (OPERATING RANGE)		
	MOS	OPR
1	— 0.55" (14 mm)	19.68' (6 m)
3	— 1.18" (30 mm)	59' (18 m)
LENGTH OF BARS		
12	— 11.8" (300 mm)	
18	— 17.7" (450 mm)	
24	— 23.6" (600 mm)	
30	— 29.5" (750 mm)	
35	— 35.4" (900 mm)	
41	— 41.3" (1050 mm)	
47	— 47.2" (1200 mm)	
53	— 53.1" (1350 mm)	
59	— 59" (1500 mm)	
65	— 65" (1650 mm)	
71	— 70.9" (1800 mm)	
CASCADE RECEIVER CABLE LENGTH		
A	— 1' (.31 m)	
B	— 3' (.91 m)	
C	— 8' (2.43 m)	
CASCADE TRANSMITTER CABLE LENGTH		
A	— 1' (.31 m)	
B	— 3' (.91 m)	
C	— 8' (2.43 m)	

Four (4) end mount swivel brackets are included with each light bar pair for mounting.

Two (2) additional center mounting brackets are included with each light bar pair with a field of coverage of 47 and up.

NOTE: Use the chart above to configure a part number for EACH additional cascading light bar pair for the 2nd, 3rd, and/or 4th pair in the cascading system. A maximum of four (4) light bar pairs may be cascaded, and they can be of different lengths.

REMOTE OPERATOR STATIONS

Remote operator stations are available that can be used in conjunction with an interface when a plain door enclosure or loose interface components are chosen. These remote operator stations are available with an off/on keyed selector switch, a light curtain reset button, or an off/on keyed selector switch and reset button. Each remote operator station is furnished in a steel enclosure.

ORDERING INFORMATION	
PART NO.	DESCRIPTION
LLD1236	Light Curtain off/on remote operator station
LLD1237	Light Curtain reset remote operator station
LLD1238	Light Curtain on/off with reset remote operator station



LLD1236



LLD1237



LLD1238

LASER ALIGNMENT TOOL—PART NO. LAT-1

A laser alignment tool is available to aid in the alignment of any point-of-operation light curtain system. It is particularly useful with applications involving mirrors.

The laser alignment tool includes a 9-volt battery, a mounting clip, and has a built-in circular bubble level. **This alignment tool is to be used for set up only.**



PERIMETER LIGHT BEAM SYSTEM

The perimeter light beam system is designed to meet safety standards for one-sided or multi-sided hazardous area and access protection. It can be used for safeguarding robotic work cells, automatic machinery work envelopes, assembly lines, and other manufacturing work cells.

FEATURES

- Meets industry OSHA, ANSI, UL, IEC, and EN safety standards
- Operating ranges: Short—2.6' to 65' (.8 to 20 m)
Long—49' to 230' (15 to 70 m)
- Number of beams—2, 3, or 4
- Beam separation—12" to 23" (300 mm to 584 mm)
- 24 ms response time
- Strobe-light and weld-flash immunity
- Transmitter and receiver cable lengths up to 100' (30.5 m)
- Restart interlock
- External device monitoring (EDM)
- LED 7-segment alignment and diagnostics display

The perimeter light beam system consists of a transmitter and receiver. Each is encased in a rigid, aluminum die-cast housing which makes them very durable. Communication between the transmitter and receiver is accomplished optically; no external controller is required.

An invisible infrared beam of light is formed between the transmitter and receiver. Interruption of this beam of light sends a stop signal to the machine's control. This signal is designed to stop hazardous machine motion or prevent the initiation of machine motion.

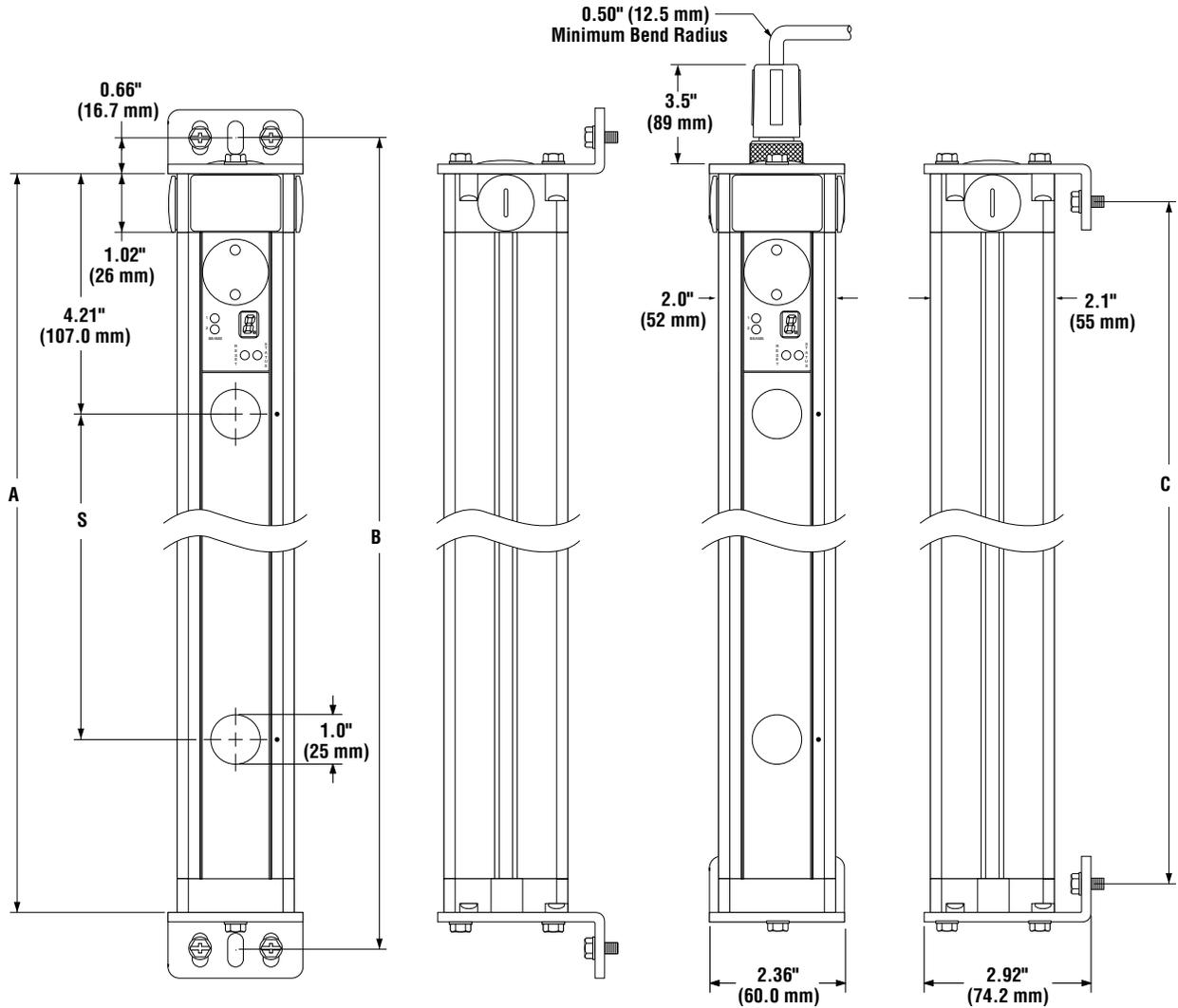
Mirrors increase the coverage of the safeguarded area. Two sides of a hazardous area can be safeguarded with the use of one perimeter light beam system and one mirror. Three sides of a hazardous area can be safeguarded by using one perimeter light beam system and two mirrors. See pages 31-32 for information about mirrors.

The perimeter light beam system is delivered ready for operation. Configuration settings are accessible from the front of the beams and can be changed while the system remains mounted.



Perimeter Light Curtain System Used as Access Protection for an Automatic Machine Work Envelope

PERIMETER LIGHT BEAM DIMENSIONS



NUMBER OF BEAMS	FIELD OF COVERAGE INCHES (mm)	S BEAM SEPARATION INCHES (mm)	A INCHES (mm)	B INCHES (mm)	C INCHES (mm)
2	19.7 (500)	19.7 (500)	26.9 (684)	28.2 (717)	25.9 (659)
2	23 (584)	23 (584)	30.8 (768)	31.6 (802)	29.3 (743)
3	31.5 (800)	15.7 (400)	38.7 (984)	40.1 (1017)	37.8 (959)
3	42 (1066)	21 (533)	49.2 (1251)	50.6 (1284)	48.3 (1226)
4	35.4 (900)	11.8 (300)	42.7 (1084)	44 (1117)	41.7 (1059)

SELECTING PERIMETER LIGHT BEAM SYSTEM

To determine the 8-digit configured part number for the perimeter light beam system required, follow the directions below and use the information in the **PART NUMBERING SYSTEM CHART** below.

1. The first 3 digits determines the choice of a short range perimeter system or a long range perimeter system.
2. The 4th, 5th, and 6th digits determine the number of beams and beam separation.
3. The 7th digit determines the length of the transmitter cable.
4. The 8th digit determines the length of the receiver cable (can be a different length from the transmitter cable).

SAMPLE $\overset{1}{\boxed{P\ B\ S}} - \overset{2}{\boxed{3\ 4\ 2}} - \overset{3}{\boxed{1}} - \overset{4}{\boxed{2}}$

The sample shown, Part No. PBS-342-1-2, is a short range perimeter light beam system. It has three beams with 21.0" (533 mm) of beam separation, 42.0" (1066 mm) field of coverage, with a 15' (4.5 m) transmitter cable and a 25' (7.6 m) receiver cable.

PERIMETER LIGHT BEAM PART NUMBERING SYSTEM CHART																												
PERIMETER LIGHT BEAM SYSTEM TYPE			RECEIVER CABLE W/PLUG																									
PBS	— Short range: 2.62' to 65.6' (0.8 m to 20 m)		X X X	0 — No cable																								
PBL	— Long range: 49.2' to 229.6' (15 m to 70 m)		X X X	1 — 15' (4.5 m)																								
NUMBER OF BEAMS, BEAM SEPARATION, AND FIELD OF COVERAGE <table border="1"> <thead> <tr> <th></th> <th>NO. OF BEAMS</th> <th>SEPARATION</th> <th>FIELD OF COVERAGE</th> </tr> </thead> <tbody> <tr> <td>219</td> <td>2</td> <td>19.7" (500 mm)</td> <td>19.7" (500 mm)</td> </tr> <tr> <td>223</td> <td>2</td> <td>23.0" (584 mm)</td> <td>23.0" (584 mm)</td> </tr> <tr> <td>331</td> <td>3</td> <td>15.7" (400 mm)</td> <td>31.5" (800 mm)</td> </tr> <tr> <td>342</td> <td>3</td> <td>21.0" (533 mm)</td> <td>42.0" (1066 mm)</td> </tr> <tr> <td>435</td> <td>4</td> <td>11.8" (300 mm)</td> <td>35.4" (900 mm)</td> </tr> </tbody> </table>				NO. OF BEAMS	SEPARATION	FIELD OF COVERAGE	219	2	19.7" (500 mm)	19.7" (500 mm)	223	2	23.0" (584 mm)	23.0" (584 mm)	331	3	15.7" (400 mm)	31.5" (800 mm)	342	3	21.0" (533 mm)	42.0" (1066 mm)	435	4	11.8" (300 mm)	35.4" (900 mm)	X	2 — 25' (7.6 m)
				NO. OF BEAMS	SEPARATION	FIELD OF COVERAGE																						
			219	2	19.7" (500 mm)	19.7" (500 mm)																						
			223	2	23.0" (584 mm)	23.0" (584 mm)																						
			331	3	15.7" (400 mm)	31.5" (800 mm)																						
342	3	21.0" (533 mm)	42.0" (1066 mm)																									
435	4	11.8" (300 mm)	35.4" (900 mm)																									
			X	5 — 50' (15.2 m)																								
			X	7 — 75' (22.8 m)																								
			X	9 — 100' (30.4 m)																								
				TRANSMITTER CABLE W/PLUG																								
				0 — No cable																								
				1 — 15' (4.5 m)																								
				2 — 25' (7.6 m)																								
				5 — 50' (15.2 m)																								
				7 — 75' (22.8 m)																								
				9 — 100' (30.4 m)																								

Four (4) end mount swivel brackets are included with each perimeter light beam system for mounting.

LASER ALIGNMENT TOOL—PART NO. LAT-1

A laser alignment tool is available to aid in the alignment of any perimeter light curtain system. It is particularly useful with applications involving mirrors.

The laser alignment tool includes a 9-volt battery, a mounting clip, and has a built-in circular bubble level. **This alignment tool is to be used for set up only.**



LASER SCANNER KITS

RKFD #	MOUNTING	CABLE LENGTH
SCAN001	VERTICLE BASE	10M CABLE
SCAN002	VERTICLE BASE	20M CABLE
SCAN003	HORIZONTAL BASE	10M CABLE
SCAN004	HORIZONTAL BASE	20M CABLE
SCAN005	PROTECTIVE SHIELD	
SCAN006	10M EXTENSION ADDER	
SCAN007	20M EXTENSION ADDER	

RKFD #	MOUNTING	CABLE LENGTH
SCAN021*	UNIVERSAL	15M CABLE
SCAN022*	UNIVERSAL	30M CABLE

**Both Include Protection Brackets & Programming Cable*

SAFETY ZONES	WARNING ZONES	RANGE SAFETY		WARN RANGE	ANGLE	OSSD OUTPUTS	NONSAFE OUTPUTS
6	2	5.5M @ 70MM	3M @ 40MM	40M	275 DEG	2	2
32	2	5M @ 70MM	3M @ 50MM	20M	270 DEG	4	2

MOUNTING OPTIONS

The S3000 safety laser scanner can be mounted vertically or horizontally. A mounting kit (sold separately) is required. S3LMK1 is the base mounting kit—S3LMK2 adds on to the S3LMK1, and S3LMK3 adds on to S3LMK1 and S3LMK2. See the ordering information below.

ORDERING INFORMATION	
PART NO.	DESCRIPTION
S3LMK1	Mounting Kit #1 – No Adjustment Capability
S3LMK2	Mounting Kit #2 – Provides Vertical Adjustment (an S3LMK1 is Required in Addition to an S3LMK2)
S3LMK3	Mounting Kit #3 – Provides Horizontal Adjustment (an S3LMK1 and S3LMK2 are Required in Addition to an S3LMK3)

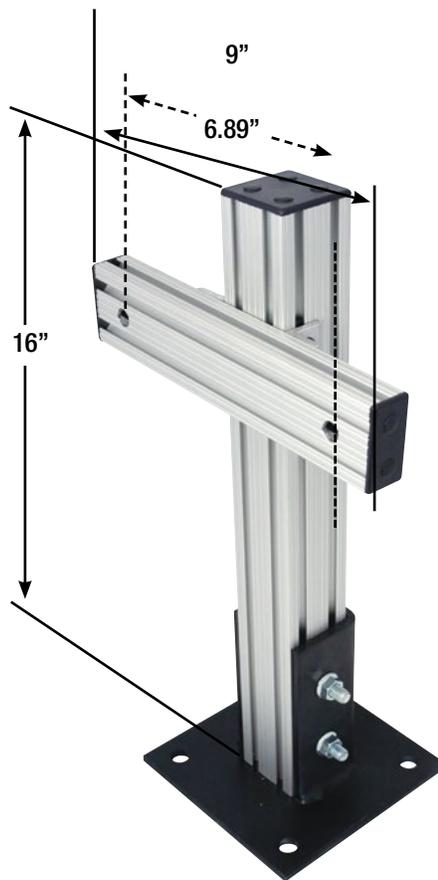
S3000 Mounting Kits



S3000 FLOOR STAND

This floor stand is designed specifically for mounting the S3000 safety laser scanner. The stand is constructed of aluminum extrusion on a steel base plate which can be bolted to the floor.

ORDERING INFORMATION	
PART NO.	DESCRIPTION
FKT1093	Floor Stand for S3000 Safety Laser Scanner – 2" x 2" x 16" Extruded Aluminum Post on a 6" x 6" Steel Base Plate



BANNER 70MM 24VDC LIGHT TOWER COMPONENTS

RSI NUMBER	DESCRIPTION	
LIGHT SEGMENT		
TLA70YEL	YELLOW SEGMENT	92212
TLA70RED	RED SEGMENT	92213
TLA70GRN	GREEN SEGMENT	92211
TLA70BLU	BLUE SEGMENT	92214
TLA70RGB14	14 COLOR SELECTABLE SEGMENT	803732
TLA70GYB	GREEN / YELLOW / BLUE SEGMENT*	??

*Only One Color on at a Time, Counts as 3 Segments

RSI NUMBER	DESCRIPTION	
SOUNDER (AUDIBLE) SEGMENT		
TLA70SOUNDER	SOUNDER, 92dB	92221
TLA70LSOUNDER	LOUD SOUNDER, 85-101dB	96055
TLA70MTSOUNDER	MULTI-TONE SOUNDER, 75- 101dB	801150
TLA70PSOUNDER	PROGRAMMABLE AUDIBLE DEVICE**	801967

**Requires Engineering Time to Program (1 hr)

RSI NUMBER	DESCRIPTION	
TLA70100	12" POLE ASSEMBLY FOR 1 TO 6 SEGMENTS	92224, 93148, 10444, 78414
TLA70102	12" ADJUSTABLE ANGLE BASE ASSEMBLY	92224, 93148, 10444, 93150

PICK BASE ASSEMBLY AND EACH SEGMENT SEPERATELY UP TO SIX (6) SEGMENTS
NOTE IF LIGHT IS STEADY, SLOW FLASH OR FAST FLASH ON THE SALES ORDER DESCRIPTION
NORMAL ORDER IS – RED TOP COLOR, YELLOW MIDDLE COLOR, GREEN BORROM COLOR WITH SOUNDER AT TOP OF STACK
IF BLUE OR OTHER COLOR IS USED, IT WILL BE ABOVE THE GREEN SEGMENT UNLESS SPECIFIED BY THE CUSTOMER

TOWER LIGHT BRACKET— CMC569M

An optional mounting bracket for self-contained tower light assemblies is available for mounting the tower light in a convenient location. The right angle bracket is made of 12-ga. stainless steel and has curved mounting slots for versatility and orientation.



TOWER LIGHT ASSEMBLY CONTROL BOX—LLD1631

The tower light interface box provides a convenient means of mounting and wiring the tower light. The LLD1631 standard box comes with enough terminals to accommodate five (5) lights or four (4) lights with an alarm in the tower light assembly. This control box is approximately 8" x 6" x 6".



Inside View of Tower Light
Assembly Control Box

NO-GO INDICATOR LIGHT



ORDERING INFORMATION	
PART NO.	DESCRIPTION
LLD141	No-Go Indicator Light Mounting Box and Lens Projectors

Most point-of-operation light curtains will not detect workpieces that present a profile of 1/4" or less. However, if the workpiece profile becomes bowed enough to be seen in the plane of light, it will be detected.

On press brake operations, the machine will not start a stroke because the workpiece quite often protrudes through the plane of light and is detected. This becomes frustrating for operators because they have to look to the right or to the left for the red and green indicator lights on the transmitter or receiver to determine if the obstruction is detected. To avoid frustrating the operator, a large red no-go indicator light can be installed on the slide and in the peripheral sight of the operator. This light allows the operator to hold the workpiece in the correct position. At the same time, the no-go light will let them know if their hands or the workpiece is being detected by the light curtain. In some cases, the red no-go indicator light can be used to avoid channel blanking.

The red no-go indicator light has a low-profile design. It is protected from workpieces which bend into the light, and is easily wired into existing light curtain systems.

The no-go indicator light includes the light, the mounting box, and instructions on how to wire it into the light curtain control system.

TEST RODS FOR EZ-SCREEN LIGHT CURTAINS



A test rod is included with each shipment of an EZ-Screen light curtain system. When a light curtain is used for safeguarding, a test rod must be used to test the light curtain after each setup or after any maintenance work performed—refer to pages 60-61 for a sample function-testing checklist for light curtains.

ORDERING INFORMATION	
PART NO.	DIAMETER/MOS (MIN. OBJECT SENSITIVITY)
STP13	0.55" (14 mm)
STP14	1.18" (30 mm)
STP3	1.75" (45 mm)

OPTIONAL MOUNTING BRACKETS FOR POINT-OF-OPERATION LIGHT CURTAIN SYSTEMS

—PART NO. EZA-MBK-20

These optional mounting brackets are for use with the point-of-operation light curtain systems on pages 8-14. These brackets are designed to mount point-of-operation light curtain systems to engineered/slotted aluminum framing (for example, Rockford Systems' Ex-Al™ products). Set of two (2).



SAB-A (SWING-AWAY WITH ADJUSTABLE GUARDS) AND SAB-NA (SWING-AWAY WITH NONADJUSTABLE GUARDS) MOUNTING BRACKETS

Swing-away light curtain mounting brackets with guards are ideal for many machines, including gap-frame presses and press brakes, when the light curtain must be swung out of the way for setup, die changes, or maintenance. The light curtain transmitter and receiver are easily aligned when they are swung back into the machine operating position. The 2" square extruded-aluminum brackets include side barrier guards as shown. The nonadjustable portion of these guards can be constructed of black or yellow mesh (1/2" square, 16 gauge), or clear polycarbonate (3/16"). The lower portion of the barrier guard can be constructed of adjustable, black-oxidized steel hairpins. This allows for feeding of stock, location of chutes, etc., on the sides of the point of operation.

These guards incorporate a hinge assembly on the corner. This allows the light curtain to be swung out. This assembly can also be used to adjust the light curtain panel forward and backward to adjust for safety distance. A built-in locking pin in this assembly holds the panel in place.

Swing-away brackets and barrier guards are built to specifications and measurements provided. See the next page for the appropriate **SAB-A** or **SAB-NA** measurement form.

SAB-A MOUNTING BRACKET



Swing-Away Light Curtain Mounting Bracket with
Material Feeding Segment Built Into the Guards

SAB-NA MOUNTING BRACKET

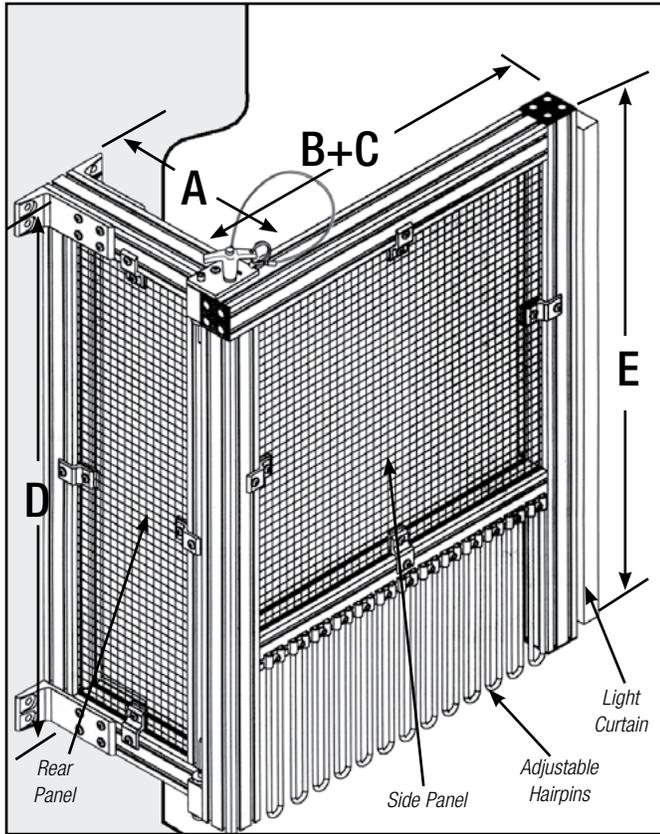


Swing-Away Light Curtain Mounting Bracket
with Nonadjustable Guards

SWING-AWAY MOUNTING BRACKET SPECIFICATIONS

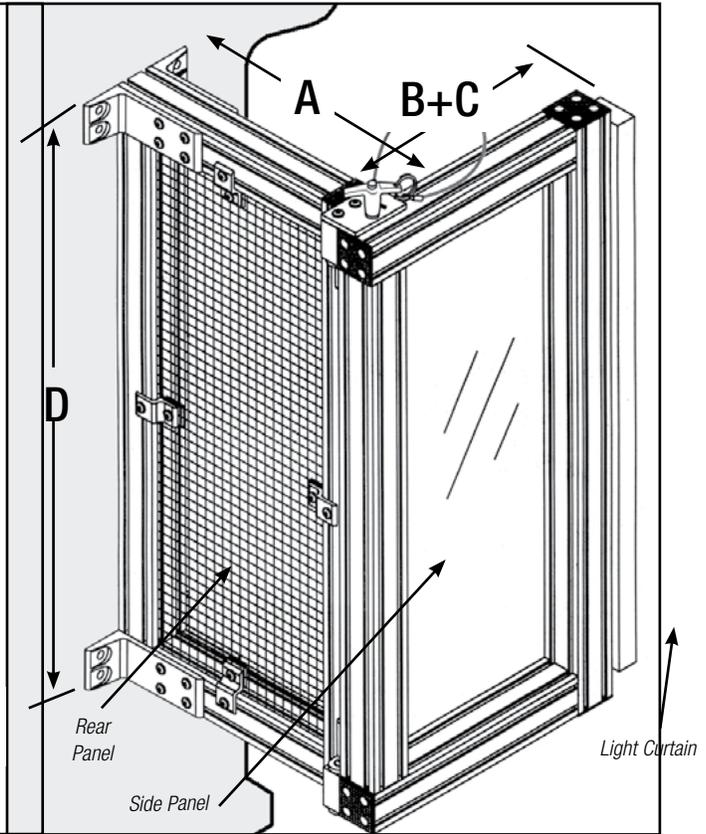
SAB-A

(WITH ADJUSTABLE GUARDS)



SAB-NA

(WITH NONADJUSTABLE GUARDS)



Note: B + C dimension includes safety distance. Stopping time of the machine must be determined to establish the safety distance. Please consult the factory if assistance is needed.

Select the appropriate SAB (swing-away bracket) for your application. If adjustability is required in the lower portion of the barrier guard section, select the mounting bracket **SAB-A**. If adjustability is not required, select the mounting bracket **SAB-NA**.

Please complete one of the measurement forms (see page 27-29) when ordering these brackets. The A, B, C, D, and E dimensions will be determined from the measurements supplied. Check the material type for the sides and rear panels below.

SAB-A

LEFT SIDE OF MACHINE	RIGHT SIDE OF MACHINE
Side Panel Material Type	
<input type="checkbox"/> Black Mesh <input type="checkbox"/> Yellow Mesh <input type="checkbox"/> Clear Polycarbonate	<input type="checkbox"/> Black Mesh <input type="checkbox"/> Yellow Mesh <input type="checkbox"/> Clear Polycarbonate
Rear Panel Material Type	
<input type="checkbox"/> Black Mesh <input type="checkbox"/> Yellow Mesh <input type="checkbox"/> Clear Polycarbonate	<input type="checkbox"/> Black Mesh <input type="checkbox"/> Yellow Mesh <input type="checkbox"/> Clear Polycarbonate

SAB-NA

LEFT SIDE OF MACHINE	RIGHT SIDE OF MACHINE
Side Panel Material Type	
<input type="checkbox"/> Black Mesh <input type="checkbox"/> Yellow Mesh <input type="checkbox"/> Clear Polycarbonate	<input type="checkbox"/> Black Mesh <input type="checkbox"/> Yellow Mesh <input type="checkbox"/> Clear Polycarbonate
Rear Panel Material Type	
<input type="checkbox"/> Black Mesh <input type="checkbox"/> Yellow Mesh <input type="checkbox"/> Clear Polycarbonate	<input type="checkbox"/> Black Mesh <input type="checkbox"/> Yellow Mesh <input type="checkbox"/> Clear Polycarbonate

MEASUREMENT FORM FOR MODELS SAB-A AND SAB-NA SWING-AWAY BRACKETS

Company _____ Address _____

City _____ State _____ ZIP _____

Attention _____ Rep. _____

Machine Mfr. and Model No. _____ Machine No. _____

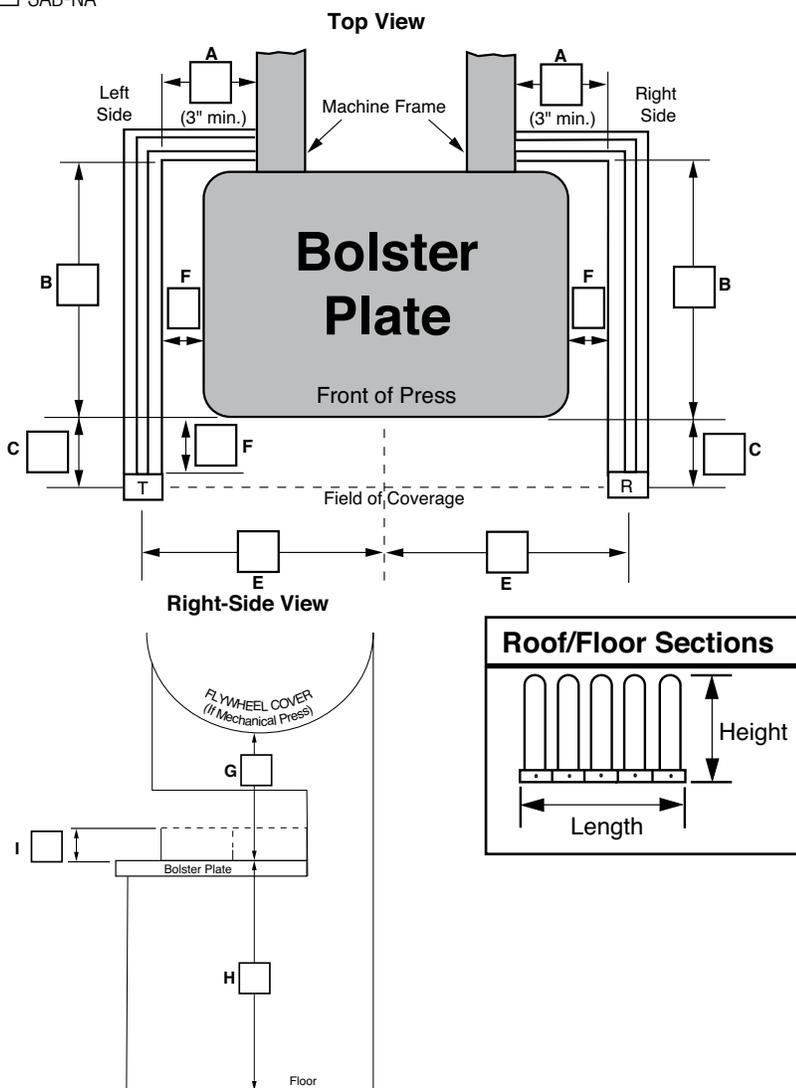
Measured By _____

Determine which mounting brackets are required: SAB-A (with adjustable barrier guards) or SAB-NA (with nonadjustable barrier guards). Check the bracket type required and complete measurements for the machine where brackets will be applied.

SAB-A*

SAB-NA*

PRESS APPLICATION



MEASURING INSTRUCTIONS

Check type of press:

Mechanical Hydraulic Other

Size of light curtain: _____"

A: Enter dimensions from mounting point on press frame to inside of swing-away mounting bracket. (Be sure bracket extending forward will clear bolster and any obstruction on the side of the press frame.)

B: Enter dimension from front side of machine frame mounting bracket to front edge of bolster plate (assuming nearest pinch point to operator is at the front edge of bolster).

C: Enter the minimum safety distance determined by the safety distance formula. Stopping time of the press must be determined to establish safety distance.

D: Enter the panel height for the guard on the left and right side of machine.

Left _____" Right _____"

Note: The light curtain mounting extrusion will be a minimum of 8" longer than the light curtain field of coverage.

E: If roof section(s) are required, enter E dimension(s) (height) and provide length of roof section(s):
Left _____" Right _____"

F: If floor section(s) are required, enter F dimension(s) (height) and provide length of floor section(s):
Left _____" Front _____" Right _____"

G: If hairpins are required on side panel extending upward, enter G dimension (height) above the guard to the flywheel cover and provide length _____".

H: Height from floor to top of bolster.

I: Maximum feedline height (used to determine hairpin length if adjustable brackets).

Notes:

* 1/2" square black mesh will be furnished in the nonadjustable portion of the assembly unless otherwise specified in Notes section above.



Precautions should be taken when applying light curtains for point-of-operation safeguarding. Be sure that someone cannot pass through or stand undetected between the plane of light and the hazard when a light curtain is mounted in a vertical position. If a light curtain must be mounted in this manner due to the safety distance requirements or because of the configuration of the machine, be sure that supplemental safeguarding is provided to safeguard this pass-through area. Examples of supplemental safeguarding include a horizontally mounted light curtain, single-beam devices, guards, or pressure-sensitive safety mats on the floor.

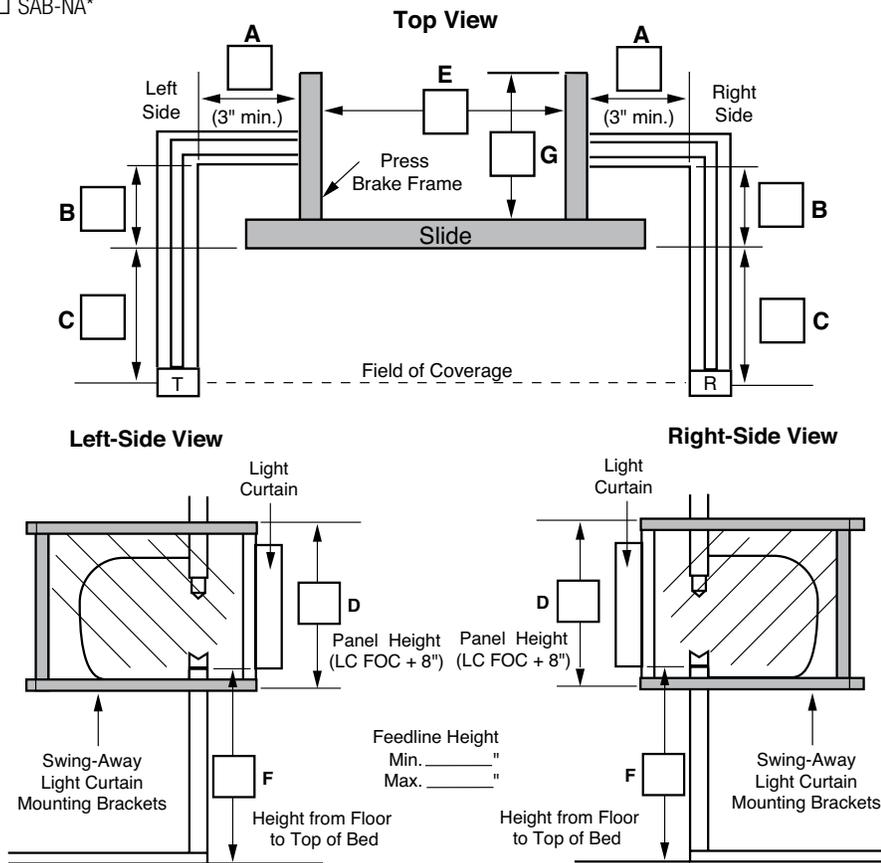
MEASUREMENT FORM FOR MODELS SAB-A AND SAB-NA SWING-AWAY BRACKETS

Company _____ Address _____
 City _____ State _____ ZIP _____
 Attention _____ Rep. _____
 Machine Mfr. and Model No. _____ Machine No. _____
 Measured By _____

Determine which mounting brackets are required: SAB-A (with adjustable barrier guards) or SAB-NA (with nonadjustable barrier guards). Check the bracket type required and complete measurements for the machine where brackets will be applied.

- SAB-A*
 SAB-NA*

PRESS BRAKE APPLICATION



MEASURING INSTRUCTIONS

Check type of press brake:

- Mechanical
 Air Clutch
 Other

Size of light curtain: _____"

A: Enter dimensions from mounting point on machine frame to inside of swing-away bracket. (Be sure bracket extending forward will clear slide.)

Note: Left and right side dimensions may be different due to an extension on one end of the slide.

B: Enter dimension from front side of machine frame mounting bracket to front of slide or bed.

Note: Left and right side dimensions may be different due to available mounting surfaces on side of machine.

C: Enter the minimum safety distance determined by the safety distance formula. Stopping time of the machine must be determined to establish safety distance.

D: Enter the panel height for the guards on the left and right end of the machine.

Note: The light curtain mounting extrusion will be a minimum of 8" longer than the light curtain field of coverage.

E: Enter inside frame dimension at the rear of machine.

F: Enter height from floor to top of bed. Also provide maximum and minimum feedline height.

G: Enter dimension from back of the slide to rear of machine.

If floor/roof sections are required, please read the instructions (E & F) on the previous page and provide dimensions in the Notes section above.

Notes:

* 1/2" square black mesh will be furnished in the nonadjustable portion of the assembly unless otherwise specified in Notes section above.



Precautions should be taken when applying light curtains for point-of-operation safeguarding. Be sure that someone cannot pass through or stand undetected between the plane of light and the hazard when a light curtain is mounted in a vertical position. If a light curtain must be mounted in this manner due to the safety distance requirements or because of the configuration of the machine, be sure that supplemental safeguarding is provided to safeguard this pass-through area. Examples of supplemental safeguarding include a horizontally mounted light curtain, single-beam devices, guards, or pressure-sensitive safety mats on the floor.

STATIONARY MOUNTING BRACKET SPECIFICATIONS FOR MODELS: SB-2, SB-3 OBI, SB-3 SS, SB-3 SSG, SB-5, AND SB-5 G

If more than one machine is to be measured, please make copies of this page.

Company _____ Address _____
 City _____ State _____ ZIP _____
 Attention _____ Rep. _____
 Machine Mfr. and Model No. _____ Machine No. _____
 Measured By _____

Check the required stationary bracket. If the standard dimensions specified here do not fit your application, indicate the dimensions required. The A dimension for all brackets should be a minimum of 8" more than the light curtain field-of-coverage height.

SB-2	2-Section Mounting Bracket (2-Dimensional)	Std	Req'd
	A	32"	
	B*	20"	

SB-3 OBI	3-Section Mounting Bracket (3-Dimensional)	Std	Req'd
	A	32"	
	B*	24"	
	C	12"	(3" Min.)

SB-3 SS	3-Section Mounting Bracket (2-Dimensional)	Std	Req'd
	A	44"	
	B*	12"	

SB-3 SSG	3-Section Mounting Bracket (2-Dimensional) With Guards	Std	Req'd
	A	44"	
	B*	12"	
	Guard Mat'l	Blk	**

SB-5	5-Section Mounting Bracket (3-Dimensional)	Std	Req'd
	A	36"	
	B*	24"	
	C	12"	(3" Min.)

SB-5 G	5-Section Mounting Bracket (2-Dimensional) With Guards	Std	Req'd
	A	36"	
	B*	24"	
	C	12"	(3" Min.)
	Guard Mat'l	Blk	**

*B dimension must include safety distance. Stopping time of the machine must be determined to establish the safety distance. Please consult the factory if assistance is needed.

**CHOICES OF GUARDING MATERIAL: 1/2" square or 1" square black (Blk) or yellow (Y) mesh, or polycarbonate (PC). 1/2" square black mesh is furnished as standard guarding material unless otherwise specified.

STATIONARY MOUNTING BRACKETS

These stationary light curtain mounting brackets are economical, heavy-duty, and versatile. Their design allows them to be tailored to each individual machine. They are available in two-, three-, or five-section assemblies. They are ideal for applications where side barriers (guards) will be fabricated by the user or provided separately. Two of the stationary light curtain mounting brackets can also be furnished with integral guarding material. See the measurement form on the previous page.

The two-section and three-section (SS) brackets can be used whenever mounting brackets can be installed on the front surface of the machine. The three-section (OBI) should be used when the brackets must be mounted to the sides of the machine (see photo). The five-section can also be mounted on the sides of the machine, at both the top and the bottom for greater stability. All of these brackets are designed for use on gap-frame presses or press brakes.

These brackets are constructed of 2" square extruded aluminum which attach to the machine with L-shaped mounting feet. The brackets are fastened to the mounting feet with T-nuts and cap screws. Each mounting foot has two holes which are used for mounting the bracket to the machine. Fasteners are included with each assembly.



*3-Section (OBI) Stationary Light Curtain Mounting Bracket
(barrier guard has been removed from machine for photo)*



*Floor Stand With Light Curtain Transmitter
(Light Curtain Sold Separately)*

*Floor Stand With Mirror
(Mirror Sold Separately)*

When light bars (transmitter or receiver) cannot be conveniently mounted to the machine, a floor stand can be furnished. Floor stands can also be used when safeguarding large work envelopes or perimeter areas. Mirrors or single-beam devices can be attached to the floor stand when the application requires multiple-sided safeguarding. Light bars, single-beam devices, or mirrors can easily be adjusted up or down on any side of the upright extruded-aluminum stand.

This floor stand assembly consists of a 6' length of 2" square extruded aluminum, one base, and two right-angle brackets with fasteners. The base has four holes for permanent attachment to the floor with bolts (not furnished). Other floor stand sizes are available. Please consult the factory.

MIRRORS FOR LIGHT CURTAINS

Mirrors can be used with the light curtain to protect more than one side of the point of operation or work envelope. The mirrors can help protect two, three, and even four sides of the point of operation or perimeter area (see next page). They are usually mounted on a 45° angle at each corner of the area to be safeguarded. Mounting hardware is provided which can be used with the floor stand illustrated on the previous page, or with the SAB-LC/M bracket illustrated on page 39. Shock and vibration isolation mounting fasteners are also provided with each mirror.

The mirror frame is constructed of 1 1/2" square aluminum extrusion with a rubber gasket. This gasket protects the mirror from machine vibration and shock load.

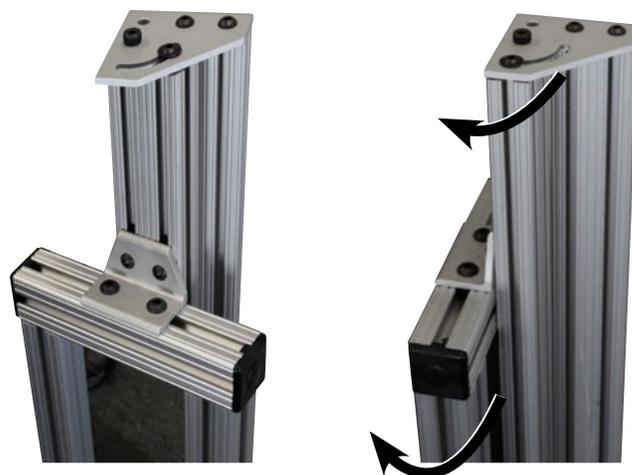
ORDERING INFORMATION	
PART NO.	DESCRIPTION OF MIRROR
KTR226	7" Field of Coverage
KTR227	12" Field of Coverage
KTR228	16" Field of Coverage
KTR229	18" Field of Coverage
KTR230	21" Field of Coverage
KTR231	24" Field of Coverage
KTR232	28" Field of Coverage
KTR233	35" Field of Coverage
KTR234	36" Field of Coverage
KTR235	42" Field of Coverage
KTR236	48" Field of Coverage
KTR237	56" Field of Coverage

Special-size mirrors are available upon request.



ADJUSTABLE MIRROR MOUNTING BRACKET —PART NO. MMB-F

Adjustable mirror mounting brackets are available for mounting mirrors to floor stands. These brackets are designed to provide easier alignment between light curtains and mirrors. Each adjustable mirror mounting bracket consists of two pieces of 1" x 2" extruded aluminum (48" long) connected by a rotating corner bracket. Please contact Rockford Systems if the standard dimension does not meet your requirements.



Adjustable Corner Bracket Provides Easy Alignment

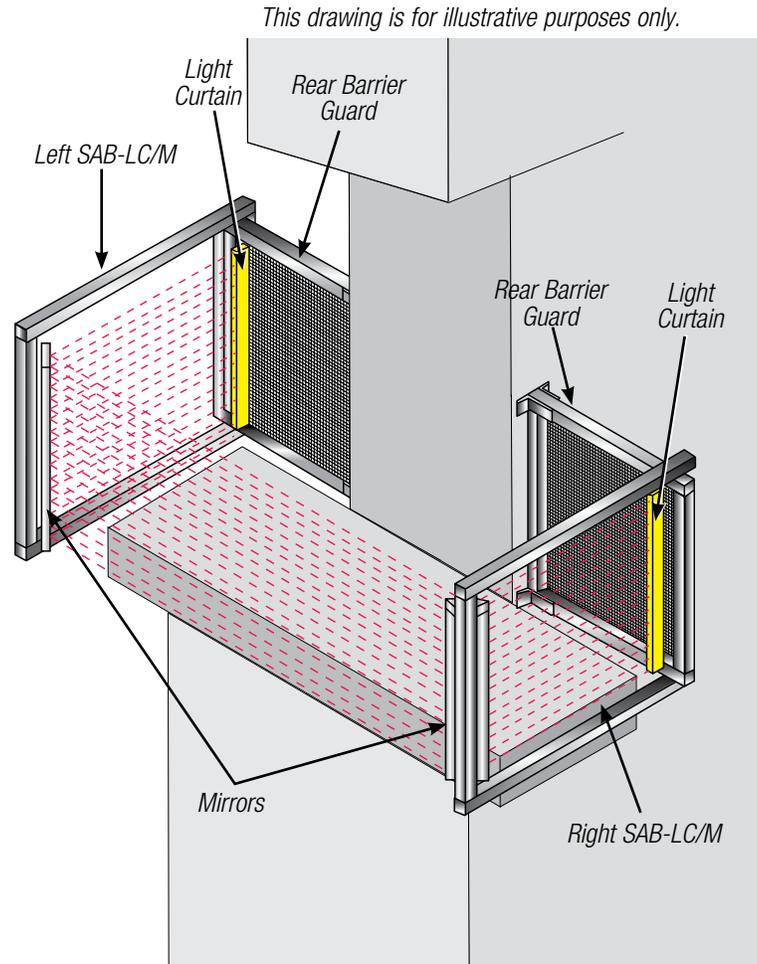
LIGHT CURTAIN AND MIRROR SWING-AWAY MOUNTING BRACKETS (PART NO. SAB-LC/M)

These brackets can be used on a variety of machines which require two-sided or three-sided light curtain protection. One light curtain and one mirror provide two-sided protection; one light curtain and two mirrors provide three-sided protection (see illustration).

The left and right sides of these brackets have the ability to adjust in both directions. This provides flexibility for different production runs so the light curtain can always be mounted at the proper safety distance.

The assembly for **three-sided** protection consists of the brackets on the left and right side plus the rear barrier guards. One light curtain and two mirrors (see previous page for mirror part numbers) must be ordered separately.

The assembly for **two-sided** protection consists of one left-side bracket or one right-side bracket. Please specify at time of order. One light curtain and one mirror must be ordered separately. One floor stand or one light curtain mounting bracket is also required to mount the other light bar. See pages 32-38 for brackets, floor stands, and mirrors.



Three-Sided Application With SAB-LC/M Mounting Brackets

TWO-HAND CONTROL



Two-hand control can be used as a safeguarding device in the single-stroke mode of operation on part-revolution clutch presses and hydraulic press and press brakes.

There are many requirements that must be met before two-hand control can be used as a point-of-operation safeguard. These requirements are located in OSHA 29 CFR 1910.217 and ANSI B11.1, B11.2, B11.3, and B11.19. We have referenced the following paragraphs for your convenience:

OSHA

(c)(3)(i) Point-of-operation devices shall protect the operator by:

(e) Requiring application of both of the operator's hands to machine operating controls and locating such controls at such a safety distance from the point of operation that the slide completes the downward travel or stops before the operator can reach into the point of operation with his hands;

(c)(3)(vii) The two-hand control device shall protect the operator as specified in paragraph (c)(3)(i)(e) of this section.

(a) When used in press operations requiring more than one operator, separate two-hand controls shall be provided for each operator, and shall be designed to require concurrent application of all operator controls to activate the slide. The removal of a hand from any control button shall cause the slide to stop.

(b) Each two-hand control shall meet the construction requirements of paragraph (b)(7)(v) of this section.

(c) The safety distance (D_s) between each two-hand control device and the point of operation shall be greater than the distance determined by the following formula:

$D_s = 63 \text{ inches/second} \times T_s$ where:

D_s = minimum safety distance (inches);

63 inches/second = hand speed constant; and

T_s = stopping time of the press measured at approximately 90° position of crankshaft rotation (seconds).

(d) Two-hand controls shall be fixed in position so that only a supervisor or safety engineer is capable of relocating the controls.

(b)(7)(v) Two-hand controls for single stroke shall conform to the following requirements:

(a) Each hand control shall be protected against unintended operation and arranged by design, construction, and/or separation so that the concurrent use of both hands is required to trip the press.

(b) The control system shall be designed to permit an adjustment which will require concurrent pressure from both hands during the die closing portion of the stroke.

(c) The control system shall incorporate an antirepeat feature.

(d) The control system shall be designed to require release of all operator hand controls before an interrupted stroke can be resumed.

ANSI

The following formula is used to compute the minimum safety distance (D_s) on mechanical power presses to meet the ANSI (American National Standards Institute) B11.1 press safety standard:

$D_s = K \times (T_s + T_c + T_r + T_{spm})$ where:

K = Hand speed constant (63 inches/second)

T_s = Stop time of equipment measured at the final control element

T_c = Response time of the control system

T_r = Response time of the two-hand control device and its interface

T_{spm} = Additional time allowed for the stopping performance monitor to compensate for variations in normal stopping time

D_{pf} = The added distance due to the depth penetration factor. Note: If the channel blanking feature is used on light curtains, additional safety distance must be enforced based on the number of channels blanked.

When determining the safety distance, a portable or built-in stop-time measuring unit must be used to check the stopping time (T_s) of the machine. Please see pages 5-6 for details on a portable STM (stop-time measurement) device.

The application of any safeguarding device, the requirements of proper machine interface, as well as the safety distance formulas may be difficult to understand and apply. When any of these safeguarding devices detailed in this section are a consideration, these factors must be evaluated. To help understand how to apply these devices, we offer monthly safeguarding seminars to educate the employer/user on the safety requirements.

ALL-IN-ONE TWO-HAND CONTROL

The all-in-one two-hand control is a NEMA 12 control box with a control module, two relays, a terminal strip, and two buttons. Everything in the control box is prewired and ready for the user to bring wires in from the machine actuator.

FEATURES

- Buttons must be maintained (actuated) during hazardous portion of the cycle
- Nonresumption of an interrupted cycle
- Provides control reliability of the two-hand control portion of the control system
- Compact design for ease in mounting and can be easily applied to small machines or devices
- Choice of control actuating buttons
- Available in 24 V DC or 115V DC

The all-in-one two-hand control can be applied to most any machine or device that is pneumatically, hydraulically, or electrically operated that is usually manually fed. These machines or devices include small presses, stakers, riveters, and assembly machines. The all-in-one two-hand control can be used as a point-of-operation safeguarding device **as long as it is located at the proper safety distance**. For more information on two-hand control or two-hand trip, see pages 35 and 36-37. See the chart on the next page for selecting the proper two-hand control part number.

For information on mechanical and hydraulic power press and press brake controls, please call us toll-free at 1-800-922-7533, or visit our Web site at www.rockfordsystems.com.



All-In-One Two-Hand Control With Banner Buttons

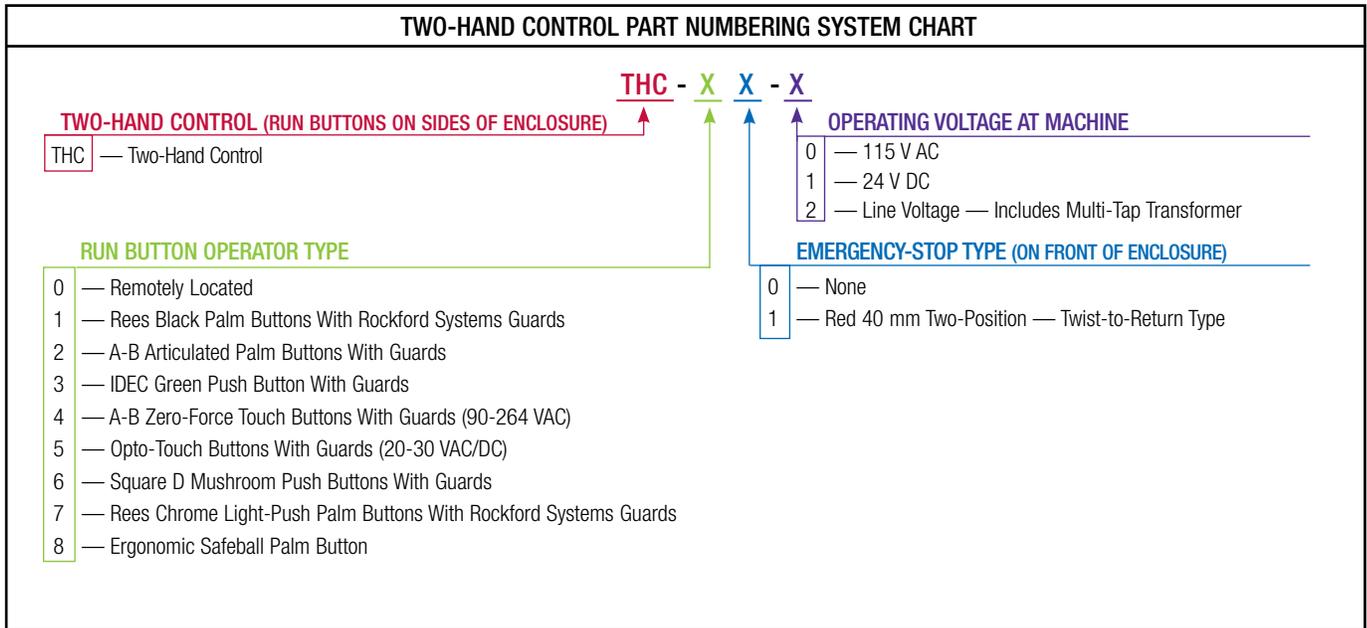


All-In-One Two-Hand Control with Allen-Bradley (A-B) Buttons on Sides and Emergency-Stop Button on Front

SELECTING AN ALL-IN-ONE TWO-HAND CONTROL

To determine the 6-digit configured part number for the two-hand control required, follow directions 1-4 below and use the information in the **PART NUMBERING SYSTEM CHART** below.

1. The first 3 digits for all two-hand controls are THC
2. The 4th digit determines the type of run button, if provided, on the control enclosure. Zero (0) indicates no run buttons provided.
3. The 5th digit determines the type of emergency-stop button, if provided. Zero (0) indicates no emergency button provided.
4. The 6th digit is for the operating voltage existing at the machine.



Rees Black Palm Button With RSI Guard



A-B Articulated Palm Button With A-B Guard



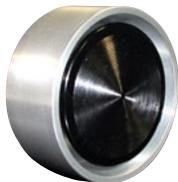
IDEC Button With Guard



A-B Zero-Force Touch Button With Guard



Opto-Touch Button With Guard



Mushroom Push Button With Guard (SQ-D)



Rees Chrome Light-Push Button With RSI Guard



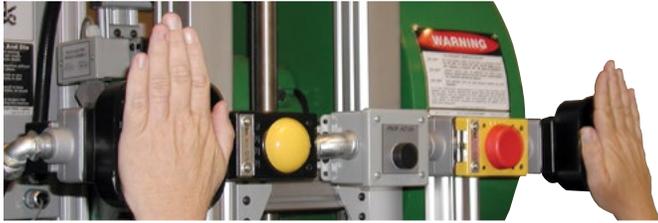
Ergonomic Safeball Palm Button



Red Two-Position E-Stop — Twist-to-Return

All buttons have 1 NO and 1 NC contact arrangement.

TWO-HAND TRIP



Note: There are two (2) possible applications for two-hand trip on full-revolution-clutch presses: to initiate a press cycle only, or as a method of safeguarding the point of operation for operators. In both instances, OSHA has established certain requirements. Applicable ANSI standards can also be referenced for two-hand trip.

(1) TWO-HAND TRIP

—USED AS A METHOD OF INITIATING A PRESS CYCLE ONLY

F(b)(6)

(i) A two-hand trip shall have the individual operator's hand controls protected against unintentional operation and have the individual operator's hand controls arranged by design and construction and/or separation to require the use of both hands to trip the press and use a control arrangement requiring concurrent operation of the individual operator's hand controls.

(ii) Two-hand trip systems on full-revolution-clutch machines shall incorporate an antirepeat feature.

(iii) If two-hand trip systems are used on multiple-operator presses, each operator shall have a separate set of controls.



This description covers the use of two-hand trip as an initiating means only, to obtain a press cycle. It does not provide any type of point-of-operation safeguarding. Some other properly applied and installed guard or device must also be provided in accordance with OSHA 29 CFR 1910.217(c).

(2) TWO-HAND TRIP—USED AS A METHOD OF SAFEGUARDING THE POINT OF OPERATION.

TWO-HAND TRIP

(c)(3)(i) Point-of-operation devices shall protect the operator by:

(e) Requiring application of both of the operator's hands to machine operating controls and locating such controls at such a safety distance from the point of operation that the slide completes the downward travel or stops before the operator can reach into the point of operation with his hands;

(c)(3)(viii) The two-hand trip device shall protect the operator as specified in paragraph (c)(3)(i)(e) of this section.

(a) When used in press operations requiring more than one operator, separate two-hand trips shall be provided for each operator, and shall be designed to require concurrent application of all operator controls to activate the slide.

(b) Each two-hand trip shall meet the construction requirements of paragraph (b)(6) of this section.

(c) The safety distance (D_m) between the two-hand trip and the point of operation shall be greater than the distance determined by the following formula:

$D_m = 63 \text{ inches/second} \times T_m$ where:

D_m = minimum safety distance (inches);

63 inches/second = hand speed constant; and

T_m = the maximum time the press takes for the die closure after it has been tripped (seconds). For full-revolution-clutch presses with only one engaging point, T_m is equal to the time necessary for one-and-one-half revolutions of the crankshaft. For full-revolution-clutch presses with more than one engaging point, T_m shall be calculated as follows:

$$T_m = \left[1/2 + \frac{1}{\text{Number of engaging points per revolution}} \right] \times \text{time necessary to complete one revolution of the crankshaft (seconds)}$$

Note: See chart (next page) for easy reference when applying two-hand trip on full-revolution presses.

(d) Two-hand trips shall be fixed in position so that only a supervisor or safety engineer is capable of relocating the controls.



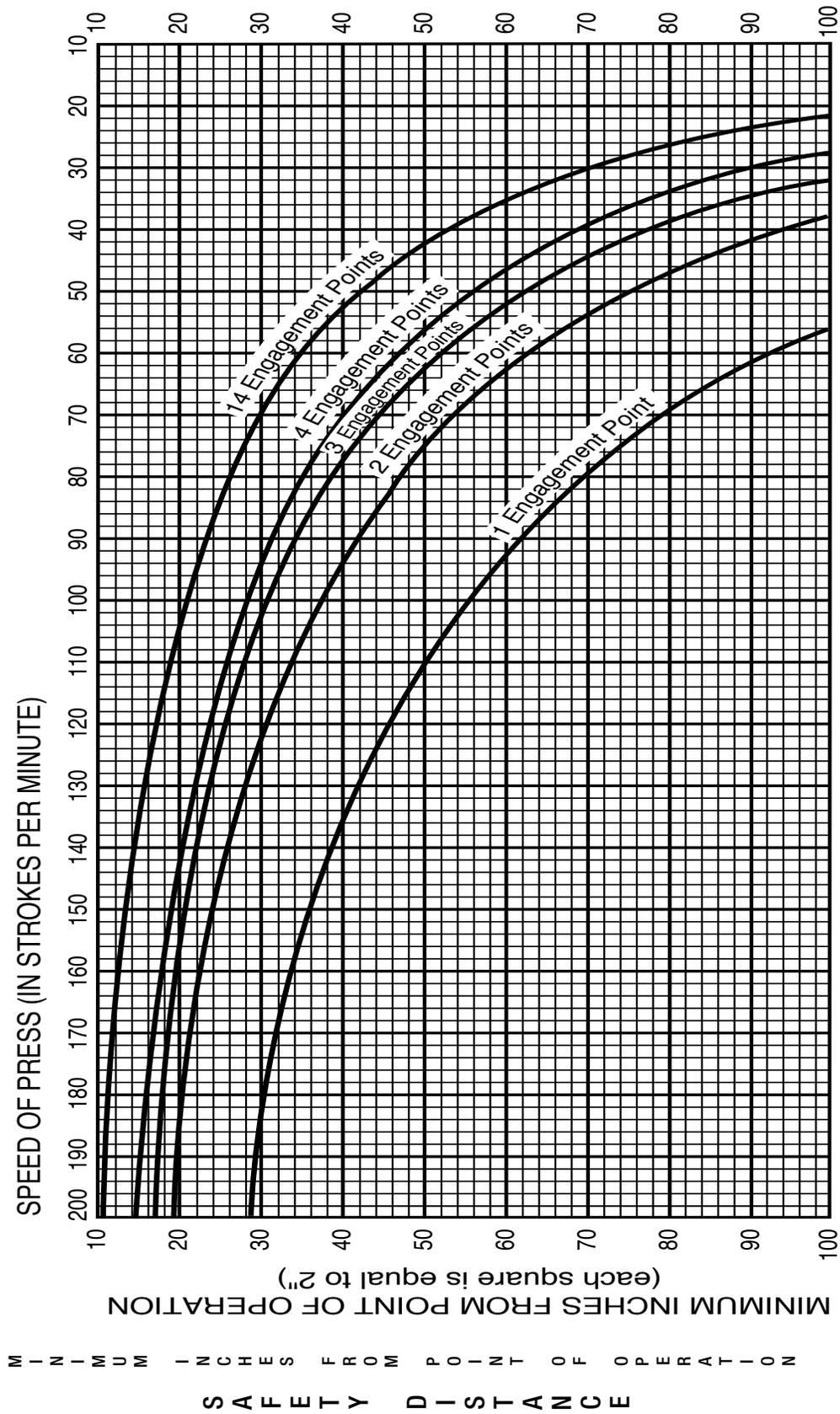
When applying two-hand trip to meet the requirements for a point-of-operation safeguarding device, make sure the buttons are located on the press so they are at least the minimum safety distance required by the preceding OSHA formula. Refer to the chart on the next page.



This means the palm buttons must be located far enough away so that after the press is tripped and the operator releases one or both palm buttons, the operator cannot "beat the ram" or reach into the point of operation or other pinch points before the dies close.

TWO-HAND TRIP SAFETY DISTANCE CHART

To establish the proper safety distance for two-hand trip on full-revolution-clutch presses, determine the speed of the press in SPM (strokes per minute) when running in the continuous mode and the number of engagement points in the clutch mechanism. Then determine the **Safety Distance** from the following chart.



Each square is equal to 2" of safety distance.
 1, 2, 3, 4, and 14 engagements points in the clutch mechanism are the most common. Machines with other engagement points may exist.

GATE OR MOVABLE BARRIER DEVICE



Example of a Type A Gate Package

INTRODUCTION

Why use a gate device? According to the OSHA and ANSI standards, “operators must be prevented from inadvertently placing their hands or any other body parts in the point of operation during the die-closing portion of the press stroke.” The movable gate device uses a proven method of placing a physical barrier between the operator and the point-of-operation hazard during the die-closing portion of the press stroke.

Other advantages of gate devices include the following:

1. Operators are not physically attached with wristlets to the machine as they are when using a pullback or restraint device. This means operator resistance is minimized because of the nonrestrictive design allowing more freedom of movement.
2. These devices protect other employees in the machine area.
3. A foot switch can be used to actuate the press. This minimizes stress to the hands and arms which can be caused by palm buttons.

Two types of gates are available. The first is a type A gate. It protects the operator during the entire machine cycle. This means the gate will not open until after the machine's cycle is complete and stopped (usually in the up position). Type A gates are the only gates that should be used on full-revolution-clutch presses.

The second is a type B gate. It protects the operator during the downstroke only. The gate can open after the hazardous portion of the cycle has passed. Both type A and B gates can be used on part-revolution-clutch machines, hydraulic presses, and other cyclic machines where material is being manually fed.

TYPE A GATE SEQUENCE OF OPERATION

When the actuating means (palm buttons or foot switch) is operated, air pressure is released from the bottom of the gate-operating cylinder. This allows the gate to descend by gravity. Once the gate is fully down, a gate-down proximity switch senses this and the machine is allowed to make a cycle. If the gate cannot complete its downward travel, this gate-down proximity switch will not sense the gate and will prevent a machine cycle.

If the actuating means is released before the machine starts its cycle, the gate returns to the full open position with a type A gate. When the machine is actually making a cycle, air pressure is applied to the top of the gate-operating cylinder which holds the gate down and prevents it from being raised until the machine has completed its cycle. If the machine malfunctions and does not stop at the end of a normal cycle, the gate remains in the closed position.

According to ANSI (see next page), the gate must open after every cycle in order to reset the antirepeat system. If this does not happen, the machine will not make another stroke. To accomplish this, the gate control requires a signal from the machine at the open position. This signal is normally obtained from a photo-sensor or limit switch operated by a cam. Actuation of the limit switch is accomplished by the rotation of the crankshaft or any other member of the machine which makes one cycle or oscillates along one axis every stroke.

When a type A gate package is furnished for a full-revolution-clutch machine, the top-dead-center signal is provided by a limit switch assembly.

TYPE B GATE SEQUENCE OF OPERATION

The type B gate operates in a similar manner as the type A gate. When the actuating means (palm buttons or foot switch) is operated, air pressure is released from the bottom of the gate-operating cylinder. This allows the gate to descend by gravity. Once the gate is fully down, a gate-down proximity switch senses this and the machine is allowed to begin the cycle. If the gate cannot complete its downward travel, this gate-down proximity switch will not sense the gate and will prevent a machine cycle.

TYPE B GATE SEQUENCE OF OPERATION (CONTINUED)

If the actuating means is released before the machine starts its cycle, the gate returns to the full open position. When the machine is actually making a cycle, air pressure is applied to the top of the gate-operating cylinder which holds the gate down and prevents it from being raised until the hazardous portion of the cycle has passed.

The gate must open every cycle in order to reset the antirepeat system. The sequence for this is the same as for the A gate described on the previous page.

OSHA AND ANSI REQUIREMENTS FOR POWER PRESSES

The OSHA requirements for gate or movable barrier devices are located in 29 CFR 1910.217(c)(3)(i) as follows:

(c)(3)(i) Point-of-operation devices shall protect the operator by:

- (f) Enclosing the point of operation before a press stroke can be initiated, and maintaining this closed condition until the motion of the slide has ceased; or
- (g) Enclosing the point of operation before a press stroke can be initiated, so as to prevent an operator from reaching into the point of operation prior to die closure or prior to cessation of slide motion during the downward stroke.

(c)(3)(ii) A gate or movable barrier device shall protect the operator as follows:

- (a) A Type A gate or movable barrier device shall protect the operator in the manner specified in paragraph (c)(3)(i)(f) (above) of this section, and
- (b) A Type B gate or movable barrier device shall protect the operator in the manner specified in paragraph (c)(3)(i)(g) (above) of this section.

Note: OSHA states that the gate must enclose the point of operation. The gates illustrated are furnished as a single-panel only, allowing access to the point of operation. Other guarding material is required to safeguard the sides and back of the point of operation. Complete the proper measurement form (page 41, 43, or 44) if these need to be supplied with the gate.

The ANSI requirements for gates or movable barrier devices are located in 8.6.6 of ANSI B11.1.

8.6.6 Movable Barrier Device

- 1) A movable barrier device, when used, shall enclose the point of operation before a press cycle (stroke) can be initiated.
- 2) The device shall prevent the individual from reaching the hazards associated with the point of operation by reaching over, under, around, or through the device when in the closed position.
- 3) In conjunction with the press control, the device shall actuate the clutch and initiate the press cycle (stroke).
- 4) The barrier shall be capable of being returned to the open position should it encounter an obstruction prior to enclosing the point of operation.

5) The device shall require opening of the barrier to reset the antirepeat system of the press production system every time the press stops before a successive cycle (stroke) can be initiated.

6) The device shall be in compliance with 6.11 and 8.8.

7) The device shall provide visibility to the point of operation when necessary for safe operation of the press production system.

8) The device in and of itself shall not create a hazard to the operator or others.

8.6.6.1 Type A movable barrier device

- 1) A type A movable barrier device, when used, shall protect the individuals as specified in 8.6.1 (e).
- 2) The type A movable barrier device shall, in normal single-cycle operation, be designed to hold in the closed position until the slide has completed its cycle (stroke) and has stopped at top of cycle (stroke).

8.6.6.2 Type B movable barrier device

- 1) A type B movable barrier device shall protect the individuals as specified in 8.6.1 (f).
- 2) The device shall not be used on full-revolution-clutch presses.
- 3) The device shall, in normal, single-stroke operation, be designed to hold in a closed position during the closing portion of the cycle (stroke), or until cessation of slide motion during the closing portion of the cycle (stroke).
- 4) When the protection of the operator is dependent upon the stopping action of the press, a stopping-performance monitor shall be required in conformance with 6.12.

GATE ASSEMBLIES



Basic Gate Assembly (Without Side or Rear Safeguarding)

GATE CONSTRUCTION

The panel framework of these gates is constructed of 1" x 2" extruded aluminum which slides up and down on roller bearings in a rail extrusion. The panel of the gate is furnished with either clear polycarbonate (3/16"-thick) or an adjustable lower section.

The standard gate assembly is furnished with hinges allowing it to swing open. A button-head cap screw on a locking plate holds the gate in place. This feature is useful when changing dies or working on dies in the machine.

*Other lift heights are available. Please complete the measurement form on page 41,43 or 44.

For full-revolution-clutch presses, part-revolution-clutch presses, or hydraulic presses with a gate interface, please consult the factory.

The gate assembly can be furnished with side guards. The gate and side panel can be swung open to the left when changing dies. A dead-bolt latch is located on the right extrusion. When side guards are furnished, this latch releases the gate so it can be swung completely open.

These gates are easily mounted on the bolster of the machine or on a special plate or bracket on the front of the machine.

The gate assemblies listed are designed for a variety of machines, including full-revolution-clutch presses. Side guards are also required when using a gate. Gates are made according to the measurements submitted. Please complete the appropriate measurement form on page 41,43 or 44 for a complete assembly.

GATE ASSEMBLY COMPONENTS

- Gate frame assembly
- Gate panel
- Proximity switch (24 V DC only) or limit switch
- Air cylinder(s)
- Quick dump valves
- Air flow control valves
- Solenoid air valve assemblies
- 1/8" air regulator gauge and mounting bracket
- Extrusion, hinge assembly, and mounting hardware

PRICING/ORDERING INFORMATION

The following information is required to order or price a gate assembly:

1. Choose a gate lift height of either 12** or 18**
2. Provide gate's **outside dimensions** in height and width

OR

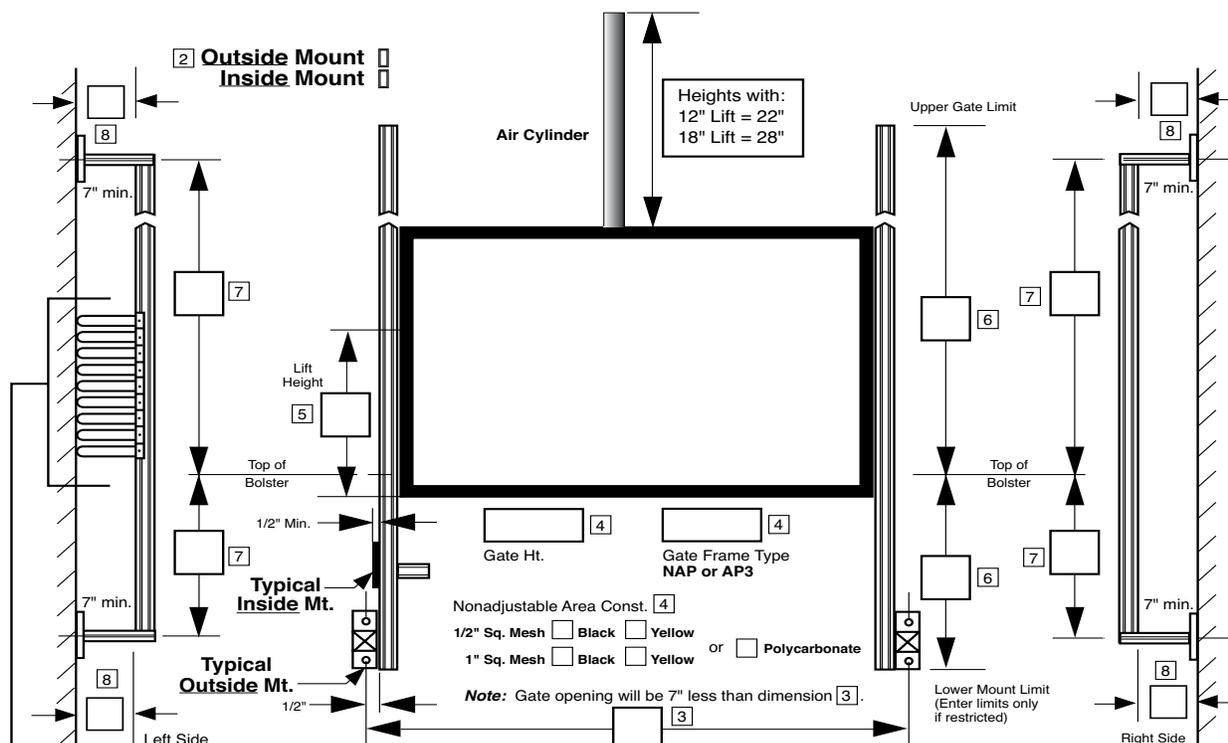
Provide gate's **inside opening dimensions** in height and width

GATE ASSEMBLY & BARRIER GUARD MEASUREMENT FOR STRAIGHT-SIDE, HYDRAULIC, OR COLUMN-TYPE MACHINES

If more than one machine is to be measured, please make copies of this page.

1 Company _____ Address _____
 City _____ State _____ ZIP _____
 Attention _____ Rep. _____
 Mach. Mfr. & Model No. _____ Mach. No. _____ Measured By _____

Check Type of Machine: Straight Side (SSG) Hydraulic (HG) Column (CG)



5 GATE LIFT HEIGHT
 12" 18" Other _____"

8 MOUNTS: FMG EMG

9 SIDE GUARDS

	Left Side	H	L
	Right Side		

10 FLOOR SECTION

Gate	H	L
------	---	---

11 HINGED GATE
 No Yes—Type of Interlock:
 Locking Nonlocking

12 CHOOSE ONE
 Proximity Switch (24 V DC only)
 Limit Switch

MEASURING INSTRUCTIONS

The gate assembly measurement form is designed to be used for the XL1SSG, XL1HG, or the XL1CG.

- Fill in the complete heading as indicated.
- Check whether an **Outside** or **Inside** mount is required. (See lower left side of front view drawing for examples.)
- Enter center mounting dimension. The gate opening will be approximately 7" smaller than this dimension.
- Enter gate height, frame type, and construction of nonadjustable area.
- Enter gate lift height: 12", 18", or other.
- Enter upper and lower gate mount limits, if any.
- If outside mounted, enter the appropriate location of upper and lower mounting point for each mount.
- Enter the desired length and type of mount supports; either FMG for direct or EMG for extended. Allow for any obstructions (7" minimum).
- Enter dimensions for side guards if required.
- Indicate if floor section is required for the gate frame. Provide height and length.
- Indicate if hinged gate is required. If yes, indicate the type of interlock switch required.
- Choose a proximity switch (for 24 V DC only) or a limit switch.

MEASURING INSTRUCTIONS FOR GATE ASSEMBLY MODELS XL2G THROUGH XL6G

The following instructions are for measuring XL2G through XL6G gate assemblies and barrier guards. The basic information necessary to quote or fabricate any of the listed gates and barrier guards is the size of the gate, the frame type, nonadjustable area construction, height of panel(s), panel segments (if required), and mounts to attach the gate and guards to the machine. **The length of all panels will be determined by Rockford Systems.**

The following instructions are purposely kept as simple as possible to avoid long explanations of the many variations available.

1. Fill in the complete heading as indicated.
2. Check appropriate gate model number.
 - XL2G** = 2 panel and gate
 - XL3G** = 3 panel and gate
 - XL4G** = 4 panel and gate
 - XL5G** = 5 panel and gate
 - XL6G** = 6 panel and gate
 (If any panels are not required, cross them out in the panel chart.)
3. Measure and record the bolster width and depth.
4. Measure web width of frame, if the barrier guard is to be mounted to the front of the frame behind the bolster plate.
5. Measure and record the distance from the mounting point of the guard on the frame of the machine to the rear of the bolster. Measure and record the outside width of the press frame behind the bolster plate.
6. Indicate desired position of L and R panels and gate relative to the bolster. Drawing shows panels and gate outbound of the bolster. If panels or gate should be inbound, enter minus (-) dimensions, or on the bolster, enter zero.
7. Enter the minimum and maximum feedline heights. Enter distance from the bottom of the gate to bolster (usually 0 inches). If below bolster, enter inches.
8. Measure and record the clearance from the flywheel cover or obstruction to the top of the bolster. This dimension could affect the panel height if the panel is to be swung underneath. Indicate if view is from left or right side of the machine.

When measuring, be sure the gate will lift completely without hitting any obstruction.

9. Measure and record the feedline depth.
10. Indicate the gate lift height required, normally 12" or 18" is sufficient.
11. Indicate mounts required for **LR, L, R, or RR** panels.

SFM	Side Frame Mount
SFM7	Side Frame Mount (3", 5", or 7")
SFM24	Side Frame Mount up to 24"
FFM	Front Frame Mount

Note: The panel will begin approximately 2½" from the mounting point with the SFM, SFM7, or SFM24 mount. The panel will begin approximately 1" from the mounting point with the FFM mount.

12. Indicate frame type for each panel and gate.

NAP	Nonadjustable Panel
AP1	Adjustable Panel (1/2 frame)
AP2	Adjustable Panel (5/8 frame)
AP3	Adjustable Panel (3/4 frame)
AP4	Adjustable Panel (Center—Full frame)
AP5	Adjustable Panel (Lower—Full frame)
API	Adjustable Panel (Inclinable)

The gate can ONLY be NAP or AP3.

13. Indicate the construction of the nonadjustable area for each panel.

B	1/2" Sq. Black Mesh (16 gauge)
B1	1" Sq. Black Mesh (12 gauge)
Y	1/2" Sq. Yellow Mesh (16 gauge)
Y1	1" Sq. Yellow Mesh (12 gauge)
PC	Polycarbonate (3/16" thick)

The gate is normally polycarbonate.

14. Indicate height of each panel.
15. Indicate length of each panel. **Rockford Systems will determine length(s) based on other dimensions provided.**
16. Indicate panel segment type, height, length, and if hinged or nonhinged, if required.

FS	Feeder Segment
AS	Adjustable Segment
PCS	Polycarbonate Segment
ES	Empty Segment
17. Indicate if **L, LF, Gate, RF, or R** panels require an interlock switch and choose locking or nonlocking.
18. Indicate if **L, LF, Gate, RF, or R** panel needs to be hinged (L or R).

The gate ALWAYS hinges left.
19. Indicate if hairpins are required in place of **LR** or **RR** panel. The number of hairpins supplied will be determined by the height of the **L** or **R** panel. Indicate the height of hairpins required in the box.
20. Indicate if roof section(s) are required. Provide height and length.
21. Indicate if floor section(s) are required. Provide height and length.
22. Choose proximity switch (for 24 V DC only) or limit switch.

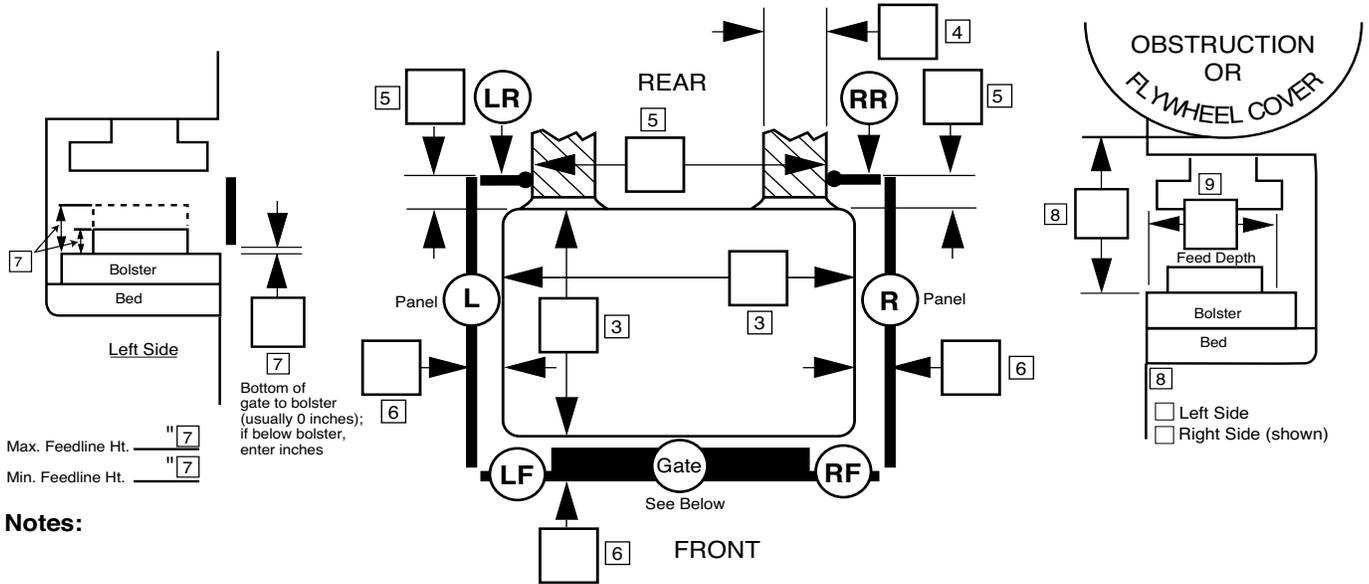
GATE ASSEMBLY & BARRIER GUARD MEASUREMENT FORM—GAP OR C-FRAME MACHINES

GATE ASSEMBLY WITH MULTI-PANEL GUARDS—XL2G, XL3G, XL4G, XL5G, XL6G

If more than one machine is to be measured, please make copies of this page.

(See previous page for instructions.)

1 Company _____ Address _____
 City _____ State _____ ZIP _____
 Attention _____ Rep. _____
 Mach. Mfr. & Model No. _____ Mach. No. _____ Measured By _____



Notes:

2 **MODEL**
 XL-2G XL-3G
 XL-4G XL-5G
 XL-6G

10 **GATE LIFT HEIGHT**
 12" Other _____
 18" _____

11 **MOUNTS**
 SFM SFM-3, -5, -7
 (Circle one)
 SFM-24 FFM

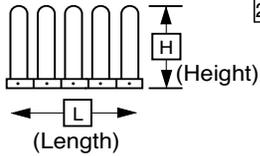
17 **ELEC. INTERLOCK**
 Locking Nonlocking

22 **CHOOSE ONE**
 Proximity Switch (24 V DC only)
 Limit Switch

PANEL CHART							
Panel	LR	L	LF	Gate	RF	R	RR
Frame Type NAP, AP1, AP2, AP3, AP4, AP5, API	12	12	12	12	12	12	12
Nonadjust. Area Const. B, B1, Y, Y1, PC	13	13	13	13	13	13	13
H (Height)	14	14	14	14	14	14	14
L RSI To (Length) Complete	15	15	15	15	15	15	15
Panel Segment Type FS, AS, PCS, ES	16	16	16		16	16	16
H (Height)							
L (Length)							
H (Hinged) NH (Nonhinged)							
Electrical Interlock Y (Yes) N (No)		17	17	Y	17	17	17
Hinged L or R		18	18	L	18	18	18
Hairpins (In place of LR or RR)	19						19

20 **ROOF SECTION**

Panel	H	L
* L		
LF		
Gate		
RF		
* R		



21 **FLOOR SECTION**

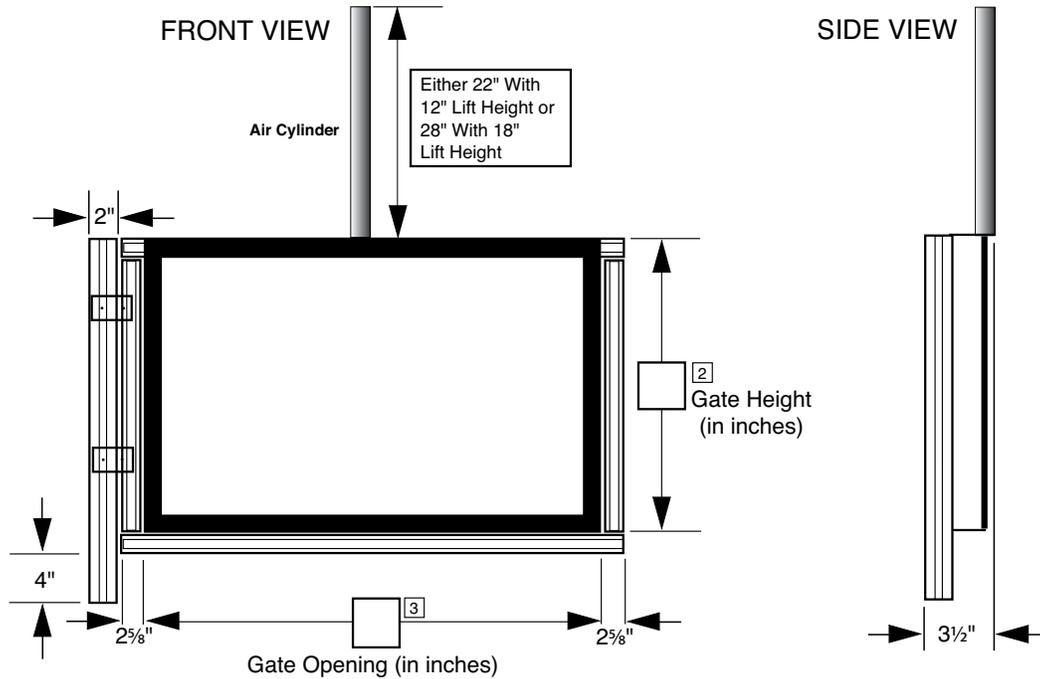
Panel	H	L
L		
LF		
Gate		
RF		
R		

*Indicate in the Notes section above if a vertical section of hairpins is required above the L or R panel.

SWING-AWAY GATE ASSEMBLY & BARRIER GUARD MEASUREMENT FOR STRAIGHT-SIDE, HYDRAULIC, OR COLUMN-TYPE MACHINES

If more than one machine is to be measured, please make copies of this page.

Company _____ Address _____
 City _____ State _____ ZIP _____
 Attention _____ Rep. _____
 Mach. Mfr. & Model No. _____ Mach. No. _____ Measured By _____



INSTRUCTIONS

- 1 Provide complete information.
- 2 Determine gate height required.
- 3 Determine gate opening required.
- 4 Determine gate lift height required.
- 5 Choose gate panel construction required.
- 6 Choose proximity switch or limit switch.
- 7 Choose type of interlock switch.

GATE ASSEMBLY COMPONENTS

- Gate frame assembly
- Gate panel
- Proximity switch (24 V DC only) or limit switch
- Air cylinder(s)
- Air flow control valves
- Quick dump valves
- Solenoid air valve assemblies
- 1/8" air regulator gauge and mounting bracket
- Extrusion, hinge assembly, and mounting hardware

4	GATE LIFT HEIGHT
<input type="checkbox"/> 12" <input type="checkbox"/> 18" <input type="checkbox"/> Other _____"	

5	GATE PANEL CONSTRUCTION
Check box 1 or 2 below:	
1. <input type="checkbox"/> NAP (Nonadjustable Panel)—Choose from the following: Nonadjustable Area <input type="checkbox"/> Polycarbonate OR <input type="checkbox"/> Wire Mesh <input type="checkbox"/> 1/2" Square or <input type="checkbox"/> 1" Square <input type="checkbox"/> Black or <input type="checkbox"/> Yellow	
 Gate Panel	
2. <input type="checkbox"/> AP3 (Adjustable Panel)—Choose from the following: Nonadjustable Area <input type="checkbox"/> Polycarbonate OR <input type="checkbox"/> Wire Mesh <input type="checkbox"/> 1/2" Square or <input type="checkbox"/> 1" Square <input type="checkbox"/> Black or <input type="checkbox"/> Yellow	
 Gate Panel	
Adjustable Area—Hairpin will be 4" maximum.	

6	<input type="checkbox"/> Proximity Switch (24 V DC only) <input type="checkbox"/> Limit Switch
---	--

7	<input type="checkbox"/> Locking Interlock <input type="checkbox"/> Nonlocking Interlock
---	--

PRESSURE-SENSITIVE SAFETY MATS

Safety mats are intended to be used as auxiliary or additional safeguarding equipment to protect operators and other employees in the machine area. They must not be used as the primary method of safeguarding except when all other means are not applicable.

These mats can safeguard many types of machines. Consider the following when choosing mats:

- 1) How is the mat to be interfaced to the existing motor control or equipment? Does a new control or starter need to be added?
- 2) Can the motion of the machine that is creating the point-of-operation hazard be stopped quickly? If it can, what kind of clutch and brake arrangement does it have? Is the machine hydraulically or pneumatically operated? Is it operated by any other means?

Before applying a safety mat to any machine, make sure it will be interfaced correctly with the machine control and make sure it does not interfere with productivity. The whole machine system must be considered, including safeguarding, machine control, disconnects,

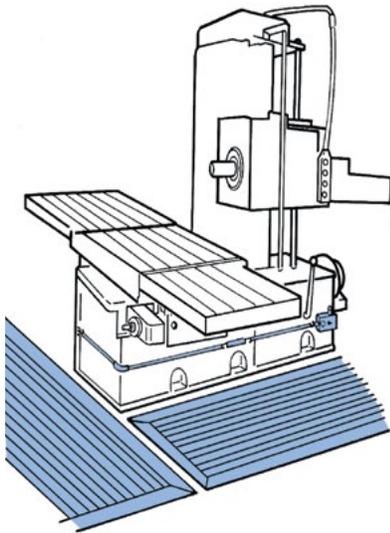
starters, covers for rotating parts, auxiliary parts, feeding and retrieving of workpieces, etc.

The pressure-sensitive, heavy-duty safety mats described on these pages are highly resistant to wear, oils, grease, acids and most common chemicals.

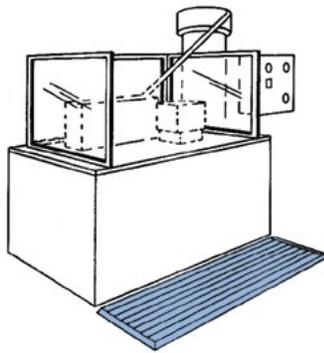
These mats function in two different ways. One way is that the machine will not start if someone or some object is on the mat. Another way is that if the machine is already operating or cycling, it will stop if someone steps onto the mat. In this case, the machine needs to be restarted once the mat has been cleared.

The mat(s) must be located so an operator or other employee, when stepping onto the mat, cannot reach into the point-of-operation hazard prior to the machine's hazardous motion coming to a stop. See ANSI/RIA R15.06 robot safety standard for detailed guidelines on mat safety distance. Also see the ANSI B11.19 for guidelines on mat control system reliability.

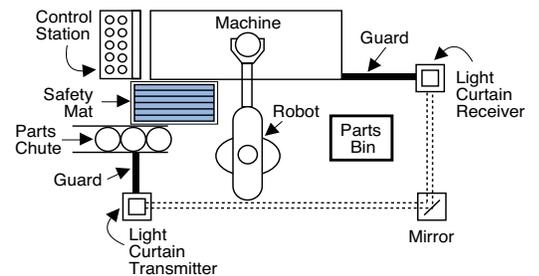
MATS CAN BE APPLIED TO MANY DIFFERENT MACHINES AND AUXILIARY EQUIPMENT FOR PROTECTION.



Drilling, Milling, and Boring Machines



Assembly Machines



Robots and Auxiliary Equipment

REPLACEMENTS FOR LRS/RKR/THS CONTROLLERS				
PART NO.	DEVICE	APPLICATION	DESCRIPTION	
GIC2508	Mat Controller – Buttons on Door	For use with safety mats. When used with multiple mats, they are wired in series	Manual reset with safety bypass control and indicators for interlocks closed [green light] and in safety bypass mode [yellow light]	Provides 2 normally open/held closed dry contacts & 3 normally closed/held open interlock outputs
GIC2509	Mat Controller – Plain Door			
GIC2510	Bump Switch Controller – Buttons on Door	For use with bump or edge switches. For more than 1 switch, wire in series		
GIC2511	Bump Switch Controller – Plain Door			

PRESSURE-SENSITIVE SAFETY MATS (CONTINUED)

The heavy-duty pressure-sensitive safety mats offered have been successfully used to provide auxiliary safeguarding for the hazard areas that exist in many industrial environments. Some of these include:

- Robotic welding
- Laser welding/cutting
- Water jet machines
- Pick-and-place robots
- Plastics molding machines
- Assembly machines
- Automated material handling
- Packaging machinery
- Textile machinery
- Conveyors
- Paper converting machinery
- CNC punches and tube benders



The single-piece molded construction of these safety mats means these mats will not delaminate. The mats encase conductive plates which provide stop/restart signals when pressure is applied or released. Each mat top surface has a rib pattern running parallel with the mat length which helps prevent slipping, yet is easy to clean.

All mats are supplied with a 20' single-jacketed, four-wire cord exiting from the width end of the mat. The outside edge of each mat has a lip to attach either an aluminum ramp or a blunt edge. The lip can also be removed when joining two mats with a mat connector. The mat dimensions provided are for the active area of the mat.

These mats can be supplied individually or in multiple configurations. They are available in various sizes and can be tied together (electrically) in series.

The part numbers listed in the chart on the next page do not include any ramps, blunt edges, or connectors. Follow the instructions below the chart to add ramp edging.

Note: A mat control box Part No. RKR162, or Zone Monitor

MAT SPECIFICATIONS

Operating Temperature	-35° to 120°F
.....	(-37° to 49°C)
Individual Mat Sizes	12" x 12" to 48" x 72"
Activation Force	3 to 5 ft/lb (normal foot traffic)
Mat Cover Material	Molded vinyl
Shore A Hardness	72 ± 2
Mat Cable Length	20 ft
Load Capacity.....	3,000 psi
Applicable Standards....	Designed to meet or exceed ANSI B11.19,
.....	OSHA 1910.212, and ANSI/RIA R15.06

ELECTRODE ASSEMBLY:

- Normally open switch
- High-durability 24-gauge steel
- 18-gauge, 4-wire, single-jacketed lead wires and optional application-specific wiring options
- Hermetically encapsulated switch and lead wires
- Designed to meet IP67 and NEMA 6
- Water-tight and totally submersible

For a complete chemical resistance chart, contact the factory.

STANDARD MATS

These heavy-duty pressure-sensitive safety mats are constructed of molded vinyl material. The molding encases two separated parallel steel plates. These plates make contact when the mat is stepped on. They have a black, ribbed pattern top surface to help prevent slipping and are easy to clean.

The mats are active over the entire surface, except the narrow border. They are designed for low-voltage (24-V DC) control circuits.

All standard size safety mats can be modified, i.e., with notches, cutouts, angles, or holes. Various configured layouts of any dimension can be supplied. Various colors, sizes, and shapes of mats are available along with different wiring options to meet your requirements. To obtain an assessment to meet your needs, submit a layout drawing complete with all dimensions and a list of your specific requirements.



Part No. PSM2436-1
Safety Mat (Includes EDG1000 Series Ramp Edging)

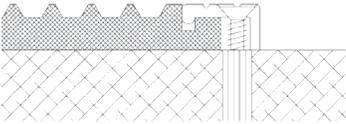
The pressure-sensitive safety mat information in the chart is for mats without EDG1000 Series ramp edging. To include mitered ramp edging on all four sides of the mat, add a 1 to the part number and add 4" to both the width and length provided in the chart.

All mats are furnished with a 20' four-wire cord that exits the mat at the width end.

STANDARD MAT SIZES		
PRESSURE-SENSITIVE MATS CHART		
PART NO.	WIDTH	LENGTH
PSM1212	12"	12"
PSM1224	12"	24"
PSM1236	12"	36"
PSM1248	12"	48"
PSM1260	12"	60"
PSM1272	12"	72"
PSM1636	16"	36"
PSM1824	18"	24"
PSM1836	18"	26"
PSM1848	18"	48"
PSM1860	18"	60"
PSM1872	18"	72"
PSM2420	24"	20"
PSM2424	24"	24"
PSM2430	24"	30"
PSM2436	24"	36"
PSM2442	24"	42"
PSM2448	24"	48"
PSM2456	24"	56"
PSM2460	24"	60"
PSM2472	24"	72"
PSM2828	28"	28"
PSM2833	28"	33"
PSM2843	28"	43"
PSM2856	28"	56"
PSM3030	30"	30"
PSM3036	30"	36"
PSM3042	30"	42"
PSM3048	30"	48"
PSM3060	30"	60"
PSM3072	30"	72"
PSM3432	34"	32"
PSM3444	34"	44"
PSM3456	34"	56"
PSM3636	36"	36"
PSM3642	36"	42"
PSM3648	36"	48"
PSM3660	36"	60"
PSM3672	36"	72"
PSM4132	41"	32"
PSM4144	41"	44"
PSM4156	41"	56"
PSM4848	48"	48"
PSM4860	48"	60"
PSM4872	48"	72"

RAMP EDGING, BLUNT EDGING, AND MAT CONNECTORS

An aluminum ramp-edged mat system can be customized to fit any shape or size area. Custom-made mats can fit most areas and even provide cutouts for machine legs, posts, or other obstructions. Send us a layout drawing with complete dimensions of the area the mats need to cover, and we will provide an assessment for the required mats and accessories.



BLUNT EDGING—EDG-2000 SERIES

Recessed installations: for flush edges against thresholds, walls, and machines.

Part No. EDG-2052-N (¼" W x 52" L)

Part No. EDG-2096-N (¼" W x 96" L)

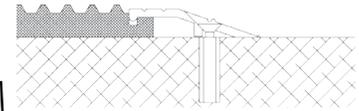
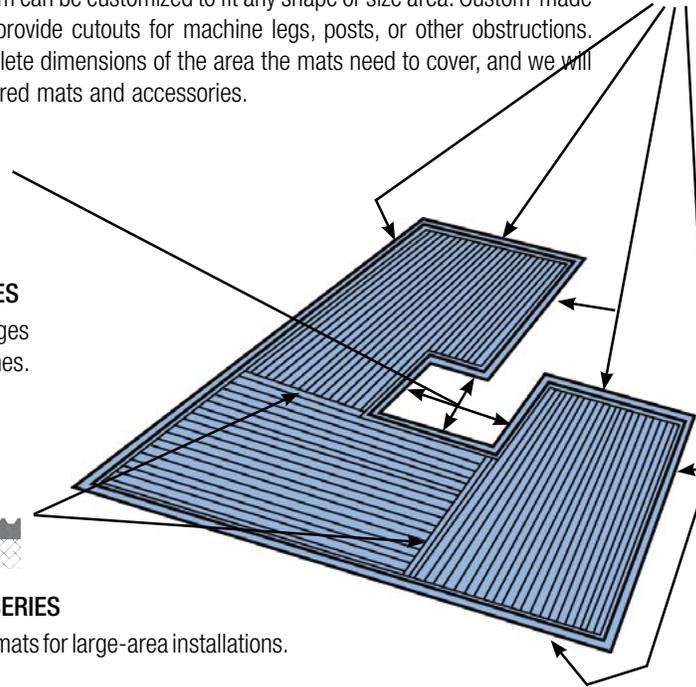


MAT CONNECTORS—CON-1000 SERIES

Joins mats together: permits add-on mats for large-area installations.

Part No. CON-1052-N (52" L)

Part No. CON-1096-N (96" L)



RAMP EDGING EDG1000 SERIES

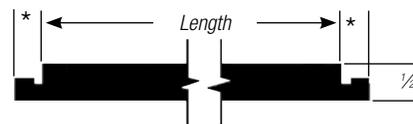
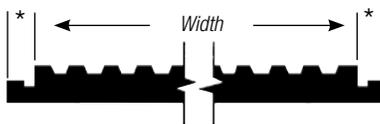
Surface installations: for easy roll-on of carts, trucks, and walk on.

Part No. EDG-1052-N
(2" W x 52" L)

Part No. EDG-1096-N
(2" W x 96" L)

THE MAT EDGE STYLE & MAT MEASUREMENT

The lip edge is the most common and widely used edge style for mats for single mat applications. The lip can be removed to create the square edge for use with the CON-1000 series mat connector.



**This dimension is not included in the mat widths and lengths. Do not include this in your measurements.*

MAT CONTROLS



MAT CONTROL BOX—PART NO. GIC2508 & GIC2509

This mat control box provides an interface for the safety mats to the existing machine control. If someone steps on the mat while the machine is operating or cycling, the control is designed to provide a stop signal; or, if someone is on the mat(s), the stop signal will not allow the machine to start a cycle. If special applications of this control are required, please consult the factory.

This mat control is furnished in a dust- and oil-tight NEMA 12 enclosure and includes a selectable latch-out feature. When the latch-out feature is turned on, the machine will not automatically be able to restart until the latch-out has been cleared. This is accomplished with the use of the key-operated selector switch. When the latch-out feature is turned off, the machine can be restarted when the mat is cleared.

CONTROL BOX SPECIFICATIONS

Voltage 115VAC, 60 Hz
Output-Relay Contacts Rating..... 10 A, 115VACResistive

MAT CONTROLS (CONTINUED)

If the mat control box Part No. RKR162 is not required, a DIN-rail mounted control module is available. Each control module has 4 NO safety contacts and 1 NC auxiliary contact. The control module allows operation in either automatic or manual reset modes.

ORDERING INFORMATION	
PART NO.	DESCRIPTION
RFT139	120 VAC, 24-V DC Control Module



Part No. RFT139

This DIN-rail mount control module can be mounted into an existing enclosure.

MAT JUNCTION BOXES

If multiple mats are grouped together to provide auxiliary or perimeter (work-envelope) safeguarding, junction boxes may be required to facilitate the installation.

Use either mat junction box with either the mat control box RKR162 (previous page) or a DIN-rail mount control module from above. Each mat junction box includes 20' of four-wire cord.

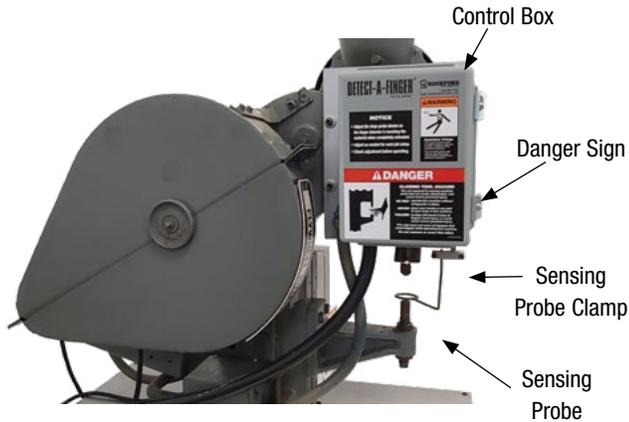
ORDERING INFORMATION	
PART NO.	DESCRIPTION
RKR020	Mat Junction Box to Accommodate From 2-5 Safety Mats
RKR021	Mat Junction Box to Accommodate From 2-10 Safety Mats



Part No. RKR021

This mat junction box can provide wiring for up to 10 mats for easy tie-in to the mat control. (Cover has been removed for photo.)

DETECT-A-FINGER® GEN II DROP-PROBE DEVICES FOR RIVETERS



INTRODUCTION

For organizations that use riveters and welders, the new and improved Detect-A-Finger Gen II drop-probe device helps to protect operator's fingers from pinch-point hazards and meets the compliance requirements for a Category 2 safeguarding device. The Gen II upgrades include a longer stroke up to 1.85", unified right- and left-handed operation, a pre-punched enclosure to achieve faster electrical connections, and a softer probe rod for accurate template development, designed to provide a safer and more cost effective solution that reduces the potential for operator bypassing. The Detect-A-Finger drop-probe devices are used on small machines, such as riveters, eyeletters, stakers, staplers, crimpers and fastening machines, to help protect the operator's fingers from point-of-operation hazards. To make retrofitting older models quick and easy, the Gen II features the identical mounting pattern as the original model, creating a "drop-in" solution that is simple to deploy.

RKC008 AND RKC009 SERIES

HOW IT WORKS

The aluminum "template" probe is shaped by the user to fit each application. This template is then used as an aid to facilitate the forming of the "permanent" steel hexagonal drop probe, which can be adjusted from 0" to 1.85" and are keyed to the device, thereby preventing operator bypassing. These devices are designed to drop by gravity. If a finger or workpiece is in the way of the probe and the probe is not allowed to complete its downward travel, the machine will not start a cycle or stroke. On these models, the rotary solenoid is in the control box and when energized, after initiation of the cycle, allows the probe to drop. A spring returns the probe to its starting or up position. Another drop-probe device uses interlocking cams in its operating mechanism. The control box consists of the probe arm, rotary electric solenoid, two-hand control safety relay, redundant limit switches, basic circuit with terminals and other mechanical mechanisms. On machines that are mechanically operated, an air cylinder or electric solenoid may have to be added to the operating linkage to trip the machine. On machines that are hydraulically or pneumatically operated, the drop-probe control can usually be interfaced with the existing control system.



When updating machines to meet safety standards, please make sure that each machine is looked at as an individual system that includes, but is not limited to, safeguarding (drop-probe device), machine control, disconnect switch, motor starter, covers for rotating components, auxiliary parts, lockout/tagout equipment, and feeding and retrieving of workpieces. Two 20" drop-probe rods are furnished with each control box: one aluminum template and one hexagonal steel permanent rod. These rods are shaped by the user for the workpiece or assembly requirements.



SEQUENCE OF OPERATION

The operator initiates the cycle of the machine usually by an overt action on the foot switch. This energizes the rotary solenoid in the control box, which allows the drop probe to drop until it makes contact with a limit switch. If an obstruction, such as a finger, gets in the way of the probe, the limit switch is not contacted and the machine does not start its cycle. If nothing obstructs the probe and the limit switch is operated, a relay will signal the machine to start its cycle or cause it to trip. Next, the relay drops out, de-energizing the control box solenoid, allowing the probe to move up and out of the way. At this time, the machine completes its cycle and stops. The foot switch must be released and re-initiated to begin another cycle.

The Detect-A-Finger Gen II is available in two models: Part No. RKC009 is for mounting on the right side of a machine (probe on left), and Part No. RKC008 is for mounting on the left side of a machine (probe on right). Rockford Systems also offers a new drop-probe kit (FCT057), that includes a clamp, one soft aluminum rod to aid in creating a template, and one tougher steel hex probe. If needed, add the FOOT SWITCH (CTD088). Complete installation instructions and a maintenance manual are furnished with each device.



Select the Detect-A-Finger Gen II For Riveters that allows the sensing probe to enter the point of operation, without obstructing the work area, and provides for as short and rigid of a sensing probe design as possible.

ALTERNATIVE PINCH-POINT SAFETY SYSTEM

Our new, premium solution – the UNITROL SOFT TOUCH Pinch-Point Safety System – is the first and only fully passive safeguarding equipment designed to prevent a pneumatic riveter, welder or other small machine from applying full force if it detects fingers in the machine's point-of-operation area by measuring electrical continuity between electrodes. If anything other than metal is present between the electrodes, their sensors will not detect continuity and the electrodes will open automatically.

Please call 1-800-922-7533 to learn more about Rockford Systems' range of riveting and welding safety solutions.

SPECIFICATIONS AND OPERATING DATA

CONTROL BOX

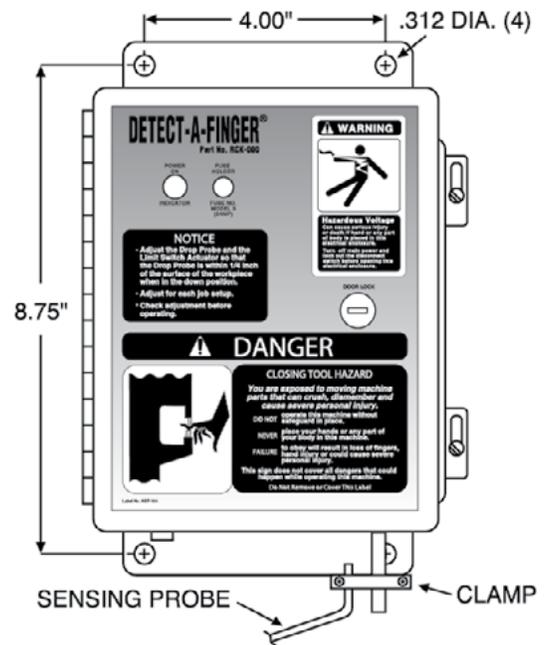
Part Number..... RKC008 or RKC009
Fuse.....313 Series, 3AG, 3 Amps, 250V, Slow Blow
Input Voltage 115 + 15% VAC, 50/60 Hz
Operating Current..... 0.8 Amps Typical

Output Relay Ratings	Resistive	General Use
	10A 110VAC	7.5A 110VAC
	7.5A 220VAC	5A 220VAC
	10A 30VDC	

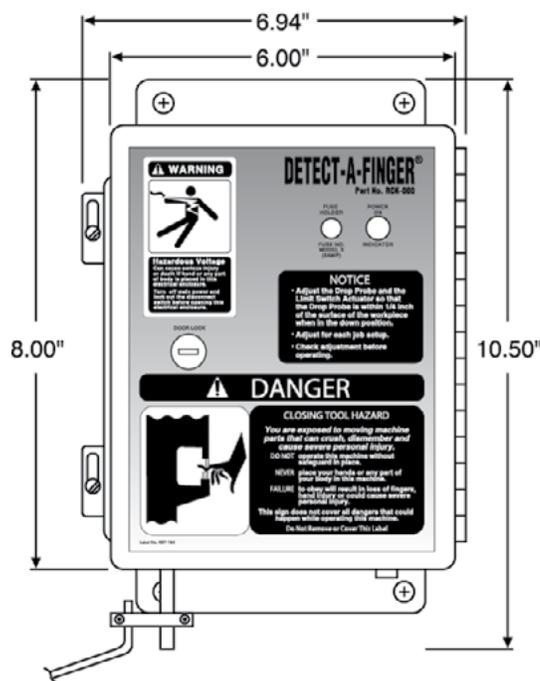
Operating Current..... 3.0 Amps Typical
Duty Cycle..... 25% (10 Second Maximum)
 Continuous On-Time)
Stroke..... Travel Adjustable to 1.75 (1-3/4) Inches Max.
Mechanical Life Relay - 10 Million Operations
 Rotary Solenoid - 100 Million Operations
Weight 3.5 Lbs.

SENSING PROBE (UNFORMED)

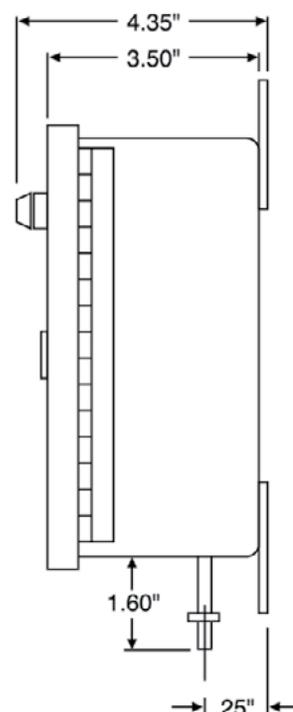
Part Number.....FCT-057
Wire Size..... 156 Dia. x 20.438 inches Long
Material..... 12L14 Carbon Steel Hex
Total Weight.....(Including Probe and Clamp)
0.15 lbs. Maximum Allowable



Left Side Mount Control Box
(Part No. RKC008)



Right Side Mount Control Box
(Part No. RKC009)



RKC008 AND RKC009 SERIES (CONTINUED)

ADDITIONAL COMPONENTS

If the machine that is being safeguarded with an RKC or DAFseries drop-probe device has single-stroke capability, additional components may be required to trip or cycle the machine.

ADDITIONAL COMPONENTS	
PART NO.	DESCRIPTION
RCL001	50 lb Pull Air Cylinder – 1-1/8" Bore x 1" Stroke
RCL002	100 lb Pull Air Cylinder – 1-1/2" Bore x 1" Stroke
RCL003	200 lb Pull Air Cylinder – 2" Bore x 2" Stroke
RCD140	1/4" Monitored Dual-Solenoid Air Valve Assembly
RCL043	1/4" Filter-Regulator-Lubricator Assembly
RCD071	1/4" Air Lockout Valve
CTD011	Foot Switch Yellow
CTD088	Foot Switch Orange

Note: For push-type or longer stroke air cylinders, please consult the factory.

SINGLE-STROKE TRIP-CONTROL SYSTEM

If the machine that is being safeguarded with an RKC or DAF series drop-probe device obtains its force from a flywheel but does not have a single-stroke mechanism, a component package can be furnished. For best safety practices, choose the control box and component package plus an appropriate sized air cylinder from above.

CONTROL BOX NO. FPF000-F PLUS	
COMPONENT PACKAGE NO. FNF011 CONSISTING OF:	
PART NO.	DESCRIPTION
RCD140	1/4" Dual-Solenoid Air Valve
RCL043	1/4" Filter-Regulator-Lubricator Assembly
CTD062	Air Pressure Switch
CML002	Cam and Strap Assembly
CMK103	Limit Switch Assembly
CTD011	Foot Switch Yellow
CTD088	Foot Switch Orange
HOS4000	Self-Latching Emergency Stop Palm Button

For fused disconnect switches or magnetic motor starters, please refer to Safety Shields catalog. Call us toll-free at 1-800-922-7533 or visit our Web site at www.rockfordsystems.com for the latest catalog.

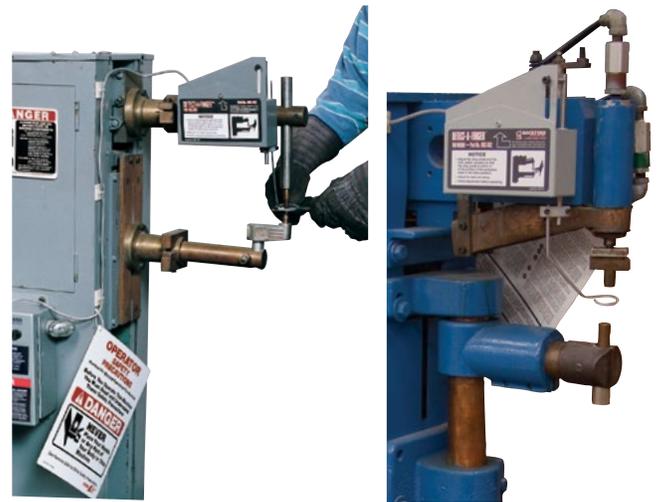


RKC500 SERIES

FOR SAFEGUARDING RESISTANCE-TYPE SPOT WELDERS

The RKC500 series Detect-A-Finger® drop-probe device reduces accidents at the point of operation where an operator's fingers can enter. The key components of this device are a sensing probe module with the rod shaped to fit over or around the workpiece, and a control module. When the operator initiates a machine cycle, the sensing probe is released and drops by gravity over or around the workpiece. If the operator's fingers are still in the hazard area, the sensing probe will not reach its preset position and will not allow the spot welder to start its cycle. If there are no obstructions to prevent the sensing probe from dropping, when it reaches its preset position, the control unit will allow the machine to cycle.

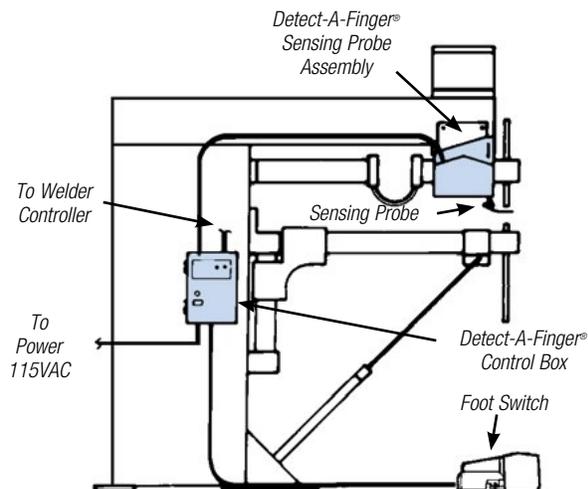
The compact design of the sensing probe module allows it to be attached to the welder arm. The drop-probe stroke is 15/8".



Rocker-Arm Welder

Air-Operated Welder

TYPICAL APPLICATION: PRESS-TYPE RESISTANCE WELDER



This Detect-A-Finger® drop-probe assembly may be mounted either to the moving member of a welder (upper arm), like the rocker-arm type illustrated above, or may be mounted to a fixed part of a welder, like the press-type illustrated above. Depending on the type of welder, a single-stage or a two-stage foot switch may be required.

The Detect-A-Finger® may also be applied to mechanical foot pedal-type welders. To convert from a mechanical operation, the mechanical pedal must be removed and replaced with an air cylinder to operate the arm and foot switch. The cylinder bore and stroke (push- or pull-type) can be determined from actual machine measurements, and the method and location of attachment to the welder linkage. The air cylinder can be controlled by a three-way normally closed 115 VAC solenoid air valve. Adjustable flow control valves may be employed to smooth the welder arm movement, and an air filter-regulator-lubricator assembly may also be required. See previous page for these components.

RKC500 SERIES (CONTINUED)

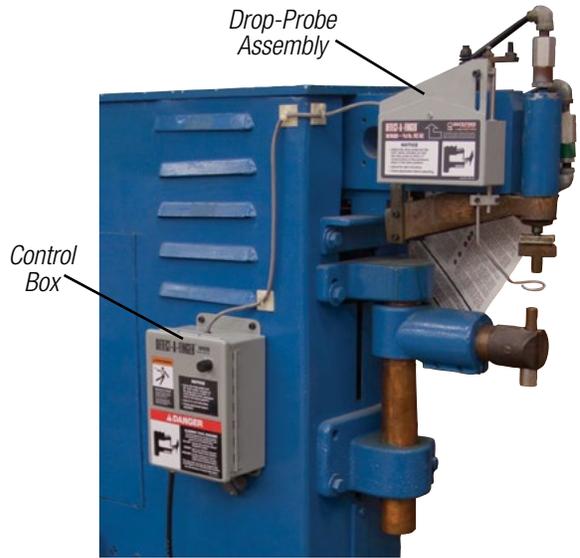
COMPONENTS

The RKC500 Detect-A-Finger® device for spot welders consists of two components: the control box (mounted on the frame of the welder) and the drop-probe assembly (mounted on the upper arm).

The control box provides interface of the Detect-A-Finger® device to the spot welder's control system.

In addition to the control box, each unit is furnished with two plain 18" aluminum drop-probe rods. These rods are to be shaped by the user to specific requirements. To prevent welding splash, additional lightweight clear plastic shielding can be attached to the rod. Complete installation instructions and a maintenance manual are provided with each assembly. Insulated mounting hardware for the probe unit is also included.

A single-stage foot switch with a fully guarded top and sides is also available, if required. Foot switch Part No. CTD011 has a die-cast cover that protects the top and sides, and the front is protected by a hinged flap. These features protect from unintentional operation. (If a two-stage foot switch is required, please consult the factory).



Foot Switch CTD011



Foot Switch CTD088

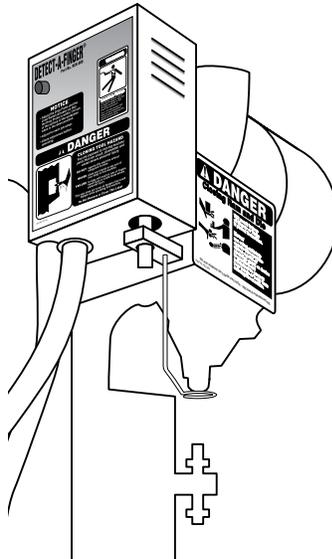
DANGER SIGNS FURNISHED WITH ALL DETECT-A-FINGER UNITS

Operator safety precautions and a danger sign are furnished (in English unless otherwise requested) with each drop-probe device.



Part No. KSC000 (English)

Part No. KSC000S (Spanish)



Operator Safety Precautions for Metal Forming Machinery

Size is 8 1/2" x 11". A hole is provided in the upper corner for attaching purposes.



Danger—Closing Ram and Die

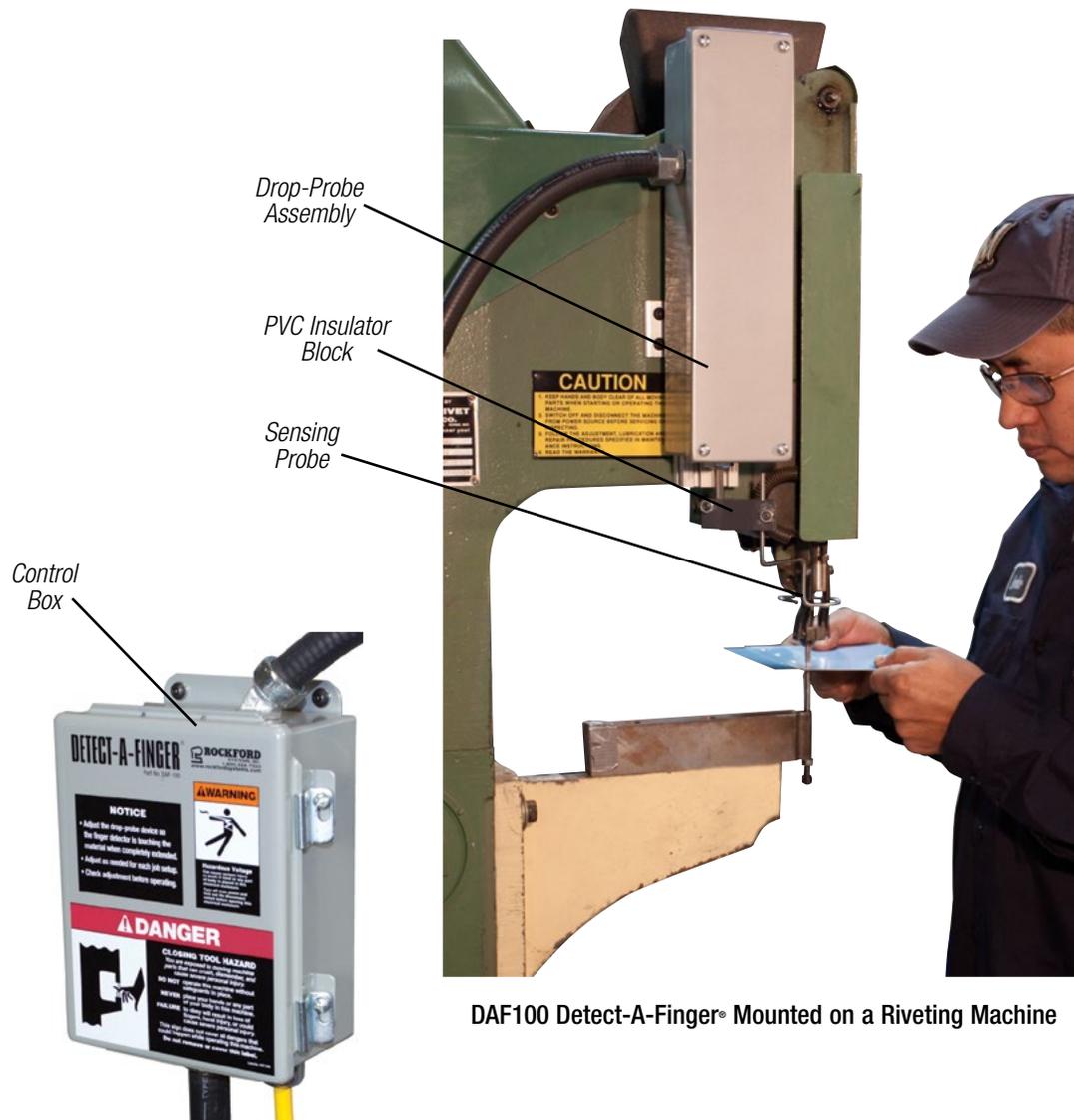
Size is 5" x 6" x .055" thick

Part No. KSC055 (English)

Part No. KSC055S (Spanish)

DAF100 SERIES

ADJUSTABLE STROKE DETECT-A-FINGER® DROP-PROBE DEVICE FOR SAFEGUARDING RIVETERS, SPOT WELDERS, EYELETTERS, STAKERS, STAPLERS, CRIMPERS, FASTENING AND ASSEMBLY MACHINES



The DAF100 Detect-A-Finger® drop-probe device is an electric-air system that consists of two main components: the drop-probe assembly and the control box. The standard unit can provide a stroke of up to 4" and can be mounted on the left or right side of the machine. Location of the DAF100 should be determined by the availability of the mounting surface, the size or shape of the workpiece, and the throat depth of the machine.

The drop-probe assembly functions by allowing the sensing probe to drop around the point-of-operation hazard prior to each intended machine cycle. If the sensing probe encounters the operator's fingers and fails to drop to a preset position, the machine cycle will not be initiated. If there are no obstructions to prevent the sensing probe from dropping, then the control unit will allow the machine to cycle when the sensing probe reaches the preset position.

DAF100 SERIES (CONTINUED)

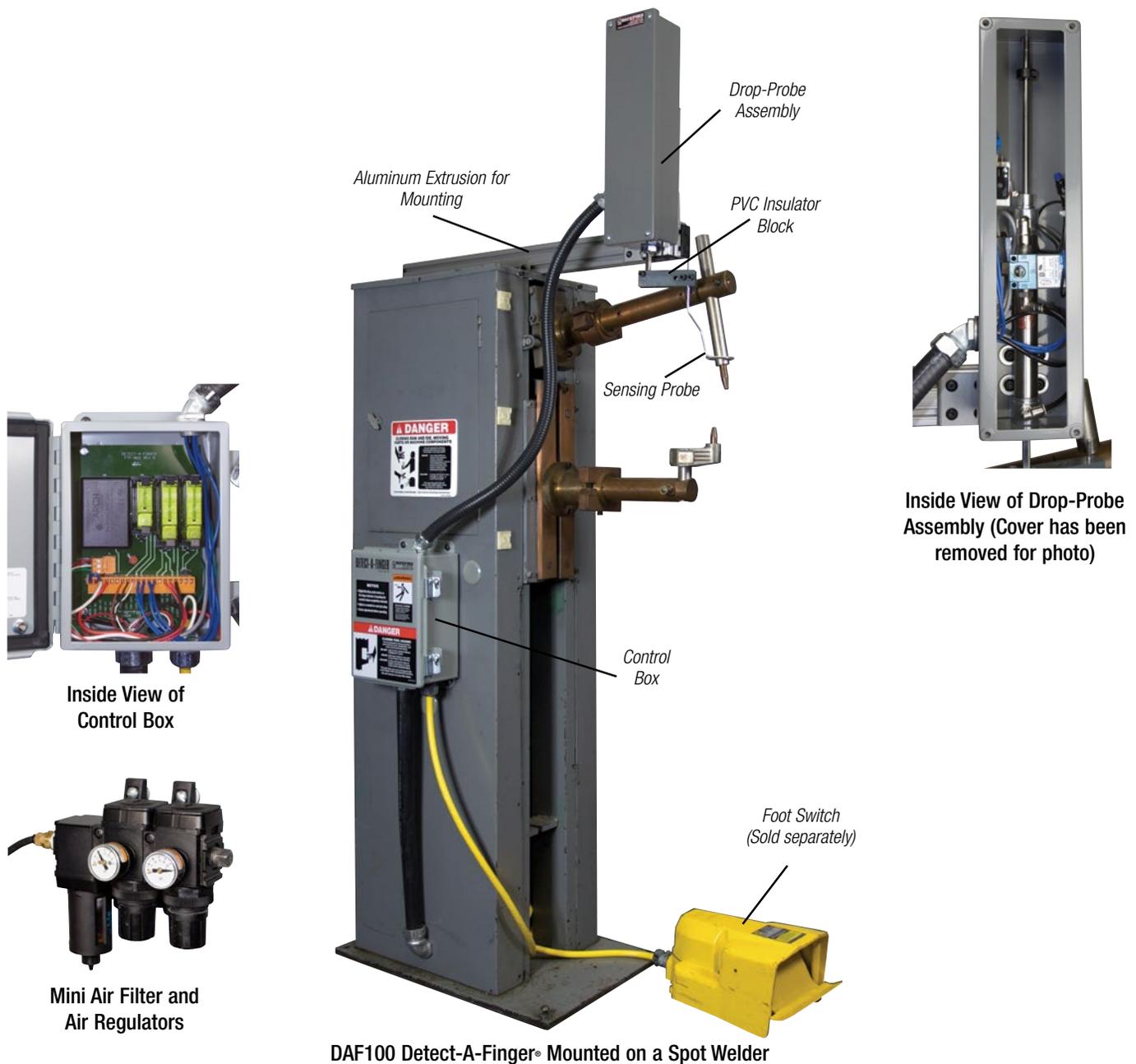
COMPONENTS

The DAF100 system consists of two main components: the drop-probe assembly and the control box. The drop-probe assembly consists of an air cylinder and solenoid operated air valve with an adjustable down stop locking collar, limit switch, magnetic proximity switch, and a PVC insulator block. The control box consists of a control circuit board, safety relays, and pin-type plug-in terminals.

Each DAF100 system is furnished with one mini air filter, two mini air regulators, 25' of 5/32" PVC tubing, 4' of 1" x 2" extruded aluminum for mounting, and two plain 18" aluminum sensing probes. These sensing probes are shaped by the user to the workpiece or assembly requirements. Complete installation instructions and a maintenance manual are provided with each assembly.

ADDITIONAL COMPONENTS

Additional components may be required to trip or cycle the machine that is being safeguarded with the DAF100 drop-probe device. See page 52 for these additional components.



UNITROL SOFT TOUCH



THE DANGER OF PINCH-POINT HAZARDS

Riveting and resistance (spot) welding are essential processes in the successful manufacturing of products in fast-paced industries including aerospace, marine, garments, railcar and automotive. Unfortunately, pinch point accidents involving these machines are all-too-common. These types of accidents occur when rivet heads or welding electrodes are driven together at forces up to 12,000 PSI while an operator's hands are pinched between them, leading to mangled, crushed or severed fingers.

According to OSHA, hand injuries account for nearly one-third of the thousands of disabling on-the-job accidents occurring each year. Most of these hand injuries are the result by pinch point accidents – 80 percent of them in fact. Since pinch points are the root of such a large number of hand injuries, it's best to install viable pinch-point safety on the two machines where these injuries commonly occur: resistance welders and riveters.



ACCORDING TO THE BUREAU OF LABOR STATISTICS,

5,000+

American manufacturing workers suffer injuries involving
amputation or limb loss
 every single year

THE SOFT TOUCH PROMISE: REDUCE INJURIES WITHOUT SACRIFICING PRODUCTIVITY

The SOFT TOUCH Pinch-Point Safety System is the first and only fully passive safeguarding system designed to prevent a riveter, spot welder or other small machine from applying full force if it detects fingers in the machine's point-of-operation area. SOFT TOUCH prevents hand injuries and eliminates associated expenses such as hospitalization, lost days of work, higher insurance premiums and legal action. It does all this while not slowing down manufacturing operations. OSHA-compliant SOFT TOUCH technology will take you from pinch point to pinch-proof without losing a minute of productivity.



UNRIVALED PINCH-POINT SAFETY THROUGH SENSOR TECHNOLOGY

UNITROL's outstanding quality and reliability, combined with the SOFT TOUCH's advanced sensors and tamper-proof operation, come together to create a best-in-class pinch-point safety system.

Unique to the industry, the SOFT TOUCH measures electrical continuity between electrodes to verify they are actually touching the part to be welded — and not the operator's fingers. If anything other than metal is present between the electrodes, their sensors will not detect continuity and the electrodes will open automatically. This simple step prevents the machine from delivering high-pressure riveting or welding force onto the operator's fingers. In addition, a display instantly warns the operator of the danger. SOFT TOUCH has proven far more effective than traditional safeguarding methods such as ring guards or light curtains. In fact, thousands of SOFT TOUCH systems have been installed around the world with a 100 percent safety record.

Because time is money, SOFT TOUCH does not waste either. When continuity is detected between the electrodes — meaning only metal is present — full riveting or welding force is applied and operations proceed normally without delay. No time-consuming operator adjustments, such as replumbing the air system to change the pneumatics, are required. Also, SOFT TOUCH will automatically compensate for any changes in transformer tap switch position or line voltage shifts, preventing production from being abruptly stopped.

As with all safeguarding equipment, proper installation is critical. The experienced safeguarding professionals at Rockford Systems can install your SOFT TOUCH system and train your operators on its safe use.

HOW SOFT TOUCH WORKS



1. The welding electrodes close under **low force**. The unique pneumatic systems designed by UNITROL for the process can counter-balance the weights of the ram on large press welders. Even where the dead-weight of the welder ram is hundreds of pounds, the electrode force produced will be 50 pounds or less.



3. If metal is **not** detected, the electrodes open automatically and do not go to welding force. A display tells the operator the problem.



...Checking for Metal

2. The welding control checks to see if metal has been detected between the electrodes within a customer set maximum time limit.



4. If metal **is** detected, full welding force is applied and the weld proceeds normally.

KEY BENEFITS:

1. Fail Safe Operation:

- If any of the system sensor wires become shortened or disconnected, the SOFT TOUCH system will lock out and not let the electrodes close, or the riveting or welding sequence to continue
- If the SOFT TOUCH sensor board detects electrode continuity before the foot switch or hand switches are closed, the system will lock out and not allow any electrode movement

2. No Operator Adjustments:

- Workers cannot remove, circumvent or tamper with any part of the system
- No operator set components
- Does not require any adjustments when new setups are made
- No user calibration, just install and turn power ON

3. No Operator Bypassing:

- The continuity system cannot be overridden and is in place at all times that the welding machine is under power

4. Primary System:

- Can be used as the primary pinch-point safety system because it is fully passive

5. Full-Electrical Redundancy:

- All inputs and outputs require closure of both electro-mechanical and solid-state redundant components for fail safe operation. Self-monitors output relay to prevent any operation if a fault in the output contacts is detected
- When welding a C-shaped part that is not fully closed and requires electrode force to push the parts together, a limit switch can be added to the riveter or welder, and be adjusted to close when the space between the electrodes is less an $\frac{1}{4}$ inch. In this case, two actions are required before the electrode force increases and the rivet or weld sequence starts

6. Does Not Stop Production:

- Automatically compensates for changes in transformer tap switch position or line voltage shifts



TYPES OF MACHINES:

Works with All Types of Welders:

- SOFT TOUCH systems are available for all resistance welders, including spot welders, projection welders, seam welders and transgun welders; 1Ø AC, 1Ø DC secondary, 3Ø frequency converters, 3Ø DC rectified secondary, and MFDC (inverters)

Works with All Types of Riveters:

- SOFT TOUCH systems are available for pneumatic riveters

Other Machine Types:

- Pneumatic clinching machines, Eyeletters, Stakers, Crimpers, Fastening and Assembly Machines

Complete System:

- SOFT TOUCH replaces the existing solenoid valves and is supplied in a single NEMA-4 enclosure that is factory prewired and pre-plumbed

Options:

- All options shown below can be ordered with the SOFT TOUCH system. They can also be easily added later in the field without modification of the control.
 1. Retract Kit to be used on all resistance welders that have a RETRACT (Hi-Lift) function
 2. Timed Bypass Switch for use with poor-conductive material
 3. Limit Switch for use with poor-conductive material or for redundant sensors
 4. Pressure Regulator Kit



in

COMPLIANCE:

- OSHA 1910.212(a) – General Machinery
- OSHA 1910.255(b)(4) – Resistance Welding Machines
- OSHA 1910.217(c)(3)(iii) – Presence Sensing Point of Operation Device
- ANSI B11.19-2010 (8.7) (Safeguarding Methods Standard)
- ANSI B154.1-1995 (Rivet Setting Equipment)

WARRANTY:

All UNITROL products include a 5-year prorated warranty. The warranty periods are determined using the date of the new control from original ship date. Please refer to the product manual for more information on the warranty.

PART NO.	DESCRIPTION
115VAC	RST300-115-RIVET
230VAC	RST300-230-RIVET



FUNCTION-TESTING CHECKLIST FOR LIGHT CURTAINS



This is a generic function-testing checklist. Your two-hand control may have other features that require different tests. Please refer to your two-hand control installation manual.



Make sure that the two-hand control has been interfaced properly to the machine's control system to provide control reliability.

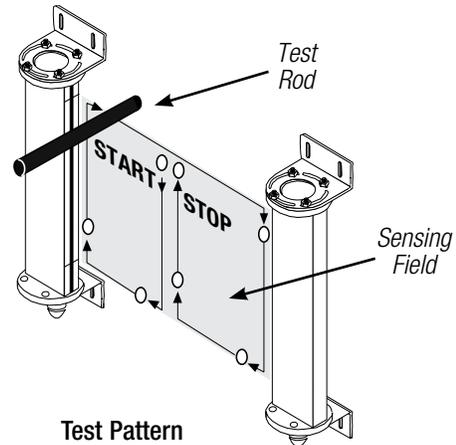
⚠ DANGER

Never place your hands or any part of your body in the hazard area while performing these tests.



Always perform these tests at every setup, operator, and shift change, as well as every time after maintenance is performed.

1. Make sure that the light curtain is mounted at the proper safety distance in accordance with the ANSI safety-distance equation. (See the next page for the safety-distance equation.)
2. Verify that someone cannot reach over, under, or around the sensing field of the light curtain to reach the hazard. Additional guards or safeguarding devices, if necessary, must protect these areas.
3. Turn on the machine and the light curtain. The green status-indicator light on the transmitter should be on and the red status-indicator light should be off. If the light curtain has a float-blanking feature, make sure that it is turned off. If fixed blanking is provided and used, this feature can remain on, and the blanked area should be occupied with an object that fills this entire space across the sensing field.
4. Use a test rod or other object sized according to the light curtain's minimum object sensitivity (sometimes referred to as the resolution) to confirm that all the channels in the sensing field are working properly. To do this, move the test rod through the sensing field in a pattern as illustrated to the right. The red status-indicator light on the transmitter should stay on during the entire test.
5. With the machine on and ready to be cycled in a production mode of operation, hold the test rod in the sensing field and attempt to cycle the machine. The machine should not cycle.
6. Cycle the machine and then quickly insert the test rod in the sensing field. The machine should stop immediately.



Note: On some machines, the light curtain is muted during the nonhazardous portion of the machine cycle. If the test rod is inserted in the sensing field while the light curtain is muted, the machine will not stop. Therefore, be sure to insert the test rod during the hazardous portion of the cycle when performing this test.

7. Confirm that when the test rod is removed from the sensing field, the machine does not restart automatically.
8. Verify that in order to start another cycle (or continue a cycle that was interrupted), the normal actuating means must be reinitiated; or, if someone can pass through the sensing field and stand inside the safeguarded area, verify that the light curtain or machine control must be manually reset before reinitiation of the normal actuating means. The reset device must be located outside of the safeguarded area (so it cannot be reached from within) and within view so the operator can verify that no one is inside the safeguarded area.
9. If any of these function tests fail, take corrective action before running production. If all tests pass, remove all keys from the selector switches before running production.

SAFETY DISTANCE FOR LIGHT CURTAINS

The safety-distance equation from Annex D of ANSI B11.19-2010, Performance Criteria for Safeguarding, is as follows:

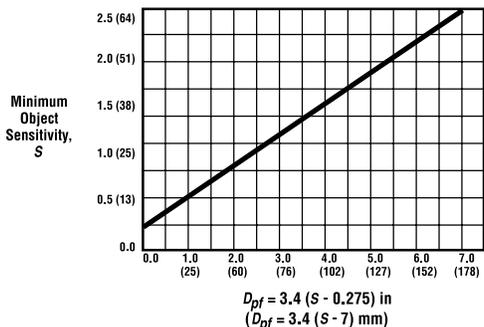
$$D_s = K(T_s + T_c + T_r + T_{spm}) + D_{pf}$$

Where:

- D_s = safety distance
- K = maximum speed that an individual can approach the hazard (63 inches/second is commonly used)
- T_s = stopping time of the machine measured at the final control element
- T_c = reaction time of the control system
- T_r = reaction time of the light curtain and its interface
- T_{spm} = additional time allowed for the stopping-performance monitor to compensate for variations in normal stopping time
- D_{pf} = amount of penetration allowed by the light curtain into its sensing field before someone is detected

The value of D_{pf} can be found using one of the following figures, and it can then be used in the safety-distance equation above.

Figure 1: D_{pf} for light curtains used in a vertical application with object sensitivity less than or equal to 2.5 inches (64 millimeters)



D_{pf} , the distance added to the safety distance due to the penetration factor, compensates for varying object sensitivities of light curtains.

When blanking features are used and when the blanked area is not completely filled by the workpiece or by mechanical guarding, the object sensitivity can be calculated as follows:

Object sensitivity = size of the blanked area plus minimum object sensitivity without blanking.

Once this value is found, then determine D_{pf} .

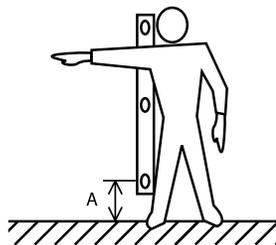
If the entire blanked area is filled with mechanical guarding or other fixed material or guards, use the light curtain's object sensitivity to determine D_{pf} .

Figure 2: D_{pf} for light curtains used in a vertical application with object sensitivity greater than 2.5 inches (64 millimeters)

For light curtains using large blanked areas, or if an individual can otherwise reach through or over the sensing field and not be detected, the distance between any two adjacent detection points shall not be greater than 24 in (600 mm), i.e., from one active point to the next active point above.

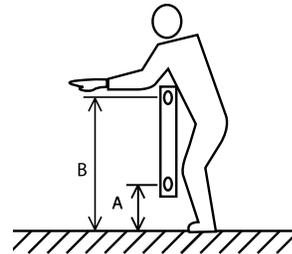
If the individual cannot reach over the top of the sensing field and the bottom of the sensing field (A) is no more than 12 in (300 mm) above the floor.

Reach Through
 $D_{pf} = 36$ in (900 mm) for reach-through applications



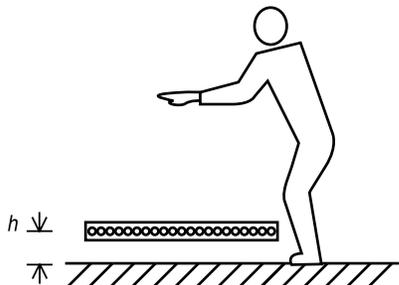
The top of the sensing field (B) is between 36 and 48 in (900 and 1200 mm) above the floor. The bottom of the sensing field (A) is no more than 12 in (300 mm) above the floor.

Reach Over
 $D_{pf} = 48$ in (1200 mm) for reach-over applications



Note: Where individuals can place themselves between the safeguarding device and the hazard zone and remain undetected, additional measures must be taken.

Figure 3: D_{pf} for light curtains used in a horizontal application (30° or less) that can be reached over



Reach Over
 $D_{pf} = 48$ in (1200 mm) for horizontal sensing-field applications without vertical sensing.

Object Sensitivity (S)	Allowable Sensing-Field Heights in Inches (Millimeters)	
	Mounting Height (h)	
	Minimum	Maximum
< 2 (50)	0	39 (990)
2.5 (64)	7.5 (190)	39 (990)
3 (76)	15 (380)	39 (990)
3.5 (89)	22.5 (570)	39 (990)
4 (102)	30 (760)	39 (990)
4.25 (108)	33.75 (860)	39 (990)
4.6 (117)	39 (990)	39 (990)

Minimum mounting height (h) can also be determined by the following:

$$h = 15(S - 2) \text{ in}$$

$$h = (S - 50) \text{ mm}$$

where S is the object sensitivity.

Note: The light curtain's horizontal coverage must be enough to hinder an individual from stepping over its sensing field. This minimum distance is 36 in (900 mm) if supplemental safeguarding or physical barriers are used such that an individual cannot step over and clear the sensing field, and 48 in (1200 mm) if no supplemental safeguarding or physical barriers are used.

FUNCTION-TESTING CHECKLIST FOR TWO-HAND CONTROL



This is a generic function-testing checklist. Your two-hand control may have other features that require different tests. Please refer to your two-hand control installation manual.



Make sure that the two-hand control has been interfaced properly to the machine's control system to provide control reliability.



Never place your hands or any part of your body in the hazard area while performing these tests.



Always perform these tests at every setup, operator, and shift change, as well as every time after maintenance is performed.

1. Before turning the machine on, verify that:

- a. The hand controls are protected against unintended or inadvertent operation. This is usually done with ring guards or fabricated shields. (If the hand controls are nonmechanical such as capacitive or optical touch buttons, make sure that only an operator's hands can actuate them and not other parts of his or her body.)
- b. The hand controls are separated by enough distance or configured to require the use of both hands.
- c. The hand controls are fixed in position at the proper safety distance. (See the safety-distance equation below.)
- d. Two individual hand controls are provided for each operator that is to be safeguarded by two-hand control. When there are multiple two-hand control stations, there must be an indicator at each station to indicate whether the station is on or off (usually accomplished with an indicator light), and the means of turning the station on and off must be supervisable (usually done with a key-operated selector switch).

2. With the machine on and ready to be cycled in the single-cycle mode of operation, perform the following tests.

- a. Actuate both hand controls and keep them actuated. The machine should make one complete cycle and then it should stop, even though the hand controls are still being actuated.
- b. Actuate both hand controls and release them while the machine is still in the hazardous portion of its cycle. The machine should stop. Both hand controls must be continuously actuated during the hazardous portion of the cycle.
- c. Actuate both hand controls and release only one control during the hazardous portion of the cycle. The hazardous motion of the machine should stop. Reactuate the hand control that was released. The machine should not finish the cycle. Repeat this with the other hand control. Again, the machine should not finish the cycle. Both hand controls must be released and reactuated before the machine can finish the cycle.
- d. If the two-hand control has a concurrent timer: Actuate one hand control, wait until the concurrent time limit has expired, and then actuate the other hand control. The machine should not cycle. The hand controls must be actuated concurrently within a certain time limit (usually 0.5 seconds or less) before a machine cycle can be initiated.
- e. If the machine is equipped with multiple two-hand control stations, turn off all stations and make sure that the machine does not cycle. Also perform the above tests at each two-hand control station.



3. If any of these function tests fail, take corrective action before running production. If all tests pass, remove all keys from the selector switches before running production.

The safety-distance equation for two-hand control from Annex D of ANSI B11.19-2010, Performance Criteria for Safeguarding, is as follows:

$$D_s = K(T_s + T_c + T_r + T_{spm})$$

Where:

- D_s = safety distance
- K = maximum speed that an individual can approach the hazard (63 inches/second is commonly used)
- T_s = stopping time of the machine measured at the final control element
- T_c = reaction time of the control system
- T_r = reaction time of the two-hand control and its interface
- T_{spm} = additional time allowed for the stopping-performance monitor to compensate for variations in normal stopping time

FUNCTION-TESTING CHECKLIST FOR TWO-HAND TRIP



This is a generic function-testing checklist. Your two-hand control may have other features that require different tests. Please refer to your two-hand control installation manual.



Make sure that the two-hand control has been interfaced properly to the machine's control system to provide control reliability.

⚠ DANGER

Never place your hands or any part of your body in the hazard area while performing these tests.



Always perform these tests at every setup, operator, and shift change, as well as every time after maintenance is performed.

1. Before turning the machine on, verify that:
 - a. The hand controls are protected against unintended or inadvertent operation. This is usually done with ring guards or fabricated shields. (If the hand controls are nonmechanical such as capacitive or optical touch buttons, make sure that only an operator's hands can actuate them and not other parts of his or her body.)
 - b. The hand controls are separated by enough distance or configured to require the use of both hands.
 - c. The hand controls are fixed in position at the proper safety distance. (See the safety-distance equations below.)
 - d. Two individual hand controls are provided for each operator that is to be safeguarded by two-hand trip. When there are multiple two-hand trip stations, there must be an indicator at each station to indicate whether the station is on or off (usually accomplished with an indicator light), and the means of turning the station on and off must be supervisable (usually done with a key-operated selector switch).
2. With the machine on and ready to be tripped in the single-cycle mode of operation, perform the following tests.
 - a. Actuate both hand controls and keep them actuated. The machine should make one complete cycle and then it should stop, even though the hand controls are still being actuated.
 - b. If the two-hand trip has a concurrent timer: Actuate one hand control, wait until the concurrent time limit has expired, and then actuate the other hand control. The machine should not cycle. The hand controls must be actuated concurrently within a certain time limit (usually 0.5 seconds or less) before a machine cycle can be initiated.
 - c. If the machine is equipped with multiple two-hand trip stations, turn off all stations and make sure that the machine does not cycle. Also perform the above tests at each two-hand trip station.
3. If any of these function tests fail, take corrective action before running production. If all tests pass, remove all keys from the selector switches before running production.

The safety-distance equations for two-hand trip from Annex D of ANSI B11.19-2010, Performance Criteria for Safeguarding, are as follows:

For machines with full-revolution clutches that have one or more clutch-engagement points:

$$D_s = K T_{mc} (1/2 + 1/N)$$

Where:

- D_s = safety distance
 K = maximum speed that an individual can approach the hazard (63 inches/second is commonly used)
 T_{mc} = time it takes to complete a machine cycle
 N = number of engagement points on the flywheel

For other machines that are tripped to initiate a cycle that cannot be stopped until the completion of the cycle:

$$D_s = K T_{hm}$$

Where:

- D_s = safety distance
 K = maximum speed that an individual can approach the hazard (63 inches/second is commonly used)
 T_{hm} = the time, after initiation of motion, until hazardous motion is completed

OSHA GUARD-OPENING REQUIREMENTS

Table O-10 details the maximum permissible openings for guards as required by OSHA 29 CFR 1910.217 for mechanical power presses. A guard-opening sign is available that can be used by engineering, maintenance, etc., for reference when designing or fabricating guards. This 10" x 12" sign is made of .055"-thick semi-rigid plastic and can be mounted with nails, screws, nylon lock-strips, etc.

OSHA GUARD-OPENING REQUIREMENTS	
The maximum permissible opening for guards as required by OSHA 29 CFR 1910.217 for mechanical power presses is as follows:	
Distance of Opening From Point-of-Operation Hazard (Inches)	Maximum Width of Opening (Inches)
1/2 to 1 1/2	1/4
1 1/2 to 2 1/2	3/8
2 1/2 to 3 1/2	1/2
3 1/2 to 5 1/2	5/8
5 1/2 to 6 1/2	3/4
6 1/2 to 7 1/2	7/8
7 1/2 to 12 1/2	1 1/4
12 1/2 to 15 1/2	1 1/2
15 1/2 to 17 1/2	1 7/8
17 1/2 to 31 1/2	2 1/2
Over 31 1/2	6

Part No. KSC-012

Part No. KSC012
OSHA Guard-Opening Requirements Sign

ANSI GUARD-OPENING REQUIREMENTS

The maximum permissible opening for guards as required by Annex D of ANSI B11.19-2010, Performance Criteria for Safeguarding, is as follows:

As a function of gap size in millimeters (inches)			As a function of distance in millimeters (inches)		
Known Gap		Minimum Distance	Known Distance		Maximum Gap
0-6	(0-0.24)	13 (0.5)	< 13 (< 0.5)		Not permitted
6.1-11	(0.25-0.375)	64 (2.5)	13-63.9 (0.5-2.49)	6	(0.250)
11.1-16	(0.376-0.625)	89 (3.5)	64-88.9 (2.5-3.49)	11	(0.375)
16.1-32	(0.626-1.250)	166 (6.5)	89-165.9 (3.5-6.49)	16	(0.625)
32.1-49	(1.251-1.875)	445 (17.5)	166-444.9 (6.5-17.49)	32	(1.250)
49.1-132	(1.876-5.000)	915 (36.0)	445-914.9 (17.5-35.99)	49	(1.875)
> 132	(> 5.0)	Not permitted	≥ 915 (≥ 36.0)	132	(5.000)

GUARD-OPENING SCALES

An OSHA or ANSI guard-opening scale can be used during the design, installation, and inspection of barrier guards to make sure they comply with the OSHA and ANSI guard-opening requirements. These engraved, acrylic copolymer guard-opening scales are available online at www.rockfordsystems.com.

OSHA GUARD-OPENING SCALE—PART NO. KSC097

This folding guard-opening scale is based on Table O-10 of OSHA 29 CFR 1910.217 for mechanical power presses, which shows the distances that guards shall be positioned from the point of operation based on opening size. It is constructed of acrylic copolymer and has permanent etched markings.



OSHA Guard-Opening Scale – Part No. KSC097

ANSI GUARD-OPENING SCALE—PART NO. KSC098

This folding guard-opening scale is based on “A Review of Machine-Guarding Recommendations” by Donald R. Vaillancourt and Stover H. Snook of the Liberty Mutual Research Center for Safety and Health. The ANSI/RIA R15.06 safety standard for industrial robots and robot systems, as well as recently revised ANSI B11—series safety standards for machine tools, use the guard-opening data from this study. The Canadian power press standard, CSA Z142-02, also uses the data from this study. One side of the scale shows English units; the other side shows metric units. It is constructed of acrylic copolymer and has permanent etched markings.



ANSI/CSA Guard-Opening Scale – Part No. KSC098

SAFETY DISTANCE GUIDE

Many OSHA and ANSI safety requirements must be met before installing two-hand control or a presence-sensing device as a point-of-operation safeguard. One requirement is that the control or device must be located at a minimum safety distance from the point of operation. This safety distance guide slide chart can be used to calculate the safety distance for these devices. The minimum safety distance is based on the stopping ability of the machine and a hand-speed constant, in addition to other factors.



Safety Distance Guide Slide Chart
Part No. LLL050

MACHINE SAFEGUARDING SEMINARS INTRODUCTION

According to safety standards, when a machine creates a hazard to operators and other employees in the machine area, it must be safeguarded. We offer this machine safeguarding seminar to educate people in positions of responsibility how to properly safeguard the point of operation and other machine hazards to meet OSHA regulations and current industry standards.

This comprehensive 21/2-day seminar provides knowledgeable interpretations of the performance language of both OSHA (Occupational Safety and Health Administration) and ANSI (American National Standards Institute) standards. Twenty-four ANSI B11-series safety standards and other related standards are covered.

Classroom discussions are combined with a PowerPoint presentation and live demonstrations of machines to help attendees understand when and where safeguarding is required and how various safeguarding works. The teaching methods used and the material covered during the 21/2 days will help attendees determine compliance issues with their machinery and processes.

The metal-turning portion of this seminar primarily focuses on the ANSI requirements for chuck shields and chip/coolant shields on manually operated machines. Safeguarding by distance and location are also covered, as well as awareness barriers and devices, pressure-sensitive mats, emergency-stop devices, drop-probe devices, color-coding, warning signs, and training requirements.

Using ANSI/RIAR15.06 as a guideline, safeguarding methods for robots are discussed. This section includes the newly incorporated risk assessment/hazard analysis. An overview and interpretation of OSHA 1910.147 Lockout/Tagout and STD 1-7.3 are also included.

TRAINING CENTER

Our training center contains a number of machines including mechanical and hydraulic power presses, press brakes, an engine lathe, a vertical mill, a drill press, a pedestal grinder, a spot welder, and riveter. These machines are under power for demonstration purposes. Most of the demonstration machines are equipped with multiple types of safeguards to show how different guards and devices can be applied and used. Hands-on opportunities abound!

TRAINING INSTRUCTORS

Our instructors are well qualified, having many years of exposure to the machine-tool industry. Their experience comes from working in the field with plant engineers, safety directors, and plant managers. Instructors are also involved in the observance of the various draft stages of ANSI B11-series safety standards for machine tools.

SEMINAR MATERIALS

Each person attending the seminar receives a variety of information regarding machine safeguarding which includes the following:

- OSHA 29 CFR 1910.211, 1910.212, 1910.217, and 1910.219
- Pertinent ANSI B11 standards
- Charts and graphs for future reference
- Safeguarding product catalogs
- U.S. Department of Labor memorandums
- Mechanical power press safety information card
- Safety distance guide slide chart
- Folding OSHA and ANSI guard-opening scales
- Laminated function-testing checklists for safeguards

REGISTRATION INFORMATION

Please consult the factory or our Web site for the registration fee. This fee includes the seminar presentation and demonstrations, seminar materials including a safety distance guide, guard-opening scales, food and beverages during breaks, lunch on the first two days, and a certificate of completion. The registration fee does not include other meals, lodging, or transportation.

To enroll, call 1-800-922-7533, or register online at www.rockfordsystems.com.

SEMINAR SCHEDULE

The machine safeguarding seminar is usually held on the third Tuesday, Wednesday, and Thursday of each month. (Thursday's session ends midmorning.) All seminar dates and times are subject to change. Please call the seminar registrar to confirm seminar dates before making travel arrangements.

CONFIRMATION

Each attendee will receive a package of detailed information prior to attending. Maps and a list of hotels are provided for students to make their own hotel reservations.

LOCATION

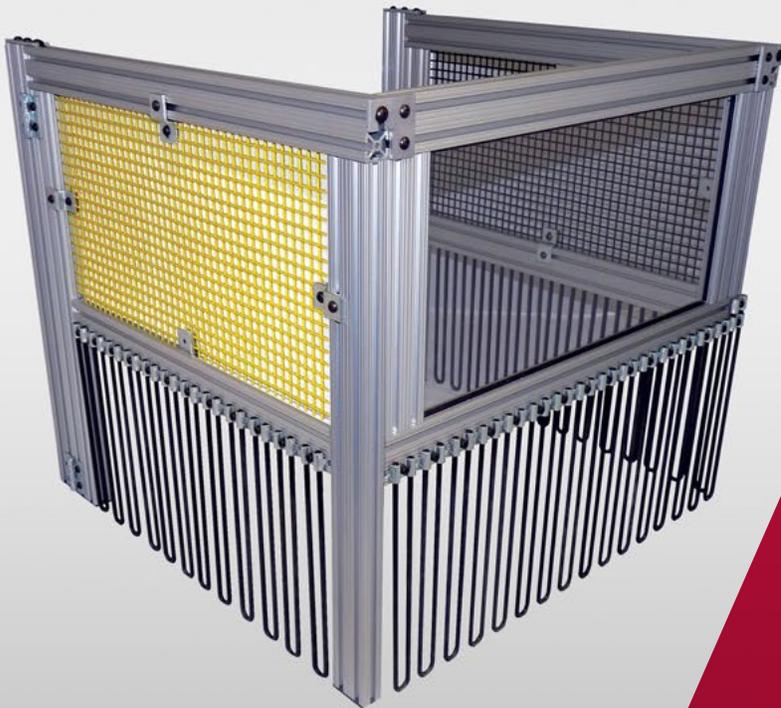
The seminar is held at our Rockford, Illinois, plant, which is located 65 miles northwest of Chicago O'Hare Airport.

ON-SITE AND SPECIAL GROUP SEMINARS

Machine safeguarding seminars can be presented at your company and tailored to the types of machines in your plant. We can also conduct special seminars at our facility for your group or company. Please contact our training department for details.



The Trusted Choice for Machine Safety



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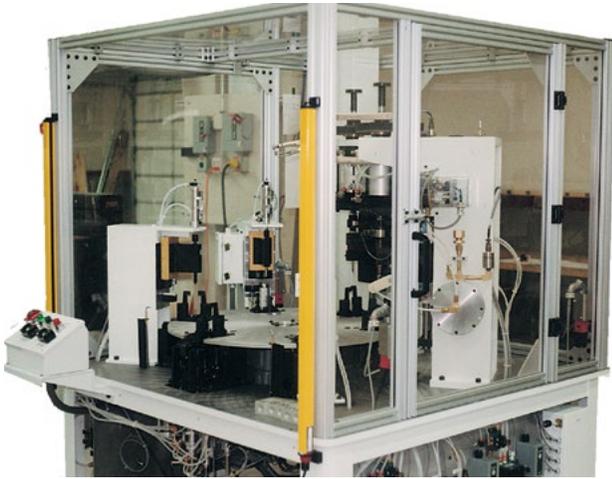
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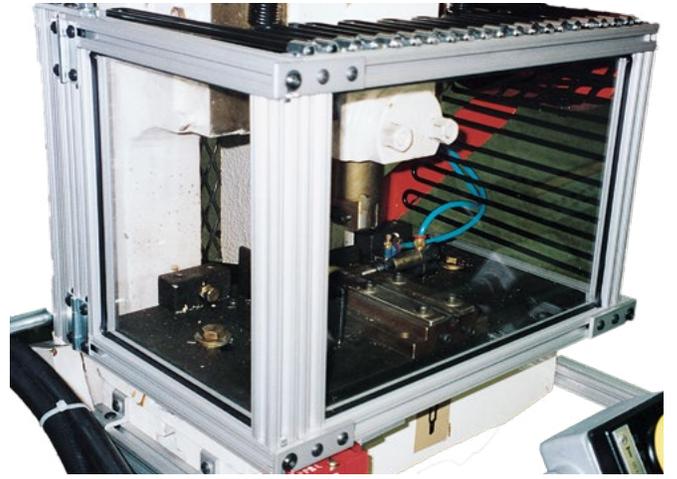
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Light Curtain Mounting Bracket and Guard Combination
Around Assembly Machine



Point-of-Operation Guard on OBI Press



Milling Machine Shield With Sliding Front Door



Air-Lift Guard on Press



Guard Mounted to Conveyor System and Machine



Point-of-Operation Light Curtains on a Press



PORTABLE DEMONSTRATION UNIT

We offer custom guards that can be designed and built to fit most machines. Our product development and engineering personnel can design guards that are unique to your machines. These guards comply with OSHA (Occupational Safety and Health Administration) and ANSI (American National Standards Institute) safety standards.

A portable demonstration unit is available. This unit features various materials that are used to construct a shield or guarding system. This portable demonstration unit is ideal as a quick reference or as a visual aid for safety specialists, loss-control engineers, etc.

Please use Part No. FFD000263 when ordering.



Portable Demonstration Unit

INTRODUCTION TO BARRIER GUARDING SYSTEMS

Barrier guards are usually the first point-of-operation safeguard considered for machines. The guards detailed in this catalog are intended and designed to meet the requirements of OSHA (Occupational Safety and Health Administration) and ANSI (American National Standards Institute) safety standards.

The OSHA 29 CFR 1910.217 requirements on the next page are specifically for guards on mechanical power presses; however, the same requirements apply for any other machinery used in industry.

When reviewing this catalog, please note guards are mounted on many different types of machines. These guards are not limited to fabricating equipment; they can be applied to any machine that requires point-of-operation safeguarding.

The EX-AL™ guarding systems can be used as a barrier (not guard) to protect the sides and rear of the machine when other safeguarding is used such as presence-sensing devices, two-hand control, pullbacks, and restraints.

An EX-AL™ guarding system can also be applied as shields on metal-cutting machines such as lathes, milling machines, and drill presses. This system is ideal for applications which require shielding from chips and coolant. At the same time, the shield provides a barrier between the point-of-operation hazard and the operator for added protection.

When operating any machine, personal protective equipment, including safety glasses, must be worn by the operator. All parts of the operator's body must be kept out of the point-of-operation hazard and the operator must not wear jewelry. Long hair must be restrained and loose clothing should be avoided.

Each EX-AL™ guarding system offered in this catalog is custom designed and built for each application. Frame extrusions are cut and assembled from detailed dimensions furnished to the factory on measurement forms, prints, or sketches. Delivery varies from stock (inventoried brackets, fasteners, etc.) to four weeks based on the quantity and complexity of the guards required.

An instruction manual, danger signs, and a CAD-generated drawing are included with each EX-AL™ shipment. This information is helpful when mounting the guard to the machine. When a measurement form has been provided for the design and fabrication of the guarding system, a copy of it will be included with the shipment of the guarding system.

Before measuring your machine for barrier guards, please refer to the following pages to select the proper guard. Take into consideration the safety and productivity requirements of each machine.

Barrier guards basically consist of three components:

1. Panels
2. Panel segments
3. Mounts

Once the decision has been made on these three components and the OSHA requirements have been read and understood (see next page), someone can measure the machine(s) for the appropriate type of guard.

OSHA GUARD REQUIREMENTS TAKEN FROM 29 CFR 1910.217 FOR MECHANICAL POWER PRESSES

(c)(2) Point-of-Operation Guards:

(i) Every point-of-operation guard shall meet the following design, construction, application, and adjustment requirements:

- (a) It shall prevent entry of hands or fingers into the point of operation by reaching through, over, under or around the guard;
- (b) It shall conform to the maximum permissible openings of Table O-10;
- (c) It shall, in itself, create no pinch point between the guard and moving machine parts;
- (d) It shall utilize fasteners not readily removable by operator, so as to minimize the possibility of misuse or removal of essential parts;
- (e) It shall facilitate its inspection, and
- (f) It shall offer maximum visibility of the point of operation consistent with the other requirements.

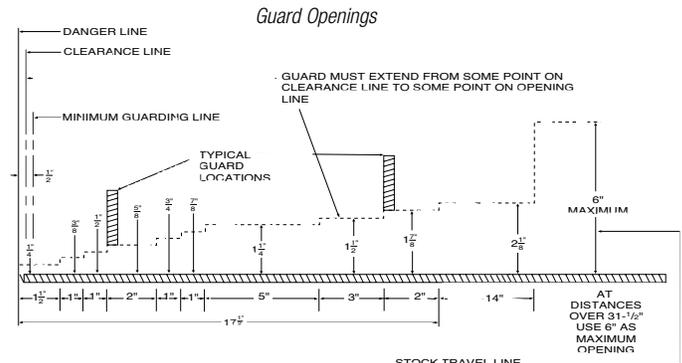
(ii) A die enclosure guard shall be attached to the die shoe or stripper in a fixed position.

(iii) A fixed barrier guard shall be attached securely to the frame of the press or to the bolster plate.

(iv) An interlocked press barrier guard shall be attached to the press frame or bolster and shall be interlocked into the press clutch control so that the clutch cannot be activated unless the guard itself, or the hinged or movable sections of the guard are in position to conform to the requirements of Table O-10.

(v) The hinged or movable sections of an interlocked press barrier guard shall not be used for manual feeding. The guard shall prevent opening of the interlocked section and reaching into the point of operation prior to die closure or prior to the cessation of slide motion. See paragraph (c)(3)(ii) of this section regarding manual feeding through interlocked press barrier devices.

(vi) The adjustable barrier guard shall be securely attached to the press bed, bolster plate, or die shoe, and shall be adjusted and operated in conformity with Table O-10 and the requirements of this subparagraph. Adjustments shall be made only by authorized personnel whose qualifications include a knowledge of the provisions of Table O-10 and this subparagraph.



Explanation of above diagram:

This diagram shows the accepted safe openings between the bottom edge of a guard and feed table at various distances from the danger line (point of operation). A guard-opening scale can be used to check the openings in a guard after installation (see next page).

The clearance line marks the distance required to prevent contact between the guard and moving parts.

The minimum guarding line is the distance between the infeed side of the guard and the danger line which is one-half inch from the clearance line.

The various openings (based on a woman's size 6 glove) are designed to prevent the operator's fingers from reaching the point of operation.

After installation of point-of-operation guards and before a machine is released for production, a check should be made to verify that the guard will prevent the operator's hands from reaching the point of operation.

Table O-10 shows the distances that guards shall be positioned from the danger line in accordance with the required openings.

Distance of opening from point-of-operation hazard (inches)	Maximum width of opening (inches)
1/2 to 1 1/2	3/4
1 1/2 to 2 1/2	3/8
2 1/2 to 3 1/2	1/2
3 1/2 to 5 1/2	5/8
5 1/2 to 6 1/2	3/4
6 1/2 to 7 1/2	7/8
7 1/2 to 12 1/2	1 1/4
12 1/2 to 15 1/2	1 1/2
15 1/2 to 17 1/2	1 3/4
17 1/2 to 31 1/2	2 1/4

Note: The standard panel is furnished with 1/4" diameter rods or hairpins that are on 3/4" centers; therefore, they will be 1/2" apart. 2 1/2" is the minimum distance the panels can be mounted from the point of operation. The same 2 1/2" distance applies to the standard 1/2" square mesh.

OSHA AND ANSI GUARD-OPENING SCALES

OSHA Guard-Opening Scale – Part No. KSC097



ANSI/CSA Guard-Opening Scale – Part No. KSC098



These guard-opening scales are used to check the openings in a guard once it has been installed.

GENERAL INSTRUCTIONS FOR APPLYING BARRIER GUARDS

A barrier guard consists basically of three components: **PANELS**, **PANEL SEGMENTS** (if required), and **MOUNTS**.

PANELS

1. Begin by determining what type of panel construction is required. Choices include a nonadjustable panel (NAP), or a variety of adjustable panels (AP1, AP2, AP3, AP4, AP5, and API).
2. Next, using a plain piece of paper or the measurement forms provided, measure accurately and record the sizes of each panel required. Important: All dimensions and information requested on each measurement form must be filled in and answered completely. Be sure to read the measuring instructions for each type of guard before writing down the dimensions.

PANEL SEGMENTS

3. Determine if a segment inside the panel is required. If it is, decide which segment type.
4. Measure the segment size required and provide its location in the panel.
5. On some smaller guards, the segment could be the entire panel.

MOUNTS

There are various mounts available for attaching the guard to the machine. Select the mount that best fits the application.

For price quotes or ordering, remember to:

1. Complete all dimensions for each barrier guard.
2. Measure accurately and complete all dimensions. Important: All dimensions and information requested on each measurement form must be filled in and answered completely. Note any machine obstructions, such as flywheel covers, knockout rods, feeds, and moving machine components on the measurement form and provide specific dimensions of these obstructions in the *Notes* section.
3. Send the completed information to Rockford for pricing.
4. When ordered, a complete barrier guard, ready for installation, will be furnished.

Note: The barrier guards and/or mounting brackets/stands in this catalog will be fabricated to within $\pm 1/8"$ of the measurements provided. Minor modification or additional material may be needed at the time of installation for proper fit to the machine or equipment.

PANELS

The standard panel frame is constructed of 1" x 2" extruded aluminum. The nonadjustable area of the panel is made of black or yellow mesh ($\frac{1}{2}$ " sq. 16-gauge or 1" sq. 12-gauge), or $\frac{3}{16}$ "-thick clear polycarbonate which is fastened in place for a permanent assembly. A panel can also be furnished with adjustable $\frac{1}{4}$ " diameter, black-oxidized steel hairpins in any portion of the panel. This provides adjustability for strip or coil feeding, or for obstructions on the machine. The hairpins are secured to the panel frame with clips, T-nuts, and socket-head cap screws.

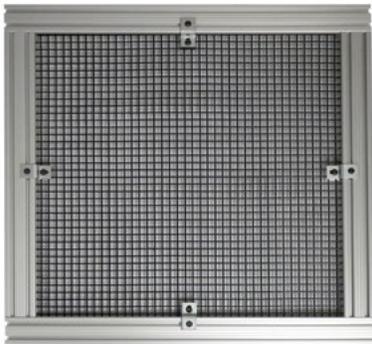
Various types of panel segments can also be furnished in the nonadjustable area of the panel to accommodate required features. A panel with adjustable hairpins does not have a panel segment unless the operator requires visibility into the point of operation. Panels can be attached to the machine using the mounts shown on pages 9 and 10.

PANEL FRAME CONSTRUCTION

NAP—NONADJUSTABLE PANELS

The NAP panel is fastened in place for a permanent assembly. It can be furnished with $\frac{1}{2}$ " or 1" black or yellow mesh, or $\frac{3}{16}$ "-thick clear polycarbonate.

$\frac{1}{2}$ " MESH PANEL



POLYCARBONATE PANEL



AP—ADJUSTABLE PANELS

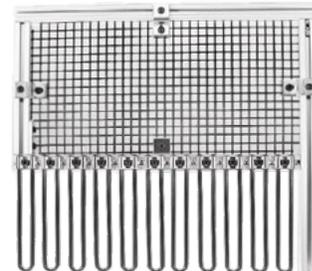
AP1—Lower Section ($\frac{1}{2}$ Frame)

The AP1 panel has a sturdy frame around the top half of the nonadjustable panel area. Steel hairpins are on the lower portion of the panel to allow for adjustability.



AP2—LOWER SECTION ($\frac{5}{8}$ FRAME)

The AP2 panel has adjustability on the lower section, with one side of the frame extending to the bottom of the panel for an extended mounting surface.



AP3—LOWER SECTION ($\frac{3}{4}$ FRAME)

The AP3 panel has adjustability on the lower section, with both sides of the frame extending to the bottom of the panel for an extended mounting surface on both sides.



PANEL FRAME CONSTRUCTION (CONTINUED)

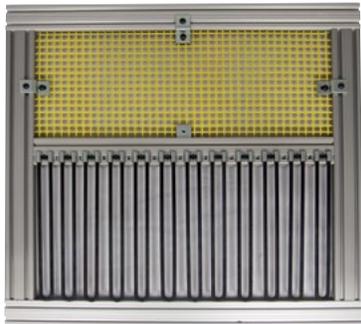
AP4—INTERIOR SECTION (FULL FRAME)

The AP4 panel has steel hairpins located in the interior section of the panel for adjustability. This can be used when the material is fed through the center portion of the panel.



AP5—LOWER SECTION FULL FRAME

The AP5 panel has adjustability on the lower section, with full-frame availability for mounting.



API—LOWER SECTION (INCLINABLE)

The API panel has inclinable steel hairpins located in the lower section. The inclinable section slants the hairpins inward for effective feeding of material and accommodation of various size dies while providing point-of-operation safeguarding. When inclining these guards, refer to the requirements of Table O-10 (see page 5) for the proper size opening.



PANEL SEGMENTS

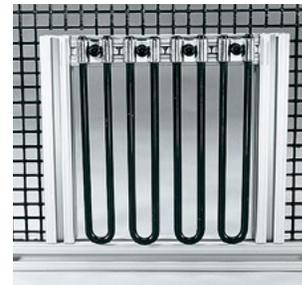
Various types of panel segments can be positioned into the nonadjustable area of the framed panel to accommodate required features. A standard panel with adjustable hairpins does not have a panel segment unless the operator requires visibility into the point of operation.

FEEDING (FS)



The feeding segment is used for strip or coil feeding through a nonadjustable area of the panel. This segment can accommodate various feedline heights.

ADJUSTABLE (AS)



The adjustable segment is used for strip or coil feeding through an adjustable area. This segment can accommodate various feedline heights. When using this adjustable segment, refer to the requirements of Table O-10 (see page 5).

POLYCARBONATE (PCS)



Polycarbonate (3/16"-thick) segments are furnished when greater visibility into the point of operation is required.

EMPTY (ES)



An empty segment can be furnished to allow the user to exchange custom-built panel segments based on production requirements. When using this type of segment, refer to the requirements of Table O-10 (see page 5).

MOUNTS

Various mounts are available which attach the barrier guards to the machine. (Please see illustrations throughout this catalog.) The mounts are furnished with all required components to mount and fasten the barrier guard to the machine.

SINGLE-PANEL BARRIER GUARD MOUNTS

DFM (Direct Frame Mount) Assembly

Part No. FKT683 (Black Steel) - Mount

Part No. FKT656 (Aluminum) - Guard or Post Mount



The DFM (direct frame mount) assembly (set of four with fasteners) attaches a guard panel to a flat surface on the machine. The slotted hook-mount allows the guard panel to be lifted off the machine without removing the fastener.

IFM (Inside Frame Mount) Assembly

Part No. FKT684—Two-Hole

Part No. FKT690—Four-Hole

The IFM (inside frame mount) assembly (set of four with fasteners) has a right angle bracket that fastens a guard panel to the inside column or frame of the machine. The IFM assembly is used when there are obstructions on the outside frame (face) of the machine, or for conveniently locating the guard between the machine frame, closer to the hazard. Depending on the size of the panel, either a two-hole (under 10" square) or four-hole (over 10" square) IFM assembly will be provided.

EM (Extended Mount) Assembly

Part No. FKT608—3"

Part No. FKT609—5"

Part No. FKT610—7"



The EM (extended mount) assembly (set of four with fasteners) connects a panel up to 3", 5", or 7" out from the machine frame. The extended mount is ideal for machines that have obstructions, an irregular mounting surface, or requirements for the panel to be mounted at a specific location.

*Two-Hole
Assembly*



*Four-Hole
Assembly*



EM24 (Extended Mount) Assembly

Part No. FKT695



This assembly consists of a set of four with fasteners. It connects a panel 8" to 24" out from the machine frame. The EM24 mount is ideal for mounting a panel to machines with obstructions that require a panel to be mounted at a greater distance than the EM described above. DFM (direct frame mounts) are included with this assembly.

HM (Hinged Mount) Assembly

Part No. FKT686

The HM (hinged mount) assembly consists of two hinges, one latch, two 1" x 1" pieces of extrusion (length determined by dimensions furnished), and fasteners. DFM (direct frame mount), IFM (inside frame mount), or EM (extended mount) assemblies must be used with this assembly to connect the hinged hardware and panel to the frame of a machine.



MOUNTS (CONTINUED)

MOUNTS FOR MULTI-PANEL BARRIER GUARDS

The following assemblies are usually applied to gap-type machines. They are used when the side panels of XL2 through XL6 guards need to be hinged to the left and right. This hinged feature may be necessary when changing dies, making tooling adjustments, or freeing jammed workpieces.

Side Frame Mount (SFM) Assembly Part No. FKT682

The SFM (side frame mount) assembly includes four right-angle brackets (either two-hole or four-hole brackets depending on the size of the panel) that connect a guard to a smooth, upright surface of a machine. Additional parts for the assembly include four hinges, two 1" x 2" extrusions, and other hardware.



SFM3, -5, or -7 (Side Frame Mount) Assembly Part No. FKT677 SFM3 Part No. FKT678 SFM5 Part No. FKT679 SFM7

The SFM3, -5 or -7 (side frame mount) assembly includes four extended mount assemblies that can be 3", 5", or 7" long. This mount is ideal for mounting a guard to a machine with an irregular surface, or to avoid obstructions at the mounting point. Additional parts for the assembly include four hinges, two 1" x 2" extrusions, and other hardware.



SFM24 (Side Frame Mount) Assembly Part No. FKT680

The SFM24 (side frame mount) assembly connects a barrier guard 8" to 24" out from the sides of the machine. This SFM24 mount is ideal for mounting a guard to a machine when the guard must extend out from the machine frame. Additional parts for the assembly include four hinges, two 1" x 2" extrusions, and other hardware.



FFM (Front Frame Mount) Assembly Part No. FKT681

The FFM (front frame mount) assembly connects a barrier guard to the throat portion of a C-frame machine using right angle brackets. This mount is applied when a multi-panel guard cannot be attached to the side of the machine using the SFM, SFM3, -5, or -7, or the SFM24 mounts described on this page. Additional parts for the assembly include four hinges, two 1" x 2" extrusions, and other hardware.



MULTI-PANEL XL2 THROUGH XL6



Example of a Multi-Panel Barrier Guard on a Power Press

Multi-panel barrier guards can be furnished for various machines including gap or C-frame presses that require barrier guards as the method of safeguarding. Ideal applications include manual strip-feeding operations in single stroke or for automatic-feeding operations in the continuous or automatic single stroke modes of operation. The guards are custom-designed for each application to meet the requirements of OSHA (Occupational Safety and Health Administration) and ANSI (American National Standards Institute). Each guard consists of three components: panels, panel segments (if required), and mounts.

The panels of these barrier guards are available in nonadjustable (NAP) and adjustable (AP1, AP2, AP3, AP4, AP5, and API) frame construction. Various panel segments can be positioned into a nonadjustable panel to meet specific requirements. Please see page 8 for details on panel segments.

Normally, panels with adjustable hairpins do not have panel segments unless the operator requires visibility into the point of operation. Mounts are used to attach guards to the machine.

Normally, the framework of the panels is constructed of 1" x 2" square extruded aluminum. Larger frame extrusions are available (see page 27 for choices). Standard panels can be furnished with black or yellow mesh (1/2" sq. 16-gauge or 1" sq. 12-gauge), or 3/16"-thick clear polycarbonate. Panels are available with adjustable, black-oxidized steel hairpins in the lower portion of the panel. These hairpins provide adjustability for strip or coil feeding, or for going around obstructions on the machine. The adjustable hairpins are secured to the panel frame with clips, T-nuts, and socket-head cap screws.

MULTI-PANEL XL2 THROUGH XL6 (CONTINUED)

This page illustrates guards that are usually applied to C-frame machines. The two-panel and four-panel barrier guards cannot be considered a safeguard. They are to be used with safeguarding devices such as two-hand trip or control, presence-sensing devices, pullbacks, or restraints. They are designed to protect the sides of the point of operation while the front is open for feeding and removing of workpieces.

The three- and five-panel barrier guards are designed to meet the requirements of a point-of-operation guard as detailed on pages 5 and 6 of this catalog. The rear of the machine must also be guarded when applying front and side guards. A roof and/or floor section is required if the guard is designed and applied where someone could reach over or under it.



Model XL2—This two-panel guard can be constructed from any of the panels shown on pages 7 and 8. The mounts can be furnished as illustrated on pages 9 and 10. The barrier shown has two panels constructed of mesh and hairpins with SFM5 mounts.



Model XL3—This three-panel guard shows the same two panels as the XL2 with the addition of a front panel made of polycarbonate and adjustable hairpins.



Model XL4—This four-panel barrier guard is similar to the XL2 shown above with the addition of right rear and left rear panels. The XL4 barrier guard is used when the guard must extend out from the machine frame to provide clearance for the machine bed or tooling. This guard is constructed of polycarbonate and mesh panels and includes feeding and adjustable segments. SFM24 and FFM mounts are shown.



Model XL5—This five-panel guard shows the same four panels as the XL4 with the addition of a front panel. This panel is made of mesh and includes a polycarbonate segment.

Note: Model XL6 (not shown) consists of two XL3 barrier guards placed on top of each other with a gap in between them to allow for large sheet metal feeding.

MEASURING INSTRUCTIONS FOR MULTI-PANEL MODELS XL2 THROUGH XL6 USED ON MECHANICAL OR HYDRAULIC POWER PRESSES WITH C-FRAME CONSTRUCTION

The following instructions are for measuring XL2 through XL6 barrier guards. The basic information necessary to quote or fabricate any of the listed guards is the frame type, nonadjustable area construction, height and length of panel(s), panel segments (if required), and mounts to attach the guards to the machine.

The following instructions are purposely kept as simple as possible to avoid long explanations of the many variations available.

1. Fill in the complete heading as indicated.
2. Check appropriate guard model number.
 - XL2** = 2 panel
 - XL3** = 3 panel
 - XL4** = 4 panel
 - XL5** = 5 panel
 - XL6** = 6 panel (gap style)
 (If any panels are not required, cross them out in the panel chart.)
3. Measure and record the bolster width and depth.
4. Measure web width of frame, if the barrier guard is to be mounted to the front of the frame behind the bolster plate.
5. Measure and record the outside width of the press frame behind the bolster plate.
6. Indicate desired position of each panel relative to the bolster. Drawing shows panels extended from the bolster. If panels should be inbound, enter minus (-) dimensions, or on the bolster, enter zero.
7. Measure and record the distance from the mounting point of the guard on the machine to the rear of the bolster, or back of press throat if using FFM mounts.
8. Measure and record the clearance from the flywheel cover to the top of the bolster. This dimension could affect the panel height if the panel is to be swung under the flywheel cover.
9. Measure and record the feedline depth if applying a gap type guard (XL6).
10. Enter the minimum and maximum feedline height if applying adjustable hairpins or inclinable panels.
11. Indicate mounts required.
 - SFM** Side Frame Mount
 - SFM7** Side Frame Mount up to 7"
 - SFM24** Side Frame Mount up to 24"
 - FFM** Front Frame Mount
12. Indicate frame type for each panel.
 - NAP** Nonadjustable Panel
 - AP1** Adjustable Panel (1/2 frame)
 - AP2** Adjustable Panel (5/8 frame)

- AP3** Adjustable Panel (3/4 frame)
- AP4** Adjustable Panel (Full frame)
- AP5** Adjustable Panel (Full frame)
- API** Adjustable Panel (Inclinable)

If adjustability is not required at the left and right front corners of the barrier guard, use AP3 panels for L and R, and AP1 panel for F for quicker removal of F panel.

If adjustability is required at the left and right front corners of the barrier guard, use AP2 panels for L and R, and AP1 panel for F and indicate in Notes section on the form. All panels (L, F, R) should have the same size nonadjustable area and it should be in the same position on all panels.

13. Indicate the construction of the nonadjustable area for each panel.
 - B** 1/2" Sq. Black Mesh (16 gauge)
 - B1** 1" Sq. Black Mesh (12 gauge)
 - Y** 1/2" Sq. Yellow Mesh (16 gauge)
 - Y1** 1" Sq. Yellow Mesh (12 gauge)
 - PC** Polycarbonate (3/16"-thick)
14. Indicate height of each panel.
15. Indicate length of each panel.
16. Indicate panel **Segment** type, height, length, and if hinged or nonhinged.
 - FS** Feeding Segment
 - AS** Adjustable Segment
 - PCS** Polycarbonate Segment
 - ES** Empty Segment
17. Indicate which panel(s) require an interlock switch and if switch is locking or nonlocking.
18. Indicate if **F** panel needs to be hinged (**L or R**).
19. Indicate if hairpins are required in place of **RR** or **LR** panel. The number of hairpins supplied will be determined by the height of the **L** or **R** panel.
20. Indicate if roof section(s) are required. Provide height and length.
21. Indicate if floor section(s) are required. Provide height and length.

MEASUREMENT FORM FOR MULTI-PANEL MODELS XL2 THROUGH XL6



5795 Logistics Parkway • Rockford, IL 61109
 Toll-Free: 1-800-922-7533 • Phone: 815-874-7891 • Fax: 815-874-6144
 www.rockfordsystems.com • customerservice@rockfordsystems.com

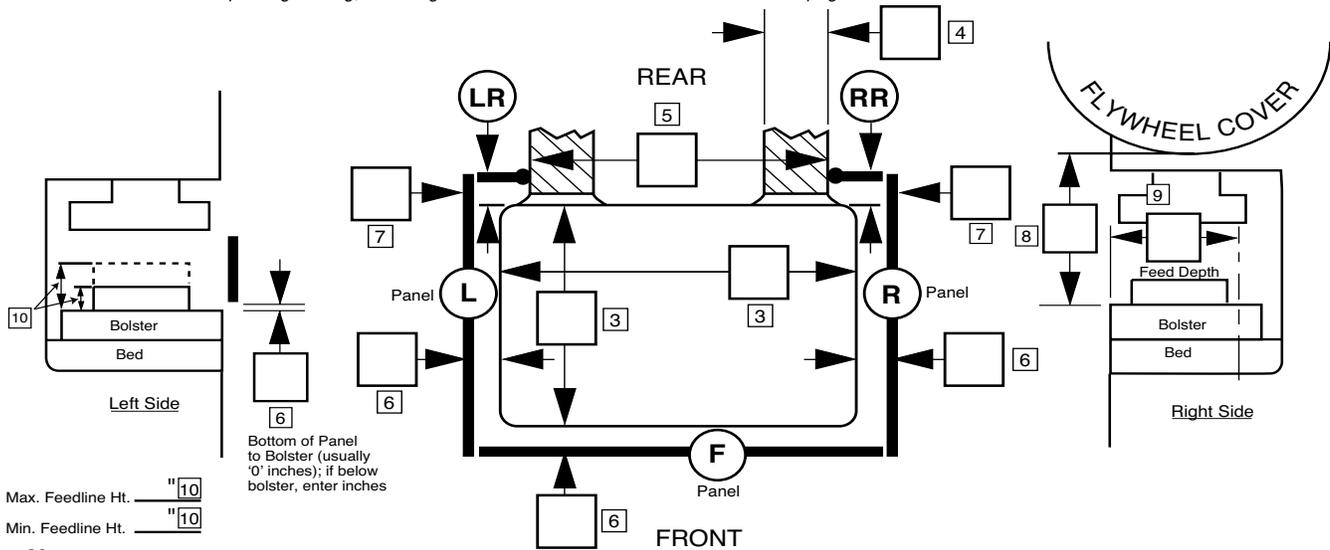
Multi-panel guards—XL2, XL3, XL4, XL5, XL6

If more than one machine is to be measured, please make copies of this page.

(See previous page for instructions.)

Company _____ Address _____
 City _____ State _____ Zip _____
 Attention _____ Rep. _____
 Machine Mfr. and Model No. _____ Machine No. _____
 Measured By: _____

Note: If rear of machine requires guarding, use Single-Panel Model XL1 measurement form on page 19.

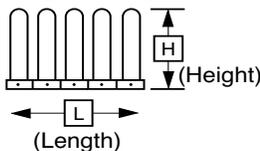


Max. Feedline Ht.
 Min. Feedline Ht.

Notes:

2	MODEL
<input type="checkbox"/>	XL-2
<input type="checkbox"/>	XL-3
<input type="checkbox"/>	XL-4
<input type="checkbox"/>	XL-5
<input type="checkbox"/>	XL-6
11	MOUNTS
<input type="checkbox"/>	SFM
<input type="checkbox"/>	SFM-3, -5, or -7 (Circle one)
<input type="checkbox"/>	SFM-24
<input type="checkbox"/>	FFM
17	ELEC. INTERLOCK
<input type="checkbox"/>	Locking
<input type="checkbox"/>	Nonlocking

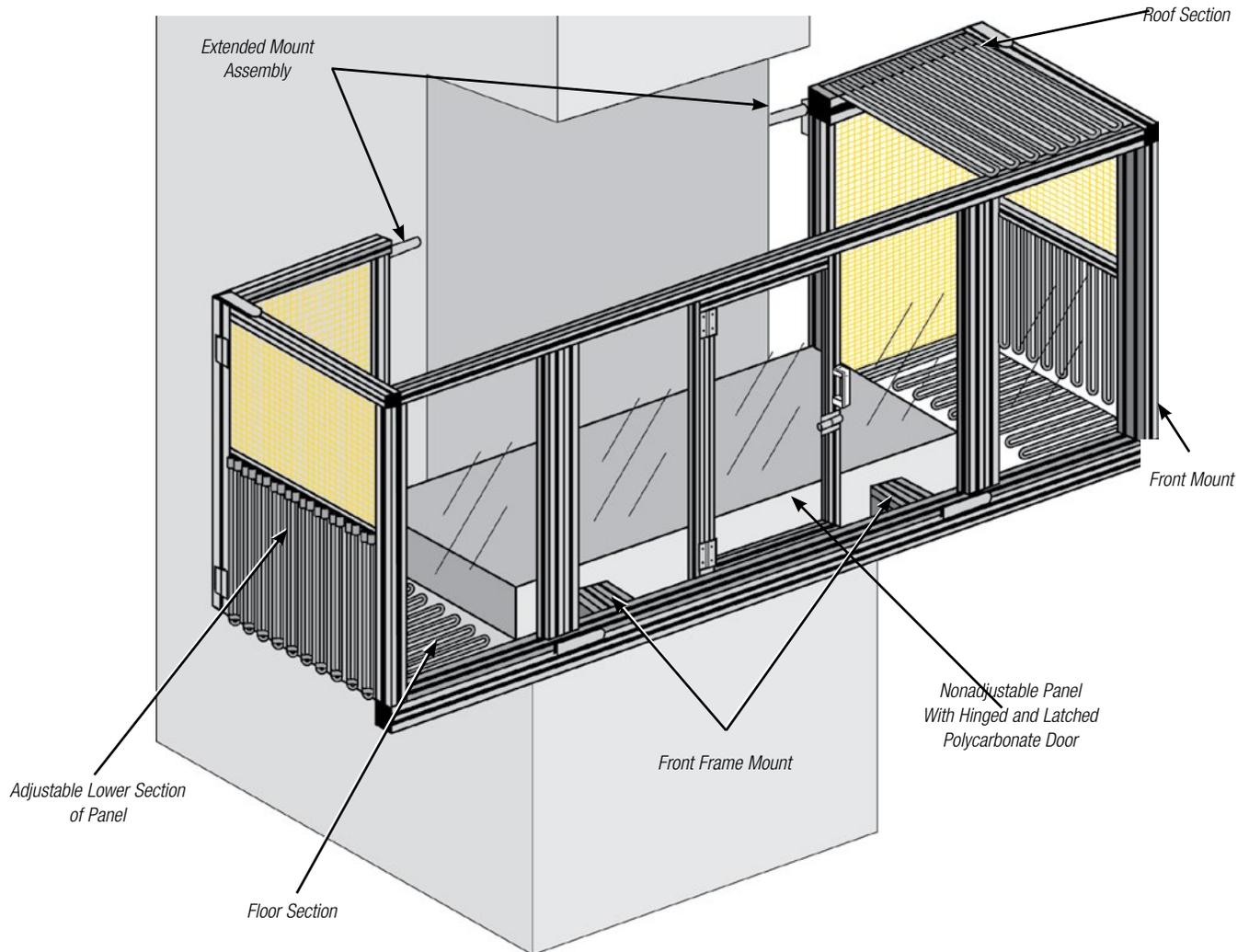
PANEL CHART					
Panel	LR	L	F	R	RR
Frame Type—NAP, AP1, AP2, AP3, AP4, AP5, or AP1	<input type="text" value="12"/>				
Nonadjust. Area Const. B, B1, Y, Y1, PC	<input type="text" value="13"/>				
H (Height)	<input type="text" value="14"/>				
L (Length)	<input type="text" value="15"/>				
Panel Segment Type FS, AS, PCS, or ES	<input type="text" value="16"/>				
H (Height)					
L (Length)					
H (Hinged) NH (Nonhinged)					
Electrical Interlock Y (Yes) N (No)		<input type="text" value="17"/>	<input type="text" value="17"/>	<input type="text" value="17"/>	
F Panel Only Hinged L or R			<input type="text" value="18"/>		
Hairpins (In place of LR or RR)	<input type="text" value="19"/>				<input type="text" value="19"/>



ROOF SECTION		
Panel	H	L
L		
F		
R		

FLOOR SECTION		
Panel	H	L
L		
F		
R		

FRONT MOUNT XL1 THROUGH XL7



Example of a Seven-Panel Guard (XL7) on a Gap-Type Machine

The front-mount guarding system is applied to machines that usually have a gap-type construction with components that extend to the right or left of the point of operation. These components can be dies, tooling, feeds, scrap choppers, etc. The front-mount extrusion provides support for the guard across the front of the machine. The front portion of the machine can be safeguarded with one, two, or three panels (see the measurement form on page 17 for the **LF**, **F**, and **RF** panels).

If panels need to be removed or hinged, please indicate how they should be attached. When measuring for a front-mount guard and the construction of the panel is determined, a roof and/or floor section is required if someone can reach over or under the guard.

The panel length will be determined at the factory based on the information provided on the measurement form.

MEASURING INSTRUCTIONS FOR FRONT-MOUNT MODELS XL1 FM THROUGH XL7 FM

The following instructions are for measuring XL1 through XL7 front mount barrier guards. The basic information necessary to quote or fabricate any of the listed guards is the frame type, nonadjustable area construction, height of panel(s), panel segments (if required), and mounts to attach the guards to the machine. **The length of all panels will be determined by Rockford Systems.**

The following instructions are purposely kept as simple as possible to avoid long explanations of the many variations available.

1. Fill in the complete heading as indicated.
2. Check appropriate guard model number.

XL1 = 1 panel	XL5 = 5 panel
XL2 = 2 panel	XL6 = 6 panel
XL3 = 3 panel	XL7 = 7 panel
XL4 = 4 panel	

(If any panels are not required, cross them out in the panel chart.) Indicate how front mount will be attached to the press: direct, extended, or tie-bar boss.
3. Measure and record the bolster width and depth.
4. Measure and record the distance from the edge of the bolster to the outside of the frame of the machine on both sides.
5. Measure and record the distance from the mounting point of the guard on the frame of the machine to the rear of the bolster.
6. Indicate desired position of **L**, **F**, and **R** panels relative to the bolster. Drawing shows panels outbound of the bolster. If panels should be inbound, enter minus (-) dimensions, or on the bolster, enter zero.
7. Indicate the distance of the **LR** and **RR** panels to the mounting point on the frame of the machine.
8. Enter the center to center distance of tie-bar bosses or extended mount locations and distance from the right edge of the bolster to the center of the right tie-bar boss or right extended mount.
9. Measure and record the distance from the edge of the bolster to the right edge of the **LF** panel and the left edge of the **RF** panel. If the edge of the panel(s) is on the bolster, enter zero. If there is no **LF** or **RF** panel(s), put an "X" in the square.
10. Enter the minimum and maximum feedline heights.
11. Indicate mounts required for **LR**, **L**, **R**, or **RR** panels.

SFM	Side Frame Mount
SFM7	Side Frame Mount up to 7"
SFM24	Side Frame Mount up to 24"
FFM	Front Frame Mount
12. Measure and record the distance from the top of the Front Mount to the top of the bolster.
13. Enter the distance between the bottom of the front panel(s) to the top of the Front Mount.
14. Indicate frame type for each panel.

NAP	Nonadjustable Panel
AP1	Adjustable Panel ($\frac{1}{2}$ frame)
AP2	Adjustable Panel ($\frac{5}{8}$ frame)
AP3	Adjustable Panel ($\frac{3}{4}$ frame)
AP4	Adjustable Panel (Full frame)
AP5	Adjustable Panel (Full frame)
API	Adjustable Panel (Inclinable)
15. Indicate the construction of the nonadjustable area for each panel.

B	$\frac{1}{2}$ " Sq. Black Mesh (16 gauge)
B1	1" Sq. Black Mesh (12 gauge)
Y	$\frac{1}{2}$ " Sq. Yellow Mesh (16 gauge)
Y1	1" Sq. Yellow Mesh (12 gauge)
PC	Polycarbonate ($\frac{3}{16}$ "-thick)
16. Indicate height of each panel.
17. Indicate length of each panel. **Rockford Systems will determine length(s) based on other dimensions provided.**
18. Indicate panel segment type, height, length, and if hinged or nonhinged, if required.

FS	Feeding Segment
AS	Adjustable Segment
PCS	Polycarbonate Segment
ES	Empty Segment
19. Indicate which panel(s) require an interlock switch and if switch is locking or nonlocking.
20. Indicate if **L**, **LF**, **F**, **RF**, or **R** panels need to be hinged (**L or R**).
21. Indicate if hairpins are required in place of **LR** or **RR** panel. The number of hairpins supplied will be determined by the height of the **L** or **R** panel.
22. Indicate if roof section(s) are required. Provide height and length.
23. Indicate if floor section(s) are required. Provide height and length.

MEASUREMENT FORM FOR FRONT MOUNT MODELS XL1 FM THROUGH XL7 FM



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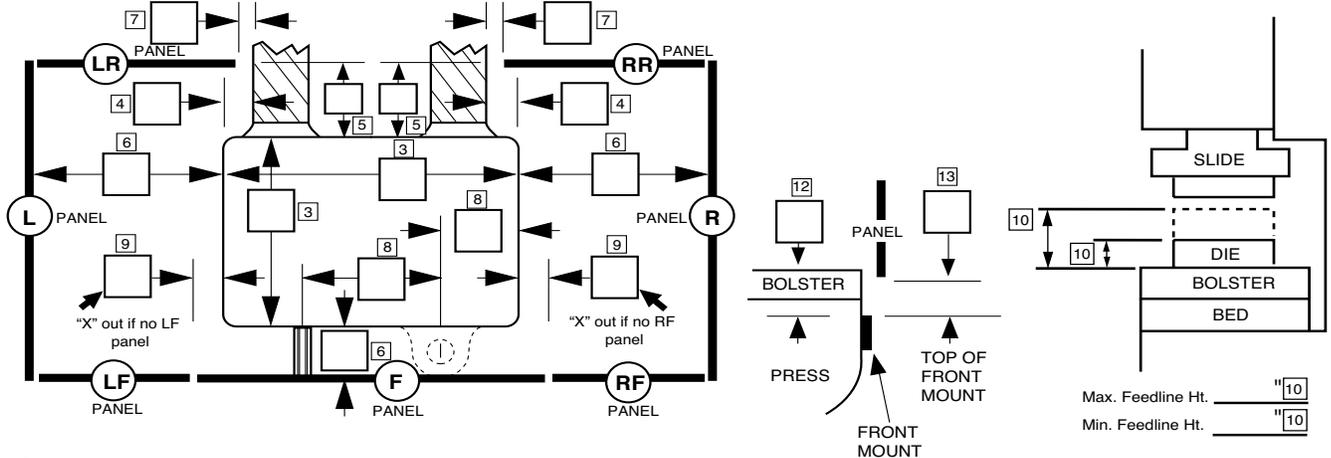
FRONT MOUNT MODELS—XL1, XL2, XL3, XL4, XL5, XL6, XL7

If more than one machine is to be measured, please make copies of this page.

(See previous page for instructions.)

Company _____ Address _____
 City _____ State _____ Zip _____
 Attention _____ Rep. _____
 Machine Mfr. and Model No. _____ Machine No. _____
 Measured By: _____

Note: If rear of machine requires guarding, use Single-Panel Model XL1 measurement form on page 19.



Notes:

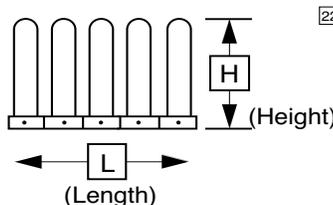
2 MODEL XL-__ FM
 1 2 3 4
 5 6 7

2 FRONT-MOUNT TYPE
 Direct Tie-Bar Boss
 Extended

11 MOUNTS FOR LR, L, R, RR
 SFM
 SFM-3, -5, or -7 (Circle One)
 SFM-24
 FFM

19 ELEC. INTERLOCK
 Locking
 Nonlocking

PANEL CHART							
Panel	LR	L	LF	F	RF	R	RR
Frame Type NAP, AP1 AP2, AP3, AP4, AP5, or API	14	14	14	14	14	14	14
Nonadjust. Area Const. B, B1, Y, Y1, PC	15	15	15	15	15	15	15
H (Height)	16	16	16	16	16	16	16
L RSI To Complete (Length)	17	17	17	17	17	17	17
Panel Segment Type FS, AS, PCS, or ES	18	18	18	18	18	18	18
H (Height)							
L (Length)							
H (Hinged) NH (Nonhinged)							
Electrical Interlock Y (Yes) N (No)		19	19	19	19	19	19
Hinged L or R		20	20	20	20	20	20
Hairpins (In place of LR or RR)	21						21



22 ROOF SECTION

Panel	H	L
L		
LF		
F		
RF		
R		

23 FLOOR SECTION

Panel	H	L
L		
LF		
F		
RF		
R		

SINGLE-PANEL MODEL XL1 OR DOUBLE PANEL MODEL XL2

The single-panel barrier guard can be furnished for any machine that requires simple, one-sided guarding. The panel can be custom designed for each application. In some applications, it is more convenient to have a double panel (split guard) with two panels in line with each other that are hinged and latched. Applications include areas of the machine not protected by a light curtain—front, rear, sides of the machine, or for auxiliary guarding.

The framework of the panel is typically constructed of 1" x 2" square extruded aluminum. The fixed area of the panel is made of black or yellow mesh (1/2" sq. 16-gauge or 1" sq. 12-gauge), or 3/16"-thick clear polycarbonate. It is fastened in place for a permanent assembly. Adjustable, black-oxidized steel hairpins are available for the lower portion of the panel. These hairpins provide adjustability for strip or coil feeding, or for going around obstructions on the machine. The adjustable hairpins are secured to the panel frame with hairpin clips, T-nuts, and socket-head cap screws. Various panel segments can also be positioned into a framed panel to meet specific requirements. Panels with adjustable hairpins normally do not have a panel segment unless the operator requires visibility into the point of operation.

A single-panel can be attached to the machine using any of the mounts described on the next page.



Single-Panel Barrier Guard With Notched Upper Left Corner Mounted on Back of a Machine



Double Panel Model XL2 With Black Mesh, Heavy Hinge Assembly and Door Handles



Single-Panel Model XL1 With Black Mesh and Direct Frame Mounts

MEASUREMENT FORM FOR SINGLE-PANEL MODEL XL1 OR DOUBLE PANEL XL2



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If more than one machine is to be measured, please make copies of this page.

Company _____ Address _____
 City _____ State _____ Zip _____
 Attention _____ Rep. _____
 Machine Mfr. and Model No. _____ Machine No. _____
 Measured By: _____



DFM (Direct Frame Mount) Assembly

Mounting center distance will be approximately 2" greater than the overall panel length.



IFM (Inside Frame) Mount Assembly

Panel length will be approximately the inside machine frame dimension.



EM (Extended Mount) Assembly

Mounting center distance will be approximately 1" greater than the overall panel length.

HM (Hinged Mount) Assembly

If hinging is required, order this HM (hinge mount) assembly along with one of the following: DFM, IFM, or EM.



If **Direct Frame Hinged Mounts** are used, the mounting center distance will be approximately 4" greater than the overall panel length.

If **Inside Frame Hinged Mounts** are used, the panel length will be approximately 2" less than the inside machine frame dimension.

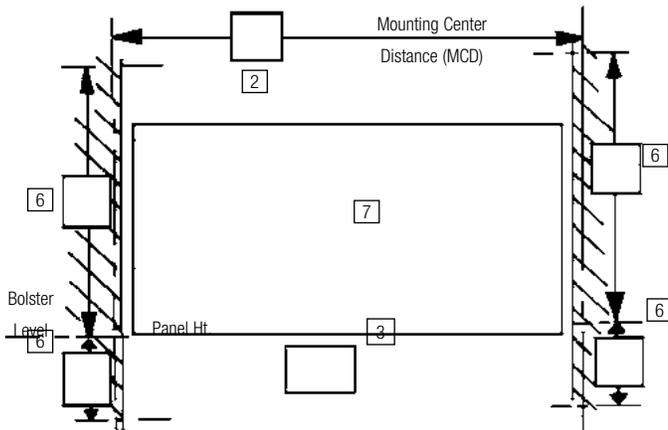
If **Extended Hinged Mounts** are used, the mounting center distance will be approximately 3" greater than the overall panel length.

MEASURING INSTRUCTIONS

This single-panel Model XL1 or double panel Model XL2 measurement form includes drawings of mounting situations. By entering dimensions and selecting the appropriate mounts, the barrier guard will mount easily to the machine.

1. Fill in the complete heading as indicated above.
2. Enter the MCD (mounting center distance).
3. Enter height and panel frame construction.
4. Enter panel construction for nonadjustable area.
5. Select appropriate mounts and check box(es) provided.
If extended mounts are selected, check the distance the panel must be out from the mounting surface. Hollow studs will accommodate up to 7 inches.
6. Enter appropriate location of all mounts, especially if above and below the panel.
7. Enter panel segment location in panel (if applicable) and select type of segment.
8. Check type of electrical interlock switch, if any.

Identify, dimension and locate desired panel segments or panel cutouts, if required, by sketching on blank panel drawing below.



Note: If the guard will be divided into two hinged and latched panels, indicate above so the proper XL2 barrier guard is furnished.

3. Panel Frame Construction (select one)

- Nonadjustable (NAP)
- Adjustable (Full Frame)AP4
- Adjustable (1/2 Frame) AP1
- Adjustable (Full Frame)AP5
- Adjustable (2/3 Frame) AP2
- Adjustable (Inclinable) API
- Adjustable (3/4 Frame) AP3

4. Nonadjustable Area Construction (select one)

- 1/2" Black Mesh
- 1/2" Yellow Mesh
- Polycarbonate
- 1" Black Mesh
- 1" Yellow Mesh

5. Mounts and Connectors

Select and enter the appropriate information

- Direct Frame Mount (DFM)
- Inside Frame Mount (IFM)
- Hollow Studs (check one) 3" 5" 7"
- Hinged Mounts (HM): (*plus either DFM, IFM, or EM*)
- Hinged Right (HR) Hinged Left (HL)

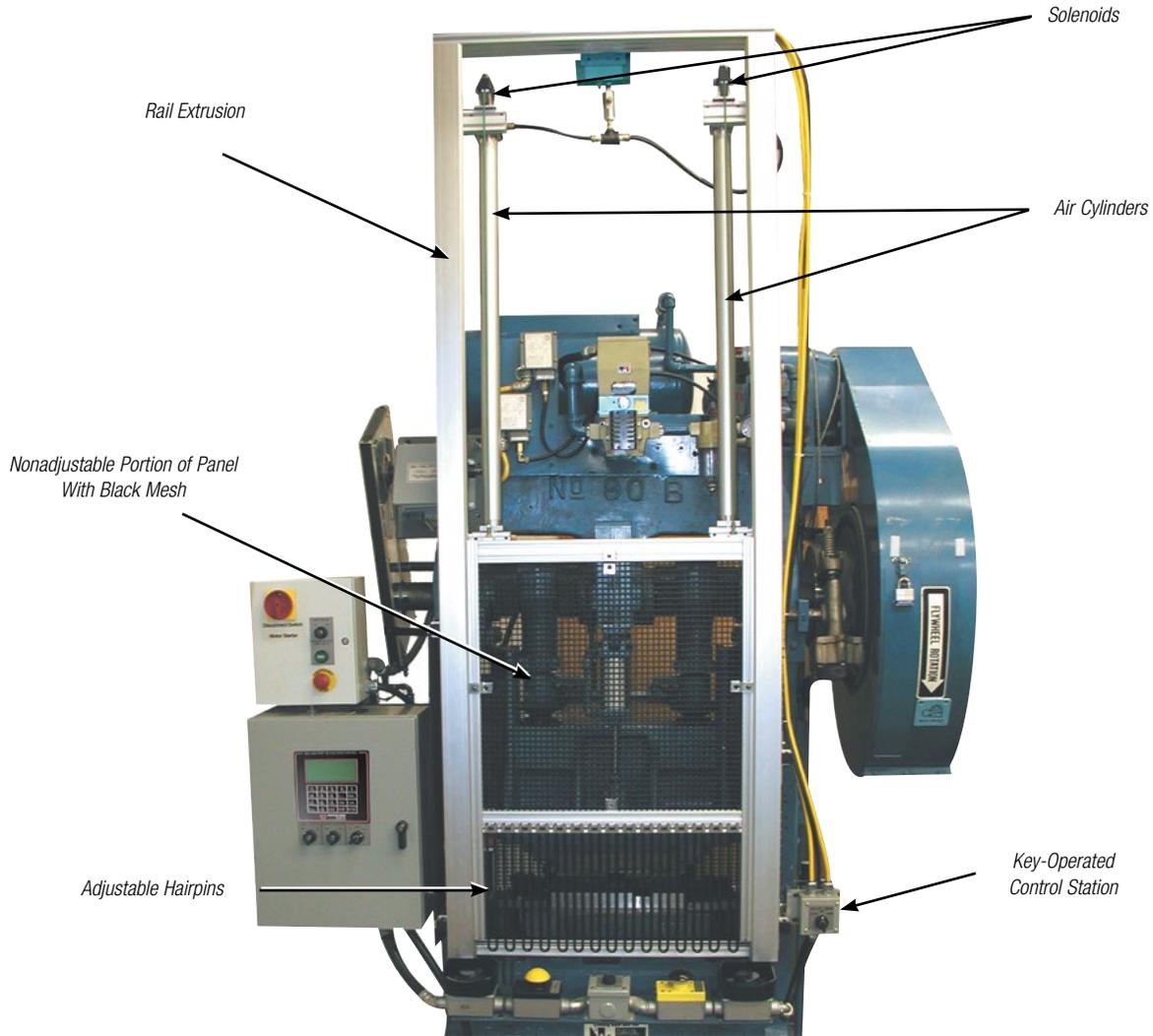
7. Panel Segment Type

- Feeding (FS)
- Polycarbonate (PCS)
- Adjustable (AS)
- Empty (ES)

8. Electrical Interlock Switch and Bracket

- Locking Nonlocking None

SPRING LIFT XL1 SL OR AIR LIFT XL1 AL



Air-Lift Guard XL1 AL on a Power Press With 1/2" Square Black Mesh and Hairpins

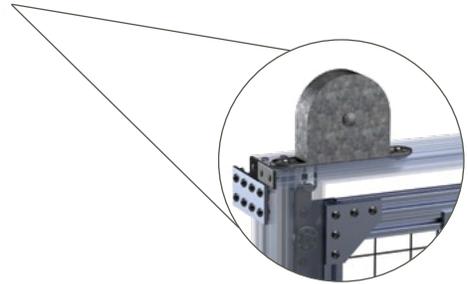
Lift-type guards, either spring lift or air lift, can be furnished on machines where guards need to be quickly and easily positioned up out of the way for die setup and maintenance. These lift-type guards are custom designed for each application to meet the requirements of OSHA (Occupational Safety and Health Administration) and ANSI (American National Standards Institute) safety standards.

These barrier guards are available with non-adjustable panels (NAP), or a variety of adjustable panels (AP3, AP4, AP5, and API). Various panel segments can be located in the nonadjustable area of the panel to meet specific requirements. Panels with adjustable hairpins do not have panel segments unless the operator requires visibility into the point of operation. The lift-type barrier guards are attached to the machine by mounting the rails directly to the machine frame.

Usually, the panel framework of the guard is constructed of a rail and carriage assembly. The nonadjustable portion of the panel can be furnished with black or yellow mesh (1/2" sq. 16-gauge or 1" sq. 12-gauge), or 3/16"-thick clear polycarbonate. A panel can be furnished with adjustable steel hairpins. The hairpins provide adjustability for strip or coil feeding, or for obstructions on the machine. The adjustable hairpins are secured to the panel frame with clips, T-nuts and socket-head cap screws.

This style of guard can also be furnished for horizontal operation rather than vertical operation as illustrated. Please contact the factory for details on horizontal applications.

SPRING LIFT XL1 SL OR AIR LIFT XL1 AL (CONTINUED)



Mechanical Motor Spring Helps Counterbalance the Spring-Lift Guard

Spring-Lift Guard XL1 SL With ½” Square Black Mesh, Hairpins, and Polycarbonate Hinged Segment

The spring-lift and air-lift guards are usually applied to a machine that has straight vertical sides with a point of operation that needs to be guarded. The mechanical motor springs on the spring-lift guard provide a counterbalance for the weight of the guard. This allows the guard to move upward from the guarded position to access the point of operation.



Part No. LLD240
Key-Operated Selector Switch Station for Air-Lift Guard
(Included in Air-Lift Assembly)

The air-lift guard is usually applied to larger machines. With this system, the guards are raised and lowered by air cylinders (2) and operating cables that are attached to the guard.

A separate key-operated selector switch station controls the movement of the guard. This selector switch operates a solenoid which controls the air cylinders. The solenoid has a built-in check valve to keep the guard from dropping if air pressure is lost.



The spring-lift and air-lift guards are not designed for manual feeding operations. For manual feeding operations using gates, please consult the factory.

MOTOR SPRING*	
PART NO.	LIFT CAPACITY
FKT673	20 LB
FKT674	30 LB
FKT675	40 LB
FKT676	50 LB

AIR CYLINDER		
PART NO.	DESCRIPTION	LIFT CAPACITY
FKT795	24" Lift Air Cylinder	174 lb
FKT796	36" Lift Air Cylinder	174 lb
FKT797	48" Lift Air Cylinder	174 lb

*Different springs are available in sets of two or four to accommodate a variety of panel weights (a minimum of two springs required for each panel). Please consult the factory.

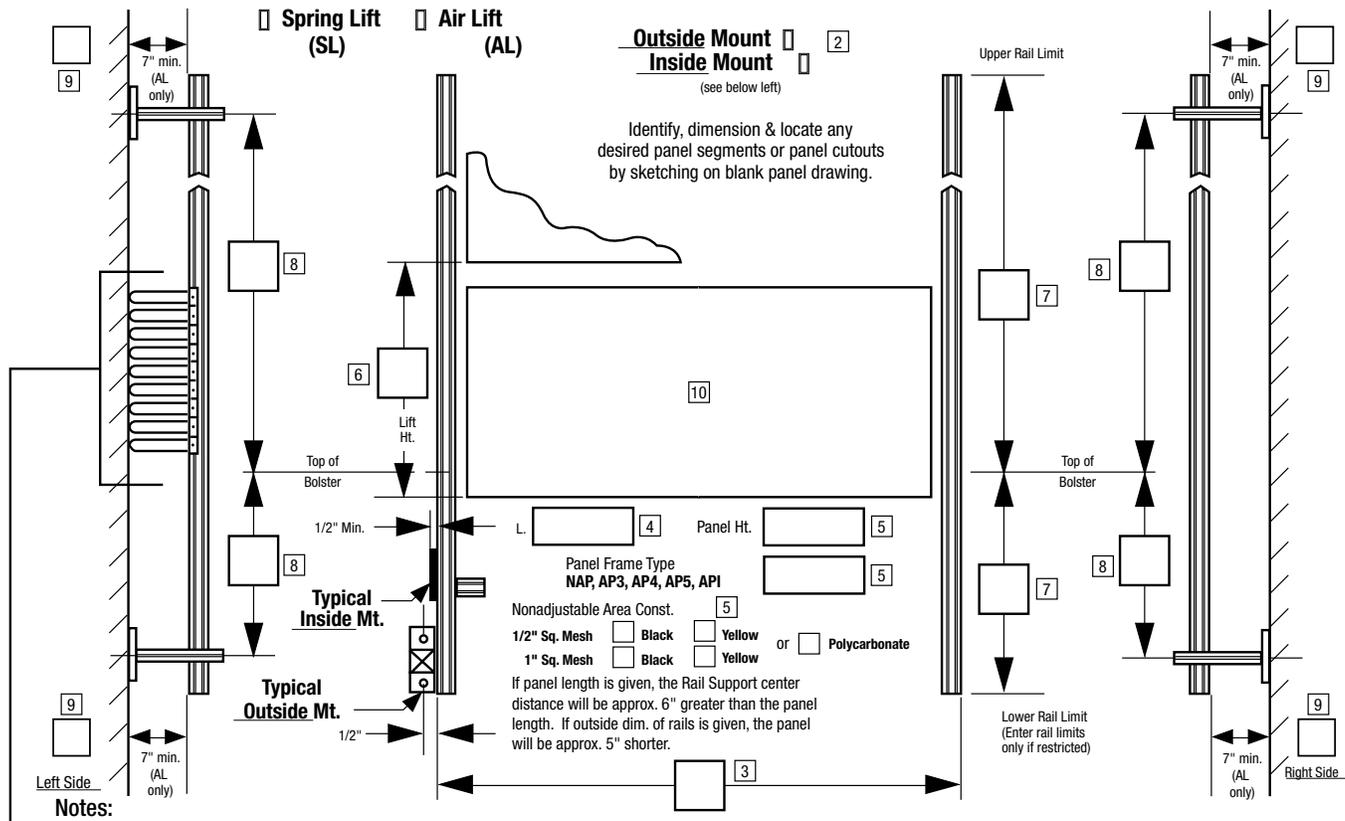
MEASUREMENT FORM FOR SPRING-LIFT MODEL XL1 SL AND AIR-LIFT MODEL XL1 AL



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If more than one machine is to be measured, please make copies of this page.

Company _____ Address _____
 City _____ State _____ Zip _____
 Attention _____ Rep. _____
 Machine Mfr. and Model No. _____ Machine No. _____
 Measured By: _____



MEASURING INSTRUCTIONS

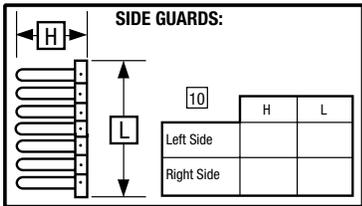
The lift guard measurement form is designed to be used for the XL1 SL and XL1 AL guards.

- Fill in the complete heading as indicated.
- Check whether an **Outside** or **Inside** mount is required. (See lower left side of front view drawing for examples.)
- Enter outside rail dimension;

or

- Enter panel length. If outside rail dimension is specified, it will dictate the panel length and vice versa. (See note.)
- Enter panel height, frame type, and construction of nonadjustable area.

- Enter lift height. This will usually be the same as panel height.
- Enter upper and lower rail limits, if any.
- If outside mounted, enter the appropriate location of upper and lower mounting point for each rail. These dimensions plus the panel height and lift height will help determine the length of the rails.
- Enter the desired length of the four rail supports. Allow for any obstructions (7" min. for air lift only).
- Enter dimensions and information for panel segments and/or side guards as required.
- Check type of electrical interlock switch, if any.



ELECTRICAL INTERLOCK

Locking
 Nonlocking
 None

INTRODUCTION TO PERIMETER GUARDING SYSTEMS

Perimeter safeguarding is used in numerous applications in manufacturing: around robots and robot systems, assembly machines, packaging machines, transfer lines, cut-to-length lines, slitting lines, etc. It is also applied in a diverse number of industries such as printing, bottling, food processing, textiles, and petroleum products.

When safeguarding the perimeter area around a machine or process, the safeguarding must prevent access to the hazard or cause the hazard to cease. To protect individuals that work in or around large work areas, several choices of primary safeguarding are available under these categories:

1. **Barrier guards** are physical barriers that prevent access to the hazard.
2. **Presence-sensing devices**, such as light curtains, single- or multiple-beam devices, area scanners, radio-frequency devices, and pressure-sensitive mats, detect the presence of a person and stop the hazardous motion of the robot or machine.
3. **Hostage controls** can be applied where an application requires that a control be held actuated while the machine is running. Two-hand controls, or a single-hand or foot control, can be used for this. A hostage control must be fixed in position at the proper safety distance to keep the operator at a safe distance from the hazard. However, hostage controls only protect the individuals using them, so other safeguarding must be provided for other personnel that are exposed to the hazard.

Additional supplemental safeguarding can be applied with the use of awareness barriers, awareness signals (audible or visual), warning signs, and color-coding. Safety procedures and personal protective equipment can also play a role in protecting individuals.

Risk assessment and hazard analysis should be done before applying safeguards to a perimeter application. First, identify the hazards; second, identify the risk that individuals will be exposed to around the machine and equipment. Lastly, decisions must be made as to what tolerable risk remains when running production, setting up, and maintaining the machine and equipment.

Two safety standards in North America are usually referenced when applying perimeter safeguarding:

1. ANSI/RIA* R15.06-1999, *American National Standard for Industrial Robots and Robot Systems—Safety Requirements*
2. CSA† Z434-03, *Industrial Robots and Robot Systems—General Safety Requirements*.

Both standards require that safeguards are designed, constructed, attached, and maintained so that personnel cannot reach over, under, around, or through the guard or device undetected and reach the hazard.

Barrier guards must prevent access to a hazard. They must be constructed with materials (such as steel or aluminum) that will hold up to the environment and application, and must not themselves create a hazard.

If openings are needed in a guard, the openings must comply with the guard-opening table in the standards. Any fixed portion of a guard must require the use of tools to be adjusted or removed. If the possibility

exists that some object, workpiece, etc., can be ejected from the hazard area, the barrier guard must contain these objects.

The requirements for barrier guards are the same in both the ANSI/RIA and CSA standards. The only difference is in the minimum height requirements of the bottom and top of the guard above adjacent walking surfaces.

ANSI/RIA R15.06 requires that the bottom of the guard be no more than 12 inches above adjacent walking surfaces and that the top of the guard be no lower than 60 inches above adjacent walking surfaces unless additional safeguarding devices are installed to prevent or detect access to the hazard.

CSA Z434 has the same language except the dimensions are 6 inches for the bottom of the guard and 72 inches for the top of the guard above adjacent walking surfaces.

When barrier guards have interlocked sections, each section must provide two sets of contacts unless the risk assessment determines one set of contacts is acceptable. If magnetic switches are used, they must be magnetically coded to reduce the possibility of defeat or interference. Switches designed with a positive opening operation must be mounted in a positive mode so that when the actuator is disengaged, the motion forces a nonresilient linkage to open the closed contact(s) tied in to the safety-stop circuit.

Switches other than positive-opening switches must be automatically monitored to detect faults with the switches or their installation. The interlocking device must not be used as an end-of-travel stop. It must be tamper-resistant and unable to be defeated without tools, and it must be capable of being easily unlocked from the inside of the safeguarded area with or without power available (when the possibility of full body access exists). The device must be interfaced to the safety-stop circuit so that the robot or machine cannot be placed in automatic operation until the interlocked guard is closed. When the guard is opened, a stop signal must be given by the device, and closing of the guard must not, by itself, restart automatic operation—automatic operation must require a deliberate action outside the safeguarded area.

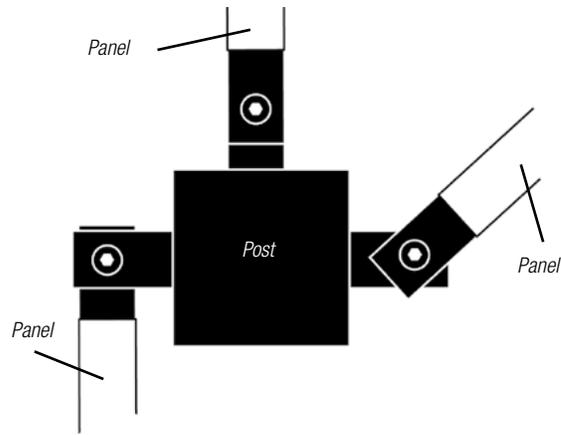
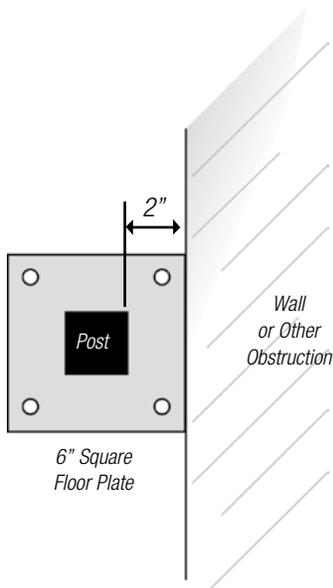
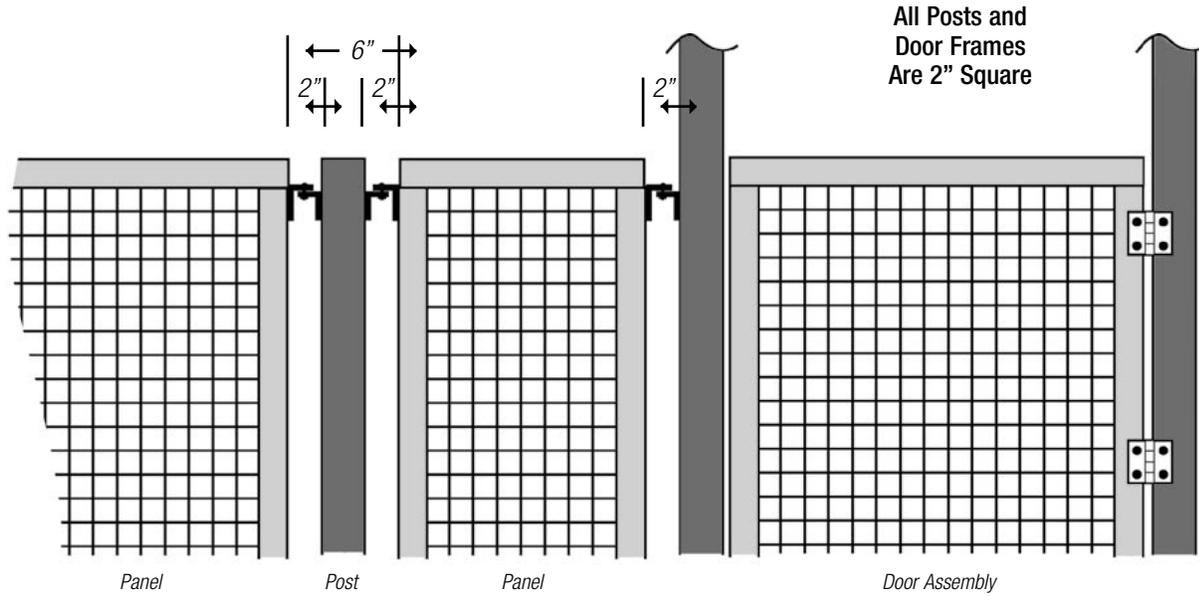
To ensure that an individual is out of the hazard area so that automatic operation cannot be accidentally restarted by someone else, the interlocking system should require a key, password or security code from that individual before permitting restart. For special interlock controls, please consult the factory for details.

*American National Standards Institute/Robotic Industries Association

†Canadian Standards Association

MEASURING PERIMETER GUARDS

The aluminum perimeter guarding systems offered in this catalog consist of aluminum panels and posts. The mounting hardware and distances between components are shown below. Please refer to the following drawings when measuring.



The standard panels are furnished in widths of 18", 24", 30", and 36". Standard doors are either 30" or 36" wide. Special panels and doors are available upon request; please consult the factory.

The L-shaped panel-to-post connector shown on page 26 will allow the panel to be positioned anywhere within 180° of the post. This allows the panel to be at an angle from the post, which makes installation easy at corners.

ALUMINUM PANELS, DOORS AND POSTS



The outside door frame is constructed of 2" square aluminum with two T-slots on each side. The frame sits in the same foot described above and the door posts are fastened together at the top for stability. The height under the door frame is 84".

The door is constructed of a 1" x 2" aluminum frame. The center portion is available in 1" or 2" square black mesh, 1" square yellow mesh, or 3/16"-thick clear polycarbonate. Special doors and center material are available upon request.

The aluminum posts are constructed of 2" square aluminum with two T-slots on each side. The standard posts are 60" or 72" high. Special-height posts are available upon request.

The foot for the post is 6" square with four holes on 4 1/2" centers. The foot is constructed of steel.

For more information about our customized perimeter guarding systems, please contact a machine safeguarding specialist.

The aluminum panels are constructed of 1" square aluminum frames with a T-slot on all four sides. The material in the center portion of the panel can be 1" or 2" square black mesh, 1" square yellow mesh, or 3/16"-thick clear polycarbonate.

The mesh is held in the frame with clamps and the polycarbonate is held in place with a rubber gasket.

The standard panels are furnished in widths of 18", 24", 30", and 36". Standard heights are 48" (60" height from the floor) and 66" (72" height from the floor). This provides a 6" sweep under the 66" high panel and a 6" sweep under the 72" high panel. Other center materials and special-size panels are available upon request.



Post

HARDWARE

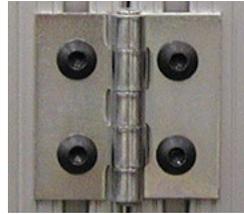
PANEL-TO-POST CONNECTOR



Part No. STL013 Panel-to-Post Connector

The connector assembly for attaching a panel to a post consists of two right-angle steel brackets. One bracket has an elongated slot and the other has a tapped hole. A fastener with nut is included.

HINGE FOR ALUMINUM DOOR



Part No. FKT584 Hinge

This steel hinge measures 2" x 2". Four hinges are furnished on each door.

DOOR STOP FOR ALUMINUM DOOR



Part No. FKT595 Door Stop

The door stop is made of aluminum. Two are furnished for each door.

INTERLOCKING DOOR BOLTS



Closed



Open

Interlocking door bolts are made of steel and aluminum components. The sliding type slides back and forth to latch the door closed and provides a guide for the interlock switch. The back side of the assembly has a knob to slide the bolt open if someone is inside the guard and the bolt is latched. It is available for both hinged and lift-off doors. The fixed type is available for sliding doors. Special latch hardware for other interlock switches is available upon request.

Note: These interlocking door bolts do not include a safety interlock switch.

For use with Safety Switches 6025060, 6022580, 6025067, and 6025073

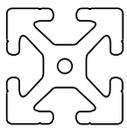
NO.	DESCRIPTION
SL20L	Sliding Type for a Hinged-Left or Lift-Off Door
SL20R	Sliding Type for a Hinged-Right or Lift-Off Door
FKT1019	Fixed Type for a Sliding Door that Opens Left to Right
FKT1020	Fixed Type for a Sliding Door that Opens Right to Left

EXTRUSIONS

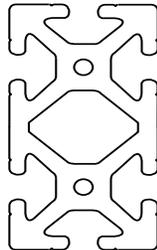
This page illustrates cross sections of the various extruded aluminum sizes that are available. Most of the guards and barriers offered in this catalog use the 1" square, 1" x 2", 1½" square, or 2" square sizes. Larger sizes are available for guards, fixtures, mounting brackets, machine bases, furniture, or anything that requires this type of material for its design and construction. Extrusions are in stock in 12-foot lengths; however, longer lengths are available up to 20 feet. The extrusions are made of strong, lightweight 6105-T5, clear anodized, #204-R1 aluminum.

MATERIAL SPECIFICATIONS

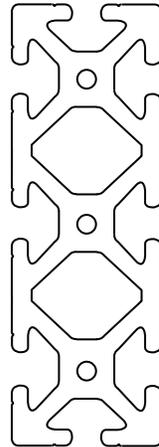
- Yield strength 35,000 lb/in² minimum
- Tensile strength 38,000 lb/in² minimum
- Elongation A5 minimum 10%
- Elongation A10 minimum 8%
- Rockwell hardness approximately E-88
- Extrusion conforming to DIN 17 615 specifications
- Twist per foot of length not to exceed .25 degree and total twist over 20 feet of length not to exceed 1.5 degrees
- Flatness .004" per inch of width
- Straightness 0.0125" per foot of length, not to exceed .120" over 20 feet of length
- All extrusions have etch and clear (204-R1) anodizing with depth of .004" and surface hardness of approximately 250 HV



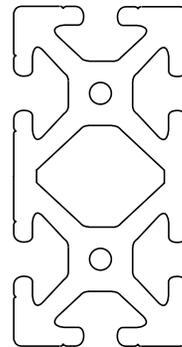
Part No. EXT1010
(per inch)
Part No. FKT1036
(per 12' length)
1" x 1"



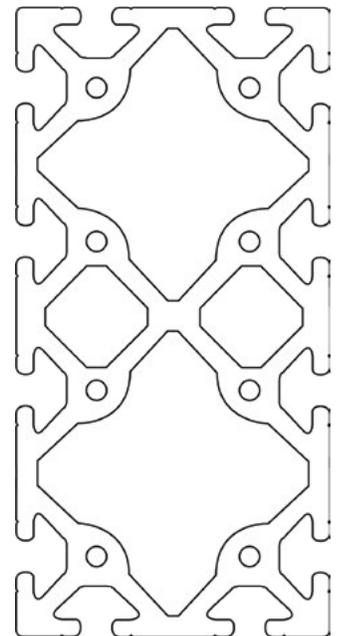
Part No. EXT1020
(per inch)
Part No. FKT1037
(per 12' length)
1" x 2"



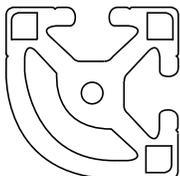
Part No. EXT1030
1" x 3"



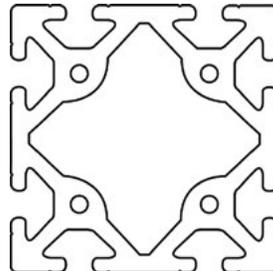
Part No. EXT1530
1½" x 3"



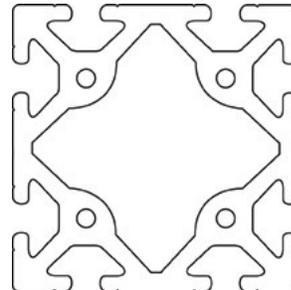
Part No. EXT3060
3" x 6"



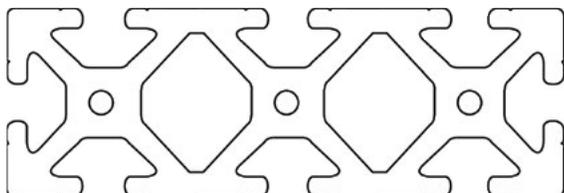
Part No. FKT537
1½" x Quarter Round



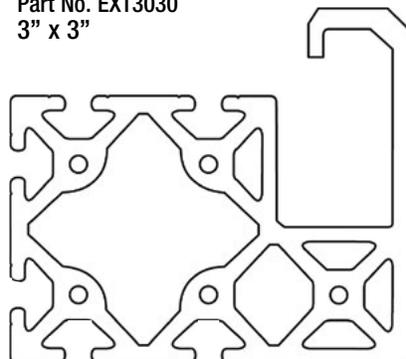
Part No. EXT2020
(per inch)
Part No. FKT1038
(per 12' length)
2" x 2"



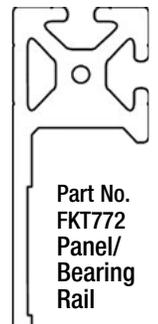
Part No. EXT3030
3" x 3"



Part No. EXT1545
1½" x 4½"



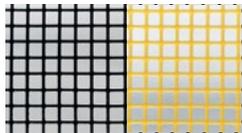
Part No. FKT773
Rail Extrusion



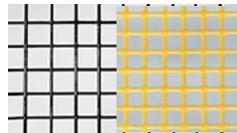
Part No. FKT772
Panel/
Bearing
Rail

MESH

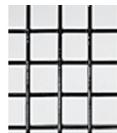
The nonadjustable area of a panel can be constructed of black or yellow mesh (1/2" square 16 gauge, 1" square 12-gauge, or 2" square 16-gauge). Usually, the 1/2" square mesh is used for point-of-operation guards and the 1" or 2" square mesh is used for large work envelope (perimeter) safeguarding. The mesh is made of PVC-coated carbon steel which is rust resistant. Black mesh provides better visibility into the point of operation. Mesh can be ordered in any size up to 48 x 96 inches. Please provide dimensions when ordering.



1/2" Square
Black or Yellow Mesh



1" Square
Black or Yellow Mesh



2" Square
Black Mesh

ORDERING INFORMATION		
PART NO.	DESCRIPTION	SIZE
MSHPVC12BLK	Black 1/2" square	Per in ²
FKT1049	Black 1/2" square	Per 4' x 8'
MSHPVC1BLK	Black 1" square	Per in ²
FKT1031	Black 1" square	Per 4' x 8'
MSHPVC2BLK	Black 2" square	Per in ²
FKT1033	Black 2" square	Per 4' x 8'
MSHPVC12YEL	Yellow 1/2" square	Per in ²
FKT1050	Yellow 1/2" square	Per 4' x 8'
MSHPVC1YEL	Yellow 1" square	Per in ²
FKT1032	Yellow 1" square	Per 4' x 8'

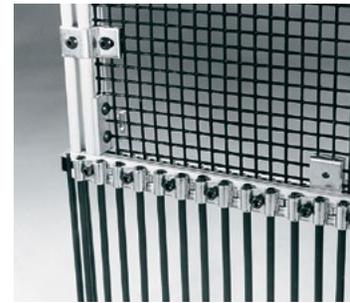
PANEL RETAINER

PART NO. FKT560

The panel retainer holds mesh in the extruded-aluminum framework of the guard. This retainer prevents panel push out and is the strongest way to hold panels in place.

Front View of Panel Retainer

Rear View of Panel Retainer



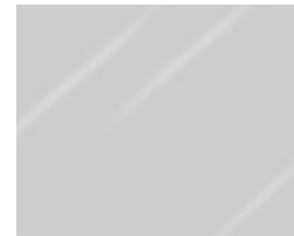
POLYCARBONATE

PART NO. SHTPLYCLR177 (PER SQ. INCH)

PART NO. FKT1035 (4' X 8')

The nonadjustable area of a panel can be constructed of clear polycarbonate. Polycarbonate is ideal when high visibility is required. It is also useful for containing chips, sparks, and coolant.

The polycarbonate is 3/16"-thick and can be mounted in extruded-aluminum frames with rubber gaskets (see below). Please provide dimensions when ordering; sizes available up to 48 x 96 inches.



3/16"-Thick Polycarbonate

RUBBER GASKET FOR POLYCARBONATE PANEL

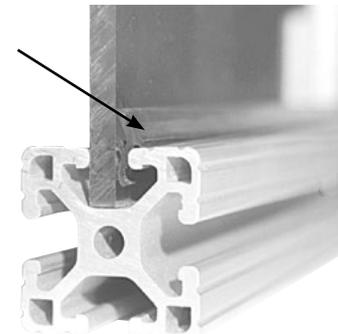
PART NO. GSKT10

The rubber gasket tightly holds the polycarbonate panels in the T-slot of the extruded aluminum. This gasket is made of high-grip rubber and is easily inserted into the T-slot after the panel is assembled in the frame. Polycarbonate panels (3/16"-thick) are secured with the gasket on one side of the panel. The gasket material can be ordered by the inch.



Rubber Gasket

Gasket Shown Inserted Into T-Slot With Polycarbonate Panel



T-SLOT COVERS

These T-slot covers snap into the T-slots of the extruded aluminum. They keep dust and dirt out and wires in place.

FKT726
Gray T-Slot Cover



FKT839
Yellow T-Slot Cover

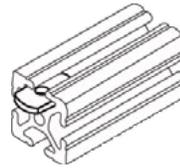


T-NUTS

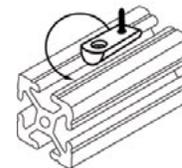
T-nuts allow joining plates, panels, hinges and other accessories to be bolted into the T-slot of any of the extrusions. They are made of hardened steel and are coated with corrosion-resistant black oxide. Standard T-nuts slide into the T-slot from the end.

The drop-in style allows the T-nut to be dropped into the slot after the extrusions have already been fastened together. T-nuts are usually fastened to button-head cap screws.

ORDERING INFORMATION	
PART NO.	DESCRIPTION
FSY028	End-Load T-nut
FST586	Drop-In Style T-nut
FSC072	Button-Head Cap Screw (1/4-20 x 1/2")



End-Load T-nut



Drop-In-Style T-nut



Button-Head Cap Screw

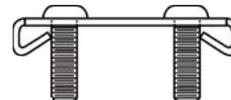
END FASTENERS

The end fastener provides a concealed method for connecting extrusions at 90° without external joining plates. The end fastener creates a tight, square joint. These fasteners consist of a stamping that aligns the T-slots and a button-head cap screw that threads into the tapped extrusion end. The end fastener is ideal for tight space restrictions. When loosened, connected extrusions glide smoothly over end fasteners. When connecting extrusions, 1/4" drilled access holes are required to allow a hex wrench to reach the button-head cap screws. Access holes are drilled 1/2" from the end of the extrusion. Additional holes are drilled at 1" centers from the first hole.

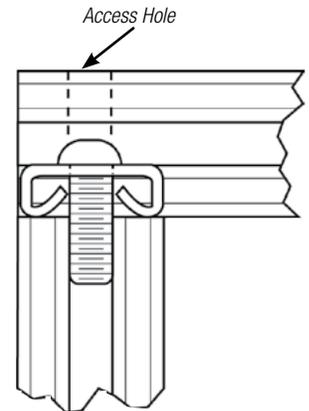
ORDERING INFORMATION	
PART NO.	DESCRIPTION
FKT562	End Fastener
FKT613	Double End Fastener
FSC072	Button-Head Cap Screw (1/4-20 x 1/2")



Part No. FKT562 End Fastener With Button-Head Screw for 1" Square Extrusions



Part No. FKT613 Double End Fastener With Button-Head Screw for 1" x 2" and 2" x 2" Extrusions



Cross Section of End Fastener Connecting Extrusions at 90°

HAIRPINS AND FASTENERS



The adjustable area of a panel consists of individual black-oxidized steel hairpins. These hairpins are 1/4" round rods on 3/4" centers (1" wide from outside to outside) which create a 1/2" opening between hairpins. Hairpins provide adjustability of the guard for going around conveyors, chutes, or other obstructions on the machine or robot.

The clip that secures the hairpin in place uses 1" of the total hairpin length, and the rounded tip uses 1/2". For this reason, add 1 1/2" to the adjustability required on the hairpin to obtain the proper hairpin length. Example: An 11" hairpin will have 9 1/2" of adjustability; a 20" hairpin will have 18 1/2" of adjustability, etc.

Part No. FKT753 Hairpin Clip Assembly



Clips and Fasteners

Each hairpin is secured to the panel frame with one clip, one socket-head cap screw, and one T-nut.

HAIRPINS AND FASTENERS (CONTINUED)

ORDERING INFORMATION					
LENGTH	PART NO.	LENGTH	PART NO.	LENGTH	PART NO.
3"	HP030	13"	HP130	22"	HP220
4"	HP040	14"	HP140	23"	HP230
5"	HP050	15"	HP150	24"	HP240
6"	HP060	16"	HP160	25"	HP250
7"	HP070	17"	HP170	26"	HP260
8"	HP080	18"	HP180	27"	HP270
9"	HP090	19"	HP190	28"	HP280
10"	HP100	20"	HP200	29"	HP290
11"	HP110	21"	HP210	30"	HP300
12"	HP120				

ROLLER BEARING ASSEMBLY

PART NO. FKT837

The roller bearing assembly is used on the spring- and air-lift guards shown on pages 20 and 21 of this catalog, and on gate assemblies. These bearings are available for guiding guards up and down or back and forth. The roller bearing assembly consists of a roller bearing, bearing plate, collar, and necessary hardware.



Roller Bearing Assembly



Roller Bearing Entering Extrusion

HINGES

PART NO. FKT687 (STANDARD)
 PART NO. FKT671 (LIFT-OFF RIGHT)
 PART NO. FKT670 (LIFT-OFF LEFT)

Hinges are used to swing guard panels and segments to the right or left. They are attached to the aluminum extrusion anywhere along the T-slot with button-head or socket-head cap screws and T-nuts (furnished). Standard aluminum hinges and lift-off hinges are available.



Part No. FKT687 One
 (1) Standard Hinge
 With Fasteners



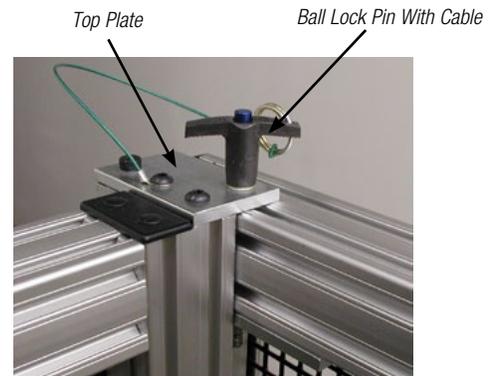
Part No. FKT671
 Lift-Off Assembly (Right)
 Part No. FKT670
 Lift-Off Assembly (Left)

Note: Both lift-off assemblies consist of five hinge parts plus fasteners.

SWING-AWAY HINGE ASSEMBLY

PART NO. FKT655

This specially designed hinge assembly is used on the light curtain swing-away mounting brackets. The assembly consists of two plates with fasteners for the top and bottom of the swing-away bracket. The top plate has a ball lock pin that holds the side guard in position. These hinges are designed to allow the side panel to move forward or backward for light curtain safety distance adjustment. Please use **Part No. FKT655** for ordering one right or left swing-away hinge assembly.



DEADBOLT LATCH

PART NO. FKT620

A deadbolt latch is ideal for holding guard doors closed. This spring-loaded deadbolt is made of anodized aluminum. A socket-head locking set-screw located towards the end of the latch requires the use of a tool to open the guard. This feature complies with OSHA 29 CFR 1910.217 (c)(2)(d). This deadbolt with side latch includes all mounting hardware.



Socket-Head Locking Set-Screw



DOOR HANDLE

PART NO. TXS101

This plastic door handle is ideal for T-slot frame doors on guards or shields. Handles bolt directly to doors and panels using two 1/4-20 screws and two T-nuts (sold separately, see chart). The handle is made of high-strength black polycarbonate and is corrosion resistant.



ORDERING INFORMATION	
PART NO.	DESCRIPTION
TXS101	Door Handle
FSC072	1/4-20 x 1/2" Screw
FSY028	T-Nut

END CAPS

End caps are made of black high-impact styrene. They fit easily onto the end of extrusions to present a finished look. Push-in fasteners (sold separately) are used to secure the end caps to the extrusion. Other sizes are available—please consult the factory.



ORDERING INFORMATION	
PART NO.	DESCRIPTION
FKT615	1" x 1" End Cap
FKT600	1" x 2" End Cap
FKT551	2" x 2" End Cap
FKT653	Push-In Fastener

T-HANDLE HEX WRENCHES

The T-handle hex wrench is an ideal way to tighten and loosen button-head cap screws and socket-head cap screws. The handle has a cushion grip and the long arm provides access to hard to reach areas. The end of the hex wrench is ball-shaped which allows for angle entry up to 25°. Two sizes are available.

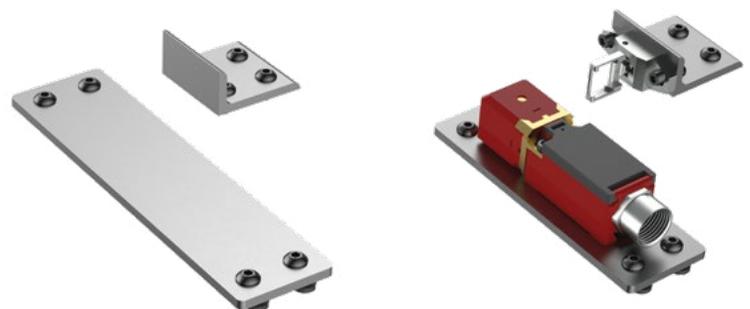


ORDERING INFORMATION	
PART NO.	DESCRIPTION
FKT658	3/16" Hex Wrench
FKT657	5/32" Hex Wrench

BRACKETS FOR INTERLOCK SWITCHES

EXAL0016 is a universal kit for mounting interlock switches to extrusions and latch assemblies, using aluminum plate and angle. Drilling and tapping for the switch components is required.

For switch-specific mounting kits or switch selection for a specific application, contact Rockford Systems at 1-800-922-7533 or email customerservice@rockfordsystems.com.



Universal Interlock Switch Mounting Bracket Kit
EXAL0016

BRACKETS AND PLATES

A variety of brackets, plates, clamps, bolts, bearings, rollers, etc., are available for attaching guards to machines and for guard assemblies. Joining plates are used to connect extruded panels without additional machining.



Part No. FKT560
Mesh Clamp Assembly



Part No. FKT604
1" Mesh Clamp



Part No. FKT647
2" Mesh Clamp



Part No. FKT562
Single End Fastener



Part No. FKT613
Double End Fastener



Part No. FKT586
1/4-20 Drop-In T-Nut



Part No. FKT587
1/4-20 Drop-In T-Nut W/Set Screw



Part No. FKT630
Channel Guide



Part No. FKT589
Roller Wheel



Part No. FKT837
Roller Bearing Assembly



Part No. FKT636
Linear Bearing



Part No. FKT649
Double-Wide Linear Bearing



Part No. FSY028
1/4-20 Standard T-Nut



Part No. FKT753
Hairpin Clip Assembly



Part No. FKT754
End Cap for Hairpins



Part No. FKT558
90° SAB Hinge Nub



Part No. FKT606
180° Living Nub



Part No. FKT555
L-Bracket W/Brass Insert



Part No. FKT559
Flat Pivot Arm W/Brass Insert



Part No. FKT656
Inside Bayonet Connector



Part No. FKT591
Locking Plate



Part No. FKT654
SAB Top Locking Plate

BRACKETS AND PLATES (CONTINUED)



Part No. FKT563
Bayonet Plate



Part No. FKT572
Joining Strip



Part No. FKT588
Joining Strip



Part No. FKT573
Joining Plate



Part No. FKT574
Joining Plate



Part No. FKT645
8-Hole Flat Joining Bracket



Part No. FKT554
90° Joining Plate



Part No. FKT575
90° Joining Plate



Part No. FKT576
90° Joining Plate



Part No. FKT577
Tee Joining Plate



Part No. FKT578
Tee Joining Plate



Part No. FKT596
Inside Corner Bracket



Part No. FKT597
Slotted Corner Bracket



Part No. FKT598
Single Floor-Mount Bracket



Part No. FKT557
Double Floor-Mount Bracket



Part No. FKT607
3/16" Inside Corner Bracket



Part No. FKT642
Inside Corner Bracket



Part No. FKT561
Inside Corner Bracket



Part No. FKT619
Inside Corner Bracket



Part No. FKT700
SSA Mounting Bracket



Part No. FKT616
Inside Corner Gusset



Part No. FKT631
90° Rotating Corner Bracket (Left)



Part No. FKT632
90° Rotating Corner Bracket (Right)



Part No. FKT691
45° Heavy-Duty Bracket



Part No. FKT1021
Ball Lock Pin With Cable

**FLOOR STAND
PART NO. KTR077**

When light bars (transmitter or receiver) cannot be conveniently mounted to the machine, a floor stand can be furnished. Floor stands can also be used when safeguarding large work envelopes or perimeter areas. Mirrors or single-beam devices can be attached to the floor stand when the application requires multiple-sided safeguarding. Light bars, single-beam devices, or mirrors can easily be adjusted up or down on any side of the upright extruded-aluminum stand.

This floor stand assembly consists of a 6' length of 2" square extruded aluminum, one base, and two right-angle brackets with fasteners. The base has four holes for permanent attachment to the floor with bolts (not furnished). Other floor stand sizes are available. Please consult the factory.



Floor Stand With Light
Curtain Transmitter

CONTROL BOX STANDS

When a control box cannot be conveniently mounted to the machine or the machine has excess vibration, rigid and adjustable control box stands are available. These stands are made of extruded aluminum and have base plates to permanently attach to the floor with bolts (not furnished).

Adjustable stands are available in models with height adjustment, and are also available in models with tilt adjustment for operator comfort.

ORDERING INFORMATION	
PART NO.	DESCRIPTION
KCL017	Vertical Adjustable Stand
KCL062	24" Wide Control Box Stand
KCL063	36" Wide Control Box Stand



Adjustable
From 28" to
47" Above the
Floor

Vertical Adjustable Stand



Tilt Adjustable Stand*

*Consult the factory for custom tilt stands.



78"
High

Control Box Stand With Control Box
and Combination Starter/Disconnect

FUNCTION-TESTING CHECKLIST FOR PERIMETER BARRIER GUARDS



This is a generic function-testing checklist. Your barrier guard may have other features that require different tests. Please refer to your barrier guard installation manual.



If the barrier guard is interlocked, make sure that the interlock device has been interfaced properly to the machine's control system to provide control reliability (if required, based on the risk assessment).

⚠ DANGER

Never place your hands or any part of your body in the hazard area while performing these tests.



Always perform these tests at every setup, operator, and shift change, as well as every time after maintenance is performed.

1. Make sure that the barrier guard is designed and constructed so that someone cannot reach over, under, around, or through the barrier guard and reach the hazard. Additional guards or safeguarding devices must protect all areas not protected by the barrier guard.
2. If there are openings in the barrier guard, check the openings for compliance with the ANSI/RIA* and CSA† guard-opening requirements. (See next page.)
3. Verify that the barrier guard is designed and constructed of materials substantial for the application to protect individuals from identified hazards. If the possibility exists that some object, workpiece, etc., can be ejected from the hazard area, confirm that the barrier guard will contain these objects.
4. Make sure that any fixed portion of the barrier guard must require the use of tools to be adjusted or removed.
5. Confirm that the barrier guard is fixed in position.
6. Check that the barrier guard is free of sharp edges and projections that may cause injury to individuals when handling, removing, or using the barrier guard.
7. Make sure that the barrier guard is installed, maintained, and operated such that it does not create any pinch points between itself and moving parts of the machine or robot.
8. Verify that the barrier guard provides adequate visibility to the point of operation, if required, with material such as perforated metal, wire mesh, or transparent polycarbonate. If visibility is provided through perforations or slots, the color of the material should be darker than the area observed to enhance visibility.
9. Check that the bottom of the guard is no more than 12 inches above adjacent walking surfaces and the top of the guard is no lower than 60 inches above adjacent walking surfaces.

Note: CSA Z434-03 uses dimensions of 6 inches for the bottom of the guard and 72 inches for the top of the guard.
10. If the barrier guard has one or more interlocked sections, perform the following tests for each interlocked section.
 - a. Check that the interlocked section opens laterally or away from the hazard, and not into the safeguarded space, and cannot close by itself and activate the interlocking circuitry.
 - b. With the machine on and ready to be cycled in a production mode of operation, open an interlocked section of the barrier guard and attempt to cycle the machine. The machine should not cycle.
 - c. An interlocked section must either (1) prevent opening until hazardous motion has stopped (with a **locking** interlock device), or (2) be located at the proper safety distance so that when it is opened, an individual cannot reach the hazard before hazardous motion has stopped (with a **nonlocking** interlock device).
 - (1) **Locking:** With all interlocked sections of the barrier guard closed while the machine is cycling, attempt to open an interlocked section. The interlocked section should not open. A locking interlocked section must open only when the hazardous motion of the machine has stopped after a normal stop command.
 - (2) **Nonlocking:** With all interlocked sections of the barrier guard closed while the machine is cycling, open an interlocked section. The machine should stop before someone can reach the hazard.



ANSI guard-opening scale being used to check openings for compliance

*American National Standards Institute/Robotic Industries Association

†Canadian Standards Association

FUNCTION-TESTING CHECKLIST FOR PERIMETER BARRIER GUARDS (CONTINUED)

- d. Verify that reclosing of an open interlocked section does not, by itself, cause any hazardous motion of the machine. Restarting of the machine must require a deliberate action outside the safeguarded area. To ensure that an individual is out of the hazard area so that automatic operation cannot be accidentally restarted by someone else, the interlocking system should require a key or a unique password or security code from that individual before permitting restart.
 - e. Verify that the interlock device will not be adversely affected by the environmental conditions.
 - f. Make sure that the interlock device is tamper-resistant and unable to be defeated without tools.
 - g. Confirm that the interlock device is not used as an end-of-travel stop for the interlocked section of the barrier guard.
 - h. Verify that the interlock device has two sets of contacts (unless the risk assessment determined that one set of contacts was acceptable). If the interlock device is a magnetic switch, make sure that it is magnetically coded to reduce the possibility of defeat or interference. Confirm that if the interlock device is a switch designed with a positive opening operation (cam-operated switching element), it is mounted in a positive mode so that when the actuator is disengaged, the motion forces a linkage to open the closed safety contact(s). If the interlock device is a switch other than a positive-opening switch (magnetic switch, limit switch, etc.), check that it is automatically monitored to detect faults with the switch or its installation.
 - i. Confirm that the interlock device is capable of being easily unlocked from the inside of the safeguarded area with or without power available (when the possibility of full body access exists).
 - j. Make sure that spare keys and actuating devices are supervisory-controlled and not readily available for the purpose of defeating the safeguard.
11. If any of these function tests fail, take corrective action before running production. If all tests pass, remove all keys from the selector switches before running production.

ANSI/RIA AND CSA GUARD-OPENING REQUIREMENTS

The minimum distance from the hazard as a function of barrier opening size as required by Table 5 of ANSI/RIA R15.06-1999, *Industrial Robots and Robot Systems—Safety Requirements*, and by Table 5 of CSA Z434-03, *Industrial Robots and Robot Systems—General Safety Requirements*, is as follows:

Barrier Opening Size (Smallest Dimension)		Minimum Distance From Hazard	
mm	inches	Slotted opening	Square opening
0.0–6.0	0.000–0.250	≥ 13.0 mm* [0.5 in]	≥ 13.0 mm* [0.5 in]
6.1–11.0	0.251–0.375	≥ 64.0 mm [2.5 in]	≥ 48 mm [1.9 in]
11.1–16.0	0.376–0.625	≥ 89.0 mm [3.5 in]	≥ 66 mm [2.6 in]
16.1–32.0	0.626–1.250	≥ 166.0 mm [6.5 in]	≥ 166.0 mm [6.5 in]
32.1–49.0	1.251–1.875	≥ 445.0 mm [17.5 in]	≥ 445.0 mm [17.5 in]
49.1–132.0†	1.876–5.000†	≥ 915.0 mm [36.0 in]	≥ 915.0 mm [36.0 in]

*Barriers shall not be located less than 13.0 mm (0.5 inches) from the hazard.

†Barrier openings shall not be greater than 132.0 mm (5.0 inches) unless a risk assessment is performed.

SAFETY DISTANCE FOR NONLOCKING INTERLOCKED BARRIER GUARDS

The safety equation for **nonlocking** interlocked barrier guards from Table 6 of ANSI/RIA R15.06-1999, *Industrial Robots and Robot Systems—Safety Requirements*, and from 10.4.3b of CSA Z434-03, *Industrial Robots and Robot Systems—General Safety Requirements*, is as follows:

$$D_s = K(T_s + T_c + T_r)$$

Where:

D_s = safety distance that the interlocked section of the barrier guard must be located from the hazard

K = maximum speed that an individual can approach the hazard (63 inches/second [1.6 meters/second] is commonly used)

T_s = worst stopping time of the machine/equipment

T_c = worst stopping time of the control system

T_r = reaction time of the interlock device and its interface

FUNCTION-TESTING CHECKLIST FOR POINT-OF-OPERATION BARRIER GUARDS



This is a generic function-testing checklist. Your barrier guard may have other features that require different tests. Please refer to your barrier guard installation manual.



If the barrier guard is interlocked, make sure that the interlock device has been interfaced properly to the machine's control system to provide control reliability.

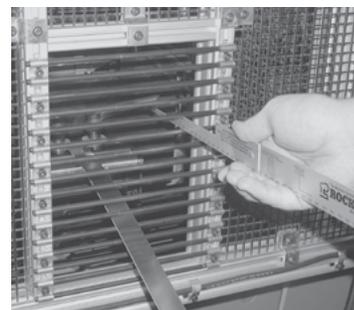
⚠ DANGER

Never place your hands or any part of your body in the hazard area while performing these tests.



Always perform these tests at every setup, operator, and shift change, as well as every time after maintenance is performed.

1. Make sure that the barrier guard is designed and constructed so that someone cannot reach over, under, around, or through the barrier guard and reach the hazard. Additional guards or safeguarding devices must protect all areas not protected by the barrier guard.
2. If there are openings in the barrier guard, check the openings for compliance with the OSHA or ANSI guard-opening requirements. (See next page.)
3. Verify that the barrier guard is designed and constructed of materials substantial for the application to protect individuals from identified hazards.
4. Make sure that the barrier guard is designed, constructed, and maintained with fasteners not readily removable to protect against unauthorized adjustment or circumvention. Examples of fasteners that should **not** be used are slotted or Phillips head screws, wing nuts, magnets, latches and hasps, and hooks and eyes.
5. Confirm that the barrier guard is designed and constructed to ensure ease of use. If the barrier guard is overly large or cumbersome, it may discourage proper use.
6. Check that the barrier guard is free of sharp edges, burrs, slag welds, etc., that may cause injury to individuals when handling, removing, or using the barrier guard.
7. Make sure that the barrier guard is installed, maintained, and operated such that it does not create any pinch points between itself and moving parts of the machine.
8. Verify that the barrier guard provides adequate visibility to the point of operation, if required, with material such as perforated metal, wire mesh, or transparent polycarbonate. If visibility is provided through perforations or slots, the color of the material should be darker than the area observed to enhance visibility.
9. If the barrier guard has one or more interlocked sections, perform the following tests for each interlocked section.
 - a. With the machine on and ready to be cycled in a production mode of operation, open an interlocked section of the barrier guard and attempt to cycle the machine. The machine should not cycle.
 - b. An interlocked section must either (1) prevent opening until hazardous motion has stopped (with a **locking** interlock device), or (2) be located at the proper safety distance so that an individual cannot reach the hazard before hazardous motion has stopped when it is opened (with a **nonlocking** interlock device; see next page for the ANSI safety-distance equation).
 - (1) **Locking:** With all interlocked sections of the barrier guard closed while the machine is cycling, attempt to open an interlocked section. The interlocked section should not open. A locking interlocked section must open only when the hazardous motion of the machine has stopped after a normal stop command.
 - (2) **Nonlocking:** With all interlocked sections of the barrier guard closed while the machine is cycling, open an interlocked section. The machine should stop.
 - c. Verify that reclosing of an open interlocked section does not, by itself, cause any hazardous motion of the machine. Restarting of the machine must require a deliberate action, such as reactuating the normal actuating means.
10. If any of these function tests fail, take corrective action before running production. If all tests pass, remove all keys from the selector switches before running production.



Guard-opening scale being used to check openings for compliance

OSHA GUARD-OPENING REQUIREMENTS

The maximum permissible opening for guards as required by OSHA 29 CFR 1910.217 for mechanical power presses is as follows:

TABLE O-10

Distance of opening from point-of-operation hazard (inches)	Maximum width of opening (inches)
½ to 1½	¼
1½ to 2½	⅜
2½ to 3½	½
3½ to 5½	⅝
5½ to 6½	¾
6½ to 7½	⅞
7½ to 12½	1¼
12½ to 15½	1½
15½ to 17½	1⅞
17½ to 31½	2⅞

ANSI GUARD-OPENING REQUIREMENTS

The maximum permissible opening for guards as required by Annex D of ANSI B11.19-2003, Performance Criteria for Safeguarding, is as follows:

As a function of gap size in millimeters (inches)		As a function of distance in millimeters (inches)					
Known Gap		Minimum Distance		Known Distance		Maximum Gap	
0–6	(0–0.24)	13	(0.5)	< 13	(< 0.5)	Not permitted	
6.1–11	(0.25–0.375)	64	(2.5)	13–63.9	(0.5–2.49)	6	(0.250)
11.1–16	(0.376–0.625)	89	(3.5)	64–88.9	(2.5–3.49)	11	(0.375)
16.1–32	(0.626–1.250)	166	(6.5)	89–165.9	(3.5–6.49)	16	(0.625)
32.1–49	(1.251–1.875)	445	(17.5)	166–444.9	(6.5–17.49)	32	(1.250)
49.1–132	(1.876–5.000)	915	(36.0)	445–914.9	(17.5–35.99)	49	(1.875)
> 132	(> 5.0)	Not permitted		≥ 915	(≥ 36.0)	132	(5.000)

OSHA AND ANSI GUARD-OPENING SCALES

OSHA Guard-Opening Scale – Part No. KSC097

ANSI/CSA Guard-Opening Scale – Part No. KSC098



An OSHA or ANSI guard-opening scale can be used during the design, installation, and inspection of barrier guards to make sure they comply with the OSHA and ANSI guard-opening requirements. These stainless-steel guard-opening scales are available online at www.rockfordsystems.com.

SAFETY DISTANCE FOR NONLOCKING INTERLOCKED BARRIER GUARDS

The safety-distance equation for nonlocking interlocked barrier guards from Annex D of ANSI B11.19-2003, *Performance Criteria for Safeguarding*, is as follows:

$$D_s = K(T_s + T_c + T_r + T_{spm})$$

Where:

- D_s = safety distance that the interlocked section of the barrier guard must be located from the point-of-operation hazard
- K = maximum speed that an individual can approach the hazard (63 inches/second is commonly used)
- T_s = stopping time of the machine measured at the final control element
- T_c = reaction time of the control system
- T_r = reaction time of the interlock device and its interface
- T_{spm} = additional time allowed for the stopping-performance monitor to compensate for variations in normal stopping time (if applicable)

EXAMPLES OF SPECIAL PERIMETER AND POINT-OF-OPERATION BARRIER GUARDS



Guard on a Straightener



Guard on a Package Roller



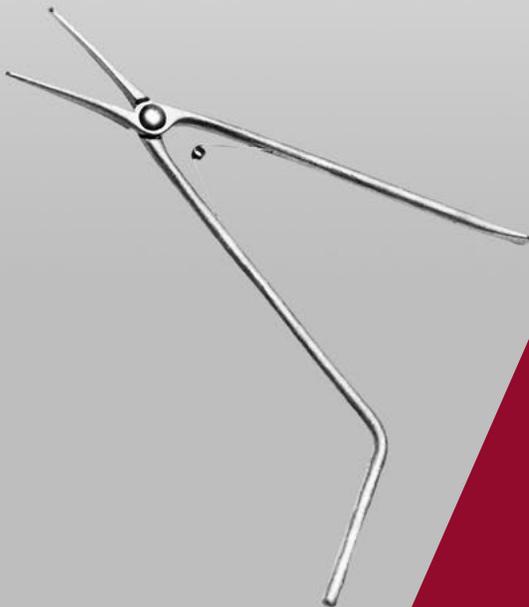
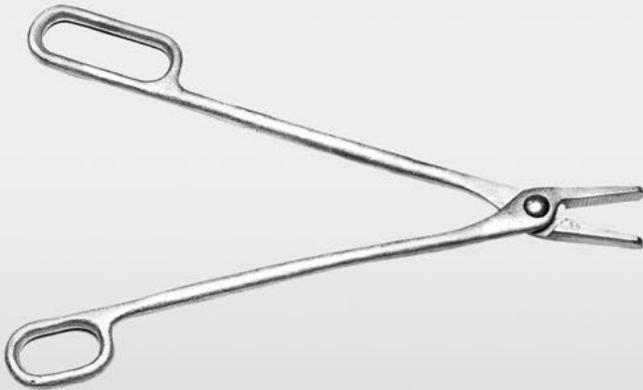
Spring-Lift Guard on a Straight-Side Press
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HAND-FEEDING AND RETRIEVAL TOOLS (PLIERS, POSITIONERS, TONGS, AND VACU-TONGS)

A wide variety of hand-feeding tools are available. They are used to keep hands out of the point of operation while feeding or removing parts from the machine. Although they are not considered to be guards or devices by themselves, hand tools do offer additional protection. In addition to numerous pliers and tongs, hand tools are available with either suction

cups or magnetic pick-ups. Most of the tools are constructed of soft alloy materials, engineered to easily crush if caught between dies or parts of the machine. Many of today's hand tools are designed with ergonomics in mind. This provides the operator with maximum comfort and minimum fatigue.

Part No. CYF550

Lightweight duckbill spring-opened pliers.
Jaw Length – 2-1/2"
Total Length – 7"
Weight – 2 oz



Part No. CYF557

Heavy-duty duckbill pliers.
Jaw Length – 3"
Total Length – 8-1/4"
Weight – 5-3/4 oz



Part No. CYF565

Similar to CYF564 with torsion spring.
Jaw Length – 3"
Total Length – 11-1/2"
Weight – 59/10 oz



Part No. CYF551

Pliers with long tapered jaws—ideal for small parts.
Jaw Length – 3"
Total Length – 7-1/2"
Weight – 2-1/4 oz



Part No. CYF558

Similar to CYF557 with thumb loop for operator comfort.
Jaw Length – 2-7/8"
Total Length – 8-5/8"
Weight – 5-1/2 oz



Part No. CYF566

Similar to CYF564 with vacuum cup.
Jaw Length – 3"
Total Length – 11"
Weight – 7 oz



Part No. CYF552

Pliers with a right-angle hook nose for gripping.
Jaw Length – 2-1/2"
Total Length – 7"
Weight – 2 oz



Part No. CYF559

Small, heavy-duty stubby pliers with good gripping capability.
Jaw Length – 1-1/2"
Total Length – 6-1/8"
Weight – 4 oz



Part No. CYF567

Heavy-duty straight-handled tongs for two-handed use.
Jaw Length – 3"
Total Length – 11-1/2"
Weight – 4 oz



Part No. CYF553

1-1/2" wide duckbill for rigid support.
Jaw Length – 3"
Total Length – 7-1/8"
Weight – 3-1/2 oz



Part No. CYF560

Medium-duty, spring-opened pliers with long nose.
Jaw Length – 4-1/2"
Total Length – 9-3/4"
Weight – 6 oz



Part No. CYF568

Medium-duty tongs with finger loops on both handles.
Jaw Length – 3"
Total Length – 10-1/2"
Weight – 6 oz



Part No. CYF555

Heavy-duty rugged plier.
Jaw Length – 2-3/4"
Total Length – 8-1/4"
Weight – 4 oz



Part No. CYF562

Ergonomic pliers with 45° bend.
Jaw Length – 3"
Total Length – 7"
Weight – 2-1/4 oz



Part No. CYF569

Popular ergonomic tongs with 30° bend and thumb loop.
Jaw Length – 2-7/8"
Total Length – 10"
Weight – 7 oz



Part No. CYF556

Similar to CYF551 with vacuum cup.
Jaw Length – 3"
Total Length – 7-1/2"
Weight – 4 oz



Part No. CYF564

Popular long-handled lightweight tongs.
Jaw Length – 3-1/8"
Total Length – 11-1/2"
Weight – 5 oz

Part No. CYF570

Ergonomic tong with 60° bend and two large loops. These tongs can be used in either direction.
Jaw Length – 2-1/2"
Total Length – 12"
Weight – 10 oz



HAND-FEEDING AND RETRIEVAL TOOLS (CONTINUED)

Part No. CYF571

Heavy-duty straight-handled tongs to handle parts up to 20 oz.
Jaw Length – 3"
Total Length – 10-5/8"
Weight – 6-1/2 oz



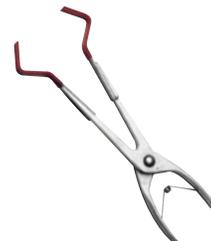
Part No. CYF577

Tong with short 1" jaw ruggedly designed for good gripping; gapped 3/16" for thick plate.
Total Length – 10"
Weight – 8 oz



Part No. CYF591

Designed to pick up 1-3/4" bushings.
Total Length – 13-1/8"
Weight – 7 oz



Part No. CYF572

Versatile heavy-duty tongs with thumb loop.
Jaw Length – 3"
Total Length – 10-1/2"
Weight – 7-1/2 oz



Part No. CYF579

Tongs with thin tapered jaw. Extremely light-weight for their size.
Jaw Length – 2"
Total Length – 10-1/2"
Weight – 8 oz



Part No. CYF593

90° bend to remove parts from die.
Total Length – 14"
Weight – 2-1/2 oz



Part No. CYF573

Similar to CYF572 with vacuum cup.
Jaw Length – 3"
Total Length – 10-1/2"
Weight – 9-1/2 oz



Part No. CYF580

Popular right-angle-jaw tongs for handling flanged or cup-shaped workpieces.
Jaw Length – 5/8"
Total Length – 10-3/8"
Weight – 9 oz



Part No. CYF595

Short-jaw tongs with long-handle protection.
Jaw Length – 2"
Total Length – 16"
Weight – 11 oz



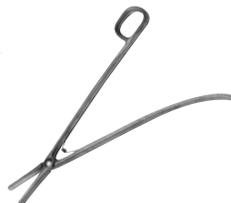
Part No. CYF574

Heavy-duty tongs with finger loops on both handles.
Jaw Length – 3"
Total Length – 10-5/8"
Weight – 8 oz



Part No. CYF586

Extra long lightweight tongs.
Jaw Length – 3"
Total Length – 16-1/4"
Weight – 8-1/2 oz



Part No. CYF597

Tongs designed to hold 1/4" stock. Jaws are spaced 1/4" parallel.
Jaw Length – 3"
Total Length – 18"
Weight – 15 oz



Part No. CYF575

Rugged tongs for heavy parts up to 5 lb.
Jaw Length – 3"
Total Length – 12"
Weight – 10 oz



Part No. CYF587

Needle-nose tongs designed to be held in the hand and closed by thumb pressure; ideal for small parts.
Jaw Depth – 2-7/8"
Total Length – 13-1/2"
Weight – 5-1/2 oz



Part No. CYF600

Lightweight tweezers.
Total Length – 6-1/2"
Weight – 11/10 oz



Part No. CYF576

Similar to CYF575 with adjustable set screw in jaw for extra gripping power or sheet pulling.
Jaw Length – 3"
Total Length – 12"
Weight – 11 oz



Part No. CYF590

Designed to pick up 1" bushings.
Total Length – 12-1/8"
Weight – 6 oz



Part No. CYF601

Heavier tweezers.
Total Length – 9"
Weight – 13/5 oz



VACUUM LIFTERS

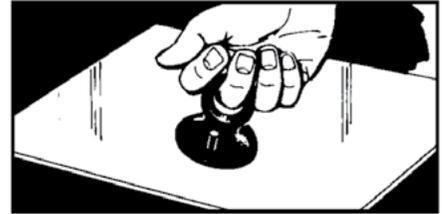
These vacuum lifters grip and hold oiled or dry sheet metal, glass, plastic, steel, plexiglass, polished stone, fiberglass, auto panels, or any other material with a smooth surface.

LITTLE-GRABBER LIFTER

These one-finger lifters are ideal for light objects or raising corners for better grip. Always handy and ready for use, yet leaves one hand free for other work. It has specially designed release tabs. Made from tough rubber compound.

Part No. KMK007 – 2-1/8" diameter (1" finger loop) – lifts 4 lbs

Part No. KMK056 – 2-5/8" diameter (1-1/4" finger loop for use with gloves) – lifts 6 lbs



KNUCKLE-SAVER LIFTER

This two-finger grip and larger cup provide extra lifting capacity. Its larger diameter makes this lifter ideal for greater loads. Breaks oil adhesions easily. It also has specially designed release tabs. Lifts about 10 pounds.

Part No. KMK008 – 3-1/4" diameter (1" finger loop)



SUPER-GRABBER LIFTER

This four-finger grip and larger cup provide extra lifting capacity. Its larger diameter makes this lifter ideal for greater loads. Breaks oil adhesions easily. It also has specially designed release tabs. Lifts about 12 pounds.

Part No. KMK055 – 4-3/4" diameter

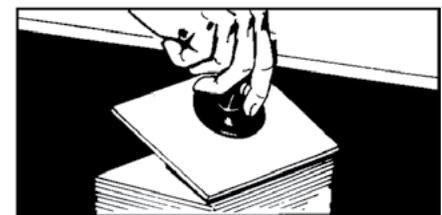


MEDIUM-DUTY LIFTER

Sturdy construction and a fast-action metal release valve offer safe, quick handling of smooth surface materials. Full-hand grip for extra strength gives operator extra freedom of movement. Lifts about 10 pounds.

Part No. KMK009 – 3-1/4" diameter

Part No. KMK013 – Replacement cup only – 3-1/4" diameter



MEDIUM-DUTY GRABBER/LIFTER

This combination grabber and lifter combines the flexibility of a grabber with the holding strength of a lifter. Just lift the tipped edge to release the vacuum. Lifts about 15 pounds.

Part No. KMK040 – 3-1/4" diameter



VACUUM LIFTERS (CONTINUED)

HEAVY-DUTY SHEET METAL LIFTER

These lifters have powerful suction to lift heavier loads. A handy trigger-valve release disengages the vacuum lifter instantly and safely. This saves wear and tear on gloves and hands. These lifters are generally used for loading, unloading, piling, and shifting sheet metal from trucks, stock, etc. The 3" cup lifts about 15 pounds; the 4" cup about 25 pounds; the 5" cup about 35 pounds.

Part No. KMK047 – single cup, 3" diameter

Part No. KMK043 – single cup, 4" diameter

Part No. KMK010 – single cup, 5" diameter



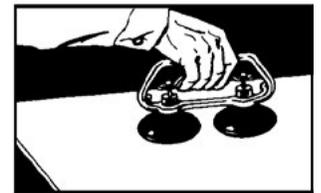
DOUBLE-CUP SHEET METAL LIFTER

These lifters have a convenient handle for one or two-handed lifting. Positive grip increases the operator's working capacity. Dual trigger valves disengage the lifter from material. The 3" cups lift about 30 pounds; the 4" cups about 50 pounds; and the 5" cups about 75 pounds.

Part No. KMK054 – 2 cups, 3" diameter each

Part No. KMK044 – 2 cups, 4" diameter each

Part No. KMK011 – 2 cups, 5" diameter each



REPLACEMENT CUPS:

Part No. KMK057 – 3" diameter single cup

Part No. KMK031 – 4" diameter single cup

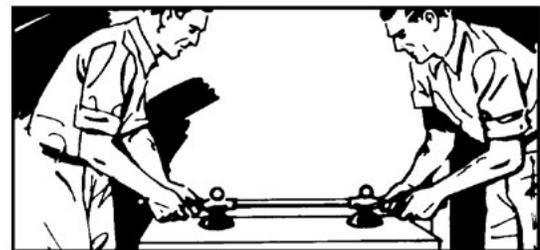
Part No. KMK014 – 5" diameter single cup

TWO-MAN VACUUM LIFTER

These lifters have extra capacity for extra safety. Ideal for moving heavy gauge metal, marble slab, heavy plate glass, and plastic sheets. The 4" cups lift about 50 pounds; the 5" cups about 75 pounds.

Part No. KMK041 – 2 cups, 4" diameter each

Part No. KMK042 – 2 cups, 5" diameter each



DOUBLE-CUP VERTI-LIFT

Powerful suction cups are used to lift and move loads from the floor without having to bend over. It has a handy trigger-valve release to disengage the vacuum lifter instantly and safely. These hand-operated vacuum lifters are used for repeated lifting and moving of non-porous materials on the ground level. The vertical handle is 32" and the total length is 37". The 4" cups lift about 50 pounds; the 5" cups about 75 pounds.

Part No. KMK045 – 4" cup diameter

Part No. KMK031 – Replacement cup (4")

Part No. KMK046 – 5" cup diameter

Part No. KMK014 – Replacement cup (5")



VACUUM LIFTERS (CONTINUED)

These lifters can be used to place and remove material in and from the machine. These tools are not to be used as a point-of-operation safeguard, but can be used to help keep the operator's hands out of the point of operation when loading parts.

These lifters have strengthened steel rods and oil-resistant flexible vacuum cups. They are ideal for handling plastic, metal, glass, and any other material that has a smooth, non-porous surface. There are three types of lifters to choose from. The single-cup lifter is available in three cup sizes. The double-cup lifter is available in one cup size. The straight-handle lifter has a handle attached to the top of the vacuum cup and provides the user with extra reach. All three lifters incorporate an instant release button. The 2-1/8" cup lifts about 3 pounds, the 3-1/4" cup lifts about 5 pounds, and the 4" cup lifts about 6 pounds. The double-cup lifters lift about 6 pounds.

REPLACEMENT CUPS:

Part No. KMK012 – 2-1/8" diameter

Part No. KMK013 – 3-1/4" diameter

Part No. KMK031 – 4" diameter



STRAIGHT-HANDLE LIFTER

PART NO.	LENGTH	CUP DIAMETER
KMK048	12" Handle	3-1/4"
KMK049	15" Handle	3-1/4"
KMK050	18" Handle	3-1/4"
KMK051	12" Handle	4"
KMK052	15" Handle	4"
KMK053	18" Handle	4"



SINGLE-CUP LIFTER

PART NO.	LENGTH	CUP DIAMETER
KMK001	12" Handle	2-1/8"
KMK034	15" Handle	2-1/8"
KMK002	18" Handle	2-1/8"
KMK003	12" Handle	3-1/4"
KMK004	15" Handle	3-1/4"
KMK035	18" Handle	3-1/4"
KMK033	12" Handle	4"
KMK005	15" Handle	4"
KMK036	18" Handle	4"



DOUBLE-CUP LIFTER

PART NO.	LENGTH	CUP DIAMETER
KMK037	12" Handle	2-1/8"
KMK006	15" Handle	2-1/8"
KMK038	18" Handle	2-1/8"

MAGNETIC TOOLS

Part No. CYF431

Pick-up capacity up to 3 pounds
with release handle.

Single magnet – 12" length



Part No. CYF432

Pick-up capacity up to 7 pounds
with release handle.

Double magnet – 14" length



Part No. CYF602

Pick-up capacity up to 3 pounds
with twist release.

Single magnet – 12" length



Part No. CYF603

Pick-up capacity up to 7 pounds
with twist release.

Double magnet – 14" length



Part No. CYF604

Pick-up capacity up to 4 ounces
with low profile.

Single magnet – 15" length



Part No. CYF605

Pick-up capacity up to 8 ounces
with low profile.

Double magnet – 15" length





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INTRODUCTION

1. **An Act—Public Law 91-596, 91st Congress, S. 2193, December 29, 1970, Duties, Section 5(a)(1)(2)(b)**
2. **OSHA 29 CFR sections that an employer (user) must comply with include:**
3. **OSHA 29 CFR 1910.147 The control of hazardous energy (lockout/tagout).**
4. **OSHA 29 CFR 1910.301-1910.399 Electrical**

ANSI Publications

B11.0	Risk Assessment for Machine Safety
B11.1	Mechanical Power Presses
B11.2	Hydraulic Power Presses
B11.3	Power Press Brakes
B11.4	Shears
B11.5	Iron Workers
B11.6	Manual Lathes
B11.7	Cold Headers and Formers
B11.8	Manual Drilling, Milling, and Boring
B11.9	Grinding Machines (and abrasive wheels)
B11.10	Metal Sawing Machines
B11.11	Gear and Spline Cutting Machines
B11.12	Roll Forming and Roll Bending Machines
B11.13	Automatic Screw, Bar and Chucking Machines
B11.14	Withdrawn See B11.18-2006
B11.15	Pipe, Tube, and Shape Bending Machines
B11.16	Metal Powder Compacting Presses
B11.17	Horizontal Hydraulic Extrusion Presses
B11.18	Coil Processing Systems
B11.19	Performance Criteria for Risk Reduction Measures
B11.20	Integrated Manufacturing Systems
B11.21	Machine Tools Laser Cutting
B11.22	Numerically Controlled Lathes
B11.23	Machining Centers
B11.24	Transfer Machines
B11.25	Large Machines (<2M Travel Axis)
ANSI/RIA R15.06	Safeguarding Industrial Robots
NFPA 79	Electrical Standard for Industrial Machinery
ASME B20.1-2012	Safety Standards for Conveyors
B11.TR1	Ergonomics (Machine Tools)
B11.TR2	Mist Control (Metal Working Fluids)
B11.TR3	Risk Assessment/Risk Reduction
B11.TR4	PLC/PES Programmable Logic Controllers
B11.TR5	Sound Level Measurements
B11.TR6	Safety Control Systems for Machines
B11.TR7	Design for Lean Manufacturing
B15.1	Mechanical Power Transmission Apparatus
B65.1	Printing Press Systems
B65.2	Binding and Finishing Systems
B65.5	Stand-Alone Platen Presses
B151.1	Horizontal (Plastic) Injection Molding Machines
B152.1	Hydraulic Die Casting Presses
B154.1	Rivet Setting Machines
B155.1	Packaging and Packaging-Related Converting Machinery
01.1	Woodworking Machinery

These standards can be purchased by contacting:

ANSI (American National Standards Institute, Inc.)
25 West 43rd Street, 4th Floor
New York, New York 10036
(212) 642-4900 • www.ansi.org

Another good reference for safety on machine tools is the following publication from the National Safety Council:

Safeguarding Concepts Illustrated—7th Edition

This publication can be purchased by contacting:

National Safety Council
1121 Spring Lake Drive
Itasca, IL 60143-3201
1-800-621-7615 • www.nsc.org

Other sources that can be used for reference include:

1. NFPA 79, Electrical Standard for Industrial Machinery

2. NEC (National Electrical Code) Handbook

These can be purchased by contacting:

National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
(617) 770-3000 • www.nfpa.org

3. NEMA (National Electrical Manufacturers Association)

1300 North 17th Street, Suite 1752
Rosslyn, VA 22209
(703) 841-3200 • www.nema.org

For additional safety information and assistance in devising, implementing or revising your safety program, please contact the machine manufacturer, your state and local safety councils, insurance carriers, national trade associations, and your state's occupational safety and health administration.

MECHANICAL POWER PRESS CONTROL SYSTEMS

Each mechanical power press must be looked at as an individual system. This system consists of, but is not limited to, the frame, all mechanical parts, clutch and brake assemblies, electrical or electronic systems, hydraulic systems, pneumatic systems, tooling or dies (present and future), tool or die setup, safeguarding, material handling, maintenance requirements, size or configuration of workpiece, and most importantly, production requirements.

OSHA STANDARDS

The controls and safeguarding systems offered in this section of the catalog will help the user of mechanical power presses (punch presses) meet or exceed OSHA 29 CFR 1910.212, 1910.217, 1910.219, 1910.147 and ANSI B11.1 safety standards as we interpret them. OSHA's Code of Federal Regulations can be purchased by contacting:

U.S. Government Printing Office

P.O. Box 371954
Pittsburgh, PA 15250-7954
(202) 512-1800
<http://bookstore.gpo.gov>

ANSI STANDARDS

There are several references available on press safety; however, most industries use the ANSI (American National Standards Institute) B11.1 standard for the best safety practice on power presses. This standard can be purchased by contacting:

ANSI

American National Standards Institute, Inc.
25 West 43rd Street, 4th Floor
New York, New York 10036
(212) 642-4900
www.ansi.org

TYPES OF CLUTCHES ON PRESSES

Most power presses have one of two types of clutches:

1. **Full Revolution** (sometimes referred to as a mechanical clutch)
2. **Part Revolution**, classified in two categories:
 - Air Clutch
 - Mechanical-Friction Clutch

CONDITION OF THE PRESS

The equipment offered in this catalog can neither cure nor overcome a malfunctioning machine or prevent a mechanical defect or failure of a component part thereof, nor prevent a repeat or unintended stroke (cycle) resulting from a mechanical malfunction, defect or failure of the machine itself.

For example, on mechanical power presses, a brake monitoring system can only detect a gradual deterioration of the brake on the press, not a catastrophic mechanical failure in the clutch/brake mechanism.



It is essential that the machine be thoroughly inspected and that all mechanical, electrical, pneumatic, and hydraulic components and systems, including all collateral equipment, be in first-class operating condition before any equipment is installed. A maintenance and inspection program must be established and implemented to keep machines in your plant in first-class condition. This program must include regular periodic inspections of each machine to ensure that, among other things, (i) the clutch and brake mechanism, mechanical linkages, and air counterbalances are operating and used properly; (ii) there is no dirt or water in the air lines; and (iii) the machine is operating at its proper speed (RPM or SPM). Any part of the machine that is worn, damaged, or not operating correctly must immediately be replaced or repaired before the machine is used.

MECHANICAL POWER PRESS CONTROL SYSTEMS

SAFETY CONSIDERATIONS ON PRESSES

Referencing OSHA 29 CFR 1910.217(d)(1), it states: “The employer shall (i) use dies and operating methods designed to control or eliminate hazards to operating personnel, and (ii) furnish and enforce the use of hand tools for freeing and removing stuck work or scrap pieces from the die, so that no employee need reach into the point of operation for such purposes.”

BASIC REQUIREMENTS

When updating presses to comply with the indicated safety standards, there are five basic requirements that must always be considered. They are:

1. **Safeguarding (Refer to Catalogs Safeguarding Devices & EX-AL)**
2. **Controls (pp. 7-46)**
3. **Disconnects (pp. 10, 11, 23, 27, 38, 45, and Safety Shields catalog)**
4. **Starters (pp. 10, 11, 23, 27, 38, 45, and Safety Shields catalog)**
5. **Covers (Refer to www.rockfordsystems.com for mechanical motion covers)**

This introduction and subsequent pages in this catalog will provide information on safety requirements in the above areas.

SAFEGUARDING

The following are OSHA-recognized methods for safeguarding the point of operation on mechanical power presses:

PART REVOLUTION

1. Barrier Guard (Refer to EX-AL catalog)
2. Two-Hand Control (pp. 18-46)
3. Presence-Sensing Device (Refer to Safeguarding Devices catalog)
4. Pullback (Not offered by Rockford Systems)
5. Restraint (Refer to Safeguarding Devices catalog)
6. Type A or B Gate (Refer to Safeguarding Devices catalog)

FULL REVOLUTION

1. Barrier Guard (Refer to EX-AL catalog)
2. Two-Hand Trip (pp. 7-17)
3. Pullback (Not offered by Rockford Systems)
4. Restraint (Refer to Safeguarding Devices catalog)
5. Type A Gate (Refer to Safeguarding Devices catalog)

When safeguarding, please keep in mind that the sides and back of the point of operation must also be safeguarded to protect the operator and other employees.

OSHA's safety distance formula for two-hand control, two-hand trip, and presence-sensing devices can be found on pages 107-108 of this catalog. Refer to our Safeguarding Devices catalog for ANSI's safety distance formulas.

CONTROLS

Controls are furnished according to the type of press: full revolution or part revolution. Please see later pages detailing these requirements for further explanation.

ELECTRICAL AND LOCKOUT REQUIREMENTS

A press system requires a proper disconnect switch, motor starter, transformer (for reducing the voltage to 120 V or less), and an air lockout valve.

When applying any of the standard control boxes offered in this catalog, a 120-V coil must exist or be changed in the present magnetic starter on the press. If a press has a manual starter, it must be replaced with a magnetic-type starter. The standard and custom control boxes are furnished with a multi-tap transformer for various primary voltages.

COVERS

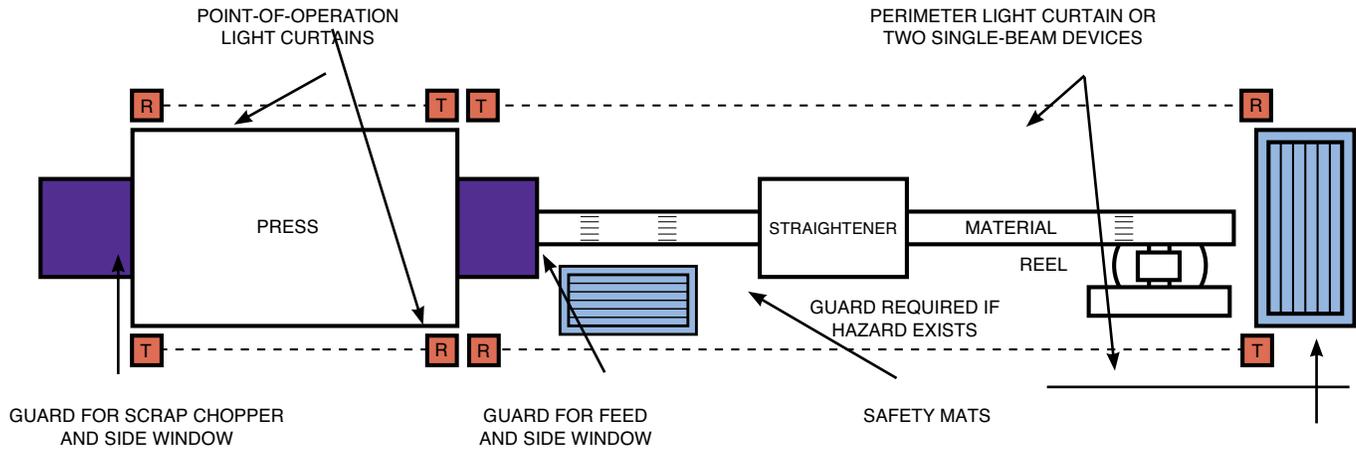
Mechanical power-transmission apparatus include components on a machine or auxiliary equipment including shafts, crankshafts, splines, pulleys, sprockets, rolls, flywheels, gears, and couplings. These components can create hazards to personnel who work on or around the machines. They must be covered in accordance with OSHA 29 CFR 1910.219 and ANSI B15.1. All apparatuses that create a hazard must be guarded (covered) if at or below a seven-foot level from the floor or platform. This is usually done by the user, either by modifying existing guards, by contacting a local sheet-metal fabricator to make a new cover, or refer to our Web site at www.rockfordsystems.com for mechanical motion covers.

AUXILIARY SAFEGUARDING

Auxiliary safeguarding is used for additional protection from injuries for all personnel in the machine area. It is used in conjunction with primary safeguarding devices. Auxiliary safeguarding also involves the guarding of other components or hazardous openings on machines. One of these hazards is created by auxiliary feeding equipment used with some power presses. Auxiliary equipment includes various types of feeds, shuttles, magazines, stackers, indexing tables, straighteners, reels, cradles, recoilers, scrap choppers, iron hands, robots, etc.

Auxiliary safeguards include such items as point-of-operation side barriers when light curtains are used, pressure-sensitive safety mats, workpiece tables, or horizontal light curtains. An additional set of light curtains can be used horizontally to prevent an operator or other persons from standing between the vertical plane of light and the point-of-operation hazard. Please remember that light curtains can only be used on part-revolution presses.

MECHANICAL POWER PRESS CONTROL SYSTEMS



STRAIGHT-SIDE PRESS ARRANGED FOR AUTOMATIC FEEDING

The two most commonly used safeguards for presses equipped with automatic feeds are guards and presence-sensing devices (light curtains). These safeguards are detailed in our machine safeguarding devices catalog—Safeguarding Devices catalog. When considering either of these safeguards, arrange them to protect the point of operation as well as the feed. This may require the guard to extend to the right or left of the bolster on OBI presses. If a scrap chopper is furnished, the guarding must also be extended to safeguard it. If a feed and scrap chopper are on the sides of straight-side presses, the feed, scrap chopper, and window openings also need to be safeguarded.

When protecting operators and other employees in the press area from hazards created by straighteners, pay-off reels, cradles, iron hands, robots, etc., the perimeter or work envelope of this auxiliary equipment can be safeguarded as illustrated above. This is usually accomplished with guards, presence-sensing devices, safety mats, or a combination of these safeguards.

When protecting these areas, keep in mind that access may be required for changing coils and removing scrap, blanks, etc.

Danger signs, used for warning, can be mounted on the machine in a position that is readily visible to the operator, setup person, or other personnel. Hand tools are another auxiliary safeguard often used when feeding and retrieving small workpieces or removing scrap from the die area. Hand tools by themselves are not a point-of-operation safeguarding device.

When using a light curtain, the mounting brackets for the transmitter and receiver may have to be modified to include safeguarding of the feed. The light curtain's plane of light commonly protects only the front of the press. Additional guards or mirrors that reflect the light curtain's plane of light are needed to safeguard the sides and back of the machine.

When safeguarding presses equipped with shuttles, magazines, stackers, indexing tables, etc., the previously discussed safeguards can be used. This assumes that the press is operating in either the continuous or automatic single-stroke mode of operation. If the press is single-stroked by overt operator action, other safeguards such as two-hand control, pullback devices, restraints, or gate devices could be used. The back and sides of the point of operation must always be protected as well.

AIR AND HYDRAULIC PRESSES

Two-hand-control packages for air presses and other air-operated machines and devices can be reviewed in our machine safeguarding devices catalog—Safeguarding Devices catalog.

Controls for hydraulic presses are also available. Two-hand control is usually furnished along with other point-of-operation safeguarding. Please see pages 51-57 for further details.

FULL-REVOLUTION-CLUTCH PRESS CONTROL SYSTEMS

OSHA 29 CFR 1910.211 DEFINITION

“Full-Revolution Clutch” means a type of clutch that, when tripped, cannot be disengaged until the crankshaft has completed a full revolution and the press slide a full stroke.

All of the full-revolution-clutch press control systems are furnished with two-hand trip that can be used as a point-of-operation safeguard—refer to pages 104, 107, 108, or Safeguarding Devices catalog for detailed information on the safety requirements for two-hand trip. Various other types of guards or devices may be more desirable, such as barrier guards, pullbacks, restraints, or type A gates. For these guards and devices, please refer to our barrier and perimeter guarding systems catalog—EX-AL catalog, and our machine safeguarding devices catalog—Safeguarding Devices catalog.

FULL-REVOLUTION CLUTCH

The full-revolution-clutch press was designed to make one full machine cycle (stroke) or crankshaft revolution after each engagement of the mechanical pin, collar, or rolling key.

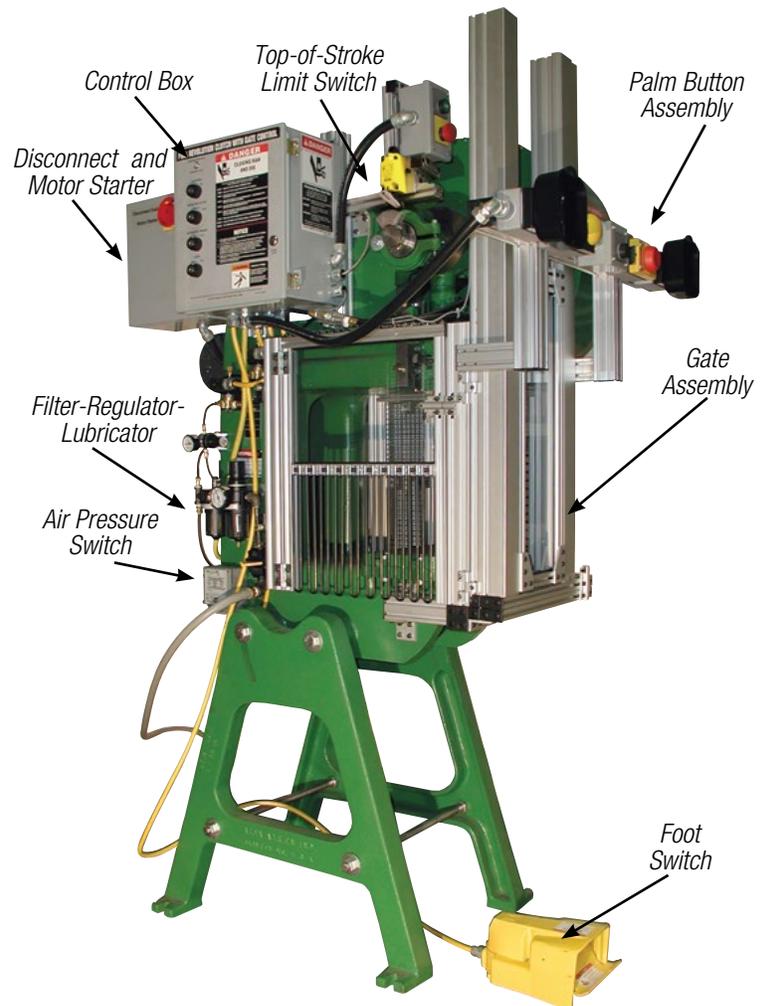
On full-revolution presses, the main concern of the clutch control is that it has single-stroke capability if the press is single-stroked. This means that if the actuating means, such as the palm buttons or foot switch, is held operated through an entire stroke, the press will stop at its normal TDC (top dead center) stopping position, barring any mechanical catastrophic failures.

This section includes trip-control systems which provide single-stroke capability, a requirement of both OSHA and ANSI. These systems also provide two-hand trip which can be used as a point-of-operation safeguarding device when mounted at the proper safety distance.

Full-revolution single-stroke trip-control systems provide other modes of operation, such as continuous-on-demand, foot-maintained continuous, automatic single stroke, and two-hand motor jog for die setup and maintenance requirements.

Two-hand motor jog is used when the die or tooling is being set up in the press, with the flywheel at rest. It allows the designated setup person to engage the clutch and jog the motor in order to bring the slide down to BDC (bottom dead center). Usually when the slide is in this position of crankshaft rotation (BDC), a die is removed and another is set up.

Three reasons to install a trip-control system on full-revolution-clutch presses that may already have single-stroke mechanisms are: 1) the two-hand motor jog feature, 2) the ease of operating a foot switch versus a mechanical foot treadle, and 3) two-hand trip eliminates the



Full-Revolution Press With Trip Control System and Gate

Not shown are the air cylinder and the monitored dual-solenoid air valve on the opposite side of the press.

foot pedal/treadle operation.

In addition to providing single-stroke capability with a trip-control system, all full-revolution presses require a safeguarding system. The following are OSHA-recognized methods for safeguarding the point of operation on full-revolution-clutch mechanical power presses:

1. Barrier Guard (Refer to EX-AL catalog)
2. Two-Hand Trip (Refer to this section)
3. Pullback (Not offered by Rockford Systems)
4. Restraint (Refer to Safeguarding Devices catalog)
5. Type A Gate (Refer to Safeguarding Devices catalog)

FULL-REVOLUTION-CLUTCH PRESS CONTROL SYSTEMS

When safeguarding, please keep in mind that the sides and back of the point of operation must also be safeguarded to protect the operator and other employees.

OSHA's safety distance formula for two-hand trip can be found on page 108 of this catalog. Refer to the graph below for a guideline in determining two-hand trip safety distance.

Other safety considerations on a full-revolution- clutch press are the main power disconnect switch, magnetic motor starter, and covers for the flywheel, gears, etc.

CONTROL SYSTEMS

A full-revolution control system consists of:

1. A control box (pp. 9-11)
- 2a. Individual components (pp. 12-14)
OR
- 2b. Component packages (pp. 15-16)
3. An air cylinder (p. 17)
4. An air lockout valve (p. 14 or 33)

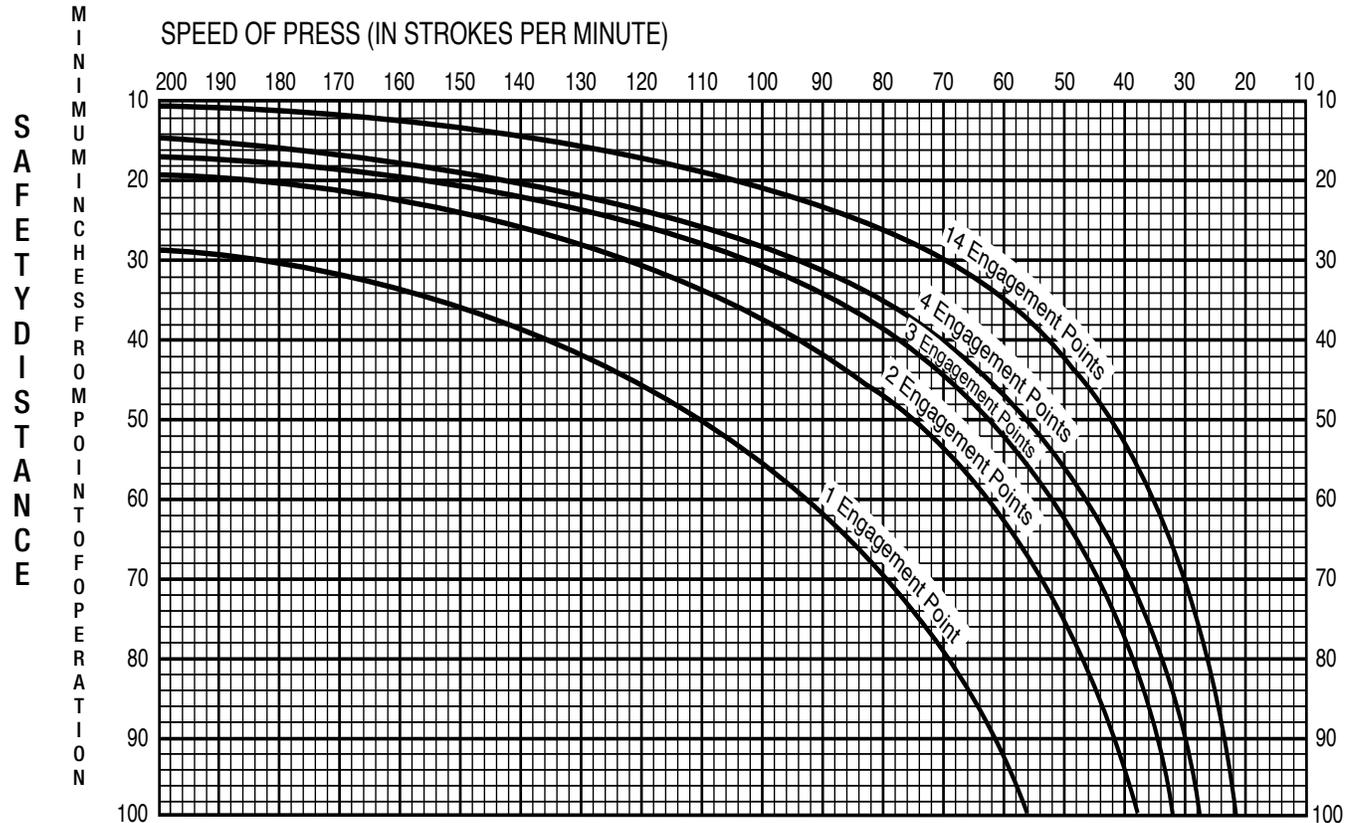
Components in the control system can include a palm button assembly, a foot switch, a monitored dual-solenoid air valve, a filter-regulator-lubricator assembly, an air pressure switch, an air lockout valve, a cam and mounting strap assembly, and a limit switch assembly. The components for these systems will vary depending on the actuating means and the modes of operation that are chosen.

SELECTING A CONTROL SYSTEM

1. To order a control system, determine which control box is required. Choose a control from pages 9-10.
2. Determine which components meet your mode-of-operation requirements. This depends on your production requirements. To simplify this step, component packages are available. See pages 15-16.
3. Select an appropriate air cylinder. Air cylinders are available in a variety of sizes and configurations to fit the specific machine application. See page 17.
4. Add an air lockout valve, if required. See page 14 or 33.

TWO-HAND TRIP SAFETY DISTANCE CHART

To establish the proper safety distance for two-hand trip on full-revolution-clutch presses, determine the speed of the press in SPM (strokes per minute) when running in the continuous mode and the number of engagement points in the clutch mechanism. Then determine the safety distance from the following chart.



STANDARD FULL-REVOLUTION CONTROL



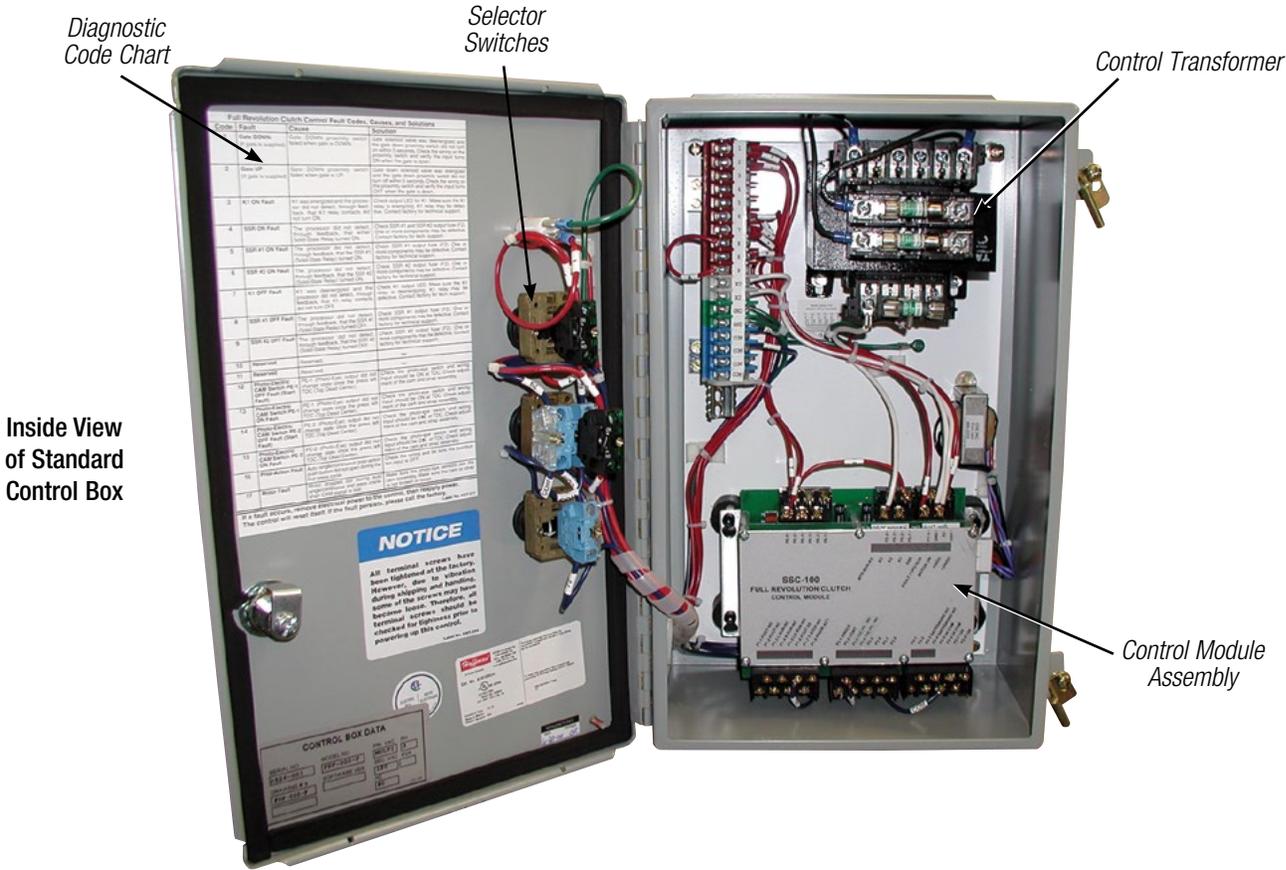
Standard Control Box (FPF000F Shown)

The electro-pneumatic trip-control system is designed for use on full-revolution-clutch mechanical power presses. It is designed and built to comply with OSHA 29 CFR 1910.217 and ANSI B11.1 and B11.19. This control updates full-revolution-clutch presses that do not presently have single-stroke capability. It can also be a replacement for existing trip-control systems.

This control is an economic, full-featured microprocessor-based press trip control. The system uses a microprocessor to cross-check and monitor the control relays. In the event of a control malfunction, further operation is prevented. See page 111 for details on control reliability.

The multi-tap transformer has a 115-, 208-, 230-, 460-, and 575-V primary, 115V secondary, and 100-VA rating. This control must be wired in to a motor starter that has a 115V operating coil. This provides primary power to the clutch control and to the control box for the two-hand motor jog mode of operation.

The standard control box is housed in a 16" x 10" x 6" NEMA 12 enclosure. The ground indicator light and operator controls are located on the front of the enclosure door. The motor controls are usually located in a remote station.



Inside View of Standard Control Box

STANDARD FULL-REVOLUTION CONTROL (CONTINUED)

STANDARD MODES OF OPERATION

- Two-hand motor jog
- Two-hand single stroke
- Two-hand “walk-away” continuous*
- Foot single stroke
- Foot-maintained continuous*
- Automatic single stroke*
- Continuous-on-demand*

*Requires a remote prior-action station.

FEATURES

- Single-stroke capability operation
- Two-hand antirepeat
- Two-hand trip as a point-of-operation safeguard
- Two-hand anti-tie down and concurrent operation
- Controls all types of full-revolution clutches
- Redundant-logic system microprocessor
- Provisions for electrically interlocking safety devices
- Isolated microprocessor logic power supply
- Redundantly monitored solid-state relay/captive-contact relay output for trip solenoid(s)
- Saddle-clamp circuit board terminal strips
- Supports redundant, self-checking solenoid valves
- Fused SSR (solid-state relay) outputs
- Type A gate interface

CUSTOM FULL-REVOLUTION CONTROL

Full-revolution-clutch custom control boxes and packages are available to fit your particular press room needs. A custom control box contains the standard control module and components as described on pages 9-10 plus the following:

- main power disconnect switch
- main drive motor starter
- ram-adjust motor starter (if required)

These boxes are furnished with an IEC through-the-door main power fused disconnect switch and an IEC magnetic motor starter (with push buttons). A reversing ram-adjust motor starter with selector and push buttons may also be included. They are prewired and built into a larger NEMA 12 enclosure.

Operator controls are located on the front of the enclosure door. The motor controls can be located in a remote station or on the enclosure door.

NEMA-style disconnect switches and motor starters, and brand-name components specified by our customers are also available. To ensure the starter(s) and disconnect are sized properly, please check horsepower for the main drive motor and slide adjust motor (if furnished) on the press, as well as full-load amps, and primary voltage to the press. After obtaining this information, please go to the chart on page 11 to determine the proper custom control box part number. Follow directions 1-7 to determine the correct part number.



Full-Revolution Custom Control Box With Clutch Control, Disconnect Switch, and Motor Starter

SELECTING A FULL-REVOLUTION-CLUTCH PRESS CONTROL

To determine the 8-digit configured part number for the full-revolution control required, follow directions 1-7 below and use the information in the **PART NUMBERING SYSTEM CHART** below.

1. The first 2 digits for all full-revolution controls are FP.
2. The 3rd digit determines the modes of operation required.
3. The 4th digit determines the size of the disconnect switch, if provided, in the control enclosure. Zero (0) indicates no disconnect switch provided.
4. The 5th and 6th digits determine the size and type of nonreversing motor starter, if provided, in the control enclosure. Zeros (00) in both positions indicate no motor starter provided.
5. The 7th digit determines the location of the operator controls.
7. The 8th digit will indicate the type of modifier provided: i.e., main drive motor control operators remote.



The sample shown, FPF112-F5, indicates that the custom full-revolution-clutch control box will provide two-hand single stroke, two-hand motor jog, two-hand continuous, foot single stroke, and foot-maintained continuous modes of operation. There will be an IEC 30A disconnect switch and an IEC 18-A nonreversing main drive motor starter without ram adjust. All operator controls will be on the door of the enclosure with the exception of the main drive motor operators which will be located remote.

FULL-REVOLUTION CONTROL PART NUMBERING SYSTEM CHART																																																																	
<p style="text-align: center;">SYSTEM TYPE PRODUCT CATEGORY</p> <p>FP — Full-Revolution Control</p> <p style="text-align: center;">MODES OF OPERATION</p> <p>A — Two-hand single stroke, two-hand motor jog, two-hand “walk-away” continuous, foot single stroke, foot-maintained continuous, automatic single stroke, and continuous-on-demand. Remote station LLD406* is required.</p> <p>G — Two-hand single stroke, two-hand motor jog, two-hand “walk-away” continuous, foot single stroke, foot-maintained continuous, and a type A gate interface. Remote station LLD400* is required.</p> <p>H — Two-hand single stroke, two-hand motor jog, and two-hand “walk-away” continuous. Remote station LLD400* is required.</p> <p>F — Two-hand single stroke, two-hand motor jog, two-hand “walk-away” continuous, and foot single stroke and foot-maintained continuous. Remote station LLD400* is required.</p> <p style="text-align: center;">DISCONNECT SWITCH SIZE—IEC (PLUS MAXIMUM MAIN MOTOR FLA)</p> <p>0 — No Disconnect Switch</p> <p>1 — 30A Disconnect — 1- to 20-FLA Main Drive Motor</p> <p>2 — 60-A Disconnect — 21- to 40-FLA Main Drive Motor</p> <p>3 — 100-A Disconnect — 41- to 66-FLA Main Drive Motor</p> <p>4 — 200-A Disconnect — 67- to 133-FLA Main Drive Motor</p> <p>5 — 400-A Disconnect — 134- to 266-FLA Main Drive Motor</p> <p style="text-align: center;">NONREVERSING MAIN MOTORS TARTER WITH OR WITHOUT RAM ADJUS</p> <p>0 — No Starter</p> <p>1 — Nonreversing Main Motor Starter without Ram Adjust</p> <p>3 — Nonreversing Main Motor Starter with 12-A Ram Adjust</p> <p>4 — Nonreversing Main Motor Starter with 18-A Ram Adjust</p> <p>5 — Nonreversing Main Motor Starter with 25-A Ram Adjust</p>	<p style="text-align: center;">MODIFIER</p> <p>-- — Blank, No Modifier</p> <p>5 — Main Motor Operators Remote**</p> <p>6 — Ram-Adjust Operators Remote**</p> <p>7 — Main Motor and Ram-Adjust Operators Remote**</p> <p style="text-align: center;">CONFIGURATION & OPERATOR LOCATION</p> <p>F — All Operators on Door of Enclosure</p> <p style="text-align: center;">MAIN MOTOR STARTER SIZE</p> <p>0 — No Starter</p> <p style="text-align: center;">IEC</p> <p>1 — 12 A</p> <p>2 — 18 A</p> <p>3 — 25 A</p> <p>4 — 32 A</p> <p>5 — 40 A</p> <p>6 — 50 A</p> <p>7 — 65 A</p> <p>8 — 80 A</p> <p>9 — 95 A</p> <p>A — 115 A</p> <p>B — 185 A</p> <p>C — 265 A</p> <table border="1" style="margin-top: 10px; width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="4" style="text-align: center;">Motor Horsepower Chart—3 Phase</th> </tr> <tr> <th></th> <th>208 V</th> <th>230 V</th> <th>460 V</th> <th>575 V</th> </tr> </thead> <tbody> <tr> <td>2</td> <td>2</td> <td>3</td> <td>7.5</td> <td>7.5</td> </tr> <tr> <td>5</td> <td>5</td> <td>5</td> <td>10</td> <td>10</td> </tr> <tr> <td>7.5</td> <td>7.5</td> <td>10</td> <td>15</td> <td>15</td> </tr> <tr> <td>10</td> <td>10</td> <td>15</td> <td>20</td> <td>20</td> </tr> <tr> <td>15</td> <td>15</td> <td>20</td> <td>30</td> <td>30</td> </tr> <tr> <td>20</td> <td>20</td> <td>30</td> <td>40</td> <td>40</td> </tr> <tr> <td>25</td> <td>30</td> <td>40</td> <td>50</td> <td>50</td> </tr> <tr> <td>30</td> <td>30</td> <td>40</td> <td>60</td> <td>75</td> </tr> <tr> <td>30</td> <td>40</td> <td>50</td> <td>75</td> <td>100</td> </tr> <tr> <td>50</td> <td>60</td> <td>75</td> <td>125</td> <td>150</td> </tr> <tr> <td>75</td> <td>100</td> <td>125</td> <td>200</td> <td>200</td> </tr> </tbody> </table>	Motor Horsepower Chart—3 Phase					208 V	230 V	460 V	575 V	2	2	3	7.5	7.5	5	5	5	10	10	7.5	7.5	10	15	15	10	10	15	20	20	15	15	20	30	30	20	20	30	40	40	25	30	40	50	50	30	30	40	60	75	30	40	50	75	100	50	60	75	125	150	75	100	125	200	200
Motor Horsepower Chart—3 Phase																																																																	
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50	60	75	125	150																																																													
75	100	125	200	200																																																													

*Required if two-hand continuous, foot-maintained continuous, automatic single stroke, and/or continuous-on-demand modes of operation are used.

**See page 50 for remote motor control operator stations or Safety Shields catalog.

INDIVIDUAL COMPONENTS

The components for these full-revolution control systems will vary depending on the actuating means and the modes of operation that are chosen. To simplify this, component packages are available. Please see pages 15-16 for part numbers and descriptions of the component packages. The control system can include the following components.

1/4" MONITORED DUAL-SOLENOID AIR VALVE

Part No. RCD140*

This three-way, 1/4" monitored dual-solenoid air valve is ideal for operating air cylinders on full-revolution presses. This dual valve is pneumatically checked. To assist in installation, this valve has a common electrical connector for both solenoids with a 12-foot cord.

1/4" FILTER-REGULATOR-LUBRICATOR ASSEMBLY (FRL)

Part No. RCL043*

This assembly is needed to meet the OSHA and ANSI requirements. This FRL assembly filters, regulates, and lubricates the air going through it. This filtered and lubricated air then goes to the solenoid air valve assembly and air cylinder. The regulator should be adjusted so just enough air pressure reaches the air cylinder to operate the clutch. This assembly includes a gauge, coupling, and steel mounting bracket.

AIR PRESSURE SWITCH

Part No. CTD062*

This air pressure switch is needed to meet the OSHA and ANSI requirements. The air pressure switch monitors low pressure to either the air cylinder air supply or ram counterbalance systems. The pressure switch must be set so if the air pressure operating the components is not adequate, or if the air pressure suddenly drops, the press becomes inoperable.

CAM AND STRAP ASSEMBLY

Part No. CML002*

A cast-aluminum cam and adjustable stainless-steel strap are furnished so the cam can easily be mounted on the crankshaft extension. The strap is adjustable up to 6" diameter and is locked in place by tightening the screw.

Note: Drilling or tapping the end of the crankshaft is not required. All that is required to install it is to slip the cam and strap assembly on the crankshaft, line it up with the top-of-stroke limit switch assembly, and tighten. See next page.

**Included in a component package on pages 15-16.*

Cv (Flow Rate)	
Inlet	1.3
Outlet	1.2
Exhaust	2.4



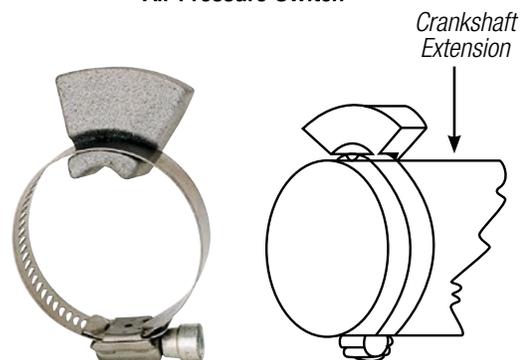
1/4" Monitored Dual-Solenoid Air Valve



Filter-Regulator-Lubricator Assembly



Air Pressure Switch



Cam and Strap Assembly

INDIVIDUAL COMPONENTS (CONTINUED)

TOP-OF-STROKE LIMIT SWITCH ASSEMBLY

Part No. CMK103*

This top-of-stroke limit switch assembly with a 25' cord is actuated by the cam mounted on the crankshaft and is specifically selected for this application. The top-of-stroke limit switch provides dual force-guided contacts to provide the signals when the machine is in the single stroke mode of operation. If the machine does not stop at top dead center, or if the switch assembly malfunctions, becomes improperly adjusted, or the mounting becomes jarred loose, the control will not allow a successive stroke.

A mounting bracket for the limit switch assembly is not furnished. To purchase the EX-AL™ mounting bracket material shown in the photo, please contact Rockford Systems at 1-800-922-7533.



Top-of-Stroke Limit Switch Mounted Above Cam and Strap Assembly on the Crankshaft

PALM BUTTON ASSEMBLIES

To meet OSHA and ANSI safety requirements, the two run/jog buttons must be protected against accidental operation (with ring guards) and separated to require the use of both hands to operate them. They also must be mounted at the proper safety distance, if they will be used as a safeguard. The electrical contact arrangement of the following buttons is 1 NO and 1 NC.

Part No. CTL502*

This palm button assembly consists of two black run/inch buttons (with ring guards), a red emergency-stop button, and a yellow top-stop button. Mounting boxes are furnished with each button. The red and yellow palm buttons each have 1 NO and 1 NC arrangement. The red button is on a yellow-covered mounting box and is equipped with a mechanical latch to meet NFPA 79.



Part No. CTL502

Part No. CTL507*

This palm button assembly consists of two black run/inch buttons (with ring guards), and a red emergency-stop button (for press applications without the continuous mode of operation). Mounting boxes are furnished with each button. The red palm button is on a yellow-covered mounting box and has 1 NO and 1 NC arrangement plus a mechanical latch to meet NFPA 79.



Part No. CTL507

See page 87-88 for other palm button assembly options.

FOOT SWITCH

Part No. CTD011* & CTD088

To meet OSHA and ANSI safety requirements, a foot switch must be protected from unintentional operation. The foot switch pedal (on the inside) is protected on the top and both sides by the cast cover and the front is protected by the hinged flap. This flap must be raised by the operator's toe before allowing the foot to enter the switch. When the hinged flap is in the down position, it is also mechanically interlocked with the operating pedal. The contact arrangement is 1 NO and 1 NC.



Foot Switch CTD011



Foot Switch CTD088

**Included in a component package on page 15-16.*

INDIVIDUAL COMPONENTS (CONTINUED)

PRIOR-ACTION STATION FOR CONTINUOUS

Part No. LLD400*

This remote prior-action station is **required** for the continuous or maintained-continuous mode of operation. If a component package is not supplied with the control box, this station must be ordered. The button is furnished separately in an enclosure so it can be mounted in a convenient location on the front of the press. The NEMA 12 enclosure size is 3½" x 4½" x 3½".



Prior-Action Station for Continuous

PRIOR-ACTION STATION FOR AUTOMATIC SINGLE STROKE OR CONTINUOUS-ON-DEMAND

Part No. LLD406*

This prior-action station is **required** for the automatic single-stroke or the continuous-on-demand mode of operation. These modes of operation are only available with the FPA control box. This prior-action push-button station can also be used for either the two-hand "walk-away" or the foot-maintained-continuous mode of operation.

This station is furnished with a three-position keyed selector switch for automatic single/off/continuous-on-demand. It also has an illuminated prior-action push button. If a component package is not supplied with the control box, this station must be ordered separately. It is furnished in its own enclosure so it can be mounted in a convenient location on the front of the press. The NEMA 12 enclosure size is 5¼" x 4" x 3¼".



Prior-Action Station for Automatic Single Stroke or Continuous-On-Demand

BAR/RUN STATION

Part No. LLD404

This remote bar/run station can be used in conjunction with a manual turnover bar when setting dies in the press. The flywheel must have holes in the periphery for insertion of a spring-loaded turnover bar** (or the flywheel can be manually turned when the flywheel cover is removed). The remote station includes a three-position selector switch for bar/off/run, and one push button used for energizing the dual-solenoid air valve to engage the clutch and release the brake. The flywheel must be at rest (static) when engaging the clutch. After the clutch is engaged, the die setup person can manually turn the flywheel with a spring-loaded turnover bar (see page 86). The enclosure size is 5¼" x 3" x 3¼".



Bar/Run Station

¼" AIR LOCKOUT VALVE

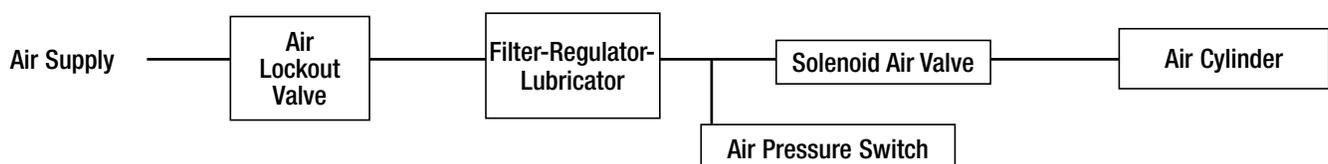
Part No. RCD071

This three-way valve is operated with the manual movement of a slide that opens and closes the valve. This valve shuts off air at the press and then bleeds off downstream air. This lockout is not included in the component packages listed on pages 15-16 and must be ordered separately. Different styles and valve sizes are available; please see page 35.



Air Lockout Valve

Pneumatic System on Full-Revolution-Clutch Power Press



*Included in a component package on pages 15-16.

**For a spring-loaded turnover bar, see page 86.

COMPONENT PACKAGE ORDERING INFORMATION

SELECTING A COMPONENT PACKAGE

Determine which modes of operation and actuating means you require. Use the following charts to select the component package you require.

MODES OF OPERATION AVAILABLE:

- H—Two-Hand Single Stroke
- F—Foot Single Stroke
- M—Foot-Maintained Continuous
- J—Two-Hand Motor Jog
- C—Two-Hand “Walk-Away” Continuous
- A—Automatic Single Stroke
- A—Continuous-On-Demand

Modes of Operation

COMPONENT PACKAGE SELECTION CHART						
Component Package	H	F	M	J	C	A
FNH011	X			X		
FNH012	X			X	X	
FNH112	X			X	X	X
FNF012	X	X		X		
FNF013	X	X	X	X		
FNF014	X	X	X	X	X	
FNF114	X	X	X	X	X	X

COMPONENT PACKAGES USED WITH FPH, FPF, OR FPG CONTROL BOXES

PACKAGE NO. FNH011		HJ
TWO-HAND SINGLE STROKE AND MOTER JOG		
PART NO.	DESCRIPTION	
RCD140	1/4" Dual-Solenoid Air Valve	
RCL043	1/4" Filter-Regulator-Lubricator Assembly	
CTD062	Air Pressure Switch	
CML002	Cam and Strap Assembly	
CMK103	Top-of-Stroke Limit Switch Assembly	
CTL507	Palm Button Assembly (3-button assembly)	

PACKAGE NO. FNH012		HJ-C
TWO-HAND SINGLE STROKE, MOTER JOG, AND TWO-HAND CONTINUOUS		
PART NO.	DESCRIPTION	
RCD140	1/4" Dual-Solenoid Air Valve	
RCL043	1/4" Filter-Regulator-Lubricator Assembly	
CTD062	Air Pressure Switch	
CML002	Cam and Strap Assembly	
CMK103	Top-of-Stroke Limit Switch Assembly	
CTL502	Palm Button Assembly (4-button assembly)	
LLD400	Continuous Prior-Action Station	

COMPONENT PACKAGES USED WITH FPA CONTROL BOXES

PACKAGE NO. FNH112		HJ-CA
TWO-HAND SINGLE STROKE, MOTER JOG, TWO-HAND CONTINUOUS, AUTO SINGLE STROKE, AND CONTINUOUS-ON-DEMAND		
PART NO.	DESCRIPTION	
RCD140	1/4" Dual-Solenoid Air Valve	
RCL043	1/4" Filter-Regulator-Lubricator Assembly	
CTD062	Air Pressure Switch	
CML002	Cam and Strap Assembly	
CMK103	Top-of-Stroke Limit Switch Assembly	
CTL502	Palm Button Assembly (4-button assembly)	
LLD406	Automatic Prior-Action Station	

PACKAGE NO. FNF114		HFMJ-CA
TWO-HAND & FOOT SWITCH SINGLE STROKE, FOOT MAINT. CONTINUOUS, MOTER JOG, TWO-HAND CONTINUOUS, AUTO SINGLE, AND CONTINUOUS-ON-DEMAND		
PART NO.	DESCRIPTION	
RCD140	1/4" Dual-Solenoid Air Valve	
RCL043	1/4" Filter-Regulator-Lubricator Assembly	
CTD062	Air Pressure Switch	
CML002	Cam and Strap Assembly	
CMK103	Top-of-Stroke Limit Switch Assembly	
CTL502	Palm Button Assembly (4-button assembly)	
CTD011	Foot Switch Yellow	
LLD406	Automatic Prior-Action Station	

Note: For control box selection, see pages 9-11. For air cylinder selection, see page 17, and for lockout valve, see page 14.

COMPONENT PACKAGE ORDERING INFORMATION (CONTINUED)

COMPONENT PACKAGES USED WITH PPF OR FPG CONTROL BOXES

PACKAGE NO. FNF012		HFJ
TWO-HAND & FOOT SWITCH SINGLE STROKE AND MOTER JOG		
PART NO.	DESCRIPTION	
RCD140	1/4" Dual-Solenoid Air Valve	
RCL043	1/4" Filter-Regulator-Lubricator Assembly	
CTD062	Air Pressure Switch	
CML002	Cam and Strap Assembly	
CMK103	Top-of-Stroke Limit Switch Assembly	
CTL507	Palm Button Assembly (3-button assembly)	
CTD011	Foot Switch Yellow	

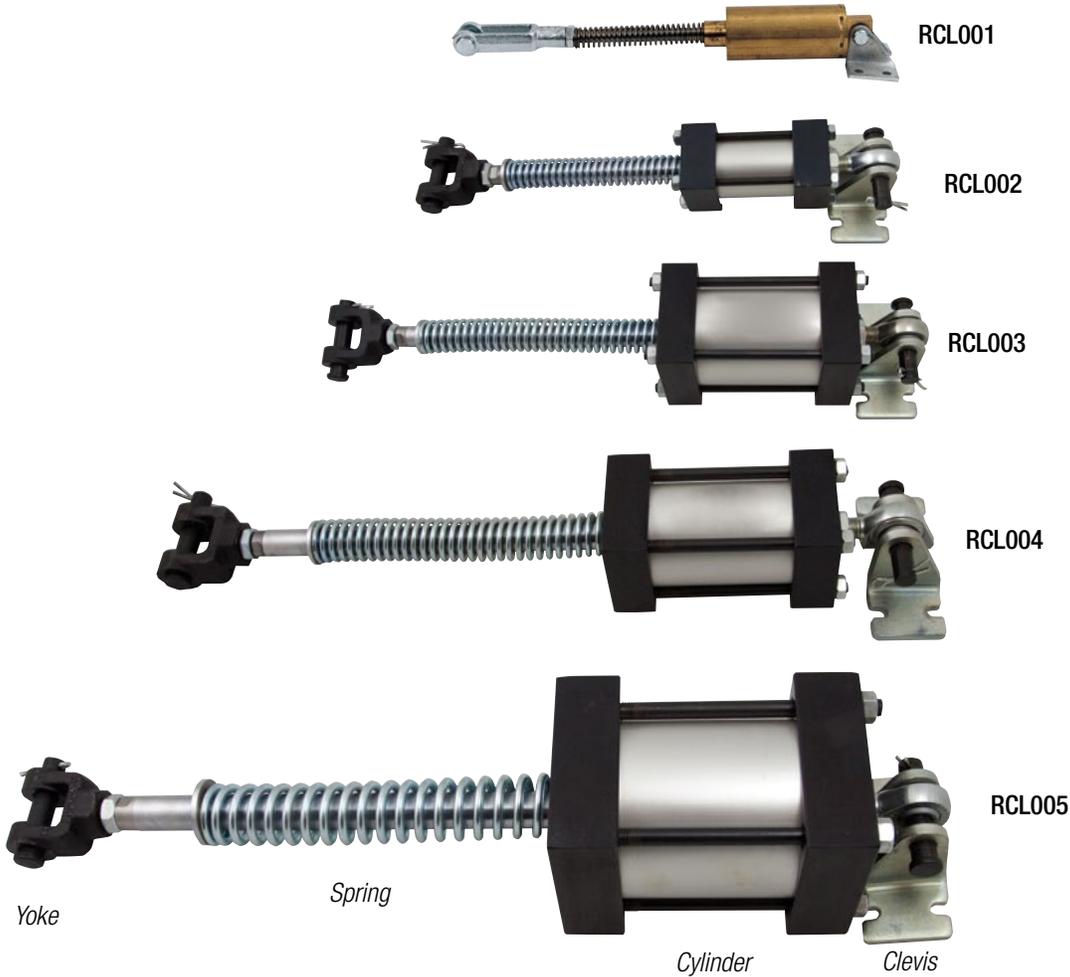
PACKAGE NO. FNF013		HFMJ
TWO-HAND & FOOT SWITCH SINGLE STROKE, FOOT MAINTAINED CONTINUOUS, AND MOTER JOG		
PART NO.	DESCRIPTION	
RCD140	1/4" Dual-Solenoid Air Valve	
RCL043	1/4" Filter-Regulator-Lubricator Assembly	
CTD062	Air Pressure Switch	
CML002	Cam and Strap Assembly	
CMK103	Top-of-Stroke Limit Switch Assembly	
CTL507	Palm Button Assembly (3-button assembly)	
CTD011	Foot Switch Yellow	
LLD400	Continuous Prior-Action Station	

PACKAGE NO. FNF014		HFMJ-C
TWO-HAND & FOOT SWITCH SINGLE STROKE, FOOT MAINTAINED CONTINUOUS, MOTER JOG, AND TWO-HAND CONTINUOUS		
PART NO.	DESCRIPTION	
RCD140	1/4" Dual-Solenoid Air Valve	
RCL043	1/4" Filter-Regulator-Lubricator Assembly	
CTD062	Air Pressure Switch	
CML002	Cam and Strap Assembly	
CMK103	Top-of-Stroke Limit Switch Assembly	
CTL502	Palm Button Assembly (4-button assembly)	
CTD011	Foot Switch Yellow	
LLD400	Continuous Prior-Action Station	

Note: For control box selection, see pages 9-11. For air cylinder selection, see page 17, and for lockout valve, see page 14.

AIR CYLINDERS

ALL ILLUSTRATED CYLINDERS ARE PULL-TYPE/SPRING RETURN



An air cylinder must be ordered separately using a specific part number. It is required to complete the control system. The air cylinder is attached to the clutch operating rod in order to trip the press. Normally, single-acting, pull-type/spring-return air cylinders are required. The return spring on the cylinder rod is compression type and is designed to prevent interleaving to meet OSHA and ANSI standards. A clevis mounting arrangement is furnished to attach the cylinder to the press frame. A rod, yoke, and pin assembly for ease in connecting to the existing clutch operating rod is standard on all cylinders. Push-type/spring-return and longer or shorter stroke air cylinders are also available. To determine the proper size or type of air cylinder, check the linkage where the cylinder will be inserted. Please consult the factory for any special requirements.

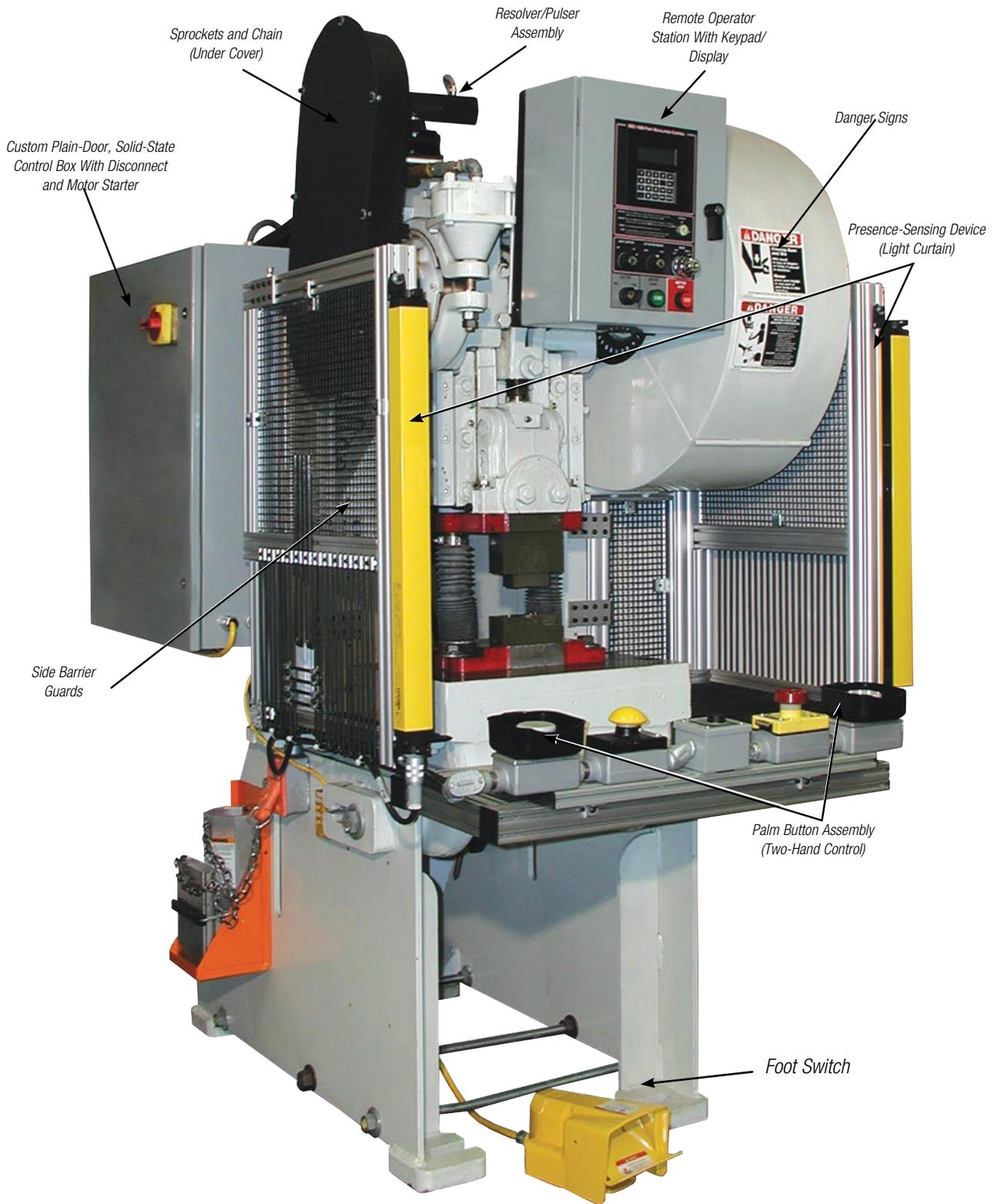
Standard Pull Type

	RCL001	RCL002	RCL003	RCL004	RCL005
PRESS SIZE (TONS)	1/4 to 7	8 to 35	36 to 70	71 to 125	126 to 200
SIZE (BORE X STROKE)	1-1/2" x 1"	1-1/2" x 1"	2" x 2"	2-1/2" x 2"	3" x 2"
PULL FORCE (@ 74 PSI)	50 lb	100 lb	200 lb	300 lb	500 lb
NPT PORT SIZE	1/4"	1/4"	1/4"	1/4"	3/8"

Standard Push Type

	RCL022	RCL023	RCL024	RCL025
PRESS SIZE (TONS)	8 to 35	36 to 70	71 to 125	126 to 200
SIZE (BORE X STROKE)	1-1/2" x 1"	2" x 2"	2-1/2" x 2"	3" x 2"
PULL FORCE (@ 74 PSI)	100 lb	200 lb	300 lb	500 lb
NPT PORT SIZE	1/4"	1/4"	1/4"	3/8"

SAFEGUARDED PART-REVOLUTION-CLUTCH PRESS



A Part-Revolution-Clutch Press With Clutch/Brake Control and a Presence-Sensing Device and Two-Hand Control as Safeguards

SSC1500 PRESS CONTROL

PART-REVOLUTION CLUTCH

The majority of part-revolution presses have an air-applied clutch and an air-released brake. They are designed to trap air in a chamber or tube. When compressed air is put into these chambers or tubes, the clutch is engaged and the brake is released. The press then starts a cycle. To stop the press, the opposite takes place. A part-revolution-clutch press can be engaged and disengaged at any position of crankshaft rotation or revolution.

Occasionally older mechanical-friction-clutch presses are found in plants and are still being used. Sometimes press brakes with mechanical-friction clutches are used as power presses. These press brakes and the older mechanical-friction-clutch presses can be updated by adding a properly sized air cylinder to the part-revolution control packages that are offered. See pages 75-76 for these air cylinders.

Due to the many detailed OSHA requirements on part-revolution-clutch presses, most existing clutch/brake control systems on presses do not meet safety standards and regulations if they were installed prior to 1971. Most of these presses do not have control reliability and brake monitoring.

The part-revolution-clutch/brake control-reliable systems in this catalog are designed to stop the press and render it inoperable if there is a single component failure in the control system. This is done by minimizing the use of static-condition components and using critical, redundant components that are checked. Microprocessors or relays of special construction are used in this type of reliable control system (see page 99). The clutch/brake control systems offered here are furnished with a built-in, two-hand control safeguarding device.

In addition to the clutch/brake control meeting the requirements of the safety standards, all part-revolution presses require a safeguarding device or guard (barrier) to protect people that operate, set up, and maintain these machines.

The following are OSHA- and ANSI-recognized methods for safeguarding the point of operation on part-revolution-clutch mechanical power presses:

1. Barrier guard (EX-AL catalog)
2. Presence-sensing device (Safeguarding Devices catalog)
3. Two-hand control (Refer to this section)
4. Pullback (Not offered by Rockford Systems)
5. Restraint (Safeguarding Devices catalog)
6. Type A or B gate (Safeguarding Devices catalog)

When safeguarding, please keep in mind that the sides and back of the point of operation must also be safeguarded to protect the operator and other employees.

OSHA's safety distance formula for two-hand control, two-hand trip, and presence-sensing devices can be found on pages 107-108 of this catalog. Refer to our Safeguarding Devices catalog for ANSI's safety distance formulas.

Other considerations on a part-revolution-clutch press are the main power disconnect switch, magnetic motor starter, covers for the flywheel, gears, etc.

PART-REVOLUTION CONTROL SYSTEMS

A part-revolution control system consists of:

1. A control box (pp. 19-27)
- 2a. Individual components (pp. 28-35)

OR

- 2b. Component packages (pp. 34-35)

We offer a variety of control boxes that can be furnished to meet your specific requirements. The SSC1500 solid-state control box version is available as follows:

1. Standard clutch/brake control
2. Custom clutch/brake control which includes a fused disconnect switch and magnetic motor starter
3. Special clutch/brake control
4. Remote operator style

SELECTING A CONTROL SYSTEM

1. To order a complete control system which includes control reliability and brake monitoring, determine which style control box is required.

A **standard** control box includes the clutch/brake control and transformer.



Standard Control

SSC1500 PRESS CONTROL

SELECTING A CONTROL SYSTEM (CONTINUED)

The clutch/brake control can also be furnished in a plain-door enclosure, as a subpanel, or as a module kit. The plain-door control requires a remote operator station. Subpanels and module kits are furnished without the enclosure; module kits include the primary internal components of the control only. Subpanels and module kits must be installed into an existing enclosure by qualified personnel. The subpanel or module kit also requires a remote operator station or a keypad/display kit.

A custom control box includes a main power disconnect switch and magnetic motor starter in the same enclosure as the clutch/brake control. A reversing ram-adjust motor starter may also be included.

Special control boxes can include either a standard or custom clutch/brake control that requires modification for any special requirements. This can be an interface of auxiliary equipment, such as a lube system, a light curtain interface for a non-Rockford light curtain, or components specified by the end user, such as NEMA starters and disconnects.

Remote operator-style control boxes include the clutch/brake control and are designed to be mounted close to the operator. A control transformer must be supplied separately or the existing transformer must be reused.

2. The CMS115 resolver/pulser assembly is always required with any of the SSC1500 controls.

3. After determining the style of control box, determine the location of the operator controls, indicator lights, and the keypad/display. Please remember these components should be installed in a convenient location for the operator. These components can be supplied as follows:

1. On the front of the enclosure
2. In a remote operator station
3. In a control bar
4. In a console
5. Loose for installation in an existing box

4. Determine which other components are required (dual-solenoid air valve, air pressure switches, etc.). If existing components comply with the safety requirements, they can be reused with the control box that is furnished. If the components do not comply, complete component packages are available. Please see pages 34-35.



Plain-Door Control

Remote Operator Station



Custom or Special Control With Remote Operator Station



Remote Operator-Style Control

SSC1500 STANDARD PRESS CONTROL

The SSC1500 control is designed for use on part-revolution-clutch power presses. It is designed and built to comply with OSHA 29 CFR 1910.217, and ANSI B11.1 and B11.19. These controls can update or replace existing relay-based control systems, found in user's plants; they can also be furnished for new or rebuilt presses.

This control includes control reliability (see page 111), motion detection with a time-based brake monitor, light curtain interface, and diagnostics (eight user-programmable inputs). It also includes batch and stroke counters with preset, a total counter, and a hard-wired emergency-stop master control relay.

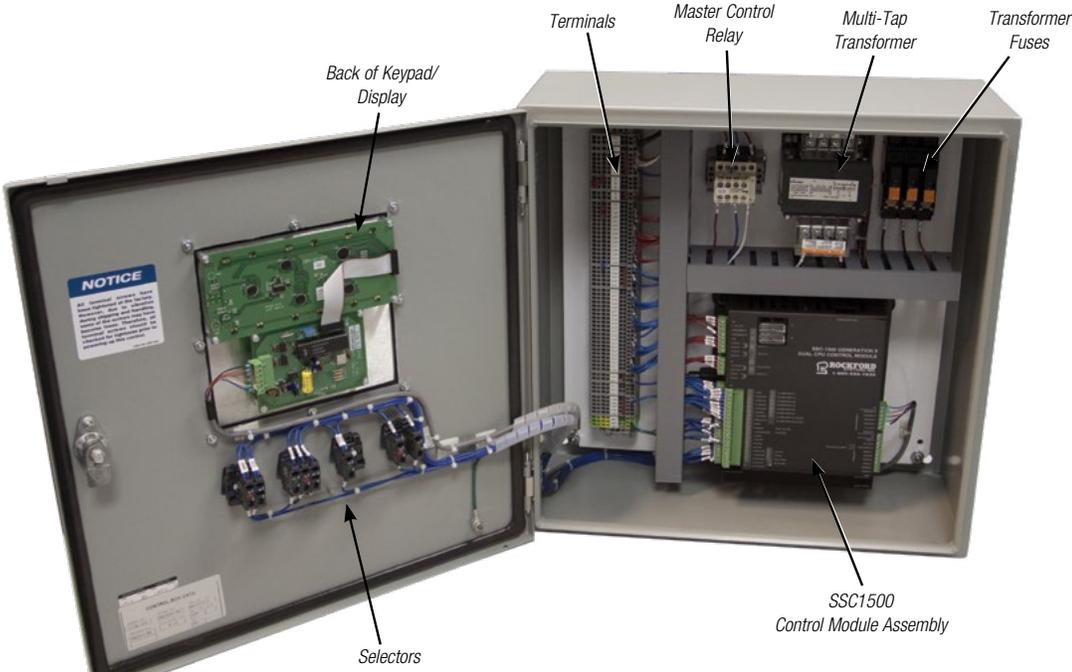
The SSC1500 is an economic, full-featured, dual-microprocessor-based control system. The system uses redundant inputs from devices such as palm buttons, foot switches, and a light curtain(s). The system output to the dual-solenoid air valve is provided by two (2) safety relays with force-guided contacts. These output relays are independently controlled and cross-checked by the microprocessors. This allows control-reliable operation of the outputs in the event of a single control component failure. Each microprocessor also has its own logic power supply. This decreases the possibility of simultaneous control failure because of a fault within the power supply system. Timing and motion detection of the crankshaft is accomplished by the resolver/pulsar assembly.

The standard control box is a 20" x 20" x 8" NEMA 12 enclosure with the operator controls and keypad/display mounted in the door, as illustrated above.

If a starter or disconnect is required in the same enclosure as the standard SSC1500 control, see page 23, SSC1500 custom controls. If a separate starter or disconnect, or combination starter disconnect is required, refer to our Safety Shields catalog.



Standard Control Box (PRC-000-FW Shown)



Inside View of Standard Control Box

SSC1500 STANDARD PRESS CONTROL (CONTINUED)

STANDARD MODES OF OPERATION

- Off
- Two-hand inch (regular, timed, or top-stop)
- Two-hand single stroke
- Foot single stroke
- Two-hand “walk-away” continuous
- Continuous-on-demand
- Automatic single stroke
- Two-hand-maintained continuous
- Foot-maintained continuous
- One-hand or foot trip single stroke
(use with light curtain or interlocked guard only)

FEATURES

- Meets and exceeds OSHA 29 CFR 1910.217 and ANSI B11.1 and B11.19
- Provides two-hand control safeguarding device
- Redundant/cross-checking microprocessors
- Redundant microprocessor logic power supplies
- Redundant solenoid relays
- 4-line x 20-character LCD (liquid crystal display) with 20-key operator interface
- Wide range of input power supply — 85-to 135-VAC
- Absolute resolver/pulsar with sync sensor for timing and motion detection
- Time-based brake monitor with programmable warning and fault set points
- Stop-time measurement test
- 6 user-programmable 24-V DC static diagnostic inputs
- Part-in-place 24-V DC input
- 2 user-programmable 24-V DC static or cyclic die protection inputs
- 7-digit stroke and batch counters with preset, and a 7-digit total counter
- Automatic variable-speed top-stop adjustment
(for continuous mode only)
- Light curtain interface(s) with off/on selector
- Light curtain mute during the nonhazardous portion of the stroke
- 4 PLS (programmable limit switch) outputs—2 on/off angles, or 1 timed off, or 1 counted output per PLS (or 3 PLS outputs and 1 auxiliary output with 1 contact)
- Information displayed when the machine is in operation: angle, speed, batch counter, stroke counter, mode of operation, and stop time
- Display of text in English or Spanish

KEYPAD/DISPLAY

The keypad/display is used to enter setup information, monitor machine operation, and display messages to the user. The keypad/display has a 4-line x 20-character LCD (liquid crystal display) with 20 keys for entering information and programming. As standard, this keypad/display is mounted in the control box. For operator convenience, it can be furnished in a remote enclosure up to a maximum of 150' from the SSC1500 control module (see page 27).

Information displayed during the machine run cycle includes:

- Angle
- Speed
- Batch Counter
- Stroke Counter
- Mode
- Stop Time

PROGRAMMING

The SSC1500 press control has eight (8) user-programmable inputs (6 static-type and 2 static- or cyclic-type inputs) that can be programmed for equipment monitoring or other user-defined functions. All inputs are 24-V DC selectable current-sinking or sourcing inputs.

There are three parameters that can be programmed for the six static-type inputs, and five parameters that can be programmed for the two static- or cyclic-type inputs. The three parameters are input logic, stop type, and fault message; the five parameters are input logic, stop type, fault message, open angle, and close angle. They can be assigned to each input from the list below. When a fault condition is detected, the machine will top stop or emergency stop, and the assigned message will be displayed. This feature helps when troubleshooting common fault conditions.

FAULT MESSAGE LIST:

Clutch/Brake Air Fault	Left Side Guard Open
Counterbalance Air Fault	Right Side Guard Open
Dual Solenoid Fault	Feeder Fault
Clutch Valve Fault*	Load Monitor Fault
Brake Valve Fault*	Safety Block Interlock
Lube Fault	Shut Height Fault
High Lube Pressure	Variable Speed Drive Fault
Low Lube Pressure	Die Protection Fault**
Low Lube Level	Short Feed Fault**
Main Motor Overload	Part Ejection Fault**
Ram-Adjust Motor Overload	Stock Buckle Fault**
Lube Motor Overload	End of Stock Fault**
Auxiliary Motor Overload	Pilot Pin Fault**
Guard Interlock Open	Part Input #1**
Front Guard Open	Part Input #2**
Rear Guard Open	Part Input #3**

**Only used on machines that have a split clutch and brake, and two dual valves have been furnished.*

***Messages typically used for die protection.*



Example of the Main Run Screen on the Keypad/Display With Selector Switches

SSC1500 CUSTOM PRESS CONTROL



SSC1500 Custom Control Box

Part-revolution-clutch SSC1500 custom control boxes are also available to house the clutch/brake controls, disconnect switch, motor starters, and any other electrical components to fit your press room needs. A custom control box contains the standard control module and components as described on pages 21-22 plus the following:

- main power disconnect switch
- main drive motor starter
- ram-adjust motor starter (if required)

These boxes are furnished with an IEC through-the-door main power fused disconnect switch and an IEC magnetic motor starter (with push buttons). A reversing ram-adjust motor starter with selector and push buttons may also be included. They are prewired and built into a NEMA 12 enclosure.

Operator controls and the keypad/display are located on the front of the door, or a plain-door control or subpanel can be furnished. If a plain-door custom control or a subpanel custom control is ordered, a remote operator station or keypad/display kit is required. See ordering information on page 26.

NEMA-style disconnect switches and motor starters, and brand-name components specified by our customers are also available.

To ensure the starter(s) and disconnect are sized properly, please check horsepower for the main drive motor and slide adjust motor (if furnished) on the press, as well as full-load amps, and primary voltage to the press. After obtaining this information, please go to the chart on page 27 to determine the proper custom control box part number. Make sure the proper suffix (F, P, S, K, C, X, Y, or Z) is in the part number. Follow directions 1-6 to determine the correct part number.

Example of part numbering system: The press requires a plain-door control and a 60-A disconnect switch (based on the full-load amp formula). It has a 10-HP motor, a reversing 32-A main motor starter without ram adjust, voltage is 230 V, and has a C4000 standard light curtain interface. The part number to order is PRC-224-PW. A remote operator station (Part No. LLD1506G2) is required for this plain-door control—see page 26.

SSC1500 REMOTE OPERATOR-STYLE CONTROL BOXES

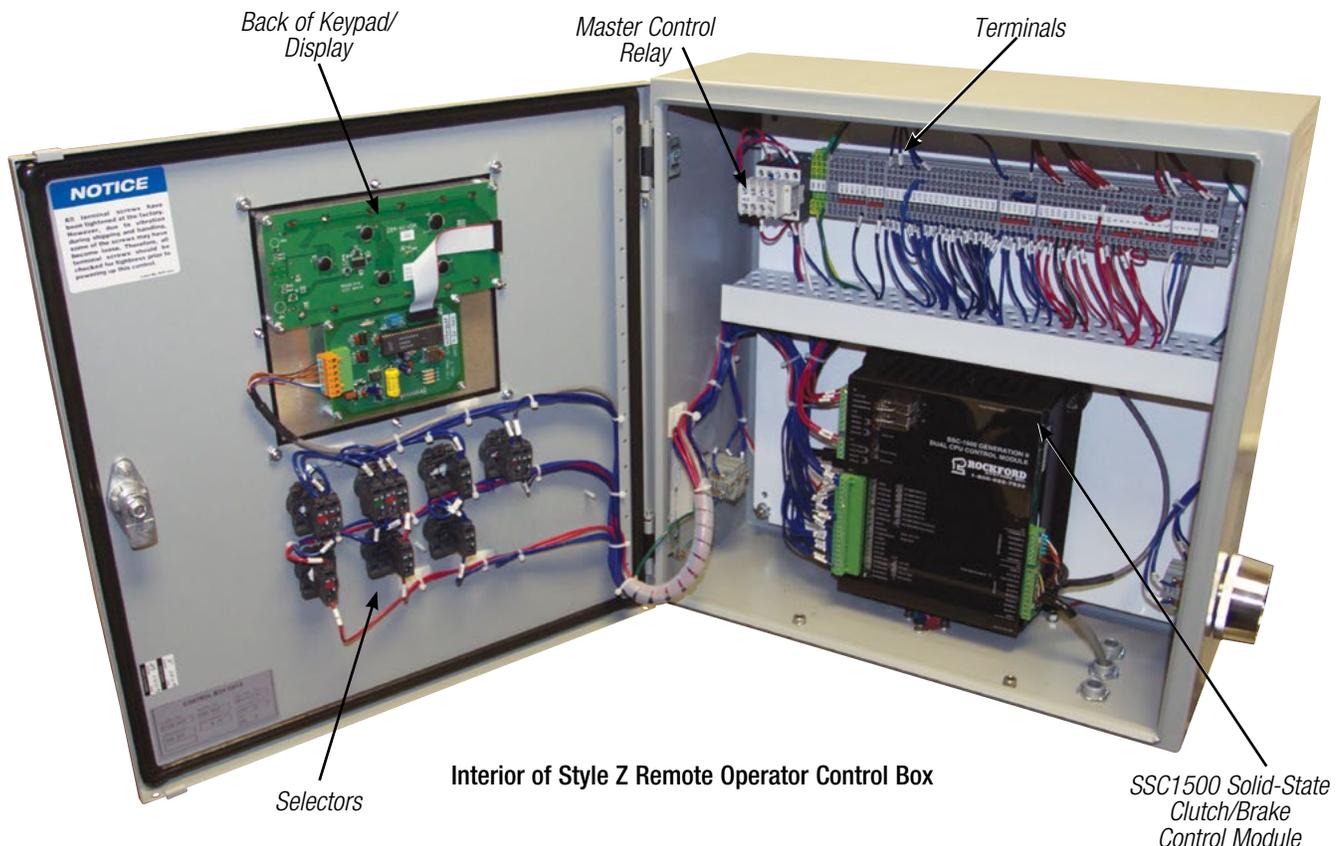
These remote operator-style clutch/brake control boxes include the same features and modes of operation as the standard SSC1500 control boxes described on pages 21-22. **However, they do not have a control transformer.** These control boxes are designed to be located on the front of the machine near the operator.

These controls are for applications where the machine's existing magnetic motor starter, fused disconnect switch, and control transformer meet the safety requirements and can be reused. If the existing control transformer cannot be reused or a new control transformer is required, please contact the factory.

The three standard remote operator-style control boxes available have the keypad/display and all operators on the door (front) of the 20" x 20" x 8" enclosure. Please see the next page for the three styles available.



Style Z Remote Operator Control Box
Clutch/Brake Control and Operators In One Box



Interior of Style Z Remote Operator Control Box

*SSC1500 Solid-State
Clutch/Brake
Control Module*

SSC1500 REMOTE OPERATOR-STYLE CONTROL BOXES (CONTINUED)



STYLE X INCLUDES:

- Keypad/display
- Program off/on selector switch
- Mode selector switch
- Actuating means selector switch
- Light curtain off/on selector switch
- Internal clutch/brake control module, master control relay, and terminals



STYLE Y INCLUDES:

- Keypad/display
- Program off/on selector switch
- Mode selector switch
- Actuating means selector switch
- Light curtain off/on selector switch
- Internal clutch/brake control module, master control relay, and terminals
- Prior-action push button
- Self-latching emergency-stop button
- Top-stop button



Style Z Includes:

- Keypad/display
- Program off/on selector switch
- Mode selector switch
- Actuating means selector switch
- Light curtain off/on selector switch
- Internal clutch/brake control module, master control relay, and terminals
- Prior-action push button
- Self-latching emergency-stop button
- Top-stop button
- Two guarded run/inch buttons located on the sides of the enclosure

CONTROL MODULE KIT—PART NO. PRC-000-KW

A control module kit allows the end user to update the clutch/brake control of a press with minimum equipment costs. The kit is supplied without the control enclosure, panel, control transformer, control fuse, terminal strips, wire duct, and wiring.

A set of electrical prints is supplied to show typical wiring and all mounting dimensions are provided in order for a qualified person to install the control module kit. The minimum area required on an existing control panel to install this kit is 18" H x 18" W x 6" D.

This control module kit includes the control module, master control relay, shock mounts, fasteners, suppressors, danger labels, and electrical prints.

The SSC1500 control can be furnished as a subpanel that includes everything in the standard control as described on pages 21-22 except for the enclosure. The area needed to mount the subpanel inside an existing control box is 18½" H x 18½" W x 6" D. See page 27 to determine the part number for the module kit or subpanel. A keypad/display kit is required unless a remote operator station is used (see below).

If the continuous mode of operation is used, a prior-action station, Part No. LLD1500, is required. See page 31.



KEYPAD/DISPLAY KIT—PART NO. LLD1513G2

The keypad/display kit can be used with any of the control boxes or the control module kit. This kit includes the keypad/display, a program off/on selector switch, a light curtain off/on selector switch, a hand/foot selector switch, an off/inch/single/continuous selector switch, and 25' of cable. Additional push buttons and nameplates for motor starters, etc., can be furnished depending on the features required. The area needed to mount the keypad/display kit is 10" H x 10½" W x 3½" D.

A resolver/pulsar assembly and cable, Part No. CMS115, is required with any of the control selections. See page 28 for further details on this component.



REMOTE OPERATOR STATIONS

For operator convenience, a remote operator station can be furnished for use with a plain-door control box, plain-door custom control box, or control module kit. The remote operator station contains the keypad/display, program off/on selector switch, and other selector switches and push buttons as required.

Remote operator stations are available in a standard format or can be customized to meet any requirements. Select from the following remote operator stations or contact the factory with your special requirements.



Remote Operator Station
Part No. LLD1504G2

REMOTE OPERATOR STATIONS

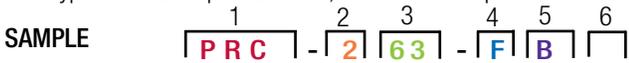
FEATURES	PART NO. LLD1504G2	PART NO. LLD1505G2	PART NO. LLD1506G2	PART NO. LLD1507G2	PART NO. LLD1508G2
KEYPAD/DISPLAY	X	X	X	X	X
PROGRAM OFF/ON SELECTOR SWITCH	X	X	X	X	X
OFF/INCH/SINGLE/CONTINUOUS SELECTOR SWITCH	X	X	X	X	X
HAND/FOOT SELECTOR SWITCH	X	X	X	X	X
LIGHT CURTAIN OFF/ON SELECTOR SWITCH	X	X	X	X	X
MAIN MOTOR START AND STOP PUSH BUTTONS		X	X	X	X
MAIN MOTOR FORWARD/REVERSE SELECTOR SWITCH			X		X
RAM-ADJUST OFF/ON SELECTOR SWITCH				X	X
RAM RAISE PUSH BUTTON				X	X
RAM LOWER PUCH BUTTON				X	X
A D D LIGHT CURTAIN BLANKING SELECTOR SWITCHES <i>(Use part # at right in place of part # above)</i>	LLD1544 G2	LLD1520 G2	LLD1521 G2	LLD1522 G2	LLD1523 G2

If any of the above remote operator stations are required without the enclosure, please consult the factory.

SELECTING AN SSC1500 PART-REVOLUTION PRESS CONTROL

TO DETERMINE THE 8- OR 9-DIGIT CONFIGURED PART NUMBER FOR THE PART-REVOLUTION CONTROL REQUIRED, FOLLOW DIRECTIONS 1-6 BELOW AND USE THE INFORMATION IN THE PART NUMBERING SYSTEM CHART BELOW.

1. The first 3 digits for all SSC1500 part-revolution controls are PRC.
2. The 4th digit determines the size of the disconnect switch, if provided, in the control enclosure. Zero (0) indicates no disconnect switch provided.
3. The 5th and 6th digits determine the size and type of motor starter(s), if provided, in the control enclosure. Zeros (00) in both positions indicate no motor starter(s) provided.
4. The 7th digit determines the location of the operator controls, or if it is a style X, Y, or Z control without the control transformer.
5. The 8th digit is for the type of light curtain interface provided.
6. The 9th digit (if required) will indicate the type of modifier provided: i.e., motor control operators remote.



The sample shown, PRC-263-FB, indicates that the custom part-revolution control box with a Banner light curtain interface will contain an IEC 60-A disconnect switch, an IEC 25-A reversing main drive motor starter, and an IEC 12-A reversing ram-adjust motor starter. The keypad/display and all operators will be located on the door of the enclosure.

SSC1500 PRESS CONTROL PART NUMBERING SYSTEM CHART																																																																							
PRC	- X X X - X X X																																																																						
SYSTEM TYPE PRODUCT CATEGORY	MODIFIER																																																																						
PRC — SSC1500 Press Control	-- — Blank, No Modifier 5 — Main Motor Operators Remote* 6 — Ram-Adjust Operators Remote* 7 — Main Motor and Ram-Adjust Operators Remote*																																																																						
DISCONNECT SWITCH SIZE—IEC (PLUS MAXIMUM MAIN MOTOR FLA)	LIGHT CURTAIN OPTIONS**																																																																						
0 — No Disconnect Switch 1 — 30A Disconnect — 1- to 20-FLA Main Drive Motor 2 — 60-A Disconnect — 21- to 40-FLA Main Drive Motor 3 — 100-A Disconnect — 41- to 66-FLA Main Drive Motor 4 — 200-A Disconnect — 67- to 133-FLA Main Drive Motor 5 — 400-A Disconnect — 134- to 266-FLA Main Drive Motor	B — Banner Light Curtain C — C4000 Advanced With LC Operators on Door V — C4000 Advanced With LC Operators Remote W — C4000 Standard																																																																						
REVERSING/NONREVERSING MAIN MOTOR STARTERS WITH OR WITHOUT RAM ADJUST	CONFIGURATION & OPERATOR LOCATION																																																																						
0 — No Motor Starters 1 — Nonreversing Main Motor Starter Without Ram Adjust 2 — Reversing Main Motor Starter Without Ram Adjust 3 — Nonreversing Main Motor Starter With 12-A Ram Adjust 4 — Nonreversing Main Motor Starter With 18-A Ram Adjust 5 — Nonreversing Main Motor Starter With 25-A Ram Adjust 6 — Reversing Main Motor Starter With 12-A Ram Adjust 7 — Reversing Main Motor Starter With 18-A Ram Adjust 8 — Reversing Main Motor Starter With 25-A Ram Adjust	F — Keypad/Display and all Operators on Door of Enclosure P — Keypad/Display and all Operators Remote (Plain Door) S — Subpanel Only—Without Enclosure, Keypad/Display, and Operators K — Kit With Module and Master Control Relay Only—Without Enclosure, Subpanel, Transformer, Keypad/Display, and Operators C — Console X — Same as F (above) Without Control Transformer Y — Same as F (above) Without Control Transformer but With E-Stop, Top Stop, and Prior Action on the Enclosure Z — Same as F (above) Without Control Transformer but With E-Stop, Top Stop, Prior Action, and Two (2) Guarded Run/Inch Buttons on the Enclosure																																																																						
MAIN MOTOR STARTER SIZE																																																																							
0 — No Starter IEC 1 — 12 A 2 — 18 A 3 — 25 A 4 — 32 A 5 — 40 A 6 — 50 A 7 — 65 A 8 — 80 A 9 — 95 A A — 115 A B — 185 A C — 265 A	<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th colspan="5">Motor Horsepower Chart—3 Phase</th> </tr> <tr> <th></th> <th>208 V</th> <th>230 V</th> <th>460 V</th> <th>575 V</th> </tr> </thead> <tbody> <tr><td>2</td><td>2</td><td>3</td><td>7.5</td><td>7.5</td></tr> <tr><td>5</td><td>5</td><td>5</td><td>10</td><td>10</td></tr> <tr><td>5</td><td>7.5</td><td>7.5</td><td>15</td><td>15</td></tr> <tr><td>7.5</td><td>10</td><td>10</td><td>20</td><td>20</td></tr> <tr><td>10</td><td>10</td><td>10</td><td>30</td><td>30</td></tr> <tr><td>15</td><td>15</td><td>15</td><td>30</td><td>40</td></tr> <tr><td>20</td><td>20</td><td>20</td><td>50</td><td>50</td></tr> <tr><td>25</td><td>30</td><td>30</td><td>60</td><td>75</td></tr> <tr><td>30</td><td>30</td><td>30</td><td>60</td><td>75</td></tr> <tr><td>30</td><td>40</td><td>40</td><td>75</td><td>100</td></tr> <tr><td>50</td><td>60</td><td>60</td><td>125</td><td>150</td></tr> <tr><td>75</td><td>100</td><td>100</td><td>200</td><td>200</td></tr> </tbody> </table>	Motor Horsepower Chart—3 Phase						208 V	230 V	460 V	575 V	2	2	3	7.5	7.5	5	5	5	10	10	5	7.5	7.5	15	15	7.5	10	10	20	20	10	10	10	30	30	15	15	15	30	40	20	20	20	50	50	25	30	30	60	75	30	30	30	60	75	30	40	40	75	100	50	60	60	125	150	75	100	100	200	200
Motor Horsepower Chart—3 Phase																																																																							
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75	100	100	200	200																																																																			
	*See page 48 for remote motor control operator stations or Safety Shields catalog. **Additional light curtain interface options are available upon request — contact Rockford Systems at 1-800-922-7533.																																																																						

SSC1500 AND SSC3000 PRESS INDIVIDUAL COMPONENTS

RESOLVER/PULSER ASSEMBLY

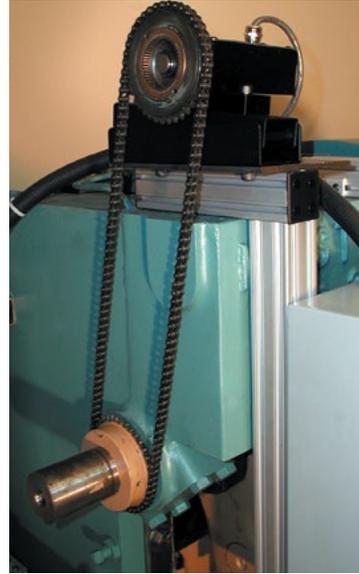
Part No. CMS115*—40' Cable

Part No. CMS115-100—100' Cable

An absolute resolver/pulser timing device is required with the SSC1500 control to provide the angular position and velocity/motion information of the machine crankshaft to the control. The resolver is a highly accurate and repeatable device which uses an internally mounted photoelectric sensor and disk to verify the position of the crankshaft.

The resolver/pulser timing device is contained in a rugged, heavy-duty housing with a spring-compression base. The spring base helps isolate the resolver from shock load and vibration that are common occurrences on presses. This provides longer life for the components inside the enclosure. The spring base also functions as a drive chain tightener. This resolver/pulser assembly can also be furnished without the spring base when a direct-coupling drive is encountered. Please consult the factory.

The 3/4" diameter steel drive shaft with keyway is mounted in sealed ball bearings. This results in a rugged resolver assembly for press applications. The resolver/pulser is furnished with a 40' cable (or optional 100' cable) that connects to the drive assembly and wires in to the control box. The cable can be cut to length and wired to terminals.



Resolver/Pulser Assembly on Press
(Sprocket and chain cover has been removed for photo)

SPROCKET ASSEMBLY

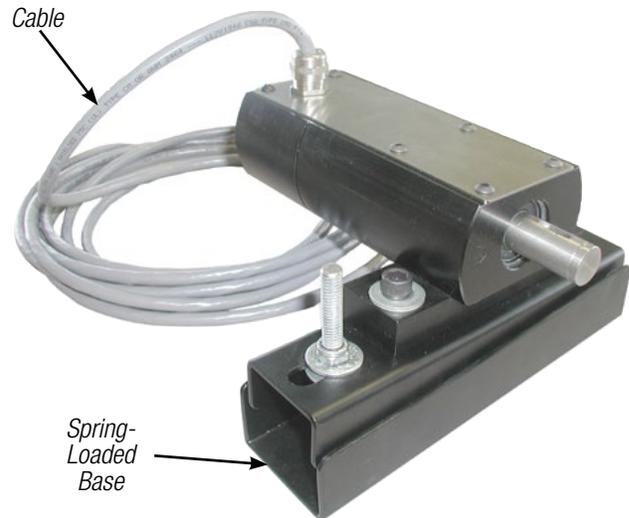
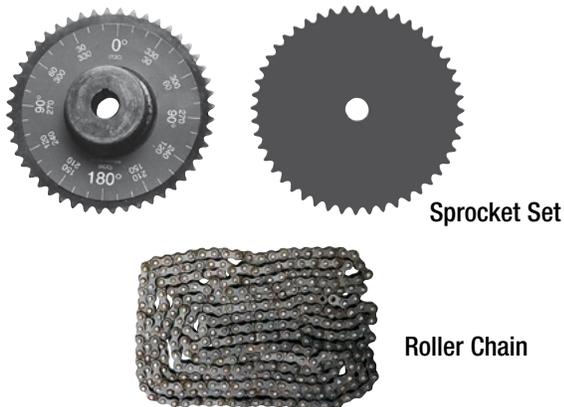
Part No. CML000*

A sprocket set consists of two sprockets. One fits on the 3/4" shaft of the CMS115 resolver/pulser assembly; the other sprocket is for mounting to the end of the press crankshaft. These 48-tooth sprockets are designed to accept ANSI No. 35 roller chain.

ROLLER CHAIN

Part No. CMS515*

ANSI No. 35 roller chain and master link is 10 feet long for driving the above sprockets.



Resolver/Pulser Assembly

**Included in a component package on page 34 or page 35.*

SSC1500 AND SSC3000 PRESS INDIVIDUAL COMPONENTS (CONTINUED)

MONITORED DUAL-SOLENOID AIR VALVE

1/2" INLET / 1/2" OUTLET PORT — Part No. RCL652
(for 10- to 25-ton presses)

1/2" INLET / 3/4" OUTLET PORT — Part No. RCL654*
(for 26- to 100-ton presses)

This three-way cross flow, series/parallel air valve includes an air pressure electrical output monitor and muffler. Air is put into the clutch and brake when the dual-solenoid air valve is electrically energized. When it is de-energized, the air is dumped through the muffler from the clutch and brake.

This valve consists of two main parts: the piloted monitor assembly and the valve body assembly. The two main valve elements move simultaneously during normal operation. If these elements should fail to move simultaneously, the internal spool shifts, inhibiting further machine operation. The pressure switch will provide a signal to the control system to indicate a fault condition. A reset button on the side of the valve can be used to reset the valve if an accidental valve fault is detected.

AVERAGE CV (FLOW RATE)		
PART NO.	PORTS 1 TO 2	PORTS 2 TO 3
RCL652	2.8	6.7
RCL654	2.8	6.7



Monitored Dual-Solenoid Air Valve

MONITORED DUAL-SOLENOID AIR VALVE WITH RESET BUTTON

1" INSET / 1" OUTLET PORT — Part No. RCL656
(for 101- to 300-ton presses)

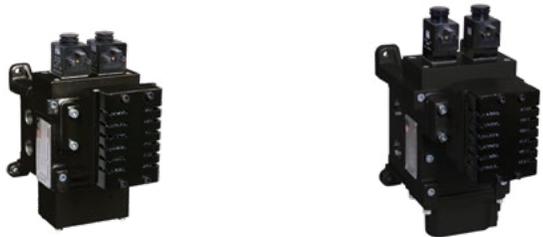
1 1/2" INLET / 2" OUTLET PORT — Part No. RCL658
(for 301- to 1000-ton presses)

This cross flow, series/parallel air valve includes an air pressure electrical output and muffler. The separate reset button provides a remote reset at floor level if the valve latches out when an accidental air valve fault is detected. This valve is used for the clutch/brakes on large presses which require larger air volume capacity.

This valve assembly consists of a pilot, monitor, valve body, and junction box. It operates on the same principles as the 1/2" and 3/4" valves described above.

NOTE: If the clutch and brake are split, two valves may be required to provide good stopping times.

AVERAGE CV (FLOW RATE)		
PART NO.	PORTS 1 TO 2	PORTS 2 TO 3
RCL656	4.63	12.55
RCL658	20.22	53.68



RCL654

RCL656



RCL658

FRL (FILTER-REGULATOR-LUBRICATOR)

This assembly is required to meet the OSHA and ANSI standards. This FRL assembly filters, regulates, and lubricates the air going through it. This filtered and lubricated air then goes to the dual-solenoid air valve assembly and clutch/brake. The regulator should be adjusted to meet the original equipment manufacturer's requirements. The assembly includes a gauge, coupling, and a steel mounting bracket. The FRL assembly can be used for any air-operated device on the press including the counterbalance or die cushion.



RCL044—1/2"

RCL045—3/4"

RCL046—1" & RCL047—1 1/2"

*Included in a component package on page 34 or page 35.

SSC1500 AND SSC3000 PRESS INDIVIDUAL COMPONENTS (CONTINUED)

AIR PRESSURE SWITCH

Part No. CTD062*

This air pressure switch monitors low pressure to either the clutch/brake air supply or slide counterbalance systems. Each system requires an air pressure switch. The pressure switch must be set so if the air pressure operating the component goes below a predetermined amount, the press becomes inoperable.

Each air pressure switch's low level setting is based on each application and the machine manufacturer's recommendations. The contact arrangement is 1 NO and 1 NC.



Air Pressure Switch

CHECK VALVE FOR COUNTERBALANCE SYSTEM

(not included in any component package on page 34 or page 35)

A check valve is required to meet the OSHA and ANSI standards. It maintains counterbalance surge tank pressure in the event of a sudden loss of air pressure. It is installed in the air line going to the tank. Please check the size of the air line going to the tank to determine the proper size valve.

Note: Press must have a counterbalance system with a surge tank to properly apply a check valve.



Check Valve

PALM BUTTON ASSEMBLY

To meet OSHA and ANSI safety standards, the two run/inch buttons must be protected against accidental operation (ring guards) and separated to require the use of both hands to operate them. They must also be mounted at the proper safety distance, if they will be used as a safeguard. The contact arrangement of these buttons is 1 NO and 1 NC.

Part No. CTL502*

This palm button assembly consists of two black run/inch buttons (with ring guards), a red emergency-stop button, and a yellow top-stop button. Mounting boxes are furnished with each button. The red and yellow palm buttons each have 1 NO and 1 NC arrangement. The red button is on a yellow-covered mounting box and is equipped with a mechanical latch to meet NFPA 79.

PART NO. RCD061—1/2"

PART NO. RCD062—3/4"

PART NO. RCD063—1"

PART NO. RCD064—1 1/2"

PART NO. RCD065—2"



Part No. CTL502

Part No. CTL507*

This palm button assembly consists of two black run/inch buttons (with ring guards), and a red emergency-stop button (for press applications without the continuous mode of operation). Mounting boxes are furnished with each button. The red palm button is on a yellow-covered mounting box and has 1 NO and 1 NC arrangement plus a mechanical latch to meet NFPA 79.



Part No. CTL507

Palm buttons can also be furnished in a control bar along with push buttons and selector switches. Please see pages 49-50 for control bars, and pages 87-88 for other palm button assembly options.

*Included in a component package on page 34 or page 35.

SSC1500 PRESS INDIVIDUAL COMPONENTS (CONTINUED)

FOOT SWITCH

Part No. CTD011* & CTD088

This foot switch is protected from unintentional operation. A die-cast cover protects the top and both sides, and the front is protected by a hinged flap. The flap must be lifted with the toe before the foot may enter the switch. The electrical contact arrangement is 1 NO and 1 NC.



Foot Switch CTD011



Foot Switch CTD088

PRIOR-ACTION STATION

Part No. LLD1500*

This prior-action station has a push button that must be depressed and released by the operator before depressing the actuating means in order to initiate the continuous mode of operation. This type of continuous mode of operation is sometimes referred to as “walk-away” continuous. This steel enclosure is 3½” x 3¼” x 3¼”. This prior-action station is also required when using the continuous-on-demand, automatic single-stroke, two-hand-maintained continuous, or foot-maintained continuous mode of operation. These modes of operation are furnished as standard features in the SSC1500 control.



Prior-Action Station

SUPERVISORY CONTROL STATION

Part No. LLD1501

Part No. LLD283*

(required when a USC000 is used—see next page)

When two or more palm button or foot switch operating stations are required on one machine, one supervisory control station is required at each operator station. This remote control station consists of an off/on keyed selector switch and a station on indicator light. The on position allows the operator to use that station, and the off position deactivates only that station. The enclosure size is 5¼” x 3” x 3¼”.



Supervisory Control Station

BAR/RUN STATION (not included in any component package on page 34 or page 35)

Part No. LLD1502

This remote bar/run station can be used in conjunction with a manual turnover bar when setting dies in the press. The flywheel must have holes in the periphery for insertion of a spring-loaded turnover bar** (or the flywheel can be manually turned when the flywheel cover is removed). The remote station includes a three-position selector switch for bar/off/run, and one push button used for energizing the dual-solenoid air valve to engage the clutch and release the brake. The flywheel must be at rest (static) when engaging the clutch. After the clutch is engaged, the die setup person can manually turn the flywheel with a spring-loaded turnover bar (see page 86). The enclosure size is 5¼” x 3” x 3¼”.



Bar/Run Station

**Included in a component package on page 34 or page 35.
**For a spring-loaded turnover bar, see page 86.*

SSC1500 PRESS INDIVIDUAL COMPONENTS (CONTINUED)

MULTIPLE-OPERATOR JUNCTION BOX

Part No. USC000*

When multiple operator stations are required, this junction box is furnished separately for wiring up to four (4) operator stations. This junction box interfaces palm button assemblies/control bars and foot switches, and will not allow the press to run if palm buttons or a foot switch is actuated without its supervisory control station on. A lighted push button with nameplate indicates a fault condition of an operator station. The button is pushed to reset. The enclosure size is 16" x 14" x 6".



Multiple-Operator Junction Box

CRANKSHAFT ANGLE DISPLAY

Part No. FTL055

The optional crankshaft angle display is a unit that shows the angular position of the crankshaft for mechanical power presses. The crankshaft position is shown both graphically (with red LEDs in a circle) and numerically (with a large, red, three-digit LED). The large display can be easily seen which helps with setup, removal of stuck workpieces, or for assistance during emergency extraction procedures.

FEATURES

- Large LED numerical display and circular LED graphic display can be easily seen
- 6" x 6" x 2" enclosure
- Mounts easily
- Supplied with 25' of cable for connection to the control
- Helps satisfy the requirements of Canadian Standard CSA Z142-02, Code for Power Press Operation: Health, Safety, and Guarding Requirements, for indication of crank angle position



Crankshaft Angle Display
Mounted on a Mechanical Power Press

*Included in a component package on page 34 or page 35.

LOCKOUT VALVES (not included in any component packages on pages 34 or 35)

SLIDE-OPERATED VALVE

This three-way valve is operated with the manual movement of a slide that opens and closes the valve. This valve shuts off air at the press and then bleeds off downstream air. It can be locked only in the off position.



PART NO.	PORT SIZE IN-OUT	BAR
RCD071	1/4"	250

MANUAL VALVE

This manually operated valve shuts off air flow when a machine needs to be locked out. To shut off and exhaust air in the line, the handle is pushed in. This causes the pressurized supply of air to be blocked, and the downstream air in the line is exhausted through the exhaust port and muffler at the bottom of the valve. The valve can be padlocked in the off position. The valve is furnished with a muffler. Port sizes available for air flow are 3/4" and 1".



PART NO.	PORT SIZE		PSI	BAR
	IN-OUT	EXH.		
RCD076	3/4"	1-1/4"	15-50	1-10
RCD077	1"	1-1/4"	15-50	1-10

MANUAL PILOT VALVE

This manually operated pilot valve is used in larger air systems. It is available for port sizes of 1 1/2" and 2 1/2". It operates in a similar manner as the manual valve. By pushing the handle in or out, it controls pilot pressure to a piston which opens or closes the valve's inlet poppet. It is designed to be locked only in the off position. This valve is furnished with a muffler.



PART NO.	PORT SIZE		PSI	BAR
	IN-OUT	EXH.		
RCD078	1-1/2"	1-1/2"	15-150	1-10
RCD079	2-1/2"	2-1/2"	30-150	2-10

EEZ-ON VALVE

This valve shuts off air supply to the machine and bleeds downstream air when the valve is closed. When the valve is open, it gradually allows air into the air system to prevent damage to air components. It can be locked only in the off position. This valve is furnished with a muffler.



PART NO.	PORT SIZE		PSI	BAR
	IN-OUT	EXH.		
RCD121	1/2"	3/4"	30-150	2-10
RCD122	3/4"	3/4"	30-150	2-10

SELECTING AN SSC1500 PRESS COMPONENT PACKAGE

To complete the SSC1500 control system, component packages are available. Component packages are listed in the charts below and on the next page. These packages can be furnished with:

- A STANDARD CONTROL • A CUSTOM CONTROL • A CONSOLE CONTROL • A SPECIAL CONTROL
- A REMOTE OPERATOR-STYLE CONTROL • A SUBPANEL • A CONTROL MODULE KIT

To select the proper component package to go with your control box, determine your requirements below:

- A** MODES OF OPERATION AND ACTUATING MEANS REQUIRED.
- B** NUMBER OF OPERATOR STATIONS REQUIRED.
- C** NUMBER OF AIR PRESSURE SWITCHES REQUIRED.

A Modes of operation: Inch, Single, and Continuous (Hand or Foot)				
B ONE OPERATOR STATION			B TWO OPERATOR STATIONS	
MODES OF OPERATION TO BE USED	C ONE AIR PRESSURE SWITCH	C TWO AIR PRESSURE SWITCHES	C ONE AIR PRESSURE SWITCH	C TWO AIR PRESSURE SWITCHES
SSC1500 Control Box	TNR-000-SSP Standard Component Package	TNR-001-SSP Component Package	TNR-002-SSP Component Package	TNR-003-SSP Component Package
<ul style="list-style-type: none"> • Two-Hand Inch • Two-Hand Single Stroke • Foot Single Stroke • Two-Hand Continuous 	COMPONENTS REQUIRED IN ADDITION TO THOSE LISTED IN STANDARD PACKAGE AT LEFT			
		CTD062 Air Pressure Switch (For Counterbalance)	CTL502 Palm Button Assembly CTD011 Foot Switch LLD283 Supervisory Control Station (2) USC000 Multiple Operator Junction Box	CTD062 Air Pressure Switch (For Counterbalance) CTL502 Palm Button Assembly CTD011 Foot Switch LLD283 Supervisory Control Station (2) USC000 Multiple Operator Junction Box
A Modes of operation: Inch, Single, and Continuous (Hand Only)				
B ONE OPERATOR STATION			B TWO OPERATOR STATIONS	
MODES OF OPERATION TO BE USED	C ONE AIR PRESSURE SWITCH	C TWO AIR PRESSURE SWITCHES	C ONE AIR PRESSURE SWITCH	C TWO AIR PRESSURE SWITCHES
SSC1500 Control Box	TNC-000-SSP Standard Component Package	TNC-001-SSP Component Package	TNC-002-SSP Component Package	TNC-003-SSP Component Package
<ul style="list-style-type: none"> • Two-Hand Inch • Two-Hand Single Stroke • Two-Hand Continuous 	COMPONENTS REQUIRED IN ADDITION TO THOSE LISTED IN STANDARD PACKAGE AT LEFT			
	CMS115 Resolver/Pulsar Timing Device With 40' Cable and Plug CML000 Sprockets (Set of 2) CMS515 10' ANSI No. 35 Roller Chain RCL654 ¼" Dual-Solenoid Air Valve RCL045 ¾" Filter-Regulator-Lubricator Assembly CTD062 Air Pressure Switch (For Clutch/Brake) CTL502 Palm Button Assembly LLD1500 Prior-Action Station	CTD062 Air Pressure Switch (For Counterbalance)	CTL502 Palm Button Assembly LLD283 Supervisory Control Station (2) USC000 Multiple Operator Junction Box	CTD062 Air Pressure Switch (For Counterbalance) CTL502 Palm Button Assembly LLD283 Supervisory Control Station (2) USC000 Multiple Operator Junction Box

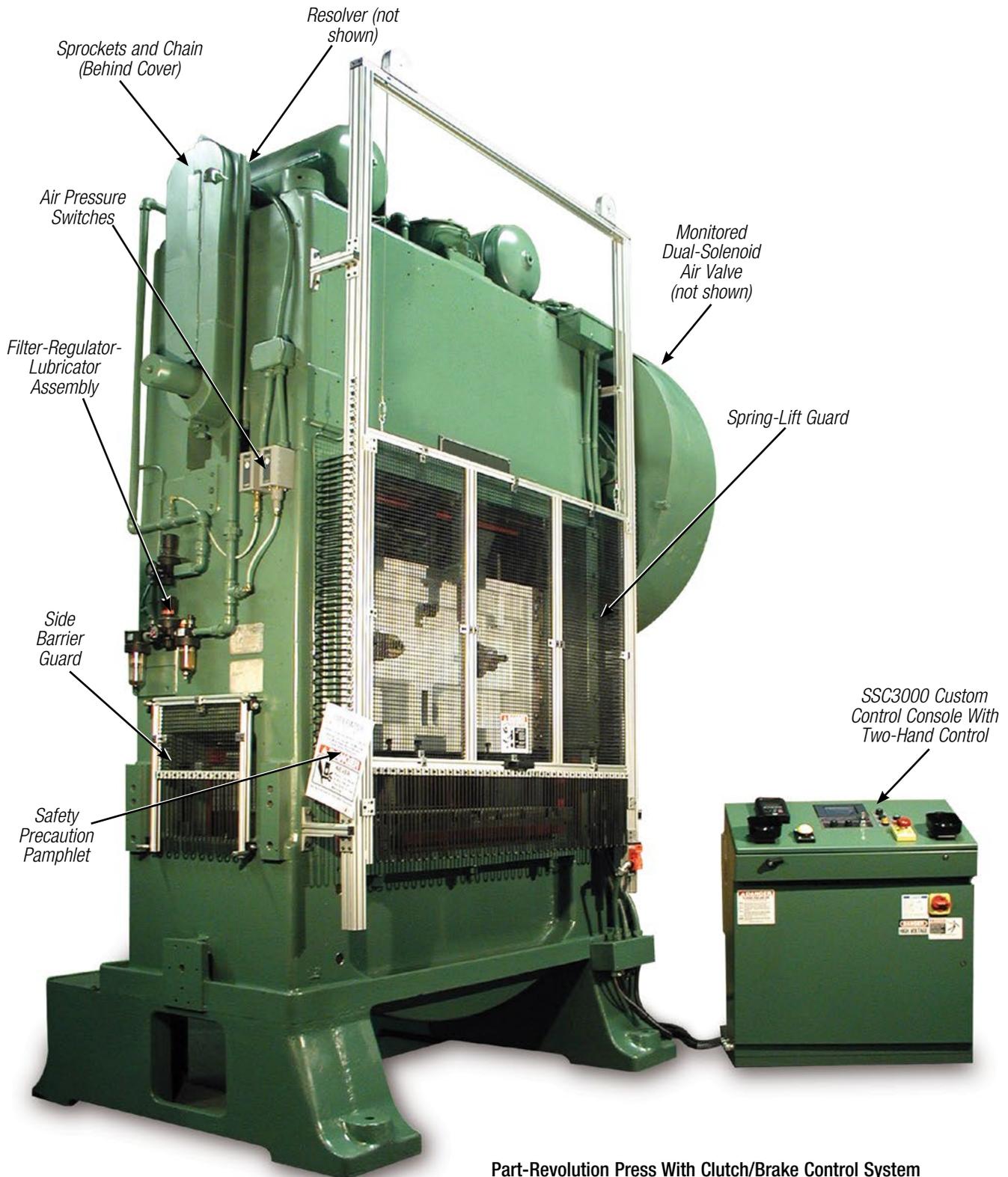
For light curtains, mounting brackets, and barrier guards for the sides of the point of operation, see Safeguarding Devices catalog.

SELECTING AN SSC1500 PRESS COMPONENT PACKAGE (CONTINUED)

A Modes of operation: Inch and Single (Hand or Foot)				
B ONE OPERATOR STATION			B TWO OPERATOR STATIONS	
MODES OF OPERATION TO BE USED	C ONE AIR PRESSURE SWITCH	C TWO AIR PRESSURE SWITCHES	C ONE AIR PRESSURE SWITCH	C TWO AIR PRESSURE SWITCHES
SSC1500 Control Box	TNK-000-SSP Standard Component Package	TNK-001-SSP Component Package	TNK-002-SSP Component Package	TNK-003-SSP Component Package
<ul style="list-style-type: none"> • Two-Hand Inch • Two-Hand Single Stroke • Foot Single Stroke 	CMS115 Resolver/Pulser Timing Device With 40' Cable and Plug CML000 Sprockets (Set of 2) CMS515 10' ANSI No. 35 Roller Chain RCL654 ¾" Dual-Solenoid Air Valve RCL045 ¾" Filter-Regulator-Lubricator Assembly CTD062 Air Pressure Switch (For Clutch/Brake) CTL507 Palm Button Assembly CTD011 Foot Switch	COMPONENTS REQUIRED IN ADDITION TO THOSE LISTED IN STANDARD PACKAGE AT LEFT		
		CTD062 Air Pressure Switch (For Counterbalance)	CTL507 Palm Button Assembly CTD011 Foot Switch LLD283 Supervisory Control Station (2) USC000 Multiple Operator Junction Box	CTD062 Air Pressure Switch (For Counterbalance) CTL507 Palm Button Assembly CTD011 Foot Switch LLD283 Supervisory Control Station (2) USC000 Multiple Operator Junction Box
A Modes of operation: Inch and Single (Hand Only)				
B ONE OPERATOR STATION			B TWO OPERATOR STATIONS	
MODES OF OPERATION TO BE USED	C ONE AIR PRESSURE SWITCH	C TWO AIR PRESSURE SWITCHES	C ONE AIR PRESSURE SWITCH	C TWO AIR PRESSURE SWITCHES
SSC1500 Control Box	TNF-000-SSP Standard Component Package	TNF-001-SSP Component Package	TNF-002-SSP Component Package	TNF-003-SSP Component Package
<ul style="list-style-type: none"> • Two-Hand Inch • Two-Hand Single Stroke 	CMS115 Resolver/Pulser Timing Device With 40' Cable and Plug CML000 Sprockets (Set of 2) CMS515 10' ANSI No. 35 Roller Chain RCL654 ¾" Dual-Solenoid Air Valve RCL045 ¾" Filter-Regulator-Lubricator Assembly CTD062 Air Pressure Switch (For Clutch/Brake) CTL507 Palm Button Assembly	COMPONENTS REQUIRED IN ADDITION TO THOSE LISTED IN STANDARD PACKAGE AT LEFT		
		CTD062 Air Pressure Switch (For Counterbalance)	CTL507 Palm Button Assembly LLD283 Supervisory Control Station (2) USC000 Multiple Operator Junction Box	CTD062 Air Pressure Switch (For Counterbalance) CTL507 Palm Button Assembly LLD283 Supervisory Control Station (2) USC000 Multiple Operator Junction Box
Console Application Only	A Modes of operation: Inch, Single, and Continuous (Hand Only)			
B ONE OPERATOR STATION			B TWO OPERATOR STATIONS	
MODES OF OPERATION TO BE USED	C ONE AIR PRESSURE SWITCH	C TWO AIR PRESSURE SWITCHES	C ONE AIR PRESSURE SWITCH	C TWO AIR PRESSURE SWITCHES
SSC1500 Control Box	TNX-000-SSP Standard Component Package	TNX-001-SSP Component Package	TNX-002-SSP Component Package	TNX-003-SSP Component Package
<ul style="list-style-type: none"> • Two-Hand Inch • Two-Hand Single Stroke • Two-Hand Continuous 	CMS115 Resolver/Pulser Timing Device with 40' Cable and Plug CML000 Sprockets (Set of 2) CMS515 10' ANSI No. 35 Roller Chain RCL654 ¾" Dual-Solenoid Air Valve RCL045 ¾" Filter-Regulator-Lubricator Assembly CTD062 Air Pressure Switch (For Clutch/Brake)	COMPONENTS REQUIRED IN ADDITION TO THOSE LISTED IN STANDARD PACKAGE AT LEFT		
		CTD062 Air Pressure Switch (For Counterbalance)	CTL502 Palm Button Assembly LLD283 Supervisory Control Station USC000 Multiple Operator Junction Box	CTD062 Air Pressure Switch (For Counterbalance) CTL502 Palm Button Assembly LLD283 Supervisory Control Station USC000 Multiple Operator Junction Box

For light curtains, mounting brackets, and barrier guards for the sides of the point of operation, see catalog *Safeguarding Devices* catalog.

SAFEGUARDED PART-REVOLUTION PRESS WITH SSC3000 PRESS AUTOMATION CONTROL



**Part-Revolution Press With Clutch/Brake Control System
With Point-of-Operation Guards**

SSC3000 STANDARD CONTROL



Standard SSC3000 Control Box (PACG2-P100-VAABCXXX Shown)

The SSC3000 solid-state press automation control is designed for use on part-revolution-clutch mechanical power presses. The SSC3000 is a rack-mounted modular control system with expandable options. These expandable options permit changes to be made, or features to be added or deleted as press requirements change. If additional features are required, plug-in cards and/or additional equipment can be added.

The basic design allows the user or OEM (original equipment manufacturer) to apply automation to mechanical power presses. The automation is usually applied to primary machines that operate in modes of continuous, automatic single stroke, or continuous-on-demand. This control can also be applied to presses that operate in the single-stroke mode of operation to perform manual secondary jobs that may be required to run automatic modes later.

The standard control box is in a 30" x 30" x 10" NEMA 12 enclosure with the operator controls and touch screen/display located in a remote operator station. The standard automation control rack is furnished with a power supply module and a Main CPU (central processing unit) Card.

The rack is designed to hold eight additional cards for expandable options. These card options include: Clutch/Brake Control, PLS (programmable limit switch), Die Protection, Load Monitor, and Angle Display.

Timing functions of the SSC3000 press automation control system are generated from a rotary resolver/pulsar assembly. This gives absolute position of the crankshaft (rotary) position.

If a starter or disconnect is required in the same enclosure as the standard SSC3000 control, see page 40, SSC3000 custom control box. If a separate starter or disconnect, or combination starter disconnect is required, refer to our Safety Shields catalog.

SSC3000 CUSTOM CONTROL

A part-revolution-clutch SSC3000 custom control box is also available to fit your particular press room needs. This control includes the same features and modes of operation as the standard SSC3000 control box described on the previous page.

A custom SSC3000 solid-state press automation control box includes a multi-tap transformer, modular control rack with power supply, and a



**Custom SSC3000 Control Box
(PACG2-P264-WAXXXXXXX Shown)**

Main CPU Card. It is furnished with an IEC through-the-door main power fused disconnect switch, an IEC magnetic motor starter(s) for the main drive motor and, a motor starter for the ram-adjust motor, if applicable. The operator controls and the touch screen/display can be located on the door, or they can be located in a remote operator station for use with a plain-door custom control box. NEMA disconnect switches and starters are also available.

To ensure the starter(s) and disconnect are sized properly, please check horsepower for the main drive motor and ram-adjust motor (if furnished) on the press, as well as full-load amps, and primary voltage to the press. After obtaining this information, please go to page 45 to determine the proper custom control box part number. Follow directions 1-7 to obtain the correct part number.

SSC3000 MODULAR CONTROL RACK KIT



PACG2-K000-XXXXXXX Shown

The modular control rack kit can be furnished when the existing control enclosure is retained. The minimum area required on an existing control panel inside the control box to install the rack kit is 15" H x 18" W x 10" D. This kit includes a master control relay, the modular control rack, a power supply, and a Main CPU Card. A dual CPU press Clutch/ Brake Controller Card and other expandable card options can be added (see pages 42-44). A complete sign package, installation manual, instructions, and electrical diagrams are furnished.

SSC3000 TOUCH SCREEN/DISPLAY KIT



Touch Screen/Display Kit—LLD3023G2

The touch screen/display kit includes the touch screen/display, an off/program/run selector, a mode selector, an actuating means selector, and a light curtain off/on selector switch, and 25' of cable. The space required to mount the touch screen/display kit is 12" H x 10" W x 3" D. A remote operator station can also be furnished that has the touch screen/display kit in an enclosure. See the next page for choices of operator stations.

SSC3000 REMOTE OPERATOR STATIONS

A remote operator station or operator kit—containing the touch screen/display, off/program/run selector switch, other selector switches, and push buttons as required—is always necessary with the press automation control system.

Remote operator stations or kits are available in a standard format or can be customized to meet any requirements. Select from the following or contact the factory with your special requirements. If the Clutch/Brake Controller Card is not provided as a part of the press automation control system, contact the factory for a special remote operator station.



Standard Remote Operator Station
Part No. LLD3004G2

SSC3000 REMOTE OPERATOR STATIONS

FEATURES	PART NO. LLD3004 G2	PART NO. LLD3005 G2	PART NO. LLD3006 G2	PART NO. LLD3007 G2	PART NO. LLD3008 G2	PART NO. LLD3009 G2	PART NO. LLD3010 G2	PART NO. LLD3011 G2	PART NO. LLD3012 G2	PART NO. LLD3023 G2
ENCLOSURE	X	X	X	X	X					
TOUCH SCREE/DISPLAY	X	X	X	X	X	X	X	X	X	X
OFF/PROGRAM/RUN SELECTOR SWITCH	X	X	X	X	X	X	X	X	X	X
MODE OF OPERATION SELECTOR SWITCH	X	X	X	X	X	X	X	X	X	X
ACTUATING MEANS SELECTOR SWITCH	X	X	X	X	X	X	X	X	X	X
LIGHT CURTAIN OFF/ON SELECTOR SWITCH	X	X	X	X	X	X	X	X	X	X
MAIN MOTOR START & STOP PUSH BUTTONS		X	X	X	X	X	X	X	X	
MAIN MOTORE FORWARD/ REVERSE SELECTOR			X		X		X		X	
RAM-ADJUST OFF/ON SELECTOR SWITCH				X	X			X	X	
LIGHT CURTAIN BLANKING SELECTOR SWITCHES <i>(Use part # at right in place of part # above)</i>	LLD3031 G2	LLD3032 G2	LLD3033 G2	LLD3034 G2	LLD3035 G2	LLD3036 G2	LLD3037 G2	LLD3038 G2	LLD3039 G2	LLD3040 G2

An additional light curtain off/on selector switch can be added to the above operator stations or kits. The additional selector switch is used when two independent light curtain systems are required. Please consult the factory.

SSC3000 BASIC SYSTEM FEATURES

MODULAR RACK DESIGN

The SSC3000 press automation control consists of a modular control rack with power supply and a Main CPU (central processing unit) Card. The control rack is mounted to the panel with shock/vibration mounts and measures 9½” H x 17½” W x 6” D. This modular rack is designed with additional slots for adding expandable card options to provide the automation features you need for your press.

MAIN CPU CARD

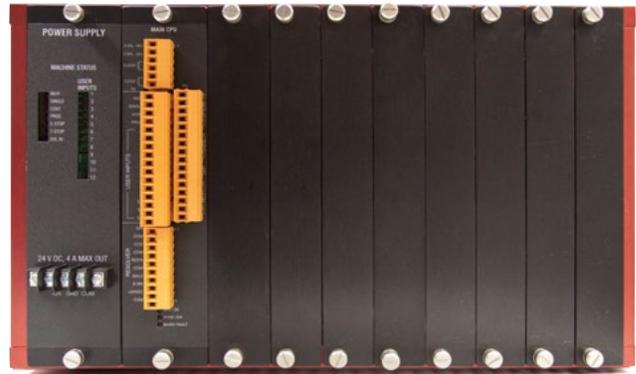
Part No. FRL-318

The SSC3000 press automation control Main CPU Card provides all the main processing for the base automation system. There are red and green LEDs (light-emitting diodes) that allow for visual indication of control operation and the status of inputs and outputs. All LED names are indicated on the cover of the Main CPU Card.

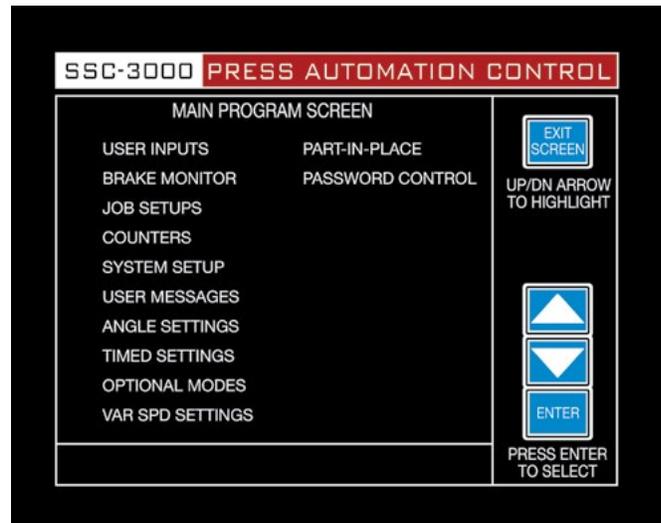
Main CPU Card Features

User Inputs

Twelve (12) programmable user inputs are dedicated to machine diagnostics. They can be programmed for equipment monitoring or other user-defined functions. After programming the 12 inputs, the current status of these inputs can be displayed on the touch screen. When a fault condition is detected, the machine will top stop or emergency stop, and the assigned message will be displayed on the touch screen from the list below. An additional ten (10) user-defined messages can be added to this list.



Main Control Rack With Power Supply and Main CPU Card



Example of Main Program Screen

Standard User Input Fault Messages

Clutch/Brake Air Fault	Lube Motor Overload	Variable Speed Drive Fault
Counterbalance Air Fault	Auxiliary Motor Overload	Die Protection Fault**
Dual Solenoid Fault	Guard Interlock Open	Short Feed Fault**
Clutch Valve Fault*	Front Guard Open	Part Ejection Fault**
Brake Valve Fault*	Rear Guard Open	Stock Buckle Fault**
Lube Fault	Left Side Guard Open	End of Stock Fault**
High Lube Pressure	Right Side Guard Open	Pilot Pin Fault**
Low Lube Pressure	Feeder Fault	Part Input #1**
Low Lube Level	Load Monitor Fault	Part Input #2**
Main Motor Overload	Safety Block Interlock	Part Input #3**
Ram-Adjust Motor Overload	Shut Height Fault	

*Used when two valves are furnished for split clutch/brake

**Messages typically used for die protection

SSC3000 BASIC SYSTEM FEATURES (CONTINUED)

MAIN CPU CARD FEATURES (CONTINUED)

TIME-BASED BRAKE MONITOR

A time-based programmable brake monitor (stopping performance monitor) with both warning and fault setpoints is included.

STM (STOP-TIME MEASUREMENT) TEST

The control includes a stop-time measurement test. This is used for establishing and maintaining the proper safety distance when applying two-hand control or light curtains as the safeguarding method.

100-JOB SETUP MEMORY

Up to 100 job setups can be stored in memory allowing for quick changeover from die to die. The die number, description, PLS outputs, die protection inputs, load monitor settings, servo feed, and counter information can be saved for each job.

COUNTERS

The batch and stroke counters can be used for die maintenance, quality control checks, or part bin exchanges. Each of these counters has a programmable preset and when it reaches the preset, the machine will top stop. The counters and presets are also saved in job memory. There is also a total counter which has security code protection. All of these counters can be displayed on the touch screen.

SYSTEM SETUP

The system setup screen is used to automatically zero the resolver, set the motion reference threshold, automatically set the sync switch position, and set the SPM (strokes per minute) range.

USER MESSAGES

Up to 10 user-defined programmable messages can be added to the general fault message list. These customized messages can be used with all user inputs and die protection inputs. The messages can be alphanumeric up to 24 characters.

PASSWORD CONTROL

The password control screen is used to enter a supervisor security code, an operator security code, and to assign the level of security code protection—none, operator, or supervisor. The security code is user-programmed up to 5 alphanumeric characters.

SSC3000 EXPANDABLE OPTIONS

DUAL CPU PRESS CLUTCH/BRAKE CONTROL CARD Part No. FTL319

The Dual CPU Press Clutch/Brake Control Card is designed to comply with OSHA 29 CFR 1910.217, and ANSI B11.1 and B11.19. This is accomplished by a redundant cross-checking, active dual-microprocessor control system. The system uses redundant inputs from devices such as palm buttons, foot switches, and light curtains. The system output to the solenoid valve(s) is provided by two monitored 24-V force-guided output relays. These primary safety output relays are independently controlled and cross-checked by the microprocessors. This allows control-reliable operation of the outputs in the event of a single control component failure. Each microprocessor also has its own logic power supply. This decreases the possibility of simultaneous control failure because of a fault within the power supply system. All inputs and outputs are optically isolated for electrical noise immunity. The Clutch/Brake Control Card also provides angle settings, timed settings, optional modes, variable speed settings, and a part-in-place input.

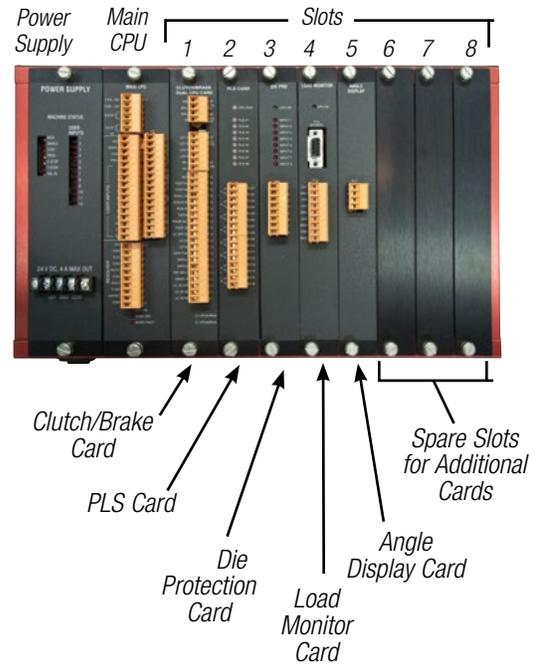
Angular position of the crankshaft is provided by a single absolute resolver/pulsar. A photoelectric sensor in the rotary timing device provides a synchronous signal which verifies the angular position.

Note: Please furnish the electrical schematics if special feeding or transfer equipment will be used on the press when the Dual CPU Press Clutch/Brake Card is used.

STANDARD MODES OF OPERATION

- Two-hand inch (regular or timed)
- Two-hand single stroke
- Foot single stroke
- Two-hand “walk-away” continuous
- Continuous-on-demand
- Automatic single stroke
- Two-hand-maintained continuous
- Foot-maintained continuous
- One-hand or foot trip single stroke (use with light curtain or interlocked guard only)

Control Rack With Cards and Card Slot Covers



PLS (PROGRAMMABLE LIMIT SWITCH) CARD Part No. FTL320

The 8-Output PLS Card is designed to provide user-programmable outputs that can be used to sequence events during the press stroke. Up to two 8-Output PLS Cards can be used for a total of 16 outputs. All outputs have depluggable terminal strips with LED (light-emitting diode) indicators for easy installation and maintenance. The programmed PLS settings for each die are stored in job memory for QDC (quick die change).

PLS outputs can be used for automatic operations such as lube mist, air blow off, or feed initiation. Each output has a programmable on and off angle.

The outputs can also be programmed to turn off after a preset period of time in hundredths of a second. This “timed output” setting overrides any off angle setting.

A counter for counted output can also be programmed for auxiliary devices, such as lube or oil systems. This counter can be interfaced to the PLS Card to provide an output signal when the counter setting is reached. For example, if an oil mist is required every three cycles, the counter setting is set to 3 strokes. When the counter reaches 3 strokes, the PLS output turns on and the oil mist is sprayed over the workpiece or die. The counter is then reset, and the cycle starts over.

SSC3000 EXPANDABLE OPTIONS (CONTINUED)

DIE PROTECTION CARD

Part No. FTL321

The 8-Input Die Protection Card is designed to provide user-programmable inputs that monitor static or cyclic events during the press stroke. Up to three 8-Input Die Protection Cards can be used for a total of 24 inputs. The 24-V DC inputs have individual jumpers that set each input to current sinking or sourcing. All inputs have depluggable terminal strips with LED indicators for easy installation and maintenance.

The die protection inputs can be used for equipment monitoring, die protection, or other user-defined functions. Five (5) parameters can be programmed for each input: logic, stop type, open angle, close angle, and fault message. Ten (10) user-defined messages exist at the end of the user-programmable fault list. These ten messages can be edited by the user via the programmable options in the main program screen.

ANGLE DISPLAY CARD

Part No. FTL323

The Angle Display Card is used in conjunction with the crankshaft angle display described below. The crankshaft angle display unit must be purchased in addition to the angle display card.

CRANKSHAFT ANGLE DISPLAY UNIT

Part No. FTL054

The optional crankshaft angle display is a unit that shows the angular position of the crankshaft for mechanical power presses. The crankshaft position is shown both graphically (with red LEDs in a circle) and numerically (with a large, red, three-digit LED). The large display can be easily seen which helps with setup, removal of stuck workpieces, or for assistance during emergency extraction procedures. The Angle Display Card must be purchased in conjunction with this crankshaft angle display unit.

FEATURES

- Large LED numerical display and circular LED graphic display can be easily seen
- 6" x 6" x 2" enclosure
- Mounts easily
- Supplied with 25' of cable for connection to the control
- Helps satisfy the requirements of Canadian Standard CSA Z142-02, Code for Power Press Operation: Health, Safety, and Guarding Requirements, for indication of crank angle position

LOAD MONITOR SYSTEM

Load Monitor Card

Part No. FTL322

The SSC3000 control is designed to accept one or two Load (tonnage) Monitor Cards in the main rack. Each card is capable of monitoring the machine load at four locations on the machine frame or components. Four to eight load cells can be installed on the machine to read up to a maximum of eight zones of tonnage overload—four load cells per Load Monitor Card.

The Load Monitor Card is programmable through the SSC3000 touch screen/display. The minimum and maximum tonnage can be set manually or with a learn key. The learn key will add 10% to or subtract 10% from the current high and low settings. When enabled, a stop signal will be given when an over or under tonnage setting is detected. *The system for load monitoring also requires a load monitor control module and sensors (see next page).*



Crankshaft Angle Display Mounted on a Mechanical Power Press

SSC3000 EXPANDABLE OPTIONS (CONTINUED)

LOAD MONITOR SYSTEM (CONTINUED)



Load Monitor Control Module
Part No. RYL102

The load monitor control module (9" H x 21/4" W x 4" D) detects the underload or overload information that is generated at each load sensor on the machine frame or component—available in a two- or four-cell sensor kit.

In order to use the load monitor system, the machine must be calibrated with calibration cells. This is done after installing the press automation control equipment and sensors. For further details on calibrating the load monitor system, please consult the factory.

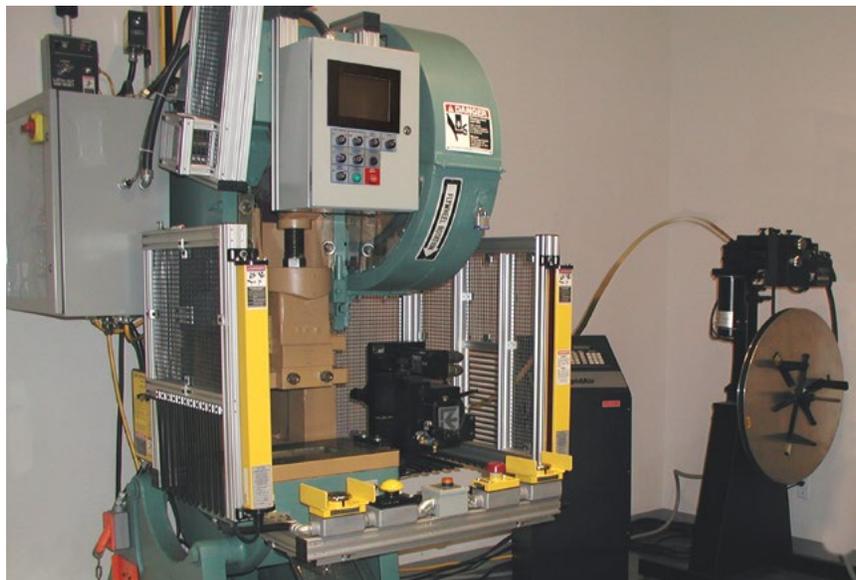
The Load Monitor Card must be purchased in conjunction with the load monitor control module and sensor kit.



PART NO.	DESCRIPTION
RYT030	FOUR-CELL SENSOR KIT
RYT031	TWO-CELL SENSOR KIT

SERVO FEED INTERFACE

A servo feed interface option is available that will communicate with the existing servo feed controller currently attached to the press or a feed that is being purchased. This interface can automate the setting for the feed length and feed rate. This speeds up die changeover because this information is stored once and then sent to the servo feed control when the tooling is changed. The interface consists of a connecting cable, electrical print, and software. Please furnish the manufacturer, model, and serial number of the servo feed to be interfaced.

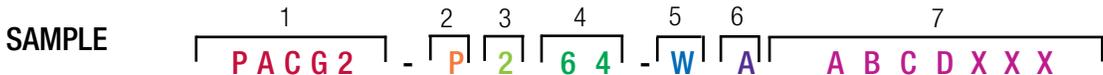


OBI With Press Automation System and Servo Feed Interface

SELECTING AN SSC3000 PRESS AUTOMATION CONTROL

To determine the 18-digit part number for the press automation control required, follow the directions given below and use the information in the **PART NUMBERING SYSTEM CHART** below.

1. The first 5 digits for all press automation controls are PACG2.
2. The 6th digit determines the location of the operator controls.
3. The 7th digit determines the size of the disconnect switch, if provided, in the control enclosure. Zero (0) indicates no disconnect switch provided.
4. The 8th and 9th digits determine the size and type of motor starter(s), if provided, in the control enclosure. Zeros (00) in both positions indicate no motor starter(s) provided.
5. The 10th digit is for the type of light curtain interface provided on the electrical schematics.
6. The 11th digit indicates if a Clutch/Brake Controller Card is required. Zero (0) indicates none is required.
7. The 12th through the 18th digits are for the expandable rack slot options or slot covers, i.e., PLS, Die Protection, Load Monitor, Angle Display Card, and/or slot covers.



The sample shown, PACG2-P264-WAABCDXXX, indicates that the plain-door custom part-revolution control box will contain a C4000 Standard light curtain interface, an IEC 60-A disconnect switch, an IEC 30A reversing main drive motor starter, and an IEC reversing ram adjust motor starter. The control will contain the Clutch/Brake Controller Card, an 8-output PLS Card, an 8-input Die-Protection Card, a 4-input Load Monitor Card, a 4-input Load Monitor Card, an Angle Display Card, and three slot covers.

SSC3000 PRESS AUTOMATION CONTROL PART NUMBERING SYSTEM CHART

P A C G 2 - X X X X - X X X X X X X X

SYSTEM TYPE PRODUCT CATEGORY

PACG2 — Press Automation Control

CONFIGURATION & OPERATOR LOCATION

- P — All Operators Remote (Plain Door)
- F — All Motor Operators on Door
- M — Main Motor Operators on Door, Ram-Adjust Operators Remote
- C — Console (All Operators Included)
- K — Kit — No Enclosure; Operators Remote
- N — NEMA Components; All Operators Remote (Plain Door)

DISCONNECT SWITCH SIZE—IEC (PLUS MAXIMUM MAIN MOTOR FLA)

- 0 — No Disconnect Switch
- 1 — 30A Disconnect — 1- to 20-FLA Main Drive Motor
- 2 — 60-A Disconnect — 21- to 40-FLA Main Drive Motor
- 3 — 100-A Disconnect — 41- to 66-FLA Main Drive Motor
- 4 — 200-A Disconnect — 67- to 133-FLA Main Drive Motor
- 5 — 400-A Disconnect — 134- to 266-FLA Main Drive Motor

REVERSING/NONREVERSING MAIN MOTOR STARTER WITH OR WITHOUT RAM ADJUST

- 0 — No Motor Starters
- 1 — Nonreversing Main Motor Starter Without Ram Adjust
- 2 — Reversing Main Motor Starter Without Ram Adjust
- 3 — Nonreversing Main Motor Starter With 12-A Ram Adjust
- 4 — Nonreversing Main Motor Starter With 18-A Ram Adjust
- 5 — Nonreversing Main Motor Starter With 25-A Ram Adjust
- 6 — Reversing Main Motor Starter With 12-A Ram Adjust
- 7 — Reversing Main Motor Starter With 18-A Ram Adjust
- 8 — Reversing Main Motor Starter With 25-A Ram Adjust

RACK SLOT #2 - #8 OPTIONS

Begin with 10th digit and proceed to the right by assigning desired option to specific slot.

- A — 8-Output PLS Card (maximum 2 each)
- B — 8-Input Die Protection Card (maximum 3 each)
- C — 4-Input Load Monitor Card* (maximum 2 each)
- D — Angle Display Card**
- X — Slot Cover(s)

RACK SLOT #1 CONTROLLER TYPE

- A — With Clutch/Brake Controller Card
- X — Without Clutch/Brake Controller Card — Slot Cover

LIGHT CURTAIN OPTIONS**

- B — Banner Light Curtain
- C — C4000 Advanced With LC Operators on Door
- V — C4000 Advanced With LC Operators Remote
- W — C4000 Standard

MAIN MOTOR STARTER SIZE

- 0 — No Starter
- IEC
- 1 — 12 A
- 2 — 18 A
- 3 — 25 A
- 4 — 32 A
- 5 — 40 A
- 6 — 50 A
- 7 — 65 A
- 8 — 80 A
- 9 — 95 A
- A — 115 A
- B — 185 A
- C — 265 A

Motor Horsepower Chart—3 Phase				
	208 V	230 V	460 V	575 V
2	2	3	7.5	7.5
5	5	5	10	10
7.5	7.5	10	15	15
10	10	10	20	20
15	15	15	30	30
20	20	20	50	50
25	25	30	60	75
30	30	30	60	75
30	40	40	75	100
50	60	60	125	150
75	100	100	200	200

* An RYL102 load monitor control module and sensor kit(s) are needed in addition to the load monitor card—see pages 43-44.

** An FTL054 crankshaft angle display unit is needed in addition to the angle display card—see page 43.

CONTROL SYSTEMS | 45

SSC3000 COMPONENT PACKAGES

To complete the SSC3000 control system, component packages are available to use with the SSC3000 control box. These component packages are similar to those listed on pages 34 and 35 for use with the SSC1500 control box; however the prior-action component part number changes within the component packages listed on page 36—see below.

The prior-action station included with the continuous mode of operation component packages is Part No. LLD3000. This replaces the prior-action station Part No. LLD1500 in the component packages listed on page 36.

The component package part number also changes when ordering an SSC3000 component package. Change the selected component package's part number suffix **-SSP** listed on pages 34-35 to the suffix **-SSC** when ordering an SSC3000 component package.

SSC3000 INDIVIDUAL COMPONENTS

PRIOR-ACTION STATION—Part No. LLD3000*

This prior-action station has an illuminated push button that must be depressed and released by the operator before depressing the actuating means in order to initiate the continuous mode of operation. This steel enclosure is 3½" x 3¼" x 3¼". The prior-action station is required when using the "walk-away" continuous, continuous-on-demand, automatic single stroke, two-hand-maintained continuous, or foot-maintained continuous mode of operation. These modes of operation are standard features of the SSC3000 control.



Prior-Action Station

SUPERVISORY CONTROL STATION

Part No. LLD3001

Part No. LLD283* (required when a USC000 is used—see below)

When multiple operator stations are required, this supervisory control station is furnished separately for each set of palm buttons and/or foot switch operator station. It has its own enclosure and includes an off/on key-operated selector switch and a green on indicator light. The enclosure size is 5¼" x 3" x 3¼".



Supervisory Control Station

BAR/RUN STATION (NOT INCLUDED IN ANY COMPONENT PACKAGE)

Part No. LLD3002

This remote bar/run station can be used in conjunction with a manual turnover bar when setting dies in the press. The flywheel must have holes in the periphery for insertion of a spring-loaded** turnover bar (or the flywheel can be manually turned when the flywheel cover is removed). The remote station includes a three-position selector switch for bar/off/run, and one push button used for energizing the dual-solenoid air valve to engage the clutch and release the brake. The flywheel must be at rest (static) when engaging the clutch. After the clutch is engaged, the die setup person can manually turn the flywheel with a spring-loaded turnover bar (see page 86). The enclosure size is 5¼" x 3" x 3¼".



Bar/Run Station

MULTIPLE-OPERATOR JUNCTION BOX

PART NO. USC000*

When multiple operator stations are required, this junction box is furnished separately for wiring up to four (4) operator stations. This junction box interfaces palm button assemblies/control bars and foot switches, and will not allow the press to run if palm buttons or a foot switch is actuated without its supervisory control station on. A lighted push button with nameplate indicates a fault condition of an operator station. The button is pushed to reset. The enclosure size is 16" x 14" x 6".



Multiple-Operator Junction Box

* Included in an SSC3000 component package on page 36 or page 37 after changing the suffix **-SSP** to **-SSC** in the component package number.

** For a spring-loaded turnover bar, see page 86.

CONTROL CONSOLES

All of the previously mentioned part-revolution-clutch controls can be furnished as special control systems engineered to your specifications. Please consult the factory for further details on your requirements. This page illustrate some examples of special controls that can be designed.

A floor-standing console contains the clutch/brake or hydraulic controls and motor controls mounted inside on subpanels. These are typically used on high-speed or large presses. Consoles are used in place of controls mounted to the machine to avoid extreme press shock vibration. Isolating the press controls in the console gives electrical components a longer life. Control consoles are usually furnished in oil-tight enclosures which have a sloped top for operator convenience. Casters are optionally available to provide mobility of the console. The enclosure door has a lockable handle so that unauthorized personnel cannot tamper with the controls.

These consoles may be furnished with IEC or NEMA disconnect switches and magnetic motor starters. The disconnect handle is located on the enclosure door (lockable in the off position). The starter push buttons (and selector, when a reversing starter is furnished) are located on the sloped front. These consoles are available in the configuration shown or any other way that meets your requirements. User-supplied or user-specified components can also be incorporated into these control consoles.

Please furnish exact motor horsepower, voltage, and full-load amps when ordering disconnect switches and motor starters.

SPECIAL CONTROLS

Have you ever been in a position where you required a unique control, but lacked the time or expertise to design one? If so, we can help you. We have the knowledge and experience to design, manufacture, and install a control panel or an entire control system to meet your specific requirements.

At your request, our safety control specialists can visit your plant to determine exactly what is required or you can mail us your existing prints. A proposal will be submitted to you detailing the exact specifications and costs involved.

Our engineering personnel will design the circuit for the control system. Every control is designed to the applicable OSHA and ANSI standards. The final stage of design results in a complete set of control circuit schematics, connection and layout diagrams.

Next, the control design is sent to our production department. Control panel assembly begins here with the layout and wiring of the control. After the manufacture of the control is complete, it is subject to a rigorous testing procedure which ensures proper operation.

If you require installation of the special control, we have highly skilled installation crews that are available to install the control system or to instruct your own maintenance personnel.

Each special machine control we design can be unique. You have our commitment to quality.



Floor-Standing Control Console



Special Control With Operator Interface, Push Buttons, and Selector Switches



Special Control With Enclosure Door Open Showing SSC1500 Control, Variable Frequency Drive, and Other User-Requested Components

REMOTE MOTOR CONTROL OPERATOR STATIONS FOR USE WITH SSC1500 PRESS CONTROLS, SSC3000 PRESS CONTROLS, AND SSC1500 PRESS BRAKE CONTROLS

Part No. VOS1000

—For use with *nonreversing* motor starters

This 6¾" x 3½" x 3" station is a motor control green start push button and a red stop push button in a NEMA 12 metal enclosure.



Part No. VOS1000

Part No. LLD3213

— For use with *reversing ram adjust* motor starters

This 8¾" x 3½" x 3" station has black ram raise and ram lower push buttons, and a two-position ram-adjust off/on selector switch in a NEMA 12 metal enclosure.



Part No. LLD3213

Part No. VOS1100

—For use with *reversing* motor starters

This 8¾" x 3½" x 3" station is a motor control green start push button, a red stop push button, and a two-position forward/reverse selector switch in a NEMA 12 metal enclosure.



Part No. VOS1100

Part No. LLD3215

— For use with *reversing main motor starters and reversing ram-adjust* motor starters

This 8¾" x 6¼" x 3¾" station has a two-position ram-adjust off/on selector switch, black ram raise and ram lower push buttons, a two-position forward/reverse selector switch, a motor control green start push button, and a red stop push button in a NEMA 12 metal enclosure.



Part No. LLD3214

Part No. LLD3214

— For use with *nonreversing* main motor starters and *reversing ram-adjust* motor starters

This 8¾" x 6¼" x 3¾" station has a two-position ram-adjust off/on selector switch, black ram raise and ram lower push buttons, a motor control green start push button, and a red stop push button in a NEMA 12 metal enclosure.



Part No. LLD3215

CONTROL BARS

Control bars of various configurations can be provided to mount either to the machine or on a pedestal-type floor stand. The standard control bars can have various guarded run/inch palm buttons, emergency-stop and top-stop palm buttons, a multiple operator supervisory station selector switch with indicator light, and either of two types of prior-action push buttons. Please refer to the **CONTROL BAR PART NUMBERING SYSTEM CHART** on the next page to obtain the part number of the standard control bar required.

Special control bars can be provided with other required selector switches and indicator lights, depending on the individual requirements. Consult the factory for pricing and delivery when a special control bar is required.



Part No. MCB3111-1



Part No. USC2611-1



Special Control Bar With Additional Selector Switch and Indicator Light in a Larger Enclosure

FLOOR STANDS FOR CONTROL BARS

Control bars and any palm button assembly can be furnished with either of these floor stands.



Part No. KCL000
—Floor Stand With Base and Top Plate

This 37" **nonadjustable** heavy-duty floor stand includes a top plate and a 4" x 4" column. The base has four holes for permanent attachment to the floor; bolts are not furnished.



Part No. KCL017
—Adjustable Floor Stand With Base and Top Plate

The **adjustable** column (28" to 47") on this floor stand can easily be moved up and down for operator comfort. A hand tool is required to make adjustments. The base has four holes for permanent attachment to the floor; bolts are not furnished. Custom heights are available. Please consult the factory.

SELECTING A CONTROL BAR

To determine the 7- or 8-digit configured part number for a standard control bar, follow directions 1-6 below and use the information in the **CONTROL BAR PART NUMBERING SYSTEM CHART** below.

1. The first 3 digits for all control bars are MCB or USC.
2. The 4th digit determines the size of the bar enclosure.
3. The 5th digit determines the type of run/inch button provided.
4. The 6th digit determines the type of emergency-stop button provided.
5. The 7th digit determines the type of top-stop or return button provided.
6. The 8th digit will indicate the type of modifier provided; e.g., supervisory selector switch, indicator light, and prior-action push button.

CONTROL BAR PART NUMBERING SYSTEM CHART	
X X X - X X X - X	
<p>CONTROL BAR</p> <p>MCB — Universal Control Bar USC — Control Bar for Use With USC000 Multiple-Operator Junction Box Only</p> <p>ENCLOSURE SIZE (4" x 4" x X)</p> <p>1 — 18" — Run Buttons on Ends of Enclosure 2 — 24" — Run Buttons on Ends of Enclosure 3 — 30" — All Operators on Front of Enclosure 4 — 36" — All Operators on Front of Enclosure</p> <p>RUN BUTTON OPERATOR TYPE</p> <p>1 — Rees Black Palm Button With Rockford Systems Guards—Front Only 2 — A-B Articulated Palm Button With A-B Guards—Front Only 3 — N/A 4 — IDEC Green Push Button With IDEC Guard 5 — A-B Zero-Force Touch Buttons With Guards (90-264 VAC) 6 — Banner Opto-Touch Buttons With Guards (20-30 VAC/DC) 7 — Mushroom Push Buttons With Guards (SQ-D) 8 — Rees Chrome Light-Push Button With Rockford Systems Guards—Front Only</p>	<p>MODIFIER</p> <p>0 — None 1 — Includes Station Off/On Selector Switch and Indicator 2 — Includes Prior-Action Push Button 3 — Includes Station Off/On Selector Switch, Indicator, and Prior Action Push Button 4 — Includes Lighted Prior-Action Push Button (SSC) 5 — Includes Station Off/On Selector Switch, Indicator, and Lighted Prior-Action Push Button</p> <p>TOP-STOP OR RETURN TYPE</p> <p>0 — None 1 — Rees Yellow Top-Stop Palm Button (1 NO and 1 NC) 2 — A-B Yellow Top-Stop 40 mm Mushroom Palm Button (1 NO and 1 NC) 3 — Rees Yellow Return Palm Button (1 NO and 1 NC) 4 — A-B Yellow Return 40 mm Mushroom Palm Button (1 NO and 1 NC)</p> <p>EMERGENCY-STOP TYPE</p> <p>1 — Rees Red Palm Button—Latch-Out Type 2 — A-B Red 40 mm Two-Position—Twist-to-Return</p>

OPERATOR AND EMERGENCY-STOP TYPE BUTTONS FOR CONTROL BARS



Rees Black Palm Button
With RSI Guard



A-B Articulated Palm
Button With A-B Guard



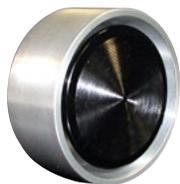
IDEC Button With Guard



A-B Zero-Force Touch
Button With Guard



Opto-Touch Button
with Guard



Mushroom Push Button
With Guard (SQ-D)



Rees Chrome Light-Push
Button With RSI Guard



Rees Red E-Stop
Button—Latch-Out



A-B Red Two-Position
E-Stop—Twist-to-Return

All buttons have 1 NO and 1 NC contact arrangement.

HYDRAULIC POWER PRESS CONTROL SYSTEMS



Hydraulic Press With a Light Curtain and Two-Hand Control Device as the Point-of-Operation Safeguard— Also Has a Hydraulic Control With Control Reliability

Each hydraulic power press must be looked at as an individual system. This system consists of, but is not limited to, the machine frame, all mechanical parts, hydraulic system, electrical or electronic systems, pneumatic systems, tooling or dies (present and future), tool or die setup, safeguarding, material handling, size or configuration of workpiece, maintenance requirements, and most importantly, production requirements.

OSHA REGULATIONS

For hydraulic power presses, the main safety requirements that must be complied with fall under OSHA 29 CFR 1910.212, General Requirements for all Machines. This section of the CFR requires point-of-operation safeguarding.

If auxiliary equipment on the hydraulic power press has mechanical power-transmission apparatuses, then OSHA 29 CFR 1910.219 must be complied with. For lockout/tagout requirements, OSHA 29 CFR 1910.147 should be referenced.

ANSI STANDARDS

There are several references available on hydraulic press safety; however, most end-users rely on the ANSI (American National Standards Institute) B11.2 standard for best safety practices.

In ANSI B11.2, subclause 6.3 Control System, it states that “All components and subsystems of the control system shall be designed to operate together to provide total system compliance with the requirements of this clause. Control components shall be selected, constructed and connected together in such a way as to withstand expected operational and environmental stresses. The control system shall meet the following design and construction requirements:”

6.3.1 PRESS PUMP MOTORS

The control system shall not permit the initiation of slide(s) motion unless at least one pump motor is running. This requirement may not apply to die setting operations—see subclause 9.2.3 in ANSI B11.2.

6.3.2 POWER FAILURE

The control system shall be designed so that in the event of power failure, restoration of power will not result in any hazardous slide motion.

6.3.3 CONTROL RELIABILITY

Control systems shall be designed and constructed so a single failure or fault within the system:

1. Does not prevent the normal stopping action from being applied to the press, when required;
2. Does not create unintended slide motion;
3. Does prevent initiation of a successive stroke until the failure is corrected.

See Electrical Requirements in this section for other requirements found in ANSI B11.2.

6.6.5 HYDRAULIC COMPONENTS AND CIRCUITS

Hydraulic component circuits that control slide(s) motion shall comply with the requirements of 6.3.3.

CONTROLS

The controls described in this catalog include two-hand control as a point-of-operation safeguarding device. The palm buttons must be depressed concurrently and maintained during the hazardous downstroke of the ram. Release of one or both palm buttons reverses or stops the action of the ram. The controls offered also include a light curtain interface.

ELECTRICAL REQUIREMENTS

The ANSI B11.2 standard requires a proper main power disconnect switch. A motor starter is also required that drops out when power is lost and will not restart automatically. All AC control circuits and solenoid valves must be powered by 120 V or less (obtained from the transformer), and the control system must be protected against false operation due to an accidental ground.

UPDATING HYDRAULIC POWER PRESSES

To update the electrical system or to add point-of-operation safeguarding to hydraulic power presses, the electrical and hydraulic schematic diagrams must be reviewed by Rockford Systems' engineering department. Please provide these schematics to our sales personnel or factory-authorized representatives when they visit your plant to conduct a machine survey.

STANDARD HYDRAULIC POWER PRESS CONTROL

This solid-state control system is designed for use on hydraulic power presses. It is designed and built to comply with OSHA 29 CFR 1910.212 and ANSI B11.2 and B11.19. This control can update or replace existing control systems on hydraulic power presses found in users' plants or can be furnished for new or rebuilt hydraulic power presses.

This control includes control reliability, two-hand control, light curtain interface, and diagnostics (one user-programmable input). It also includes batch and stroke counters with presets, and a hard-wired emergency-stop master control relay.

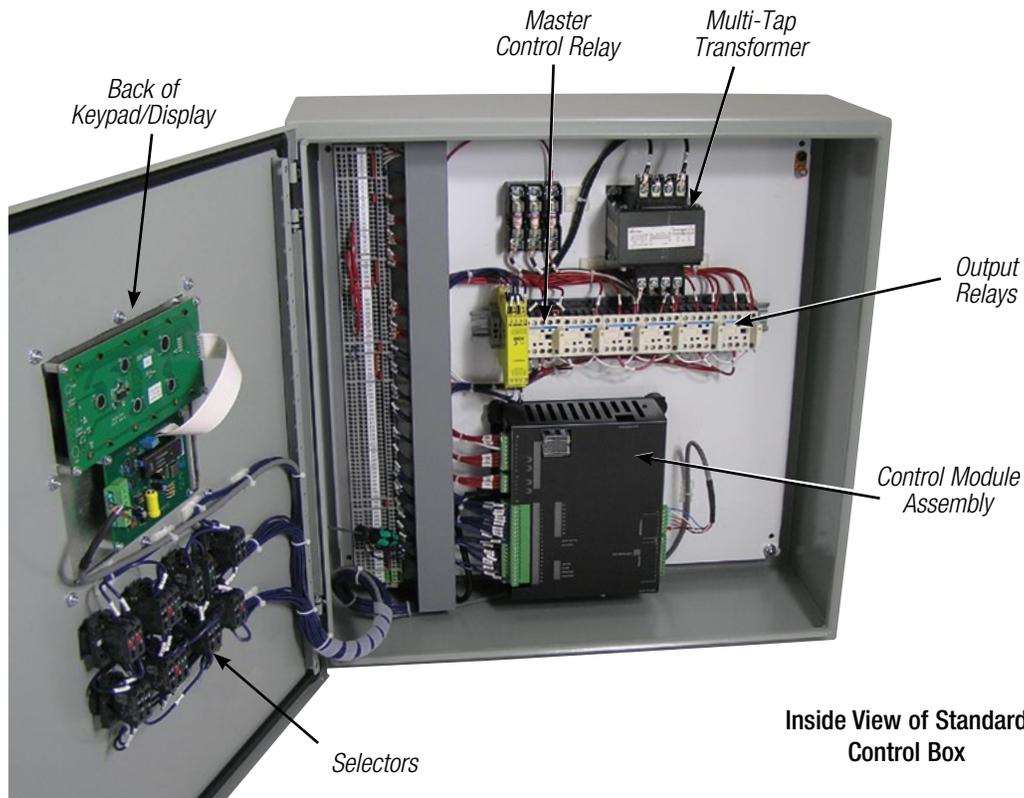
This is an economic, full-featured dual micro-processor-based control system. The system uses redundant inputs from devices such as palm buttons, foot switches, and light curtain(s). The system output to the solenoid valves is provided by two force-guided relays. These output relays are independently controlled and cross-checked by the microprocessors. This allows control-reliable operation of the outputs in the event of a single control component failure in the control. The standard hydraulic power press control has minimum requirements for the press it is to control. These minimum requirements include a directional or one up and one down solenoid valve(s) for the ram, a TOS (top-of-stroke) limit switch, and a BOS (bottom-of-stroke) limit or pressure switch. In most cases, if these already exist, they can be reused. Speed-change valves and limit switches can also be supported with the standard hydraulic control. If other valves exist (additional speed change valves, prefill, regeneration, level, bypass, etc.), please consult the factory for a quote on a special-designed control.

The standard control box is a 20" x 20" x 8" NEMA 12 enclosure with the operator controls and keypad/display mounted in the door, as illustrated above.

A starter or disconnect can be included in a larger enclosure, or a combination starter disconnect can be furnished separately.



Standard Control Box



Inside View of Standard Control Box

STANDARD HYDRAULIC POWER PRESS CONTROL (CONTINUED)

OPERATOR INTERFACE KEYPAD/DISPLAY

The operator interface keypad/display is used to enter setup information, monitor machine operation, and display messages on a 4-line x 20-character LCD (liquid crystal display). As standard, this keypad is mounted on the control box door. For operator convenience, it can be installed in a remote operator station. Programming is accessed by a keyed selector switch.

PROGRAMMING

The hydraulic power press control can be quickly and easily programmed. There is one 24-V DC selectable current-sinking or sourcing programmable diagnostic input provided for the user. A fault message, input logic, and stop type can be assigned to the input from the user input fault message list. When a fault condition is detected, the machine will top stop or emergency stop, and the assigned message will be displayed. This feature helps when troubleshooting common fault conditions.



Keypad/Display

MODES OF OPERATION

- Off
- Two-hand inch
- Two-hand single stroke
- Foot single stroke
- Foot switch trip or one-hand trip single stroke (used in conjunction with a point-of-operation safeguard)*
- High, high/low, low speed change
- Two-hand automatic (continuous)
- Automatic single stroke*

*Additional components may be required to use this mode of operation.

FEATURES

- Meets and exceeds OSHA 29 CFR 1910.212 and ANSI B11.2 and B11.19
- Provides two-hand control safeguarding device
- Redundant and cross-checking microprocessors
- Redundant switching style DC power supplies
- Two monitored ram advance (up or down) 24-V force-guided output relays
- External relay monitoring (for use when external relays are used to energize the down valves)
- Blocking valve monitoring
- Press control operates on 85-135 VAC
- Provisions for optional light curtain interface with off/on supervised keyed selector switch
- Easy to read back-lit liquid crystal operator interface display having 4 lines x 20 characters
- One (1) 24-V DC digital user input, programmable, selectable canned message
- One (1) ram speed change (fast-slow) output, standard 120 VAC with a selector switch for high, high/low, low speed (to support machines with a speed change solenoid valve)
- One (1) ram return (up or down) output, standard 120 VAC with a selector switch for pressure, pressure/distance, distance return
- Bottom dwell timer (0-600 seconds)
- Decompression timer (50-250 ms)
- 7-digit stroke counter
- 7-digit batch counter with preset
- Operator interface keypad and display, text in English or Spanish

For control reliability

CUSTOM HYDRAULIC POWER PRESS CONTROL

A custom control box contains the standard control module and components described on pages 52-53 plus the following:

- main power disconnect switch
- main hydraulic pump motor starter

The box will vary in size based on the disconnect switch and motor starter components. The box is furnished with an IEC through-the-door main power fused disconnect switch and an IEC hydraulic pump magnetic motor starter (with push buttons). They are prewired and built into a NEMA 12 enclosure.

Operator controls and the keypad/display are located on the front of the door, or a plain-door control or subpanel can be furnished. A remote operator station or keypad/display kit is required if a plain-door control or subpanel is ordered. See the next page for information on remote operator stations.

To ensure the starter(s) and disconnect are sized properly, please check horsepower for the main hydraulic pump motor on the machine, as well as full-load amps and primary voltage to the machine. After obtaining this information, go to the chart on page 56 to determine the proper custom control box part number. Follow directions 1-7 to determine the correct part number.



Remote Operator Station

Custom Plain Door Control Box

REMOTE OPERATOR-STYLE CONTROL BOXES

Remote operator-style X, Y, and Z hydraulic control boxes include the same features and modes of operation as the standard hydraulic control boxes. **However, they do not have a control transformer.** These control boxes are designed to be located on the front of the machine near the operator.

These controls are for applications where the machine's existing magnetic motor starter, fused disconnect switch, and control transformer meet the safety requirements and can be reused. If the existing control transformer cannot be reused or a new one is required, please contact the factory.

The keypad/display and all operator controls are located on the door (front) of the remote operator-style control box.

CONTROL MODULE KIT

A control module kit allows the end user to update the hydraulic control of a press with minimum equipment costs. The kit is supplied without the control enclosure, panel, control transformer, control fuse, terminal strips, wire duct, and wiring.

A set of electrical prints is supplied to show typical wiring, and all mounting dimensions are provided in order for a qualified person to install the control module kit. The minimum area required on an existing control panel to install this kit is 18" H x 18" W x 6" D.

This control module kit includes the control module, control relays, shock mounts, fasteners, suppressors, danger labels, and electrical prints. A keypad/display kit is required unless a remote operator station is used (see next page).

If the automatic (continuous) mode of operation is used, a prior-action station

—Part No. LLD6100—is required. See page 57.

SUBPANEL

A subpanel control can also be furnished. It is the same as the standard control described on pages 52-53 without the enclosure. The minimum area required in an existing control enclosure is 18 1/2" H x 18 1/2" W x 6" D.



KEYPAD/DISPLAY KIT

Part No. LLD6011 (for RHPC—Press Controls)

The keypad/display kit can be used with any of the control boxes or the control module kit. This kit includes the keypad/display, an off/program/run selector switch, a light curtain off/on selector switch, a hand/foot selector switch, an inch/single/automatic selector switch, a high/low speed selector switch, a pressure/pressure distance/distance return selector switch, and 25' of cable. Additional push buttons, nameplates, and selector switches for the motor starter, etc., can be furnished depending on the features required. Please consult the factory.



REMOTE OPERATOR STATIONS

For operator convenience, a remote operator station can be furnished for use with a plain-door standard control box, plain-door custom control box, module kit, or subpanel. The remote operator station contains the keypad/display, program selector switch, and other selector switches as required.

Remote operator stations are available in a standard format or can be customized to meet any requirements. Select from the following remote operator stations.



Part No. LLD6001
Remote Operator Station for Hydraulic Press

REMOTE OPERATOR STATIONS FOR HYDRAULIC PRESSES

FEATURES	PART NO. LLD6000	PART NO. LLD6001	PART NO. LLD6002	PART NO. LLD6003	PART NO. LLD6004	PART NO. LLD6005	PART NO. LLD6006	PART NO. LLD6007
KEYPAD/DISPLAY	X	X	X	X	X	X	X	X
OFF/PROGRAM/RUN SELECTOR SWITCH	X	X	X	X	X	X	X	X
INCH/SINGLE/ AUTOMATIC SELECTOR SWITCH	X	X	X	X	X	X	X	X
HAND/FOOT SELECTOR SWITCH	X	X	X	X	X	X	X	X
LIGHT CURTAIN OFF/ON SELECTOR SWITCH	X	X	X	X	X	X	X	X
HIGH/LOW SPEED SELECTOR SWITCH	X	X	X	X	X	X	X	X
PRESSURE/PRESSURE DISTANCE/DISTANCE RETURN SELECTOR SWITCH	X	X	X	X	X	X	X	X
MAIN MOTOR START AND STOP PUSH BUTTONS		X		X		X		X
PRIOR-ACTION BUTTON FOR AUTOMATIC MODES OF OPERATION			X	X			X	X
ADVANCED LIGHT CURTAIN BLANKING SELECTOR SWITCHES					X	X	X	X

SELECTING AN RHPC HYDRAULIC PRESS CONTROL

To determine the 10-digit configured part number for the hydraulic press control required, follow directions 1-8 below and use the information in the **PART NUMBERING SYSTEM CHART** below.

1. The first 4 digits for all hydraulic press controls are RHPC.
2. The 5th digit determines the size of the disconnect switch, if provided, in the control enclosure. Zero (0) indicates no disconnect switch provided.
3. The 6th digit determines if a nonreversing motor starter is provided. Zero (0) indicates no motor starter provided.
4. The 7th digit determines the size of nonreversing motor starter that is provided in the control enclosure. Zero (0) indicates no motor starter provided.
5. The 8th digit determines the location of the operator controls, or if it is a style X, Y, or Z control without the control transformer.
6. The 9th digit is for the type of light curtain interface provided.
7. The 10th digit (if required) will indicate the type of modifier provided: i.e., motor control operators remote.

SAMPLE 1 2 3 4 5 6 7
R H P C - 2 1 3 - F W 5

The sample shown, RHPC-213-FW5, indicates that the custom control box is for a hydraulic press with a C4000 standard light curtain interface including an IEC 60-A disconnect switch and an IEC 25-A nonreversing motor starter. The keypad/display and all operators will be on the door of the enclosure, except for the motor controls which will be located remote.

RHPC HYDRAULIC CONTROL PART NUMBERING SYSTEM CHART																																																																									
<div style="display: flex; justify-content: space-around; align-items: center;"> RHPC - X X X - X X X </div>																																																																									
<p>SYSTEM TYPE PRODUCT CATEGORY</p> <p>RHPC —Hydraulic Control for Presses</p>	<p>MODIFIER</p> <p>-- —Blank, No Modifier</p> <p>5 —Motor Operators Remote*</p>																																																																								
<p>DISCONNECT SWITCH SIZE—IEC (PLUS MAXIMUM MAIN MOTOR FLA)</p> <p>0 —No Disconnect Switch</p> <p>1 —30A Disconnect—1- to 20-FLA Main Drive Motor</p> <p>2 —60-A Disconnect—21- to 40-FLA Main Drive Motor</p> <p>3 —100-A Disconnect—41- to 66-FLA Main Drive Motor</p> <p>4 —200-A Disconnect—67- to 133-FLA Main Drive Motor</p> <p>5 —400-A Disconnect—134- to 266-FLA Main Drive Motor</p>	<p>LIGHT CURTAIN INTERFACE OPTIONS</p> <p>B —Banner Standard</p> <p>C —C4000 Advanced With LC Operators on Door</p> <p>V —C4000 Advanced With LC Operators Remote</p> <p>W —C4000 Standard</p>																																																																								
<p>NONREVERSING MAIN MOTOR STARTER</p> <p>0 —No Starter</p> <p>1 —Nonreversing Starter</p>	<p>CONFIGURATION & OPERATOR LOCATION</p> <p>F —Keypad/Display and All Operators on Door of Enclosure</p> <p>P —Keypad/Display and All Operators Remote (Plain Door)</p> <p>S —Subpanel Only—Without Enclosure, Keypad/Display, and Operators</p> <p>K —Kit with Module and Control Relays Only—Without Enclosure, Subpanel, Transformer, Keypad/Display, and Operators</p> <p>X —Same as F (above) Without Control Transformer</p> <p>Y —Same as F (above) Without Control Transformer but With E-Stop, Return/Inch-up, and Prior Action on the Enclosure</p> <p>Z —Same as F (above) Without Control Transformer but With E-Stop, Return/Inch-up, Prior Action, and Two (2) Guarded Run/Inch Buttons on the Enclosure</p>																																																																								
<p>MAIN MOTOR STARTER SIZE</p> <p>0 —No Starter</p> <p style="text-align: center; color: green;">IEC</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2"></th> <th colspan="4">Motor Horsepower Chart—3 Phase</th> </tr> <tr> <th>208 V</th> <th>230 V</th> <th>460 V</th> <th>575 V</th> </tr> </thead> <tbody> <tr><td>1 —12 A</td><td>2</td><td>3</td><td>7.5</td><td>7.5</td></tr> <tr><td>2 —18 A</td><td>5</td><td>5</td><td>10</td><td>10</td></tr> <tr><td>3 —25 A</td><td>5</td><td>7.5</td><td>15</td><td>15</td></tr> <tr><td>4 —32 A</td><td>7.5</td><td>10</td><td>20</td><td>20</td></tr> <tr><td>5 —40 A</td><td>10</td><td>10</td><td>30</td><td>30</td></tr> <tr><td>6 —50 A</td><td>15</td><td>15</td><td>30</td><td>40</td></tr> <tr><td>7 —65 A</td><td>20</td><td>20</td><td>50</td><td>50</td></tr> <tr><td>8 —80 A</td><td>25</td><td>30</td><td>60</td><td>75</td></tr> <tr><td>9 —95 A</td><td>30</td><td>30</td><td>60</td><td>75</td></tr> <tr><td>A —115 A</td><td>30</td><td>40</td><td>75</td><td>100</td></tr> <tr><td>B —185 A</td><td>50</td><td>60</td><td>125</td><td>150</td></tr> <tr><td>C —265 A</td><td>75</td><td>100</td><td>200</td><td>200</td></tr> </tbody> </table>		Motor Horsepower Chart—3 Phase				208 V	230 V	460 V	575 V	1 —12 A	2	3	7.5	7.5	2 —18 A	5	5	10	10	3 —25 A	5	7.5	15	15	4 —32 A	7.5	10	20	20	5 —40 A	10	10	30	30	6 —50 A	15	15	30	40	7 —65 A	20	20	50	50	8 —80 A	25	30	60	75	9 —95 A	30	30	60	75	A —115 A	30	40	75	100	B —185 A	50	60	125	150	C —265 A	75	100	200	200				
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	208 V	230 V	460 V	575 V																																																																					
1 —12 A	2	3	7.5	7.5																																																																					
2 —18 A	5	5	10	10																																																																					
3 —25 A	5	7.5	15	15																																																																					
4 —32 A	7.5	10	20	20																																																																					
5 —40 A	10	10	30	30																																																																					
6 —50 A	15	15	30	40																																																																					
7 —65 A	20	20	50	50																																																																					
8 —80 A	25	30	60	75																																																																					
9 —95 A	30	30	60	75																																																																					
A —115 A	30	40	75	100																																																																					
B —185 A	50	60	125	150																																																																					
C —265 A	75	100	200	200																																																																					

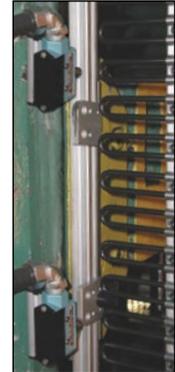
*See page 48 for remote motor control operator stations or Safety Shields catalog.

HYDRAULIC CONTROL SYSTEMS INDIVIDUAL COMPONENTS

LINEAR CAM AND LIMIT SWITCH ASSEMBLY

Part No. CMT048

The linear cam and limit switch assembly consists of two limit switches and two adjustable cams mounted on an extruded-aluminum bracket. This assembly can provide the linear timing of the top and bottom limits of the machine cycle on a hydraulic machine.



HIGH/LOW LIMIT SWITCH ASSEMBLY

Part No. CMT049

An additional linear cam and limit switch assembly can be used for a high/low signal during the closing portion of the hydraulic stroke. This assembly consists of one limit switch and one adjustable cam mounted on an extruded-aluminum bracket.

PALM BUTTON ASSEMBLY

Part No. CTL525

Palm button assembly consists of two black run/inch buttons (with ring guards), a red emergency-stop button and a yellow return/inch-up button. Mounting boxes are furnished with each button. The electrical contact arrangement for all buttons is 1 NO and 1 NC.



Part No. CTL525

FOOT SWITCH

Part No. CTD011 & CTD088

This foot switch is protected from unintentional operation. A heavy-duty die-cast cover protects the top and both sides, and the front is protected by a hinged flap. The flap must be lifted with the toe before the foot may enter the switch. The electrical contact arrangement is 1 NO and 1 NC.



Foot Switch CTD011



Foot Switch CTD088

PRIOR-ACTION STATION

Part No. LLD6100

This prior-action station has a push button that must be depressed and released by the operator before depressing the actuating means in order to initiate the automatic mode of operation. This NEMA 12 enclosure size is 3½" x 4½" x 3½".



Prior-Action Station

SUPERVISORY CONTROL STATION

Part No. LLD6101

Part No. LLD283 (required when a USC000 is used—see below)

When two or more palm button or foot switch operating stations are required on one machine, one supervisory control station is required at each operator station. This remote control station consists of an off/on keyed selector switch and a station on indicator light. The on position allows the operator to use that station, and the off position deactivates only that station. The enclosure size is 5¼" x 3" x 3¼"



Supervisory Control Station

MULTIPLE-OPERATOR JUNCTION BOX

Part No. USC000

When multiple operator stations are required, this junction box is furnished separately for wiring up to four (4) operator stations. This junction box interfaces palm button assemblies/control bars and foot switches, and will not allow the press to run if palm buttons or a foot switch is actuated without its supervisory control station on. A lighted push button with nameplate indicates a fault condition of an operator station. The button is pushed to reset. The enclosure size is 16" x 14" x 6".



Multiple-Operator Junction Box

PRESS BRAKE CONTROL SYSTEMS

INTRODUCTION

Press brakes are one of the most difficult machine tools to safeguard because of their general purpose-type use in industry. General purpose means a press brake can be used to bend from very small parts to very large parts. Production runs on these machines can be one part to thousands of parts. With this type of operation, press brakes must be versatile.

Today, with advanced technology, it is now possible for industry to safeguard press brakes and maintain the same levels of productivity when the employer (user) considers all components in the press brake system. A complete safeguarded system includes, but is not limited to, the type of press brake, the safeguard itself, tooling to be used, size, shape or configuration of workpiece, material handling, production, maintenance, and any anticipated future needs.

OSHA STANDARDS

Under OSHA, press brakes are cited for noncompliance in accordance with 29 CFR 1910.212— Machine Guarding, which specifically requires point-of-operation safeguarding. All machines fall under this same regulation where it states: “the safeguarding shall be in conformity with any appropriate standard.” Some states may have their own rules and regulations for press brakes.

ANSI STANDARDS

There are several references available on press brake safety; however, most industries use the ANSI (American National Standards Institute) B11.3 standard. This standard can be purchased by contacting:

ANSI

American National Standards Institute, Inc.
25 West 43rd Street, 4th Floor
New York, New York 10036
(212) 642-4900
www.ansi.org

TYPES OF PRESS BRAKES

There are two basic categories of press brakes:

1. Part-Revolution

Mechanical-Friction Clutch
Air Clutch (Single- or Two-Speed)

2. Hydraulic (Down-Acting and Up-Acting)

Each one of these press brake types is discussed on subsequent pages in this section. There are also servo-drive (electric) and hydra-mechanical press brakes that can be safeguarded. Please consult the factory.



POINT-OF-OPERATION HAZARD

Fortunately, most press brake operations do not require the operators to place their hands or any part of their body into the point-of-operation hazard; however, exposure to point-of-operation injuries still exists. Because of this exposure, the operator(s) must be safeguarded from point-of-operation hazards. Best safety practice is when operators are **never** required to put their hands or any part of their body in the point of operation at any time. Sometimes as the workpiece bends up, a hazard may be created between the part and the front face of the slide. When this happens, be sure the operators do not place their fingers on the top or sides of the material, but support the material from underneath.

HELPERS

Many times two or more operators are feeding and retrieving workpieces from press brake dies. The employer may describe one person as an operator and one person as a helper; however, a helper is considered an operator when exposed to any point-of-operation hazards. Each operator must be safeguarded and should have his/her own set of operating controls for cycling the machine such as palm buttons or a foot switch.

METHODS FOR CYCLING AND SETUP

SEQUENCE OR HIGH/LOW OPERATION

When there is a concern about whip-up action of material, or positioning of a part, the sequence or high/low speed-change mode of operation is used. Sequence is accomplished by stopping the slide on the downstroke (on down-acting machines) just above the workpiece, then completing the downward part of the stroke in a slow, controlled speed. In the high/low mode, the slide does not stop; when selected, it goes into a slower speed for bending the workpiece.

SINGLE STROKE

In the single-stroke mode, the machine slide will descend through the workpiece and return automatically to stop at the beginning of the cycle. In a high production situation, with certain workpieces, machines are usually single-stroked (cycled) rather than operated in the sequence or high/low mode. The controls offered in this catalog allow the operator to inch on the downstroke in the single-stroke, sequence, and high/low modes, on both mechanical and hydraulic press brakes.

INCH/SETUP

When the inch mode of operation is provided on press brakes, it must be used for setup only. **Never** operate a press brake in the inch mode for production operations.

PRESS BRAKES USING POWER PRESS TOOLING

If mechanical or hydraulic press brakes use press tooling (i.e., conventional or unitized dies) for stamping parts, please refer to pages 20-52 for mechanical press control box and component selection, and pages 75 and 76 for air cylinder selection (mechanical-friction-clutch press brakes only), or pages 52-56 for hydraulic press control box selection.

BASIC SAFETY REQUIREMENTS

When updating press brakes to comply with the indicated safety standards, there are five basic requirements that must always be considered. They are:

1. Safeguarding (Refer to Safeguarding Devices catalog)
2. Controls
3. Disconnects (Refer to Safety Shields catalog)
4. Starters (Refer to Safety Shields catalog)
5. Covers (Refer to www.rockfordsystems.com for mechanical motion covers)

This introduction and subsequent pages in this catalog will provide information on safety requirements in these areas.

SAFEGUARDING

Press brake safeguarding can be accomplished by using one of the following safeguarding devices:

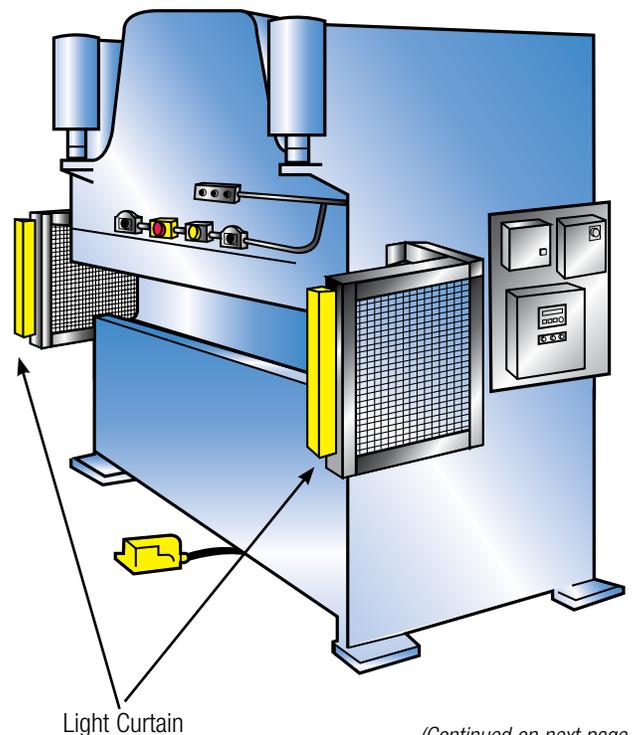
1. Presence-sensing device (Refer to Safeguarding Devices catalog)
2. Two-hand control device (Refer to this catalog)
3. Pullback device (Not offered by Rockford Systems)
4. Restraint device (Refer to Safeguarding Devices catalog)
5. Hostage control device (pp. 61-62)

PRESENCE-SENSING DEVICES

Of all the recognized point-of-operation safeguarding devices for press brakes, the light curtain is the most versatile for short- to long-run operations and for small to large workpieces. Proper use of this device provides protection for all operators and passersby in production modes of operation. It also minimizes operator resistance to using safety devices.

A muting feature, most commonly used with press brakes, allows the light curtain to be bypassed during the nonhazardous portion of a press brake stroke. This is generally from $\frac{1}{4}$ " or less above the workpiece to the bottom of the stroke and back to the top of the stroke. Blanking of beams or the use of float blanking are also popular options for press brake applications; however, these options must be closely supervised and discouraged whenever possible.

When applying light curtains, they must be mounted at a safe distance—refer to Safeguarding Devices catalog.



(Continued on next page.)

METHODS FOR CYCLING AND SETUP (CONTINUED)

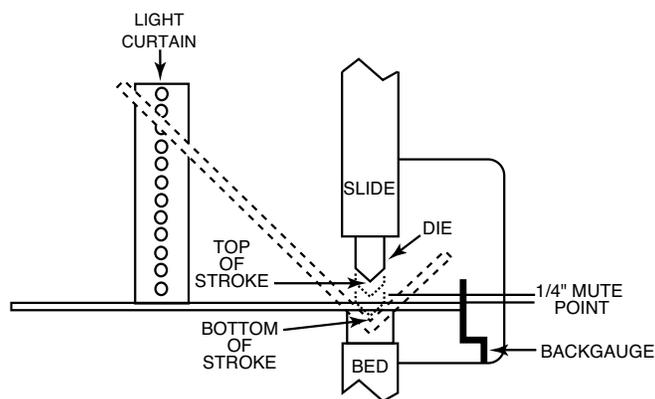
HOW A LIGHT CURTAIN WORKS AS A SAFEGUARDING DEVICE ON PRESS BRAKES:

- STEP 1** The operator inserts the workpiece into the press brake die and supports it either with his/her hands, on rails, or on a table.
- STEP 2** The press brake is activated by a foot switch or palm buttons.
- STEP 3** If the light curtain is interrupted during the die-closing portion of the cycle, the press brake slide will stop.
- STEP 4** If the light curtain is not interrupted, the press brake will continue its downstroke and will either: 1) make contact with the workpiece and finish the single stroke in normal speed (or in high/low speed if chosen), or 2) stop above the workpiece if in sequence mode. In the sequence mode, the workpiece may be inserted or positioned at this time and then the slide is reactivated to finish the stroke.

Note: The light curtain is muted once the die is a maximum of 1/4" above the workpiece.

When the light curtain is muted, it is automatically turned off or bypassed during the bending operation to permit the workpiece or operator's hand to move through the plane of light without interrupting the cycle.

- STEP 5** The slide returns to the beginning of the cycle.



This illustration is of a down-acting press brake bending a workpiece with a light curtain used as the safeguard.

TWO-HAND CONTROL DEVICES

Two-hand control, as a point-of-operation safe-guarding device for press brakes, is ideal for short-run job-shop operations. Workpieces can be from very small to very large.

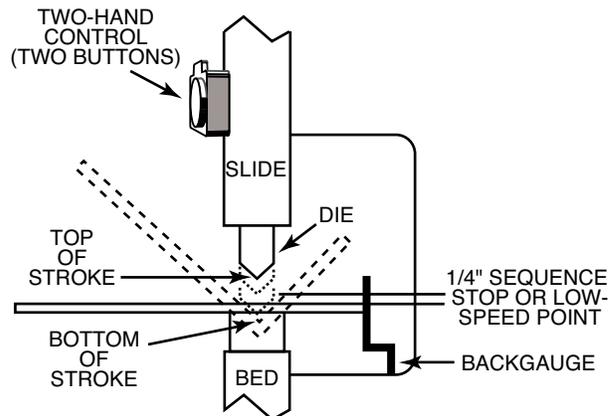
Each operator station is arranged with two guarded run palm button assemblies. These buttons are usually mounted to the slide of the press brake; however, they can also be installed on a floor stand (see page 49) for more flexibility.

Two-hand control provides protection against point-of-operation injury during the die-closing portion of the cycle. Two-hand control is arranged so the operator(s) must hold the palm buttons depressed until the slide reaches a point 1/4" or less above the workpiece. If either palm button is released, the slide stops. Both palm buttons must then be released and reactivated to finish the stroke. Two-hand control is usually arranged to provide this protection in the two-hand single-stroke, sequence, or high/low mode of operation. See information below and on the next page for additional details on how two-hand control and sequence mode of operation work.

How Two-Hand Control Works:

- STEP 1** By depressing the two run buttons, the operator(s) initiate the press brake cycle.
- STEP 2** The operator(s) must hold the two run buttons until the slide completes its downward travel to the workpiece or until the slide stops 1/4" or less above the workpiece. If the operator(s) remove one hand from the run buttons, the slide will stop. In the single-stroke or high/low mode, the slide will make one complete cycle.
- STEP 3** In the sequence mode, the slide will automatically stop at a preset position 1/4" or less above the workpiece. This preset position is adjustable for different feed-line heights or material thicknesses.
- STEP 4** If the workpiece is not already placed in the die, it may be inserted at this time.
- STEP 5** The palm buttons or the foot switch is now reactivated, causing the slide to continue through the bottom of the cycle and automatically return at high speed to the beginning of the cycle.

Note: The controls illustrated provide the ability to inch the slide down with the palm buttons or foot switch in the single, sequence, or high/low mode of operation. By inching the slide down in these modes, the operator makes sure the upper die is going to bend the workpiece in the correct position. This also avoids hazardous whip-up action of the workpiece when inching through the workpiece bend.



This illustration is of a down-acting press brake bending a workpiece with two-hand control used as the safeguard.

METHODS FOR CYCLING AND SETUP (CONTINUED)

TWO-HAND CONTROL DEVICES (CONTINUED)

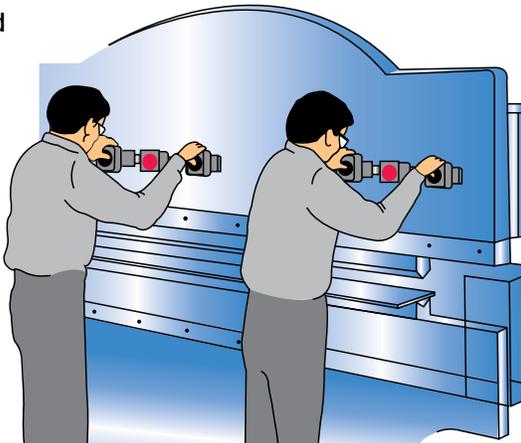
The control packages offered include control reliability to minimize the possibility of an unintended stroke of the slide if there is a single component failure in the control system. The control features antirepeat, preset timing of concurrent operation of palm buttons, and nonresumption of interrupted stroke. The palm buttons must also be mounted at the proper safety distance.

When more than one operator station is required on press brakes, two palm buttons for each station must be used and must be capable of being supervised. The supervised operator stations are arranged so that if all operating stations are bypassed, the press brake will not cycle. If a foot switch is used, one is required for each operator.

When using two-hand control, the operator cannot hold onto the workpiece during the die-closing portion of the stroke. Material tables, rails, magnets on backgauges, etc., can be used to support the workpiece.

If the dies are not the exact length of the material, auxiliary safeguarding is required.

Two-Hand Control



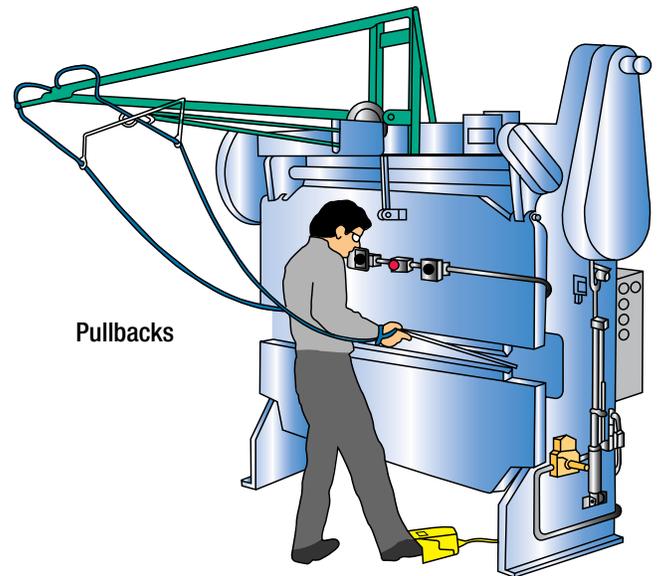
PULLBACK DEVICE (NOT OFFERED BY ROCKFORD SYSTEMS)

The overhead-pullback device is usually applied on press brakes that perform long-run jobs and when small- to medium-size parts are being produced.

The pullback is a mechanical device operated from the linear motion of the slide or upper die. When adjusted properly, it pulls the operator's hands back should they inadvertently be put into the point-of-operation hazard.

The overhead design allows the operator freedom of movement for loading and unloading workpieces without interference.

Pullbacks are designed for a fixed-length-stroke mechanical press brake; therefore, when applying them to a hydraulic press brake that may have an adjustable stroke, the stroke length will need to remain the same at all times.



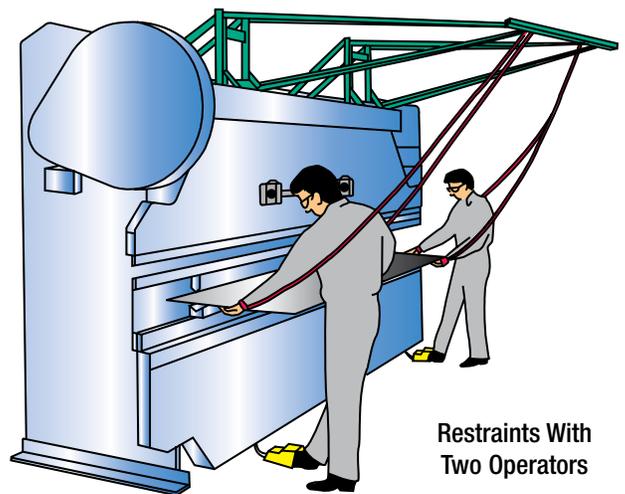
Pullbacks

RESTRAINT DEVICE

Similar to the overhead pullback, restraints are usually applied on press brakes that perform long-run jobs. The parts being produced are usually medium size with the operator holding onto the workpiece. If small parts are being fed into the die, a hand-feeding tool must be used.

Restraints are adjusted so that an operator cannot reach into the hazardous area at any time.

Both pullbacks and restraints must be properly worn, adjusted, and maintained at all times.



Restraints With Two Operators

HOSTAGE DEVICE

Hostage control devices are used on machines that perform short-run jobs with very large workpieces. The actuating means (hand or foot) must be protected against unintended operation and arranged so the operator(s) can **never** reach the point-of-operation hazard while the machine is in operation.

METHODS FOR CYCLING AND SETUP (CONTINUED)

HOSTAGE DEVICE (CONTINUED)

An example of a hostage control is a foot switch which is permanently mounted to the floor far enough away from the point of operation that the operator(s) cannot reach the point-of-operation hazard when operating the control. Two-hand control or one-hand control can be applied as well.

SAFE DISTANCE SAFEGUARDING

Safe distance safeguarding is allowable by OSHA and ANSI under certain controlled situations. Please see ANSI B11.3 for compliance guidelines. If safe distance is chosen as the primary safeguard, the control system for both mechanical and hydraulic press brakes must be control reliable. For assistance in determining your control system's reliability, please contact Rockford Systems.

AUXILIARY SAFEGUARDING

Auxiliary safeguarding is used for additional protection from injuries for all personnel in the machine area. It is used in conjunction with primary safeguarding devices. Auxiliary safeguarding also involves the guarding of other components or hazardous openings on machines.

Auxiliary safeguards include such items as point-of-operation side barriers when light curtains are used, pressure-sensitive floor mats, workpiece tables, or horizontal light curtains. An additional set of light curtains can be used horizontally to prevent an operator or other persons from standing between the vertical plane of light and the point-of-operation hazard. To prevent unauthorized entry on the back side of the press brake, an interlocked cable and danger sign can be used (refer to Safety Shields catalog).

Danger signs, used for warning, can be mounted on the press brake slide in a position that is readily visible to the operator, setup person, or other personnel. Hand tools are another auxiliary safeguard often used when feeding and retrieving small workpieces. Hand tools by themselves are not a point-of-operation safeguarding device.

CONTROLS

Press brake controls are furnished according to the type of press brake: mechanical friction, air clutch, hydraulic, hydra-mechanical, or electric. The controls and system of the safety-related functions must be control reliable. Please see page 99 for further explanation.

ELECTRICAL LOCKOUT/TAGOUT REQUIREMENTS

A press brake requires a main power disconnect switch, and a magnetic-type motor starter for the main drive motor and the slide-adjust motor. A lockout valve is required to lock out the air power to the press brake.

COVERS

Mechanical power-transmission apparatuses of the press brake such as rotating flywheels, gears, sprockets, chains, and shafts must be covered in accordance with OSHA 1910.219, Mechanical Power-Transmission Apparatus and ANSI B15.1. All apparatuses that create a hazard up to 7' above the floor or platform must be guarded (covered).

This is usually done by the user, either by modifying existing guards, by contacting a local sheet-metal fabricator, or refer to our Web site at www.rockfordsystems.com for mechanical motion covers.

OTHER SAFETY CONSIDERATIONS

Other areas of press brake safety must be considered in order to comply with the OSHA and ANSI standards. This includes, but is not limited to, the point-of-operation hazard exposure, when the workpiece length is less than the die length. This is a questionable area when using a light curtain or two-hand control (to the 1/4" or less point above the workpiece) as the point-of operation safeguard. In some cases, there is an opening in the die that is larger than 1/4" on both sides of the workpiece. Common practice is to either cut or arrange all dies to be the length of the workpiece or provide barriers on the front of the press brake allowing just enough opening for the workpiece.

Another safety consideration is the proper use of front and back material-position gauges. It is important that this gauging is designed correctly so the workpiece and hand will not inadvertently slip into the hazard area. Special care must be taken with small or narrow workpieces. For example, if the backgauge is not tall enough, the workpiece could slide over it allowing the fingers and hands to be exposed to the point-of-operation hazard.

When blanking the light beam channels of a light curtain, difficulties may arise with the angle at which the workpiece is held from operator to operator. Laying the workpieces on a table or rails, or using magnets to hold workpieces made of ferrous material in position are two ways to eliminate some of the hurdles in safeguarding a press brake.

When holding onto the workpiece, good safety practice is to have the operator's thumbs and fingers positioned alongside or underneath the workpiece—**never on top**.

As with all machinery, the best safety practice is to have a continuing safety program. The operator and all personnel connected with machinery must be safeguarded. The operator and die setter must be fully trained and instructed on all safety procedures and have full knowledge of the safeguarding device being used. The setup and maintenance personnel must also be trained on the proper safe operation of press brakes.

PRESS BRAKE CONTROL SYSTEMS

A press brake clutch/brake or hydraulic control system consists of:

1. A control box or light curtain interface
- 2a. Individual components

OR

- 2b. Component packages

We offer a variety of control boxes that can be furnished to meet your specific requirements. Solid-state control boxes are available as:

1. Standard clutch/brake or hydraulic control
2. Custom control which includes a fused disconnect switch and magnetic motor starter
3. Special control

SELECTING A CONTROL SYSTEM

1. To order a complete control system, determine which style control box is required.

A **standard** control box, with operators on the door, includes the clutch/brake or hydraulic control only. It can also be furnished in a plain-door enclosure or as a subpanel. Both plain-door or subpanel options require a remote operator station. Subpanels are furnished without the enclosure and must be installed into an existing enclosure.

A **custom** control box includes a main power disconnect switch and magnetic motor starter in the same enclosure as the clutch/brake or hydraulic control. A reversing slide-adjust motor starter may also be included.

Special clutch/brake or hydraulic control boxes can include either a standard or custom control that requires modification for any special requirements. This can be an interface of auxiliary equipment, a light curtain interface for a non-Rockford light curtain, or components specified by the end user, such as NEMA starters and disconnects.

2. After determining the style of control box, determine the location of the operator controls, and the keypad/display. Please remember these should be installed in a convenient location for the operator. These operator controls and keypad/display can be supplied as follows:

1. On the front of the enclosure
2. In a remote operator station
3. In a control bar
4. In a console
5. Loose for installation in an existing box



Plain-Door Control
(Use With Remote Operator Station)

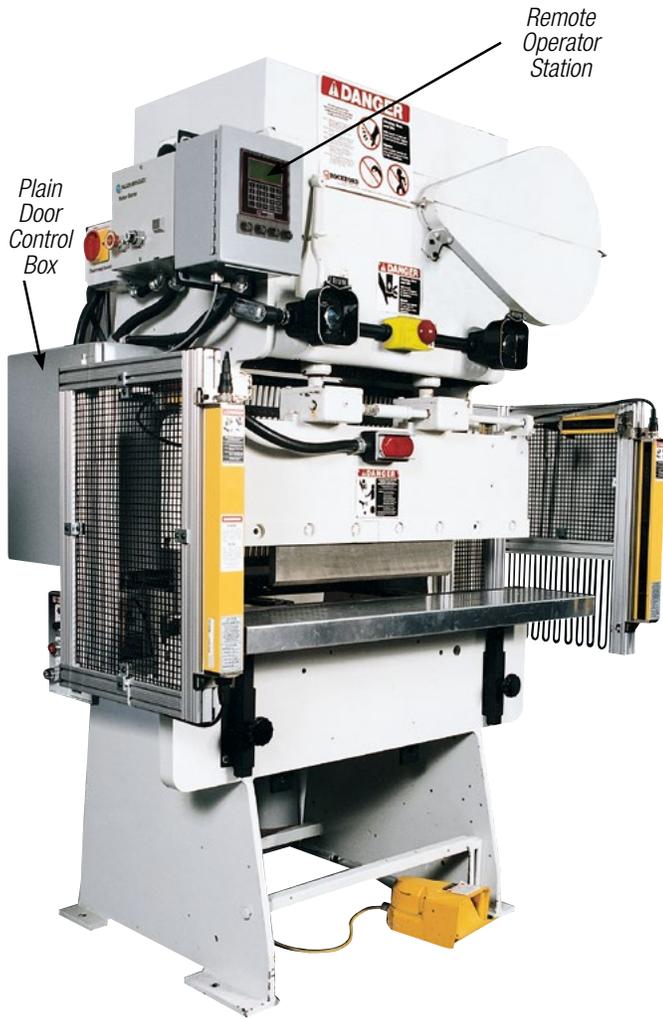


Remote Operator Station
(Use With Plain-Door, Custom, or Special Control)



Custom or Special Control
With Remote Operator Station

SSC1500 STANDARD PRESS BRAKE CONTROL



SSC1500 Press Brake Control System Installed on a Mechanical-Friction-Clutch Press Brake

The SSC1500 solid-state control system is designed for use on press brakes. It is designed and built to comply with OSHA, ANSI B11.3 and B11.19 standards with control reliability (see page 99) and brake monitoring. It can be used on both mechanical-friction and single-speed, air-clutch press brakes.

The SSC1500 solid-state control system is designed for use on press brakes. It is designed and built to comply with OSHA, ANSI B11.3 and B11.19 standards with control reliability (see page 99) and brake monitoring. It can be used on both mechanical-friction and single-speed, air-clutch press brakes.

When this control system is furnished for mechanical-friction-clutch press brakes, it is designed to replace the mechanical foot pedal/treadle operation. A foot switch and palm buttons replace the foot pedal/treadle to actuate the press brake. It is also designed for use on single-speed and two-speed air-clutch press brakes.

This control box includes sequence stop and a light curtain interface. Two-hand control or light curtains can be used as the point-of-operation safeguard. Please see pages 59-62 for further details on safeguarding.

The control, in sequence operation, allows the operator to run the slide down at high speed, stopping just above the workpiece. When the workpiece is properly positioned in the die, the clutch is engaged and the brake is released, allowing the slide to finish the cycle or inch through the bottom of the stroke. This slow-speed action, by inching through the bottom of the stroke, avoids the fast whip-up action of the workpiece. After going through the bottom of the stroke, the slide returns normally to the top of the stroke. If necessary, the slide can also be inched down by the foot switch in the single-stroke mode. Air cylinders for engaging and disengaging the clutch and brake on mechanical-friction clutches are detailed on pages 76-77.

On single-speed air-clutch/brake press brakes, the control will either allow the slide to make a single stroke or a sequence stop stroke. On two-speed air-clutch machines, the control allows single stroke, sequence stop stroke, and high/low automatic speed change.

In many applications, a light curtain is used as the safeguard. If this is the case, it is usually mounted vertically in front of the point-of-operation hazard. The control allows the light curtain to be muted from 1/4" or less above the workpiece, through the balance of the stroke.

SSC1500 STANDARD PRESS BRAKE CONTROL (CONTINUED)

MODES OF OPERATION

- Off
- Two-hand inch (regular, timed, or top-stop)
- Two-hand single stroke
- Foot single stroke
- Sequence stop (hand/hand, hand/foot, foot/foot)
- High/low automatic speed change (for two-speed only)

FEATURES

- Meets and exceeds OSHA 1910.212, ANSI B11.3 and B11.19
- Provides two-hand control safeguarding device
- Redundant/cross-checking microprocessors
- Redundant microprocessor logic power supplies
- Redundant solenoid relays
- 4-line x 20-character LCD (liquid crystal display) with 20-key operator interface
- Wide range of input power supply—85- to 135-VAC
- Absolute resolver with sync sensor for timing and motion detection
- Time-based brake monitor with programmable warning and fault set points
- Stop-time measurement test
- Adjustable sequence stop angle
- 6 user-programmable 24-V DC static diagnostic inputs
- 2 user-programmable 24-V DC cyclic die protection inputs
- 7-digit stroke and batch counters with preset, and a 7-digit total counter
- Light curtain interface(s) with off/on selector
- Light curtain mute during the nonhazardous portion of the stroke
- 4 PLS (programmable limit switch) outputs—2 on/off angles, or 1 timed off, or 1 counted output per PLS (or 3 PLS outputs and 1 auxiliary output with 1 contact)
- For two-speed operations: 3 PLS (programmable limit switch) outputs—2 on/off angles, or 1 timed off, or 1 counted output per PLS (or 2 PLS outputs and 1 auxiliary output with 1 contact)
- Information displayed during the machine run cycle: mode of operation, strokes per minute, stop time, stroke counter, batch counter, and angle of crankshaft
- Display of text in English or Spanish

The standard SSC1500 press brake control is housed in a 20" x 20" x 8" NEMA 12 enclosure with the operators and keypad/display mounted on the front of the enclosure.

KEYPAD/DISPLAY

The keypad/display is used to enter setup information, monitor machine operation, and display messages to the user. The keypad/display has a 4-line x 20-character LCD (liquid crystal display) with 20 keys for entering information and programming. As standard, this keypad/display is mounted in the control box. For operator convenience, it can be furnished in a remote enclosure up to a maximum of 150' from the SSC1500 control module (see page 70).

PROGRAMMABLE SETTINGS AT THE KEYPAD

The sequence-stop angle setting programs the stopping position on the downstroke for the sequence mode of operation—no manual setting of cams.

On two-speed press brakes, a low single-stroke top-stop angle can be programmed. The high/low automatic speed change is also programmable at the keypad.

DIAGNOSTICS AND FAULT MESSAGES

There are eight 24-V DC selectable current-sinking or sourcing programmable diagnostic inputs provided for the user. A fault message, input logic, and stop type can be assigned to each input from the list below. When a fault condition is detected, the machine will top stop or emergency stop, and the assigned message will be displayed. This feature helps when troubleshooting common fault conditions.

FAULT MESSAGE LIST:

Clutch/Brake Air Fault	Left Side Guard Open
Counterbalance Air Fault	Right Side Guard Open
Dual Solenoid Fault	Feeder Fault
Clutch Valve Fault*	Load Monitor Fault
Brake Valve Fault*	Safety Block Interlock
Lube Fault	Shut Height Fault
High Lube Pressure	Variable Speed Drive Fault
Low Lube Pressure	Die Protection Fault**
Low Lube Level	Short Feed Fault**
Main Motor Overload	Part Ejection Fault**
Ram-Adjust Motor Overload	Stock Buckle Fault**
Lube Motor Overload	End of Stock Fault**
Auxiliary Motor Overload	Pilot Pin Fault**
Guard Interlock Open	Part Input #1**
Front Guard Open	Part Input #2**
Rear Guard Open	Part Input #3**

*Only used on machines that have a split clutch and brake, and two dual valves have been furnished.

**Messages typically used for die protection.

SSC1500 CUSTOM PRESS BRAKE CONTROL



SSC1500 Custom Press Brake Control Box (Operators Located on Door Front)

Custom SSC1500 press brake control boxes are also available to fit your particular requirements. These boxes are furnished with an IEC through-the-door main power fused disconnect switch and an IEC magnetic motor starter (with push buttons). A reversing slide-adjust motor starter may also be included. They are prewired and built into a NEMA 12 enclosure.

Operator controls can be furnished on the front (F) door of the control box or on a plain (P) door with no operators except a disconnect switch. The SSC1500 custom press brake control box can be furnished in many different ways. Please refer to page 70 for the part numbering system.

If a plain door custom control or a subpanel custom control is required, a remote operator station is needed. See ordering information on page 69.

NEMA-style disconnect switches and motor starters, and brand name components specified by our customers are also available.

To ensure the starter(s) and disconnect are sized properly, please check horsepower for the main drive motor and slide adjust motor (if furnished) on the press brake, as well as full-load amps, and primary voltage to the press brake. After obtaining this information, please go to the chart on page 70 to determine the proper custom control box part number. Follow directions 1-6 to obtain the correct part number of the control box.

Example of the part numbering system: The press brake requires a C4000 advanced light curtain interface, a 60-A disconnect switch, a reversing 25-A reversing main motor starter, and a 12-A reversing ram adjust motor starter. All operators will be located on the door of the enclosure except the ram adjust motor control which will be located remote. The part number to order would be PRS263-FC6.

SSC1500 REMOTE OPERATOR-STYLE CONTROL BOXES FOR PRESS BRAKES

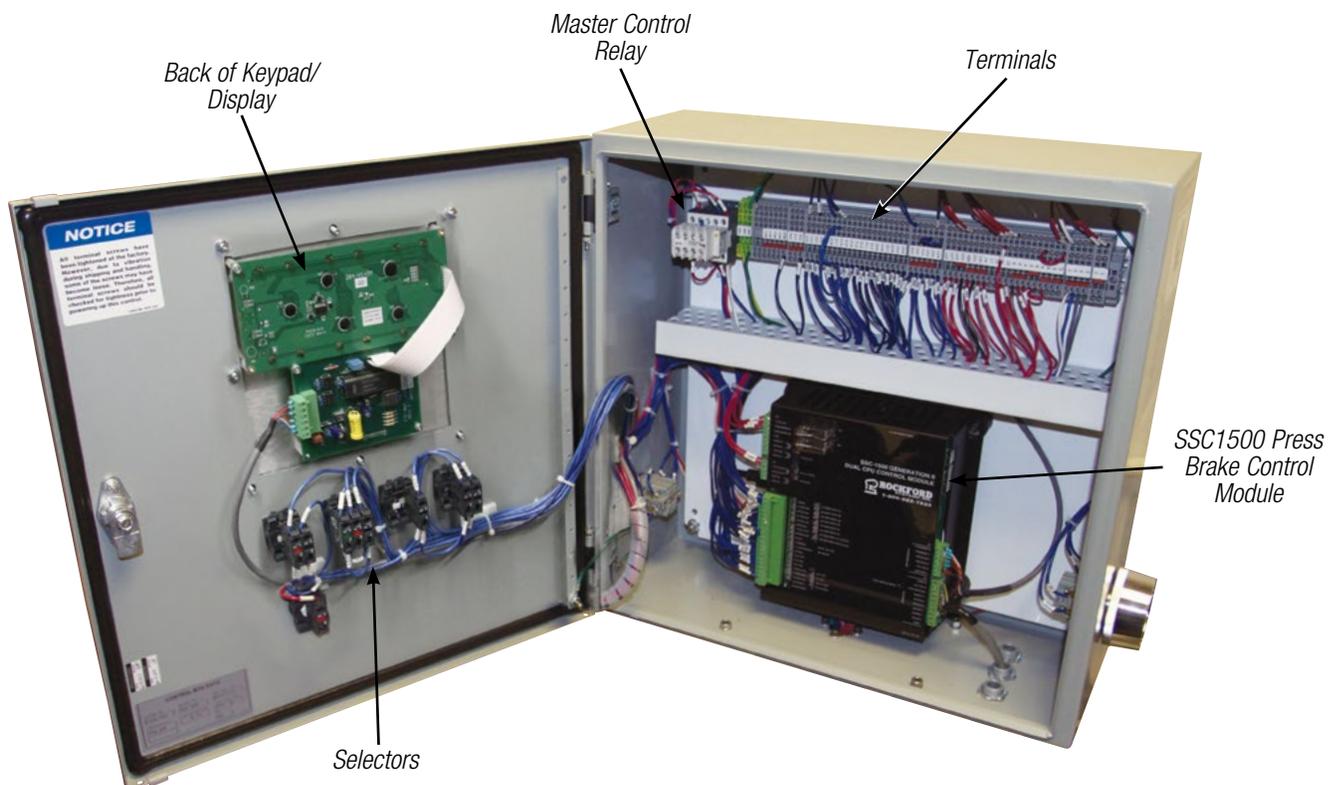


Style Z Remote Operator Control Box
Clutch/Brake Control and Operators In One Box

These remote operator-style clutch/brake control boxes include the same features and modes of operation as the standard SSC1500 control boxes described on pages 64-65. **However, they do not have a control transformer.** These control boxes are designed to be located on the front of the machine near the operator.

These controls are for applications where the machine's existing magnetic motor starter, fused disconnect switch, and control transformer meet the safety requirements and can be reused. If the existing control transformer cannot be reused or a new control transformer is required, please contact the factory.

The three remote operator-style control boxes available have the keypad/display and all operators on the door of the 20" x 20" x 8" NEMA 12 enclosure. Please see the next page for the three styles available.



Interior of Style Z Remote Operator Control Box

SSC1500 REMOTE OPERATOR-STYLE CONTROL BOXES FOR PRESS BRAKES (CONTINUED)



Style X Includes:

- Keypad/display
- Program/run/off selector switch
- Mode selector switch
- Actuating means selector switch
- Light curtain off/on selector switch
- Internal clutch/brake control module, master control relay, and terminals



Style Y Includes:

- Keypad/display
- Program/run/off selector switch
- Mode selector switch
- Actuating means selector switch
- Light curtain off/on selector switch
- Internal clutch/brake control module, master control relay, and terminals
- Self-latching emergency-stop button



Style Z Includes:

- Keypad/display
- Program off/on selector switch
- Mode selector switch
- Actuating means selector switch
- Light curtain off/on selector switch
- Internal clutch/brake control module, master control relay, and terminals
- Self-latching emergency-stop button
- Two guarded run/inch buttons located on the sides of the enclosure

CONTROL MODULE KIT

Part No. PRS000-KB (for SSC1500 PRS Controls)

Part No. PRT000-KB (for SSC1500 PRT Controls)

A control module kit allows the end user to update the clutch/brake control of a press brake with minimum equipment costs. The kit is supplied without the control enclosure, panel, control transformer, control fuse, terminal strips, wire duct, and wiring.

This control module kit includes the control module, master control relay, shock mounts, fasteners, suppressors, danger labels, and electrical prints. A keypad/display kit is required unless a remote operator station is used (see below).

A set of electrical prints is supplied to show typical wiring and all mounting dimensions are provided in order for a qualified person to install the control module kit. The minimum area required on an existing control panel to install this kit is 18" H x 18" W x 6" D.

KEYPAD/DISPLAY KIT

Part No. LLD1519G2 (for SSC1500 PRS Controls)

Part No. LLD1545G2 (for SSC1500 PRT Controls)

The keypad/display kit can be used with any of the control boxes or the control module kit. This kit includes the keypad/display, a screen label, a program off/on selector switch, a light curtain off/on selector switch, a hand, hand/foot, foot selector switch, an off/inch/single/sequence stop selector switch, and 25' of cable. Additional push buttons, nameplates, and selector switches for motor starters, etc., can be furnished depending on the features required.

A resolver/pulser assembly and cable, Part No. CMS115, is required with any of the control selections. See page 77 for further details on this component.

REMOTE OPERATOR STATIONS

For operator convenience, a remote operator station can be furnished for use with a plain-door standard control box, plain-door custom control box, or control module kit. The remote operator station contains the keypad/display, program off/on selector switch, and other selector switches and push buttons as required.

Remote operator stations are available in a standard format or can be customized to meet any requirements. Select from the following remote operator stations or contact the factory with your special requirements.



Remote
Operator
Station
Part No.
LLD1514G2

FEATURES	REMOTE OPERATOR STATIONS FOR PRS CONTROLS					REMOTE OPERATOR STATIONS FOR PRT CONTROLS				
	LLD1514 G2	LLD1515 G2	LLD1516 G2	LLD1517 G2	LLD1518 G2	LLD1534 G2	LLD1535 G2	LLD1536 G2	LLD1537 G2	LLD1538 G2
KEYPAD/DISPLAY	X	X	X	X	X	X	X	X	X	X
PROGRAM OFF/ON SELECTOR SWITCH	X	X	X	X	X	X	X	X	X	X
LIGHT CURTAIN OFF/ON SELECTOR SWITCH	X	X	X	X	X	X	X	X	X	X
OFF/INCH/SINGLE/SEQUENCE STOP SELECTOR SWITCH	X	X	X	X	X	X	X	X	X	X
HAND, HAND/FOOT, FOOT SELECTOR SWITCH	X	X	X	X	X	X	X	X	X	X
HIGH, HIGH/LOW, LOW SELECTOR SWITCH						X	X	X	X	X
MAIN MOTOR START AND STOP PUSH BUTTONS		X	X	X	X		X	X	X	X
MAIN MOTOR FORWARD/REVERSE SELECTOR SWITCH			X		X			X		X
RAM-ADJUST OFF/ON SELECTOR SWITCH				X	X				X	X
RAM RAISE PUSH BUTTON				X	X				X	X
RAM LOWER PUSH BUTTON				X	X				X	X
LIGHT CURTAIN BLANKING SELECTOR SWITCHES	LLD1524 G2	LLD1525 G2	LLD1526 G2	LLD1527 G2	LLD1528 G2	LLD1539 G2	LLD1540 G2	LLD1541 G2	LLD1542 G2	LLD1543 G2

A
D
D

(Use part # at right in place of part # above)

If any of the above remote operator stations are required without the enclosure, please consult the factory.

SELECTING AN SSC1500 PRESS BRAKE CONTROL

To determine the 8- or 9-digit configured part number for the press brake control required, follow directions 1-6 below and use the information in the **PART NUMBERING SYSTEM CHART** below.

1. The first 3 digits for all SSC1500 press brake controls are PRS or PRT.
2. The 4th digit determines the size of the disconnect switch, if provided, in the control enclosure. Zero (0) indicates no disconnect switch provided.
3. The 5th and 6th digits determine the size and type of motor starter(s), if provided, in the control enclosure. Zeros (00) on both positions indicate no motor starter(s) provided.
4. The 7th digit determines the location of the operator controls, or if it is a style X, Y, or Z control without the control transformer.
5. The 8th digit is for the type of light curtain interface provided.
6. The 9th digit (if required) will indicate the type of modifier provided: i.e., motor control operators remote.

SAMPLE 1 2 3 4 5 6
P R S - 2 6 3 - F C 6

The sample shown, PRS263-FC6, indicates that the custom part-revolution control box with sequence stop mode of operation will contain a C4000 advanced light curtain interface, an IEC 60-A disconnect switch, an IEC 25-A reversing main drive motor starter, and an IEC 12-A reversing ram-adjust motor starter. The keypad/display and all operators will be located on the door of the enclosure, except for the ram-adjust motor controls which will be located remote.

SSC1500 PRESS BRAKE CONTROL PART NUMBERING SYSTEM CHART					
SYSTEM TYPE PRODUCT CATEGORY			MODIFIER		
<div style="border: 1px solid red; padding: 2px;"> PRS — SSC1500 Press Brake Control PRT — SSC1500 Press Brake Control for Two-Speed Air-Clutch Press Brakes </div>			<div style="border: 1px solid red; padding: 2px;"> -- — Blank, No Modifier 5 — Main Motor Operators Remote* 6 — Ram-Adjust Operators Remote* 7 — Main Motor and Ram-Adjust Operators Remote* </div>		
DISCONNECT SWITCH SIZE—IEC (PLUS MAXIMUM MAIN MOTOR FLA)			LIGHT CURTAIN INTERFACE OPTIONS		
<div style="border: 1px solid orange; padding: 2px;"> 0 — No Disconnect Switch 1 — 30A Disconnect— 1- to 20-FLA Main Drive Motor 2 — 60-A Disconnect— 21- to 40-FLA Main Drive Motor 3 — 100-A Disconnect— 41- to 66-FLA Main Drive Motor 4 — 200-A Disconnect— 67- to 133-FLA Main Drive Motor 5 — 400-A Disconnect— 134- to 266-FLA Main Drive Motor </div>			<div style="border: 1px solid blue; padding: 2px;"> B — Banner Standard C — C4000 Advanced With LC Operators on Door V — C4000 Advanced With LC Operators Remote W — C4000 Standard </div>		
REVERSING/NONREVERSING MAIN MOTOR STARTERS WITH OR WITHOUT RAM ADJUST			CONFIGURATION & OPERATOR LOCATION		
<div style="border: 1px solid green; padding: 2px;"> 0 — No Motor Starters 1 — Nonreversing Main Motor Starter Without Ram Adjust 2 — Reversing Main Motor Starter Without Ram Adjust 3 — Nonreversing Main Motor Starter With 12-A Ram Adjust 4 — Nonreversing Main Motor Starter With 18-A Ram Adjust 5 — Nonreversing Main Motor Starter With 25-A Ram Adjust 6 — Reversing Main Motor Starter With 12-A Ram Adjust 7 — Reversing Main Motor Starter With 18-A Ram Adjust 8 — Reversing Main Motor Starter With 25-A Ram Adjust </div>			<div style="border: 1px solid blue; padding: 2px;"> F — Keypad/Display and all Operators on Door of Enclosure P — Keypad/Display and all Operators Remote (Plain Door) S — Subpanel Only—Without Enclosure, Keypad/Display, and Operators K — Kit with Module and Control Relays Only—Without Enclosure, Subpanel, Transformer, Keypad/Display, and Operators C — Console X — Same as F (above) Without Control Transformer Y — Same as F (above) Without Control Transformer but with E-Stop Z — Same as F (above) Without Control Transformer but With E-Stop and Two (2) Guarded Run/Inch Buttons on the Enclosure </div>		
MAIN MOTOR STARTER SIZE					
<div style="border: 1px solid green; padding: 2px;"> 0 — No Starter IEC </div>	Motor Horsepower Chart—3 Phase				
	208 V	230 V	460 V	575 V	
1 — 12 A	2	3	7.5	7.5	
2 — 18 A	5	5	10	10	
3 — 25 A	5	7.5	15	15	
4 — 32 A	7.5	10	20	20	
5 — 40 A	10	10	30	30	
6 — 50 A	15	15	30	40	
7 — 65 A	20	20	50	50	
8 — 80 A	25	30	60	75	
9 — 95 A	30	30	60	75	
A — 115 A	30	40	75	100	
B — 185 A	50	60	125	150	
C — 265 A	75	100	200	200	

*See page 48 for remote motor control operator stations or Safety Shields catalog.

**Additional light curtain interface options are available upon request—contact Rockford Systems at 1-800-922-7533.

SSC1500 INDIVIDUAL COMPONENTS

RESOLVER/PULSER ASSEMBLY

Part No. CMS115*—40' Cable

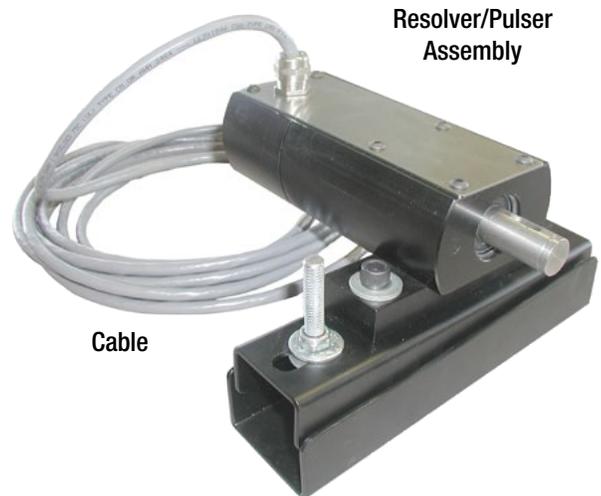
Part No. CMS115-100—100' Cable

An absolute resolver/pulser cycle timing device is required to provide the angular position and velocity/motion information of the machine crankshaft to the control. The resolver is a highly accurate and repeatable device which uses an internally mounted pulser cam and disk to verify the position of the crankshaft.

The resolver/pulser timing device is contained in a rugged, heavy-duty housing with a spring-compression base. The spring base helps isolate the resolver from shock load and vibration that are common occurrences on press brakes. This provides longer life for the components inside the resolver. The spring base also functions as a drive chain tightener.

This resolver allows the setup person to make all cycle timing adjustments with the keypad/display. These adjustments include sequence set point, mute set point, and high/low speed change.

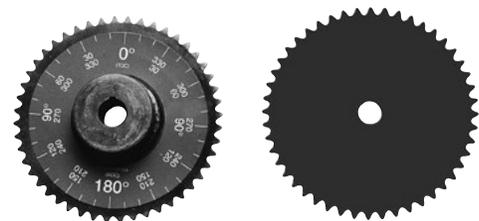
The 3/4" diameter steel drive shaft is mounted in sealed ball bearings. The resolver/pulser is furnished with a 40' cable (or optional 100' cable) that is connected to the drive assembly and wires into the control box. The cable can be cut to length and wired to terminals.



SPROCKET ASSEMBLY

Part No. CML000*

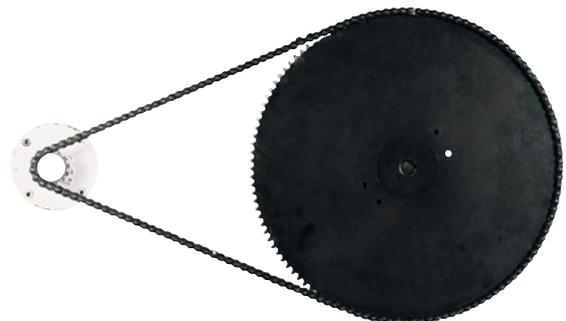
A sprocket set consists of two 1:1 sprockets. One fits on the 3/4" shaft of the CMS115 resolver/pulser assembly; the other sprocket is for mounting to the end of the press brake crankshaft to rotate the cycle timing device. These 48-tooth sprockets are designed to accept ANSI No. 35 roller chain.



SPECIAL SPROCKETS

Part No. CML100

If your machine does not have access to the crankshaft to provide 1:1 ratio drive for the resolver/pulser assembly, special sprocket sets are available to match the gear drive ratio of the machine. The smaller of the two sprockets is attached to the drive of the machine (usually on the backshaft) and the larger sprocket is attached to the resolver/pulser assembly. Please provide the gear ratio of the press brake when ordering these special sprockets along with the brand name and serial number of the press brake.



ROLLER CHAIN

Part No. CMS515*

ANSI No. 35 roller chain and master link is 10 feet long for driving any of the above sprockets.

**Included in component package on page 74.*



SSC1500 INDIVIDUAL COMPONENTS (CONTINUED)

MONITORED DUAL-SOLENOID AIR VALVE

1/2" Port—Part No. RCL652* for Mechanical-Friction Clutch

This three-way cross flow, series/parallel air valve includes an air pressure electrical output monitor and muffler. Air is put into the clutch and brake when the dual-solenoid air valve is electrically energized. When it is de-energized, the air is dumped through the muffler from the clutch and brake.

This valve consists of two main parts: the piloted monitor assembly and the valve body assembly. The two main valve elements move simultaneously during normal operation. If these elements should fail to move simultaneously, the internal spool shifts, inhibiting further machine operation. The pressure switch will provide a signal to the control system to indicate a fault condition. A reset button on the side of the valve can be used to reset the valve if an accidental valve fault is detected.



Monitored Dual-Solenoid Air Valve

AVERAGE CV (FLOW RATE)		
PART NO.	PORTS 1 TO 2	PORTS 2 TO 3
RCL652	3.0	8.0

1/2" FILTER-REGULATOR-LUBRICATOR ASSEMBLY (FRL)

Part No. RCL044* for Mechanical-Friction Clutch

This assembly is required to meet OSHA and ANSI standards. This FRL assembly filters, regulates, and lubricates the air going through it. This filtered and lubricated air then goes to the dual-solenoid air valve assembly and clutch/brake. The regulator should be adjusted to meet the original equipment manufacturer's requirements. The assembly includes a gauge, coupling, and a steel mounting bracket.



Filter-Regulator-Lubricator Assembly

AIR PRESSURE SWITCH—Part No. CTD062*

This air pressure switch monitors low pressure to either the clutch/brake-actuating air cylinder and valve or slide counterbalance systems. Each system requires an air pressure switch. The pressure switch must be set so if the air pressure operating the component is not adequate, or if the air pressure suddenly drops, the press brake becomes inoperable.

This switch is used on applications where the air pressure should not go below a predetermined amount. Each air pressure switch's low level setting is based on each application.

Note: When press brakes have an air counterbalance system, an air pressure switch and check valve are required. See page 30 for a check valve.



Air Pressure Switch

PALM BUTTON ASSEMBLY

To meet OSHA and ANSI safety requirements, the two run/inch buttons must be protected against accidental operation (ring guards) and separated to require the use of both hands to operate them. They must also be mounted at the proper safety distance, if they will be used as a safeguard. The contact arrangement of these buttons is 1 NO and 1 NC.

Part No. CTL507*

This palm button assembly consists of two black run/inch buttons (with ring guards) and a red emergency-stop button. Mounting boxes are furnished with each button. The red palm button has 1 NO and 1 NC arrangement plus a mechanical latch.

See pages 89-90 for other palm button assembly options. See page 49 for control bars.

**Included in a component package on page 74.*



Part No. CTL507

SSC1500 INDIVIDUAL COMPONENTS (CONTINUED)

FOOT SWITCH—Part No. CTD011* & CTD088

This foot switch is protected from unintentional operation. A die-cast cover protects the top and both sides, and the front is protected by a hinged flap. The flap must be lifted with the toe before the foot may enter the switch. The electrical contact arrangement is 1 NO and 1 NC.



Foot Switch CTD011



Foot Switch CTD088

SUPERVISORY CONTROL STATION

Part No. LLD1501

Part No. LLD283* (required when a USC000 is used—see below)

When multiple operator stations are required, this supervisory control station is furnished separately for each set of palm buttons and/or foot switch operator station. It has its own enclosure and includes an off/on key-operated selector switch and a green on indicator light. The enclosure size is 3½" x 6¾" x 3".



MULTIPLE-OPERATOR JUNCTION BOX—Part No. USC000*

When multiple operator stations are required, this junction box is furnished separately for wiring up to four (4) operator stations. This junction box interfaces palm button assemblies/control bars and foot switches, and will not allow the press brake to run if palm buttons or a foot switch is actuated without its supervisory control station on. A lighted push button with nameplate indicates a fault condition of an operator station. The button is pushed to reset. The enclosure size is 16" x 14" x 6".



Multiple-Operator Junction Box



Crankshaft Angle Display

CRANKSHAFT ANGLE DISPLAY

Part No. FTL055

The optional crankshaft angle display is a unit that shows the angular position of the crankshaft for mechanical press brakes. The crankshaft position is shown both graphically (with red LEDs in a circle) and numerically (with a large, red, three-digit LED). The large display can be easily seen which helps with setup, removal of stuck workpieces, or for assistance during emergency extractions procedures.

FEATURES

- Large LED numerical display and circular LED graphic display can be easily seen
- Mounts easily
- Supplied with 25' of cable for connection to the control
- Helps satisfy the requirements of Canadian Standard CSA Z142-02, Code for Power Press Operation: Health, Safety, and Guarding Requirements, for indication of crank angle position

*Included in a component package on page 74.

COMPONENT PACKAGE FOR MECHANICAL-FRICTION-CLUTCH PRESS BRAKES ONLY

To complete the SSC1500 control system for mechanical-friction-clutch press brakes, component packages are available. If component packages for air clutch press brakes are required, please see page 78. Component packages are listed in the chart below. These packages can be furnished with:

- A STANDARD Control (pp. 64-65)
- A REMOTE OPERATOR-STYLE Control (pp. 67-68)
- A CUSTOM Control (p. 66)
- A SPECIAL Control (p. 66)
- A SUBPANEL

To select the proper component package to go with your control box, determine your requirements below:

- A** Modes of operation and actuating means required.
- B** Number of operator stations required.
- C** Type of sprockets required.

A Modes of operation: Inch, Single, and Sequence Stop (Hand or Foot)					
PRS or PRT Control Box	B ONE OPERATOR STATION		B TWO OPERATOR STATIONS		
A <ul style="list-style-type: none"> • Two-Hand Inch • Two-Hand Single Stroke • Foot Single Stroke • Sequence Stop 	C STANDARD SPROCKETS	C SPECIAL SPROCKETS	C STANDARD SPROCKETS	C SPECIAL SPROCKETS	
		MNK-000-SSP Standard Component Package	MNK-002-SSP Component Package	MNK-001-SSP Component Package	MNK-003-SSP Component Package
		CMS115 Resolver/Pulser Timing Device With 40' Cable and Plug CML000 Sprocket Assembly CMS515 10' ANSI No. 35 Roller Chain RCL652 ½" Dual-Solenoid Air Valve RCL044 ½" Filter-Regulator-Lubricator Assembly CTD062 Air Pressure Switch CTL507 Palm Button Assembly CTD011 Foot Switch	COMPONENTS REQUIRED IN ADDITION TO THOSE LISTED IN STANDARD PACKAGE AT LEFT CML100 Special Sprockets (Replaces CML000)	CTL507 Palm Button Assembly CTD011 Foot Switch LLD283 Supervisory Control Station (2) USC000 Multiple Operator Junction Box	CML100 Special Sprockets (Replaces CML000) CTL507 Palm Button Assembly CTD011 Foot Switch LLD283 Supervisory Control Station (2) USC000 Multiple Operator Junction Box

A Modes of operation: Inch and Single (Hand Only)				
	B ONE OPERATOR STATION		B TWO OPERATOR STATIONS	
MODES OF OPERATION TO BE USED	C STANDARD SPROCKETS	C SPECIAL SPROCKETS	C STANDARD SPROCKETS	C SPECIAL SPROCKETS
PRS or PRT Control Box	MNF-000-SSP Standard Component Package	MNF-002-SSP Component Package	MNF-001-SSP Component Package	MNF-003-SSP Component Package
<ul style="list-style-type: none"> • Two-Hand Inch • Two-Hand Single Stroke 	CMS115 Resolver/Pulser Timing Device With 40' Cable and Plug CML000 Sprocket Assembly CMS515 10' ANSI No. 35 Roller Chain RCL652 ½" Dual-Solenoid Air Valve RCL044 ½" Filter-Regulator-Lubricator Assembly CTD062 Air Pressure Switch CTL507 Palm Button Assembly	COMPONENTS REQUIRED IN ADDITION TO THOSE LISTED IN STANDARD PACKAGE AT LEFT CML100 Special Sprockets (Replaces CML000)	CTL507 Palm Button Assembly LLD283 Supervisory Control Station (2) USC000 Multiple Operator Junction Box	CML100 Special Sprockets (Replaces CML000) CTL507 Palm Button Assembly LLD283 Supervisory Control Station (2) USC000 Multiple Operator Junction Box

Note: If the press brake has an air counterbalance, an additional CTD062 air pressure switch is required.

Please select an air cylinder from page 75 or 76 to complete this package. For light curtains, mounting brackets and barriers for sides of point of operation, see Safeguarding Devices catalog.

RCL SERIES AIR CYLINDERS

An air cylinder must be ordered **separately** for mechanical-friction-clutch press brakes that are using the packages described on page 74. It is required to complete the control system. Standard air cylinders are single-acting, pull-type, and spring return. A clevis mounting arrangement is furnished for attaching the cylinder to the machine frame. A rod, yoke, and pin assembly are used for ease in connecting to the existing clutch/brake operating rod. Other types of air cylinders are also available. Before ordering an air cylinder, please check the linkage where the cylinder will be inserted for proper stroke and diameter of air cylinder needed. Please consult the factory for any special requirements, such as push-type cylinders or longer- or shorter-stroke cylinders.



Part No. RCL004—Air Cylinder

300-lb pull @ 75 PSI, 2 1/2" bore x 2" stroke for press brake sizes up to 8' beds. (Cylinders with longer or shorter strokes, and push cylinders are available upon request.)

Part No. RCL005—Air Cylinder

500-lb pull @ 75 PSI, 3 1/4" bore x 2" stroke for press brake sizes 10' to 14' beds. (Cylinders with longer or shorter strokes, and push cylinders are available upon request.)

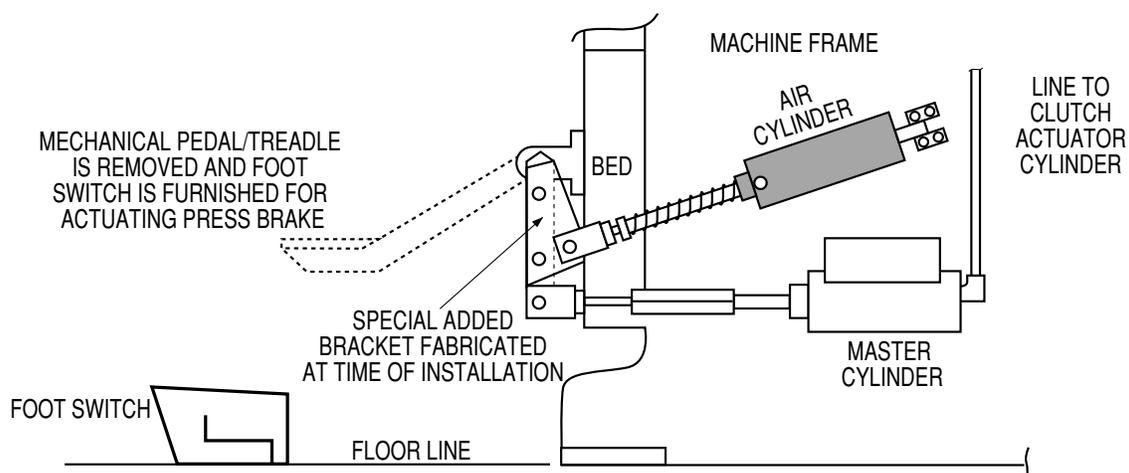
Note: Please see the next page for special tie-rod-constructed air cylinders (for larger press brakes) or special mounting features.

MASTER CYLINDER-OPERATED PRESS BRAKES (OLDER WYSONG PRESS BRAKES)

Press brakes that use a master cylinder-type hydraulic system to operate a mechanical-friction clutch and brake can be retrofitted with the controls illustrated in this catalog. The following illustration shows how the air cylinder that operates the clutch and brake can be applied.

FOOT SWITCH PACKAGE

For control systems on pages 64-74, the RCL004 air cylinder can be applied as illustrated below.



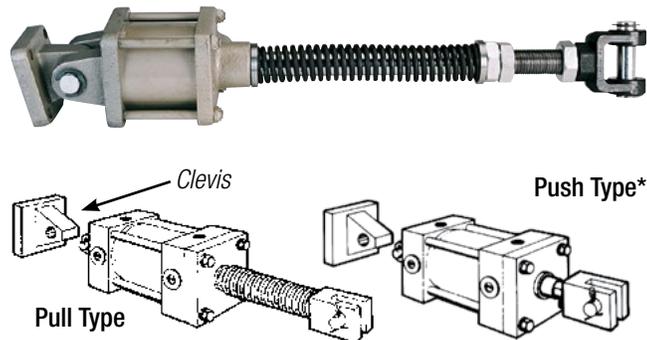
OTHER AIR CYLINDERS AVAILABLE

The following custom tie-rod-constructed air cylinders can be furnished instead of the standard RCL series cylinders offered on the previous page. These cylinders are furnished when a larger and more durable cylinder is needed to engage and disengage the mechanical-friction clutch and brake of press brakes or when the clevis mount will not fit the machine. Please note that they are offered in tie-rod construction, both pull-type and push-type, single action with spring return. The push type has an internal spring. All cylinders are furnished with yoke and pin on the operating rod to attach to the machine linkage.

When applying an air cylinder to the machine, make sure the alignment (with the machine linkage) is a straight line. Also make sure the cylinder rod, yoke, or any moving parts will not bind after installation. Be sure the rod stroke is not too long—it could cause jackknifing of the cylinder and clutch operating rod. Please consult the factory for any other special cylinder configuration (i.e., longer or shorter stroke) or additional force needed on the return spring.

TYPE A—CLEVIS MOUNT

This air cylinder is usually mounted in the vertical position on the side of the machine.

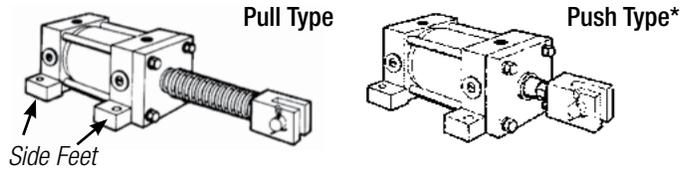


TYPE A – CLEVIS			APPROX. OVERALL LENGTH	RETURN SPRING PRESSURE	AMOUNT OF PULL OR PUSH FORCE AT 75 PSI
PART NO.	BORE	STROKE			
PULL TYPE					
RCK526	2"	2"	23"	60	100
RCK527	2"	3"	25"	40	100
RCK528	2"	4"	27"	20	100
RCK529	3"	2"	26"	120	295
RCK530	3"	3"	28"	80	295
RCK531	3"	4"	30"	40	295
RCK532	4"	2"	30-1/2"	270	460
RCK533	4"	3"	32-1/2"	195	460
RCK534	4"	4"	34-1/2"	120	460
PUSH TYPE					
RCK535	2"	2"	17"	60	135
RCK536	2"	3"	18"	40	135
RCK537	2"	4"	19"	20	135
RCK538	3"	2"	22"	120	330
RCK538	3"	3"	23"	82	330
RCK539	3"	4"	23"	40	330
RCK540	4"	2"	21-1/2"	270	520
RCK541	4"	3"	22-1/2"	195	520
RCK542	4"	4"	23-1/2"	120	520
RCK543					

*The spring is inside the cylinder on push-type air cylinders.

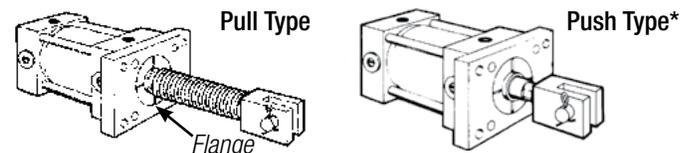
TYPE B—SIDE-FOOT MOUNT

This air cylinder can be mounted vertically, horizontally, or any angle depending upon application



TYPE B – SIDE FOOT			APPROX. OVERALL LENGTH	RETURN SPRING PRESSURE	AMOUNT OF PULL OR PUSH FORCE AT 75 PSI
PART NO.	BORE	STROKE			
PULL TYPE					
RCK544	2"	2"	21-1/2"	60	100
RCK545	2"	3"	23-1/2"	40	100
RCK546	2"	4"	25-1/2"	20	100
RCK547	3"	2"	20-1/2"	120	295
RCK548	3"	3"	22-1/2"	80	295
RCK549	3"	4"	24-1/2"	40	295
RCK550	4"	2"	28"	270	460
RCK551	4"	3"	30"	195	460
RCK552	4"	4"	32"	120	460
PUSH TYPE					
RCK553	2"	2"	15"	60	135
RCK553	2"	3"	16"	40	135
RCK554	2"	4"	17"	20	135
RCK555	3"	2"	20"	120	330
RCK556	3"	3"	21"	82	330
RCK557	3"	4"	22"	40	330
RCK558	4"	2"	17-1/2"	270	520
RCK559	4"	3"	18-1/2"	195	520
RCK560	4"	4"	19-1/2"	120	520
RCK561	4"	5"	20-1/2"	120	520
RCK590					

TYPE C—FRONT FLANGE MOUNT



This air cylinder is usually installed in applications where the cylinder rod must go through the frame of the press brake. Rear-flange mount and rod extensions at both ends are also available.

TYPE C – FRONT FLANGE			APPROX. OVERALL LENGTH	RETURN SPRING PRESSURE	AMOUNT OF PULL OR PUSH FORCE AT 75 PSI
PART NO.	BORE	STROKE			
PULL TYPE					
RCK562	2"	2"	21"	60	100
RCK563	2"	3"	23"	40	100
RCK564	2"	4"	25"	20	100
RCK565	3"	2"	23"	120	295
RCK566	3"	3"	25"	80	295
RCK567	3"	4"	27"	40	295
RCK568	4"	2"	28"	270	460
RCK569	4"	3"	30"	195	460
RCK570	4"	4"	32"	120	460
PUSH TYPE					
RCK571	2"	2"	16"	60	135
RCK571	2"	3"	17"	40	135
RCK572	2"	4"	18"	20	135
RCK573	3"	2"	21"	120	330
RCK574	3"	3"	22"	82	330
RCK575	3"	4"	23"	40	330
RCK576	4"	2"	22-1/4"	270	520
RCK577	4"	3"	23-1/4"	195	520
RCK578	4"	4"	24-1/4"	120	520
RCK579					

SINGLE- AND TWO-SPEED AIR-CLUTCH PRESS BRAKES

INTRODUCTION

Air-operated clutches and brakes use a friction arrangement that causes engagement and disengagement. When air pressure enters the clutch and brake, through a monitored dual-solenoid air valve, the clutch engages and the brake is released. To stop the motion of the press brake, the opposite takes place.

Some press brakes have one clutch that allows only one speed when cycling the machine while other press brakes have two clutches for two speeds. Two-speed air-clutch press brakes allow the slide to approach the workpiece at a fast speed, disengage (air is dumped from one clutch), then allow the second clutch to engage for a slower speed through the bending operation to the bottom of the stroke. This prevents fast whip-up action of the material. The clutches are again switched for rapid travel back to the top of the stroke.

If these types of machines are newer, they do not always require a completely new clutch/brake control package for control reliability. To verify this, please send the electrical schematics to our engineering department for review. These schematics are also necessary to review for proper interface when a light curtain will be furnished. If a single- or two-speed air-clutch press brake doesn't have control reliability and when brake monitoring is needed, the SSC1500 control can be furnished.

SELECTING A CONTROL SYSTEM FOR PART-REVOLUTION-AIR-CLUTCH PRESS BRAKES

1. Determine if the press brake is a single- or two-speed press brake (one or two clutches).
2. If the press brake is a single-speed and sequence-stop operation is required, the SSC1500 control on pages 64-74 can be used. Select a component package from page 66. Light curtains, mounting brackets, and lockout valves are not part of the component packages and must be ordered separately. Please see page 33 for an appropriate lockout valve and Safeguarding Devices catalog for light curtain options and mounting brackets.
3. If the press brake has a two-speed air clutch, the standard SSC1500 control on pages 64-74 can be used. Select the component package from page 74. Light curtains mounting brackets (Safeguarding Devices catalog), and lockout valves (page 33) are not part of the component packages and must be ordered separately.

Notes: See Safety Shields catalog for safeguarding the back side of the press brake.

COMPONENT PACKAGES FOR SINGLE- AND TWO-SPEED AIR-CLUTCH PRESS BRAKES

To complete the SSC1500 single- and two-speed air clutch press brake control system, component packages are available. Component packages are listed in the charts below. These packages can be furnished with:

- **A STANDARD** Control (pp. 64-65)
- **A REMOTE OPERATOR-STYLE** Control (pp. 67-68)
- **A CUSTOM** Control (p. 66)
- **A CONTROL CONSOLE**
- **A SPECIAL** Control (p. 66)
- **A SUBPANEL**

To select the proper component package to go with your control box, determine your requirements below:

- A** Modes of operation and initiating means required.
- B** Number of operator stations required.
- C** Type of sprockets required.

A Modes of operation: Inch, Single, and Sequence Stop (Hand or Foot)					
B ONE OPERATOR STATION			B TWO OPERATOR STATIONS		
MODES OF OPERATION TO BE USED	C STANDARD SPROCKETS		C SPECIAL SPROCKETS	C SPECIAL SPROCKETS	C SPECIAL SPROCKETS
PRS or PRT Control Box	TNK-000-SSP Standard Component Package		TNK-004-SSP Component Package	TNK-002-SSP Component Package	TNK-006-SSP Component Package
<ul style="list-style-type: none"> • Two-Hand Inch • Two-Hand Single Stroke • Foot Single Stroke • Sequence Stop 	CMS115 Resolver/Pulser Timing Device With 40' Cable and Plug CML000 Sprocket Assembly CMS515 10' ANSI No. 35 Roller Chain RCL654 ¾" Dual-Solenoid Air Valve RCL045 ¾" Filter-Regulator-Lubricator Assembly CTD062 Air Pressure Switch (For Clutch/Brake) CTL507 Palm Button Assembly CTD011 Foot Switch	COMPONENTS REQUIRED IN ADDITION TO THOSE LISTED IN STANDARD PACKAGE AT LEFT			
		CML100 Special Sprockets (Replaces CML000)	CTL507 Palm Button Assembly CTD011 Foot Switch LLD283 Supervisory Control Station (2) USC000 Multiple Operator Junction Box	CML100 Special Sprockets (Replaces CML000) CTL507 Palm Button Assembly CTD011 Foot Switch LLD283 Supervisory Control Station (2) USC000 Multiple Operator Junction Box	

A Modes of operation: Inch and Single (Hand Only)					
B ONE OPERATOR STATION			B TWO OPERATOR STATIONS		
MODES OF OPERATION TO BE USED	C STANDARD SPROCKETS		C SPECIAL SPROCKETS	C SPECIAL SPROCKETS	C SPECIAL SPROCKETS
PRS or PRT Control Box	TNF-000-SSP Standard Component Package		TNF-004-SSP Component Package	TNF-002-SSP Component Package	TNF-006-SSP Component Package
<ul style="list-style-type: none"> • Two-Hand Inch • Two-Hand Single Stroke 	CMS115 Resolver/Pulser Timing Device With 40' Cable and Plug CML000 Sprocket Assembly CMS515 10' ANSI No. 35 Roller Chain RCL654 ¾" Dual-Solenoid Air Valve RCL045 ¾" Filter-Regulator-Lubricator Assembly CTD062 Air Pressure Switch (For Clutch/Brake) CTL507 Palm Button Assembly	COMPONENTS REQUIRED IN ADDITION TO THOSE LISTED IN STANDARD PACKAGE AT LEFT			
		CML100 Special Sprockets (Replaces CML000)	CTL507 Palm Button Assembly LLD283 Supervisory Control Station (2) USC000 Multiple Operator Junction Box	CML100 Special Sprockets (Replaces CML000) CTL507 Palm Button Assembly LLD283 Supervisory Control Station (2) USC000 Multiple Operator Junction Box	

Note: If the press brake has an air counterbalance, an additional CTD062 air pressure switch is required.

HYDRAULIC PRESS BRAKE CONTROL SYSTEMS

INTRODUCTION

Each hydraulic press brake must be looked at as an individual system. This system consists of, but is not limited to, the machine frame, all mechanical parts, hydraulic system, electrical or electronic systems, pneumatic systems, tooling or dies (present and future), tool or die setup, safeguarding, material handling, size or configuration of workpiece, maintenance requirements, and most importantly, production requirements.

In ANSI B11.3, subclause 6.2 Performance of the Safety-Related Functions, it states that “The control system shall meet the requirements of 8.3.”

8.3 PERFORMANCE OF THE SAFETY-RELATED FUNCTION(S)

When a component, module, device or system failure occurs, such that it or a subsequent failure of another component, module, device or system would lead to the inability of the safety-related function(s) to respond to a normal stop command or an immediate stop command, the safety-related function shall:

- a) prevent initiation of hazardous machine motion (or situation) until the failure is corrected or until the control system is manually reset; or
- b) initiate an immediate stop command and prevent reinitiation of hazardous machine motion (or situation) until the failure is corrected or until the control system is manually reset; or
- c) prevent re-initiation of hazardous machine motion (or situation) at the next normal stop command until the failure is corrected or until the control system is manually reset.

6.14.5 HYDRAULIC COMPONENTS AND CIRCUITS

Hydraulic components and circuits that control ram motion shall comply with the requirements of 6.2 (and 8.3).

CONTROLS

The controls described in this catalog include two-hand control as a point-of-operation safeguarding device. The palm buttons must be depressed concurrently and maintained during the hazardous downstroke of the ram. Release of one or both palm buttons reverses or stops the action of the ram. The controls offered also include a light curtain interface.

ELECTRICAL REQUIREMENTS

The ANSI B11.3 standard requires a proper main power disconnect switch. A motor starter is also required that drops out when power is lost and will not restart automatically. All AC control circuits and solenoid valves must be powered by 120 V or less (obtained from the transformer), and the control system must be protected against false operation due to an accidental ground. Refer to subclause 6.1.

UPDATING HYDRAULIC PRESS BRAKES

To update the electrical system or to add point-of-operation safeguarding to a hydraulic press brake, the electrical and hydraulic schematic diagrams must be reviewed by Rockford Systems' engineering department. Please provide these schematics to our sales personnel or factory-authorized representatives when they visit your plant to conduct a machine survey.



Hydraulic Press Brake With Remote Operator Station

STANDARD HYDRAULIC PRESS BRAKE CONTROL

This solid-state control system is designed for use on hydraulic press brakes. It is designed and built to comply with OSHA 29 CFR 1910.212, ANSI B11.3 and B11.19. This control can update or replace existing control systems on hydraulic press brakes found in users' plants or can be furnished for new or rebuilt hydraulic press brakes.

This control includes control reliability, two-hand control, light curtain interface, and diagnostics (two user-programmable inputs). It also includes batch and stroke counters with presets, and a hard-wired emergency-stop master control relay.

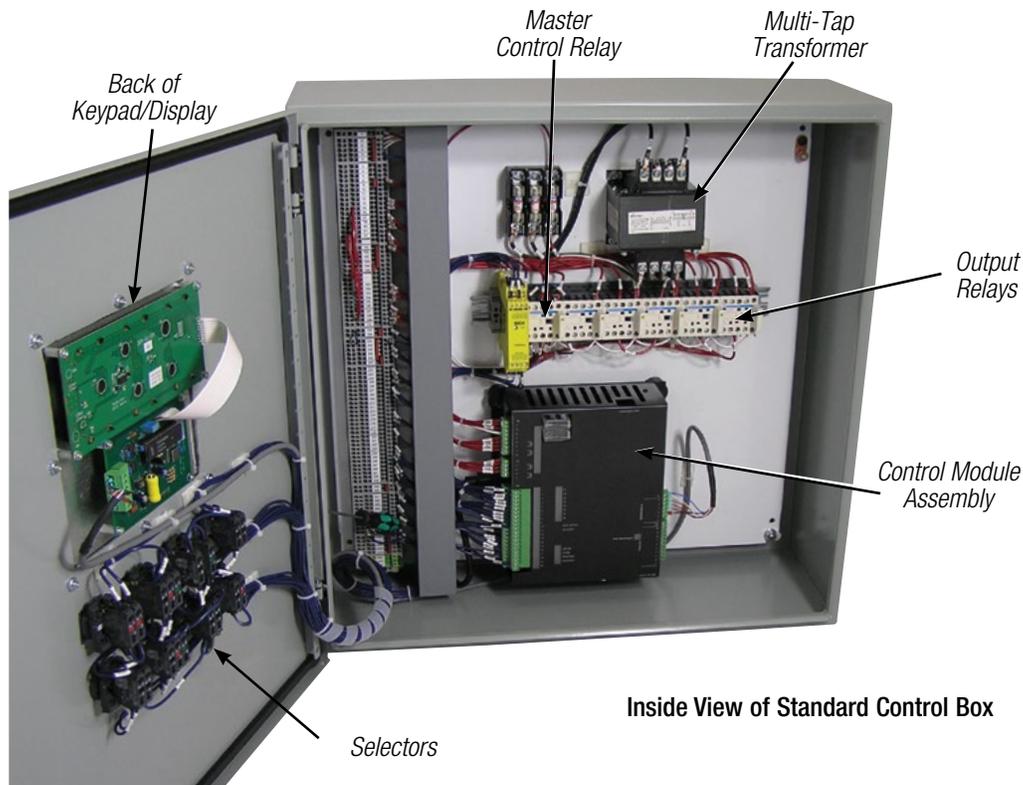
This is an economic, full-featured dual micro-processor-based control system. The system uses redundant inputs from devices such as palm buttons, foot switches, and light curtain(s). The system output to the solenoid valves is provided by two force-guided relays. These output relays are independently controlled and cross-checked by the microprocessors. This allows control-reliable operation of the outputs in the event of a single control component failure in the control. The standard hydraulic press brake control has minimum requirements for the press brake it is to control. These minimum requirements include a directional or one up and one down solenoid valve(s) for the ram, a TOS (top-of-stroke) limit switch, and a BOS (bottom-of-stroke) limit or pressure switch. In most cases, if these already exist, they can be reused. Speed-change valves and limit switches can also be supported with the standard hydraulic control. If other valves exist (additional speed change valves, prefill, regeneration, level, bypass, etc.), please consult the factory for a quote on a special-designed control.

The standard control box is a 20" x 20" x 8" NEMA 12 enclosure with the operator controls and keypad/display mounted in the door, as shown.

A starter or disconnect can be included in a larger enclosure, or a combination starter disconnect can be furnished separately.



Standard Control Box



Inside View of Standard Control Box

STANDARD HYDRAULIC PRESS BRAKE CONTROL (CONTINUED)

OPERATOR INTERFACE KEYPAD/DISPLAY

The operator interface keypad/display is used to enter setup information, monitor machine operation, and display messages on a 4-line x 20-character LCD (liquid crystal display). As standard, this keypad is mounted on the control box door. For operator convenience, it can be installed in a remote operator station. Programming is accessed by a keyed selector switch.

PROGRAMMING

The hydraulic press brake control can be quickly and easily programmed. There are up to two 24-V DC selectable current sinking or sourcing programmable diagnostic inputs provided for the user. A fault message, input logic, and stop type can be assigned to each input from the list shown. When a fault condition is detected, the machine will top stop or emergency stop, and the assigned message will be displayed. This feature helps when troubleshooting common fault conditions.

MODES OF OPERATION

- Off
- Two-hand inch
- Two-hand single stroke
- Foot single stroke
- Foot switch trip or one-hand trip single stroke (used in conjunction with a point-of-operation safeguard)*
- High, high/low, low speed change
- Sequence stop (hand/hand, hand/foot, foot/foot)

*Additional components may be required to use this mode of operation.

FEATURES

- Meets and exceeds OSHA 29 CFR 1910.212, ANSI B11.3 and B11.19
- Provides two-hand control safeguarding device
- Redundant and cross-checking microprocessors
- Redundant switching style DC power supplies
- Two monitored ram advance (up or down) 24-V force-guided output relays
- External relay monitoring (for use when external relays are used to energize the down valves)
- Blocking valve monitoring
- Press control operates on 85-135 VAC
- Provisions for optional light curtain interface with off/on supervised keyed selector switch
- Easy to read back-lit liquid crystal operator interface display having 4 lines x 20 characters
- Two (2) 24-V DC digital user inputs, programmable, selectable canned messages
- One (1) ram speed change (fast-slow) output, standard 120 VAC with a selector switch for high, high/low, low speed (to support machines with a speed change solenoid valve)
- One (1) ram return (up or down) output, standard 120 VAC with a selector switch for pressure, pressure/distance, distance return
- Bottom dwell timer (0-600 seconds)
- Decompression timer (50-250 ms)
- 7-digit stroke counter
- 7-digit batch counter with preset
- Operator interface keypad and display, text in English or Spanish



Keypad/Display

For control reliability

CUSTOM HYDRAULIC PRESS BRAKE CONTROL

A custom control box contains the standard control module and components described on pages 80-81 plus the following:

- main power disconnect switch
- main hydraulic pump motor starter

The box will vary in size based on the disconnect switch and motor starter components. The box is furnished with an IEC through-the-door main power fused disconnect switch and an IEC hydraulic pump magnetic motor starter (with push buttons). They are prewired and built into a NEMA 12 enclosure.

Operator controls and the keypad/display are located on the front of the door, or a plain-door control or subpanel can be furnished. A remote operator station or keypad/display kit is required if a plain-door control or subpanel is ordered. See page 83 for information on remote operator stations.

To ensure the starter(s) and disconnect are sized properly, please check horsepower for the main drive motor and slide adjust motor (if furnished) on the machine, as well as full-load amps, and primary voltage to the machine. After obtaining this information, go to the chart on page 83 to determine the proper custom control box part number. Follow directions 1-7 to determine the correct part number.



REMOTE OPERATOR-STYLE CONTROL BOXES

Remote operator-style X, Y, and Z hydraulic control boxes include the same features and modes of operation as the standard hydraulic control boxes. **However, they do not have a control transformer.** These control boxes are designed to be located on the front of the machine near the operator.

These controls are for applications where the machine's existing magnetic motor starter, fused disconnect switch, and **control transformer** meet the safety requirements and can be reused. If the existing control transformer cannot be reused or a new one is required, please contact the factory.

The keypad/display and all operator controls are located on the door (front) of the remote operator-style control box.

CONTROL MODULE KIT

A control module kit allows the end user to update the hydraulic control of a press brake with minimum equipment costs. The kit is supplied without the control enclosure, panel, control transformer, control fuse, terminal strips, wire duct, and wiring.

A set of electrical prints is supplied to show typical wiring, and all mounting dimensions are provided in order for a qualified person to install the control module kit. The minimum area required on an existing control panel to install this kit is 18" H x 18" W x 6" D.

This control module kit includes the control module, control relays, shock mounts, fasteners, suppressors, danger labels, and electrical prints. A keypad/display kit is required unless a remote operator station is used (see next page).

SUBPANEL

A subpanel control can also be furnished. It is the same as the standard control described on pages 89-90 without the enclosure. The minimum area required in an existing control enclosure is 18 1/2" H x 18 1/2" W x 6" D.



KEYPAD/DISPLAY KIT

Part No. LLD6025

The keypad/display kit can be used with any of the control boxes or the control module kit. This kit includes the keypad/display, an off/program/run selector switch, a light curtain off/on selector switch, a hand/foot selector switch, an inch/single/sequence stop selector switch, a high/low speed selector switch, a pressure/pressure distance/distance return selector switch, and 25' of cable. Additional push buttons, nameplates, and selector switches for the motor starter, etc., can be furnished depending on the features required. Please consult the factory.



REMOTE OPERATOR STATIONS

For operator convenience, a remote operator station can be furnished for use with a plain-door standard control box, plain-door custom control box, module kit, or subpanel. The remote operator station contains the keypad/display, program selector switch, and other selector switches as required.

Remote operator stations are available in a standard format or can be customized to meet any requirements. Select from the following remote operator stations.



Part No. LLD6021
Remote Operator Station for Hydraulic Press Brakes

REMOTE OPERATOR STATIONS FOR HYDRAULIC PRESS BRAKES

FEATURES	PART NO. LLD6020	PART NO. LLD6021	PART NO. LLD6022	PART NO. LLD6023
KEYPAD/DISPLAY	X	X	X	X
OFF/PROGRAM/RUN SELECTOR SWITCH	X	X	X	X
LIGHT CURTAIN OFF/ON SELECTOR SWITCH	X	X	X	X
HIGH/LOW SPEED SELECTOR SWITCH	X	X	X	X
PRESSURE/PRESSURE DISTANCE/DISTANCE RETURN SELECTOR SWITCH	X	X	X	X
INCH/SINGLE/SEQUENCE STOP SELECTOR SWITCH	X	X	X	X
HAND, HAND/FOOT, FOOT SELECTOR SWITCH	X	X	X	X
MAIN MOTOR START AND STOP PUSH BUTTONS		X		X
ADVANCED LIGHT CURTAIN BLANKING SELECTOR SWITCHES			X	X

HYDRAULIC CONTROL SYSTEMS INDIVIDUAL COMPONENTS

LINEAR CAM AND LIMIT SWITCH ASSEMBLY

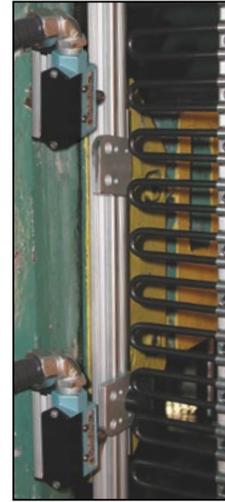
Part No. CMT048

The linear cam and limit switch assembly consists of two limit switches and two adjustable cams mounted on an extruded-aluminum bracket. This assembly can provide the linear timing of the top and bottom limits of the machine cycle on a hydraulic machine.

HIGH/LOW LIMIT SWITCH ASSEMBLY

Part No. CMT049

An additional linear cam and limit switch assembly can be used for a high/low signal during the closing portion of the hydraulic stroke. This assembly consists of one limit switch and one adjustable cam mounted on an extruded-aluminum bracket.



PALM BUTTON ASSEMBLY

Part No. CTL525

Palm button assembly consists of two black run/inch buttons (with ring guards), a red emergency-stop button and a yellow return/inch-up button. Mounting boxes are furnished with each button. The electrical contact arrangement for all buttons is 1 NO and 1 NC.



Part No. CTL525

FOOT SWITCH

Part No. CTD011 & CTD088

This foot switch is protected from unintentional operation. A heavy-duty die-cast cover protects the top and both sides, and the front is protected by a hinged flap. The flap must be lifted with the toe before the foot may enter the switch. The electrical contact arrangement is 1 NO and 1 NC.



Foot Switch CTD011



Foot Switch CTD088

SUPERVISORY CONTROL STATION

Part No. LLD6101

Part No. LLD283 (required when a USC000 is used—see below)

When two or more palm button or foot switch operating stations are required on one machine, one supervisory control station is required at each operator station. This remote control station consists of an off/on keyed selector switch and a station on indicator light. The on position allows the operator to use that station, and the off position deactivates only that station. The enclosure size is 5¼" x 3" x 3¼"



Supervisory Control Station

MULTIPLE-OPERATOR JUNCTION BOX

Part No. USC000

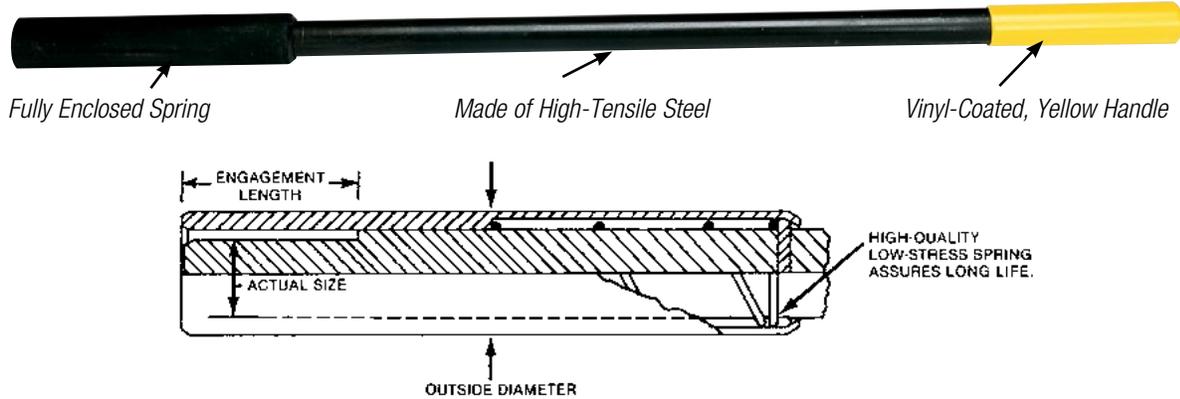
When multiple operator stations are required, this junction box is furnished separately for wiring up to four (4) operator stations. This junction box interfaces palm button assemblies/control bars and foot switches, and will not allow the press to run if palm buttons or a foot switch is actuated without its supervisory control station on. A lighted push button with nameplate indicates a fault condition of an operator station. The button is pushed to reset. The enclosure size is 16" x 14" x 6".



Multiple-Operator Junction Box

SPRING-LOADED TURNOVER BARS

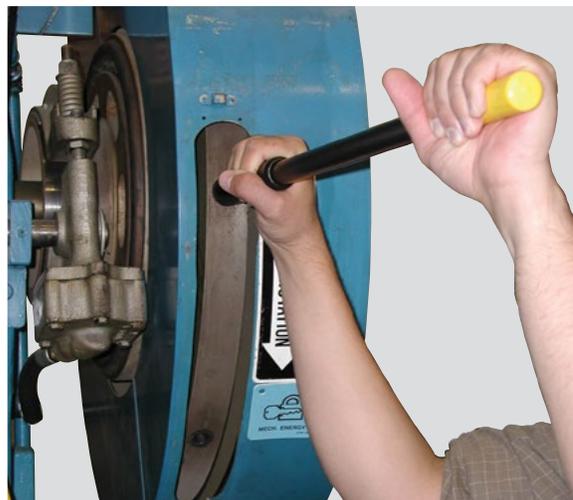
In OSHA 29 CFR 1910.217, it says that “The employer shall provide spring-loaded turnover bars for presses designed to accept such turnover bars.” The turnover bar is most frequently used with mechanical power presses. Turnover bars can also be used on four-slides or any other machine where the bar might be sent into the air if it is inadvertently left in the bar ring hole and the machine is turned on. Each spring-loaded turnover bar is self-ejecting so it can’t be left in the bar hole.



SPRING-LOADED TURNOVER BARS

PART NO.	NORMAL SIZE	ACTUAL SIZE	BAR DIAMETER	OUTSIDE DIAMETER	ENGAGEMENT LENGTH	OVERALL LENGTH	WEIGH IN POUNDS
KMR001	3/8"	.365"	3/4"	1.050"	1.50"	18"	1.8
KMR002	1/2"	.490"	3/4"	1.050"	1.75"	24"	3.5
KMR003	5/8"	.615"	3/4"	1.050"	1.75"	24"	3.5
KMR004	3/4"	.740"	15/16"	1.315"	2.00"	30"	6.7
KMR005	7/8"	.865"	15/16"	1.315"	2.00"	30"	6.7
KMR006	1"	.990"	1-1/4"	1.660"	2.50"	36"	13.7
KMR007	1-1/4"	1.240"	1-1/4"	1.660"	2.50"	36"	14.0

*Each engaging bar is made .010" under corresponding hole size. End is chamfered for easy entry. Consult the factory for special sizes.



Spring-Loaded Turnover Bar on Flywheel of Mechanical Power Press

OPTIONAL PALM BUTTON ASSEMBLIES

Other styles of palm buttons are available to meet the OSHA and ANSI safety standards. The following pages include options to our standard palm buttons listed throughout this catalog.

All palm buttons can be furnished:

- as individual palm buttons
- in sets of two with ring guards for two-hand trip or two-hand control
- in control bars, special boxes, or control consoles

Ring guards, covers, or similar devices must protect the palm button from accidental activation. Anti tie-down protection is required for single-stroke, two-hand trip, and two-hand control. It should already be built into the control system where any of these assemblies are applied. The buttons must also be mounted at a proper safety distance according to OSHA 29 CFR 1910.217 for two-hand trip or two-hand control when applying them to mechanical power presses. ANSI also requires that they be at the calculated safety distance on many other machines.

The assemblies, which include the ring guard and mounting plate, provide protection against unintended operation. All emergency-stop buttons are latch-out type buttons.

LIGHT-PUSH PALM BUTTONS

These light-push palm button assemblies can replace the standard black palm button assemblies (shown throughout this catalog) when a lighter push is required.

The run/inch palm buttons have a single plunger which provides 1 NO and 1 NC contact arrangement. The mushroom head is made of a zinc die cast and has a flat plunger. The palm button cover plate has a solid neoprene gasket which provides an oil-tight seal upon installation.

ORDERING INFORMATION

Part No. CTL533—Two chrome run/inch buttons, ring guards, and red emergency-stop palm button. The red palm button has 1 NO and 1 NC contact arrangement.

Part No. CTL534—Two chrome run/inch buttons, ring guards, red emergency-stop palm button, and yellow top-stop palm button. The red and yellow palm button each have 1 NO and 1 NC contact arrangement.

Part No. CTL538—Two chrome run/inch buttons, ring guards, red emergency-stop palm button, and yellow return/inch-up palm button. The red and yellow palm button each have 1 NO and 1 NC contact arrangement.



Part No. CTL533



Part No. CTL534



Part No. CTL538

OPTIONAL PALM BUTTON ASSEMBLIES (CONTINUED)

ARTICULATED PALM BUTTONS

These palm button assemblies have articulated chrome palm buttons and are offered in 24-V DC low-voltage or 115VAC standard-voltage contacts. The low-voltage buttons are specifically designed for use with solid-state controls only and should not be used with relay-based controls. These ergonomic, heavy-duty palm buttons can be operated at any angle and are easy to push. The buttons are chrome plated and the guards are made of steel. The buttons provide 1 NO and 1 NC contact arrangement.

STANDARD-VOLTAGE CONTACT RATINGS

Maximum Voltage 600 VAC/DC

Typical Operating Force 3.7 lb (center), 2.7 lb (perim.)

LOW-VOLTAGE CONTACT RATINGS

Minimum Voltage DC 5 V, 1 mA

Maximum Voltage DC 48 V, 0.1 A

Maximum Voltage AC 240 V, 0.4 A

Typical Operating Force 3.7 lb (center), 2.7 lb (perim.)

ORDERING INFORMATION

STANDARD-VOLTAGE CONTACTS—115VAC

Part No. CTL547—Two articulated chrome run/inch buttons with ring guards, mounting boxes, and red emergency-stop palm button.

Part No. CTL548—Two articulated chrome run/inch buttons with ring guards, mounting boxes, red emergency-stop palm button, and yellow top-stop palm button.

Part No. CTL550—Two articulated chrome run/inch buttons with ring guards, mounting boxes, red emergency-stop palm button, and yellow return/inch-up palm button.

LOW-VOLTAGE CONTACTS—24 V DC

Part No. CTL541—Two articulated chrome run/inch buttons with ring guards, mounting boxes, and red emergency-stop palm button.

Part No. CTL542—Two articulated chrome run/inch buttons with ring guards, mounting boxes, red emergency-stop palm button, and yellow top-stop palm button.

Part No. CTL544—Two articulated chrome run/inch buttons with ring guards, mounting boxes, red emergency-stop palm button, and yellow return/inch-up palm button.



Part No. CTL547



Part No. CTL548



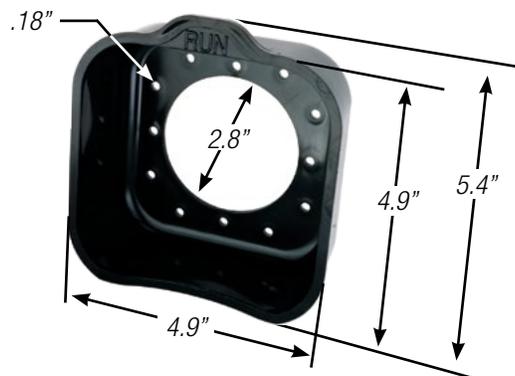
Part No. CTL550

REPLACEMENT PARTS FOR PALM BUTTON ASSEMBLIES

Universal Run Button RING Guard Part No. CTK006

This palm button ring guard is the way to protect new and existing run palm buttons from accidental operation. This high-impact PVC plastic palm button ring guard can be used with most palm button brands. The large square ring shape allows the operator to change hand position as well as use other surfaces of the hand to cycle the machine. This ring guard resists deterioration that can occur from cutting oils and other types of lubricants that come in contact with it. This ring guard has a relief for the wrist, and the word run is molded into the top of the ring guard. Four 1¼" screws are furnished with each ring guard.

12 holes for vertical or horizontal mounting



CHROME PALM BUTTON Part No. CTC737

This heavy-duty, **light-push**, single plunger run/inch palm button provides 1 NO and 1 NC contact arrangement. This 2¼" button is constructed of zinc cast and has a flat plunger. The palm button cover plate has a solid neoprene gasket which provides an oil-tight seal upon installation. This palm button can replace the black palm button described below when a lighter push is required. The force required to operate this button is 2.5 lb.



ARTICULATED CHROME PALM BUTTON WITH GUARD Part No. CTC746—Standard Voltage Part No. CTC751—Low Voltage

This ergonomic, heavy-duty palm button provides 1 NO and 1 NC contact arrangement. The palm button is chrome plated and the guard is made of steel. The straight-push force required to operate this button is 3.7 lb.



BLACK PALM BUTTON Part No. CTC726

This standard heavy-duty, single plunger run/inch palm button provides 1 NO and 1 NC contact arrangement. This 2¼" button is mushroom shaped. The palm button cover plate has a solid neoprene gasket which provides an oil-tight seal upon installation. The force required to operate this button is 5 lb.



YELLOW TOP-STOP PALM BUTTON Part No. CTC727

This heavy-duty, single plunger yellow top-stop palm button provides 1 NO and 1 NC contact arrangement. This 2¼" button has a mushroom-shaped plunger. The palm button cover plate has a solid neoprene gasket which provides an oil-tight seal upon installation. The force required to operate this button is 5 lb.



REPLACEMENT PARTS FOR PALM BUTTON ASSEMBLIES (CONTINUED)

YELLOW RETURN/INCH-UP PALM BUTTON

Part No. CTC740

This heavy-duty, single plunger yellow return/inch-up palm button provides 1 NO and 1 NC contact arrangement. This 2¼" button has a mushroom-shaped plunger. The palm button cover plate has a solid neoprene gasket which provides an oil-tight seal upon installation. This button is used to return/inch-up the ram on hydraulically or pneumatically operated machines. The force required to operate this button is 5 lb.



RED EMERGENCY-STOP PALM BUTTON WITH LOCKOUT

Part No. CTC736

This heavy-duty, single plunger red emergency-stop palm button provides 1 NO and 1 NC contact arrangement. This 2¼" button has a mushroom-shaped plunger with a spring latch that keeps the button latched down when pushed. A release is incorporated. It also has provisions for attaching a padlock to the latch. The palm button cover plate has a solid neoprene gasket which provides an oil-tight seal upon installation. The force required to operate this button is 12.5 lb.



ELECTRICAL RATINGS FOR ALL BUTTONS (EXCEPT ARTICULATED)
– HEAVY-DUTY ANSI 600/NEMA 300

NORMAL POTENTIAL	NORMAL CURRENT	INRUSH CURRENT
110 TO 120 VAC*	6.0 A	60.0 A
220 TO 240 VAC*	3.0 A	30.0 A
440 TO 480 VAC*	1.5 A	15.0 A
550 TO 600 VAC*	1.2 A	12.0
115 TO 125 V DC**	2.2 A	–
230 TO 250 V DC**	1.1 A	–

*Power factor of 0.35 or less

**Inductive loads as specified in Section 125 of Industrial Control Devices, Controllers and Assemblies, ANSI/NEMA ICS 2-1988

MOUNTING BOXES (WITH ¾" NPT THREADED HUBS)

Part No. CTK004

A single-hub mounting box is supplied with all palm button assemblies. It is used when wire terminates at this box. It can also be used when remote mounting electrical cut-off systems or duplex power outlets.

Part No. CTK003

A double-hub mounting box is supplied with all palm button assemblies. It is used when wires are required to go through the box and on to another mounting box.

Single
Hub



Double
Hub

DANGER SIGNS AND LABELS

The signs offered in this catalog are .055" thick linear polyethylene. They are semi-rigid plastic and are capable of withstanding a temperature range of -60° to 130° F. They are resistant to tears and may be mounted with nails, rivets, screws, bolts, nylon lock-straps, double-face adhesive tape, etc. Each sign is protected from fading, chipping, scratching, weather extremes, physical abuse, grease, oil, moisture, chemicals and acids. These signs do not rust, dent, or corrode. They do not curl up or rip and are lightweight and easy to handle.

OPERATOR SAFETY PRECAUTIONS FOR METALFORMING MACHINERY—8 1/2" X 11" X .055" THICK

Part No. KSC000—English

Part No. KSC000S—Spanish

OPERATOR SAFETY PRECAUTIONS

Handout for Anyone Operating This Machine

Before You Operate This Machine You Must Read and Understand These Safety Precautions

DANGER

NEVER
Place Your Hands
or Any Part of
Your Body in This
Machine

See Reverse Side for Other Safety Precautions.

OVER

Part No. KSC000

KSC000 Front—English

Do Not Operate This Machine Until You Read and Understand the Following Safety Precautions.

- 1 Never operate this machine unless you understand that these signs are dangerous. Failure to place your hands or any part of your body in this machine which could result in the loss of fingers, limbs or even death.
- 2 Never use a foot switch to operate this machine unless a point-of-operation guard, shield, or device is provided and properly maintained.
- 3 Never "ride" the foot pedal or foot switch. Never rest your foot on top of the foot pedal or inside the foot switch. Always remove your foot completely from the foot pedal or foot switch after each cycle and any time you are not intending to trip the machine.
- 4 Always use hand tools for loading or restocking material from the point of operation or any other hazardous part of the machine. Never reach through or into a hazardous area of a machine for any reason.
- 5 Never operate this machine unless you have been fully trained and have received and understand all operating instructions. Make sure you know how the machine works and how it is controlled.
- 6 Never operate this machine until you test the machine with its guard or safety device before you start or reset production. Do not begin operating the machine unless you are sure the safeguarding is adjusted properly and working correctly. If you are not sure, notify your supervisor.
- 7 Never operate this machine if it is not running properly or if you notice an unusual noise or vibration. Stop the machine immediately and advise your supervisor.
- 8 Never operate this machine with pullbacks (if furnished) unless they are adjusted properly for you. Have your supervisor demonstrate that when the sensor disconnects, the pullback will pull fingers clear of any pinch points. Always wear your seatbelt properly.
- 9 Never operate this machine with pullbacks (if furnished) unless they are adjusted properly for you. Have your supervisor demonstrate that when the sensor disconnects, the pullback will pull fingers clear of any pinch points. Always wear your seatbelt properly.
- 10 Never operate this machine with pullbacks (if furnished) without reading and understanding the instructions. Instructions must be kept with the pullback device at all times and made available to you. Clean, read, and know these instructions.
- 11 Never operate this machine unless two-hand trip, two-hand control, or pressure-sensing device (if furnished) is installed correctly and at the proper safety distance. Contact your supervisor if you have any questions regarding the proper safety distance.
- 12 Never operate this machine unless the light curtain (if furnished) is installed into the machine control system properly. Only make during the non-hazardous part of the machine cycle. Blanking should be interrupted.
- 13 Never tamper with, alter, remove, or disable any component or safeguard on this machine.
- 14 Always wear safety glasses, hearing protection and any other personal protection equipment needed when operating this machine.
- 15 Never operate this machine with long hair, loose clothing or jewelry. It could become caught in part of the machine or machinery equipment.
- 16 Be sure all persons are clear of the machine before it is cycled, especially when multiple operators or helpers are present. Do not operate machine unless you and every operator and/or helper are protected from injury by a guard or safety device.
- 17 Always stay alert (don't drowsy) and never operate this machine while under the influence of alcohol or any drug, including prescription medications.
- 18 Maintenance and Die Set-Up Personnel: Never work on the machine unless power is off and locked out. Disconnect all air, main safety devices, air used hydraulic, etc. Use an approved lockout, tagout, and safe work practices.
- 19 Always be prepared for an emergency situation should arise. You should know how to stop and shut down the machine if there is a need.
- 20 Never operate this machine unless all mechanical (power transmission, supports, etc.) and auxiliary equipment are free from hazards.

* Point of Operation: "The location in the machine where the material or workpiece is positioned and work is performed." (ANSI B11.19)

NOTICE TO EMPLOYER: These operator safety precautions must be given to all operators (including being present) and supervisors of this machine. These precautions should always be hung on the machine readily accessible and visible to the operator. Additional precautions are available upon request.

IMPORTANT: If a language barrier or insufficient schooling prevents a person from reading and understanding the contents of this pamphlet, you should either translate this information or have it read or interpreted to the person. Make sure that it is understood. If Spanish or French safety precautions are required, please consult the factory.

THESE PRECAUTIONS MUST BE REVIEWED DAILY.

KSC000 Back—English

OPERADOR PRECAUCIONES DE SEGURIDAD

PANFLETO PARA TODOS OPERADORES DE ESTA MAQUINA.

TODOS OPERADORES DEBEN DE LEER Y COMPRENDER LAS PRECAUCIONES DE SEGURIDAD ANTES DE OPERAR ESTA MAQUINA.

PELIGRO

NUNCA
METE LAS MANOS
U OTRA PARTE DEL
CUERPO EN ESTA
MAQUINA

VEA AL REVES PARA OTRAS PRECAUCIONES DE SEGURIDAD.

OTRO LADO

Part No. KSC000S

KSC000S Front—Spanish

Antes de Manejar esta Máquina Lea y Familiarícese con las Sigüientes Medidas de Seguridad.

- 1 Nunca maneje la máquina hasta haber comprendido la página que está representada. Busque colócle las máquinas, cuando se podrá comenzar la póliza de inicio, instrucciones e incluso la máquina.
- 2 Nunca maneje la máquina sin un protector en el punto de funcionamiento o dispositivo de seguridad que le protege contra lesiones corporales.
- 3 Nunca maneje la máquina con un controlador a pedal, sino que debe ser controlado por el operador. No toque el punto de control del controlador a pedal hasta que el controlador se haya detenido por completo y mantenga fuera del interruptor en todo momento si no va a iniciar la máquina.
- 4 Use siempre herramientas manuales para ajustar o retirar material del punto de funcionamiento o cualquier otra pieza peligrosa de la máquina. No alcance ni baje el dedo del punto de funcionamiento bajo ningún circunstancia.
- 5 Nunca maneje la máquina a menos que haya leído la operación de modo y comprenda completamente las instrucciones de manejo. Este seguro de saber cómo funciona y controla la máquina.
- 6 Nunca maneje la máquina hasta haberla puesto en marcha con el protector o dispositivo de seguridad antes de iniciar la producción. No ponga a andar la máquina, sino que debe estar seguro de que el dispositivo de seguridad está ajustado debidamente y funcionando correctamente. Si no está seguro, llame a su supervisor.
- 7 Nunca maneje la máquina si no está funcionando adecuadamente o si usted notara un ruido rítmico o cambio en el rendimiento de la misma. Apague la máquina inmediatamente y notifique a su supervisor.
- 8 Nunca maneje la máquina con dispositivos de retorno de los hubs, salvo que haya sido ajustados adecuadamente como al hacer el trabajo, no de "las puntas de espigas". Use siempre las muñequeras adecuadamente y bien aseguradas.
- 9 Nunca maneje la máquina con dispositivos de retorno (o los hubs) sin antes leer y comprender totalmente las instrucciones. Las instrucciones deben estar a su disposición y mantenerse en todo momento fuera al dispositivo de retorno, cuando sea y siga dichas instrucciones.
- 10 Nunca maneje la máquina a menos que el operador (incluyendo al personal de preparación, mantenimiento y supervisión) de la máquina. El presente folleto deberá colocarse en la máquina a disposición y visibilidad del operador. Están disponibles folletos de seguridad adicionales al pedido del interesado.
- 11 Nunca maneje la máquina a menos que el operador, el usuario no pudiera leer ni comprender el contenido de las Medidas de seguridad para el operador, dicha información deberá ser traducida, leída e interpretada a la persona, verificándose su comprensión. Comuníquese con la fábrica si necesitara folletos de las Medidas de seguridad en inglés o francés.
- 12 Nunca maneje la máquina a menos que el operador, el usuario no pudiera leer ni comprender el contenido de las Medidas de seguridad para el operador, dicha información deberá ser traducida, leída e interpretada a la persona, verificándose su comprensión. Comuníquese con la fábrica si necesitara folletos de las Medidas de seguridad en inglés o francés.
- 13 Nunca maneje la máquina a menos que la distancia entre los miembros de la máquina no se recomiende su operación.
- 14 Nunca maneje la máquina a menos que la correa de luz (o la luz) se encuentre correctamente colocada. Mantenga un espacio de seguridad de la coló de pasara no peligrosos de la máquina, no se recomienda su operación.
- 15 Nunca altere, retire la instalación eléctrica ni desvite ningún componente, control o dispositivo de seguridad de la máquina.
- 16 Use siempre gafas de seguridad, protectores para oídos o cualquier otro equipo de protección personal que necesite para manejar la máquina.
- 17 Nunca maneje la máquina si trae los cabellos largos, lleva ropa suelta o joyas. Pueden enredarse en las piezas de la máquina o el equipo auxiliar.
- 18 Manténgase de que todos los personal estén alejados de la máquina antes de ponerla en marcha, especialmente si hay operadores o ayudantes. No maneje la máquina a menos que usted o todos los operadores y/o ayudantes estén protegidos contra lesiones con un protector o dispositivo de seguridad.
- 19 Manténgase siempre alerta (no suelte) después de al manejar la máquina y nunca lo haga bajo la influencia de alcohol, drogas, medicinas o cualquier otro factor.
- 20 Al personal de mantenimiento y preparación de la máquina: Nunca trabaje en la máquina a menos que esté etiquetado y etiquetado, o cuando está desactivado. Sin bloqueo de seguridad colocados entre los miembros o miembros a los miembros de energía (eléctrica, neumática, hidráulica, etc.) se encuentran en uso.
- 21 Este siempre preparado para una situación de emergencia. Debe saber cómo parar y apagar la máquina si fuera necesario.
- 22 Nunca maneje la máquina a menos que todos los componentes de transmisión (rodillos, volantes, engranajes, etc.) y el equipo auxiliar estén libres de peligro.

* Punto de funcionamiento: "Lugar de la máquina/herramienta donde se coloca el material y se realiza un proceso." (ANSI B11.19)

AVISO AL EMPLEADOR: Deberá entregarse copia de estas "Medidas de seguridad para el operador" a todos los operarios (incluyendo al personal de preparación, mantenimiento y supervisión) de la máquina. El presente folleto deberá colocarse en la máquina a disposición y visibilidad del operador. Están disponibles folletos de seguridad adicionales al pedido del interesado.

IMPORTANTE: Si debido a limitaciones del idioma o escolaridad el usuario no pudiera leer ni comprender el contenido de las Medidas de seguridad para el operador, dicha información deberá ser traducida, leída e interpretada a la persona, verificándose su comprensión. Comuníquese con la fábrica si necesitara folletos de las Medidas de seguridad en inglés o francés.

REVISE DIARIAMENTE ESTA MEDIDA DE SEGURIDAD.

KSC000S Back—Spanish

GENERAL METALFORMING SIGN

—5” X 6 “ X .055” THICK



Part No. KSC054—English



Part No. KSC054S—Spanish

FOOT SWITCH SIGN

—5” X 6 “ X .055” THICK



Part No. KSC055—English



Part No. KSC055S—Spanish

Also available in French—

Part No. KSC055F (not shown)

SUGGESTED PROCEDURE FOR MOUNTING THIS SIGN

THE PURPOSE OF THIS SIGN IS TO ADEQUATELY WARN ALL PERSONNEL OF THE DANGER OF BODILY INJURY OR DEATH.

To accomplish this purpose - ALWAYS mount this sign in the following manner:

- (1) Clearly visible to the operator and other personnel
- (2) At or near eye level
- (3) PERMANENTLY fastened with bolts or rivets

NEVER OPERATE MACHINE WITHOUT THIS DANGER SIGN VISIBLE TO ALL PERSONNEL.

Reverse Side of Signs (English)

General Danger Sign

—10” x 12” x .055” thick



PRESS BRAKE DANGER SIGN

—10” X 12” X .055” THICK



SUGGESTED PROCEDURE FOR MOUNTING THIS SIGN

THE PURPOSE OF THIS SIGN IS TO ADEQUATELY WARN ALL PERSONNEL OF THE DANGER OF BODILY INJURY OR DEATH.

To accomplish this purpose - ALWAYS mount this sign in the following manner:

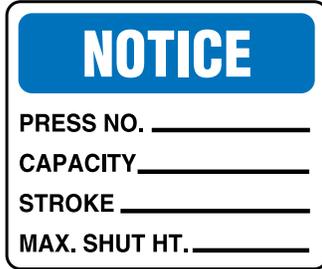
- (1) Clearly visible to the operator and other personnel
- (2) At or near eye level
- (3) PERMANENTLY fastened with bolts or rivets

NEVER OPERATE MACHINE WITHOUT THIS DANGER SIGN VISIBLE TO ALL PERSONNEL.

Reverse Side of Above Signs—English

Notice Sign for Metalforming Machinery

Part No. KSC033 5" x 6" x .055" thick



Flywheel Rotation Sign

Part No. KSC045 1¼" x 5" x .055" thick

Part No. KSC010 2½" x 10" x .055" thick



The labels offered on this page are all furnished with an adhesive back so they will stick to most clean surfaces. All mylar labels are .002" thick. Some labels are offered in various sizes to fit onto a product or into a specific area.

DANGER—CLOSING RAM AND DIE LABELS

Part No. KST146 3" x 5" x .002" thick



Part No. KST134 8" x 4¾" x .002" thick

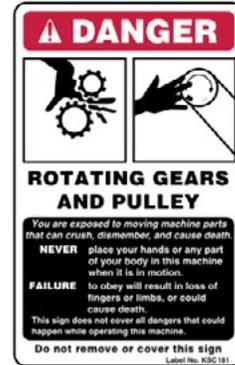
Part No. KST134S 8" x 4¾" x .002" thick—Spanish

Part No. KST145 6¼" x 3½" x .002" thick

Part No. KST145S 6¼" x 3½" x .002" thick—Spanish

ROTATING GEARS AND PULLEY LABEL

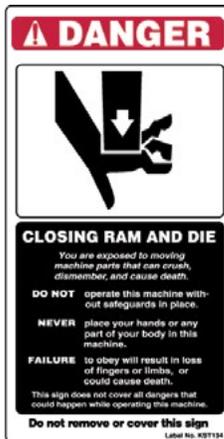
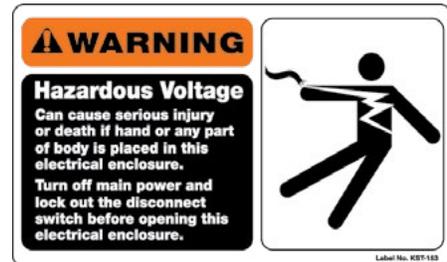
Part No. KST181 3¾" x 2½" x .002" thick



Hazardous Voltage Label

Part No. KST152 2½" x 1½" x .002" thick

Part No. KST153 3" x 5" x .002" thick



Part No. KST135 5" x 5½" x .002" thick

Part No. KST136 2½" x 3" x .002" thick

Part No. KST136S 2½" x 3" x .002" thick—Spanish

Part No. KST137 7¼" x 8" x .002" thick

Part No. KST137S 7¼" x 8" x .002" thick—Spanish

Part No. KST143 5" x 3" x .002" thick



Danger—High Voltage Label

Part No. KST194 2¼" x 5¼" x .003" thick



SAMPLE PRESS INSPECTION REPORT

Company _____

Building _____ Department _____ Press No. _____

Parts Inspected	✓ OK	Defective Condition	Corrective Action	Date Repaired
1. Frame				
2. Motor				
3. Flywheel				
4. Gears (if applicable)				
5. Crankshaft				
6. Clutch				
7. Brake				
8. Ram and Gibs				
9. Connection (Pitman) and Ram Adjusting Screw				
10. Slide Counterbalance (if furnished)				
11. Air System				
12. Electrical System				
13. Foot Switch				
14. Point-of-Operation Safeguarding				
A) Guard				
B) Presence-Sensing (Light Curtain or Radio Frequency)				
C) Pullback (Pullout)				
D) Type A or B Gate (Movable Barrier)				
E) Restraint (Holdout)				
F) Two-Hand Trip or Control				
15. Miscellaneous				
Inspected by:		Date	<input type="checkbox"/> Approved for Use	<input type="checkbox"/> Not Approved

See guide on next page

GUIDE FOR THE INSPECTION OF MECHANICAL POWER PRESSES

*Inspect for Code Violations, defects, missing parts, malfunctions, maintenance

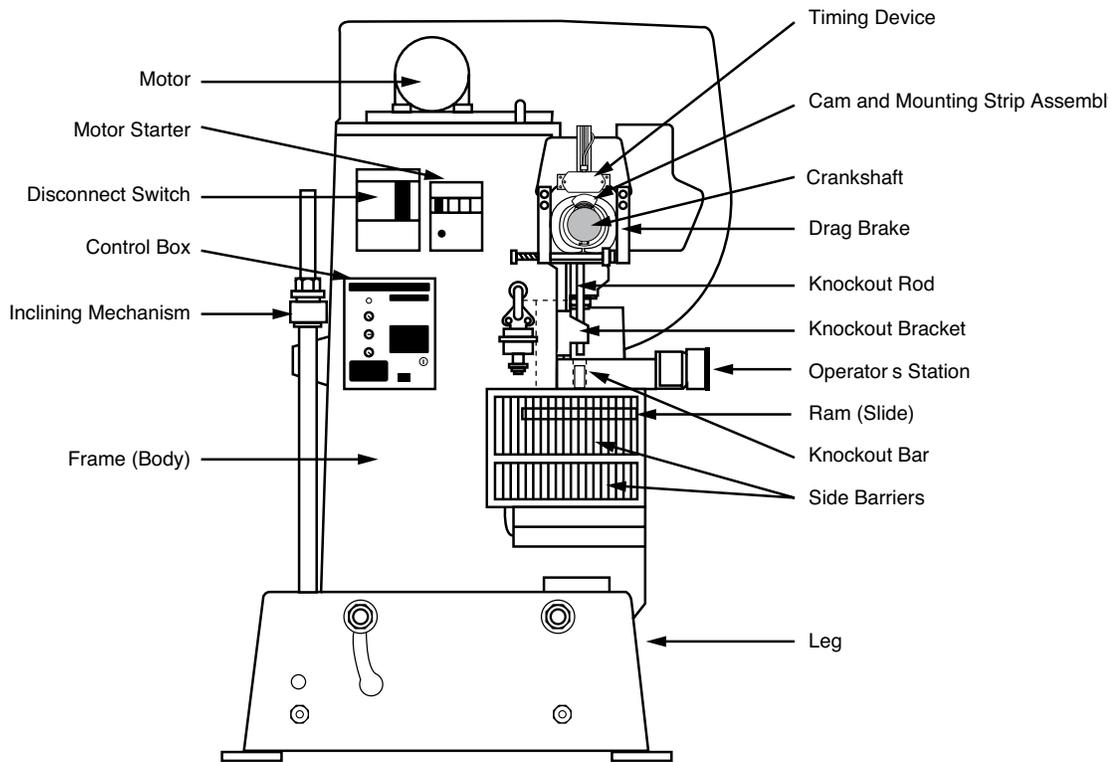
INSPECTION OF

1. Frame	Cracks? Broken or loose parts? Loose hold down bolts?	12. Electrical system	Solenoids? Motor starter disconnects from voltage fluctuation or power failure? Retripping required? Is any component bypassed?
2. Motor	Clean? Lubrication? Overheating?		Nonslip pad on contact are? Shielded from accidental operation?
3. Flywheel	Rotates in correct direction? Free running? Covered?	13. Foot switch	A) Guard – Barrier that prevents entry of operator's hands or fingers into the point-of-operation area? Adjustment and maintenance? Pinch points remaining in adjacent areas?
4. Gears	Loose? Broken or cracked teeth? Excess noise? Proper lubrication? Covered?	14. Point-of-operation safeguarding	B) Presence-Sensing (light curtain or radio frequency – part-revolution clutch only) – reliable design and proper electrical tie-in to control? Fized at proper safety distance from pinch point? Barrier guards for other hazardous point-of-operation areas?
5. Crankshaft	Cracks? Bent? Proper clearance in bearings?		C) Pullback (Pullout) – enough or too much pull on cables? Is proper adjustment being made for change in operator, die, shift? Records of inspection/maintenance being kept?
6. Clutch	Full-revolution: single-stroke capability, loose or worn parts, including linkage? Weak or broken springs? Compression springs operating on rod, or guided within hole or tube? Properly adjusted? Part-revolution: air or oil leaks? Proper alignment? Disengagement? Stopping position? Worn clutch lining? Weak or broken springs? Power or air pressure failure or deactivation? Momentary operation of stop control applies brake and releases clutch? Retripping required? Red stop button? Brake lining worn? Brake properly adjusted? Does it stop slide quickly? Are friction brakes set with compression springs operating on rod, or guided within a hole or tube?		D) Type A or B Gate (B gate for part-revolution clutch only) – point of operation enclosed before press cycle can be initiated? Barrier guards for other hazardous point-of-operation areas? E) Restraint (Holdout) – adjusted so that operator's fingers cannot reach into dies? Securely anchored? Adjusted for each operator, die, shift?
7. Brake	Face of ram parallel to bolster? Proper gib clearance? Any scoring?		F) Two-hand Trip or Control (two-hand control for part-revolution clutch only) – shielded against unintended operation? Concurrent, antirepeat? Fized in place at proper safety distance from pinch point? Interrupted stroke protection and adequate holding time (for two-hand control only)?
8. Ram and gibs	Proper bearing and ball sear clearances? Screw turns freely?	15. Miscellaneous	Comment on any other items such as: Protection from falling overhead parts. Lighting. Cleanliness. Lubrication. Pressure vessels. Hdraulic-equipment. Auxiliary equipment. General maintenance. Special types of clutches or brakes. Covering of gears, belts, pulleys. Overloading. All auziliary equipment.
9. Connection (pitman) & ram adjusting screw	Spring type: proper adjustment? Broken springs or loose nuts? Pneumatic type: air leakage? Proper air pressure? Loose connection to slide?		
10. Ram counter-balance	Proper air pressure? Valve operation? Pressure gauges? Leaks?		
11. Air system	Can main power switch be locked only in aooof position? Grounding?Condition of wiring? Relays? Rotary limit switches?		

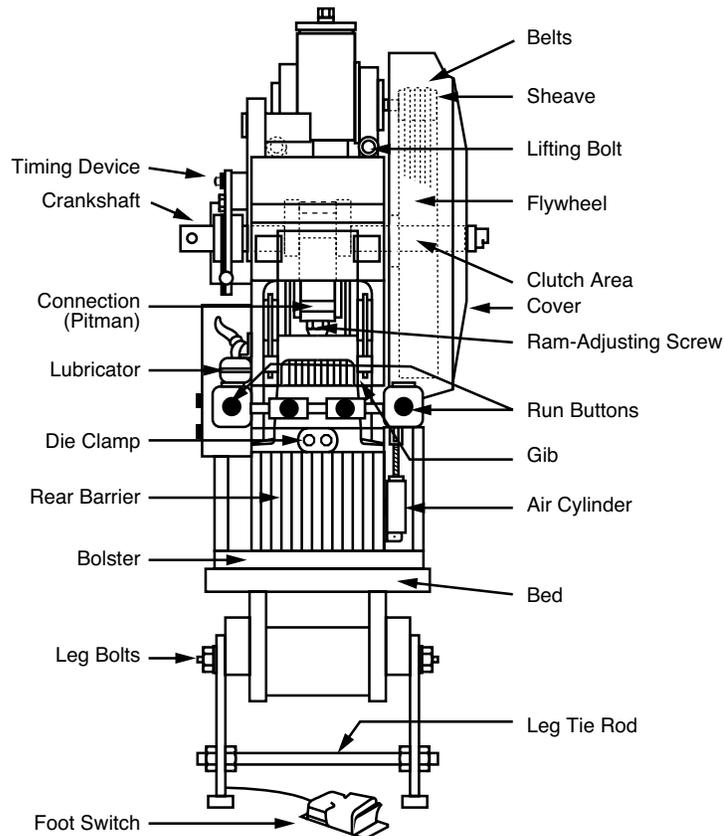
*Refer to OSHA 29 CFR 1910.212, 1910.217, 1910.219, on pages 106 through 127, ANSI B11.1 & B15.1, and other applicable regulations and standards.

FULL-REVOLUTION OBI PRESS

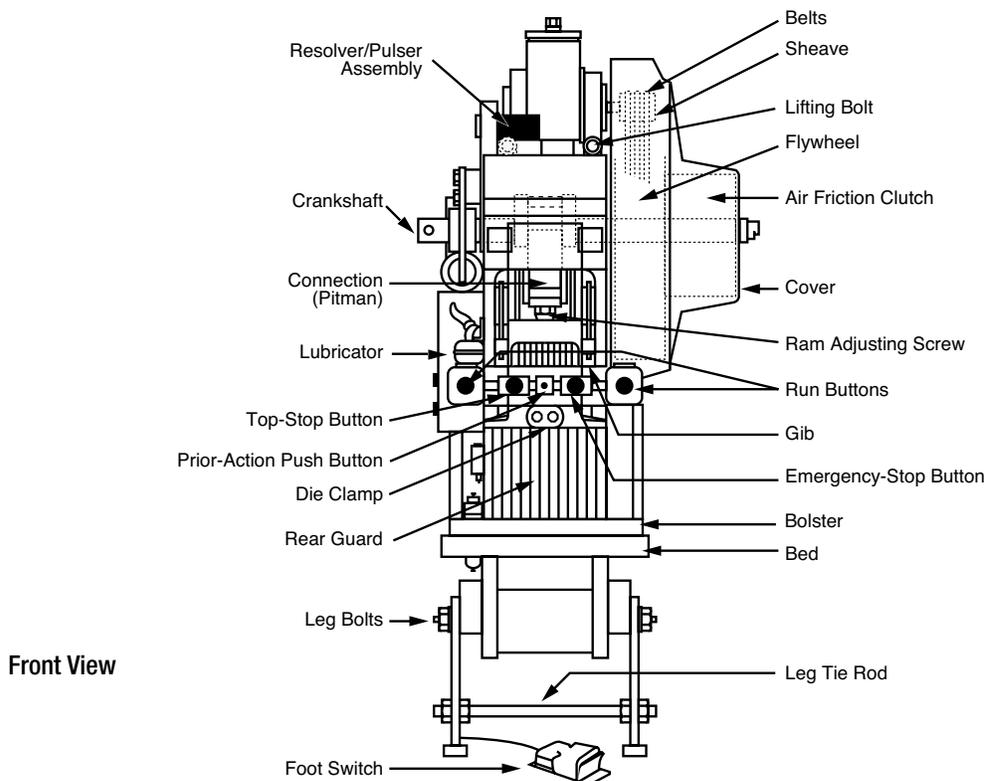
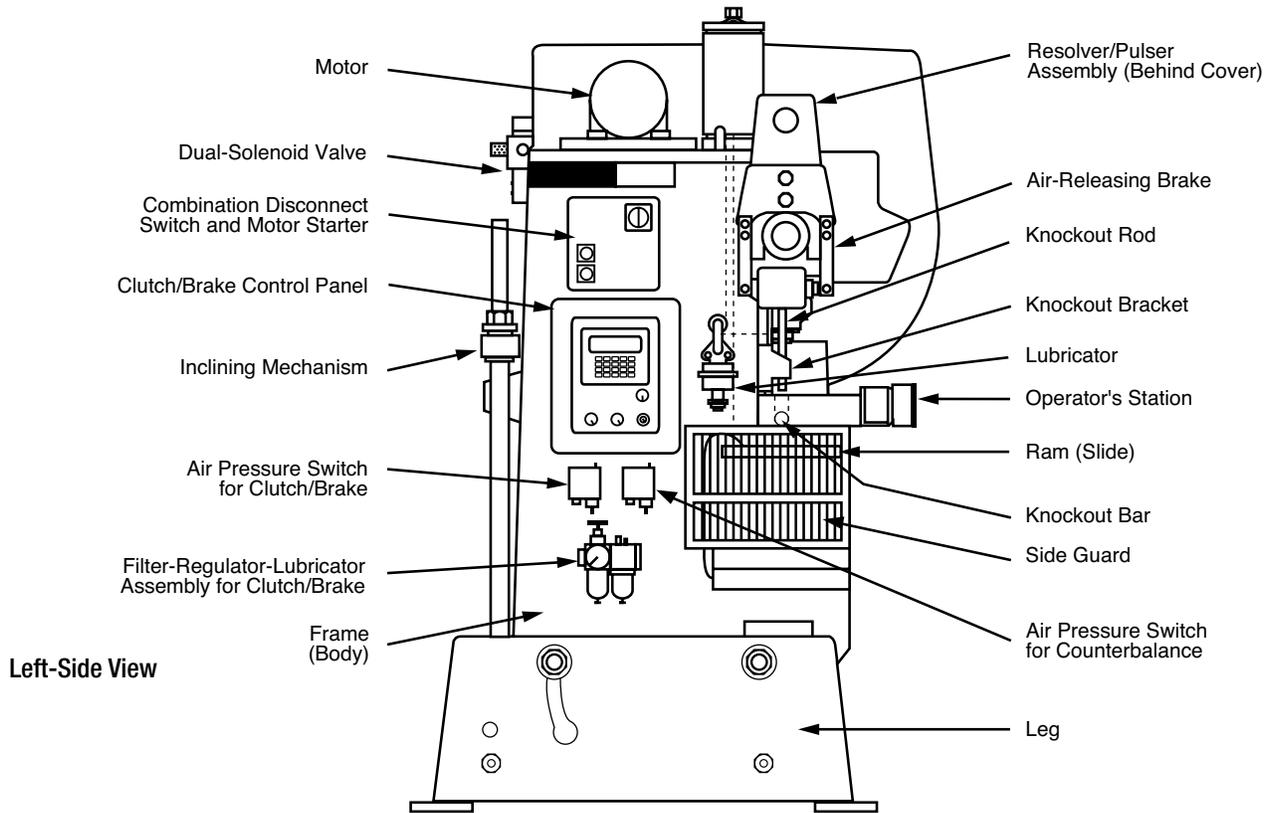
Left-Side View



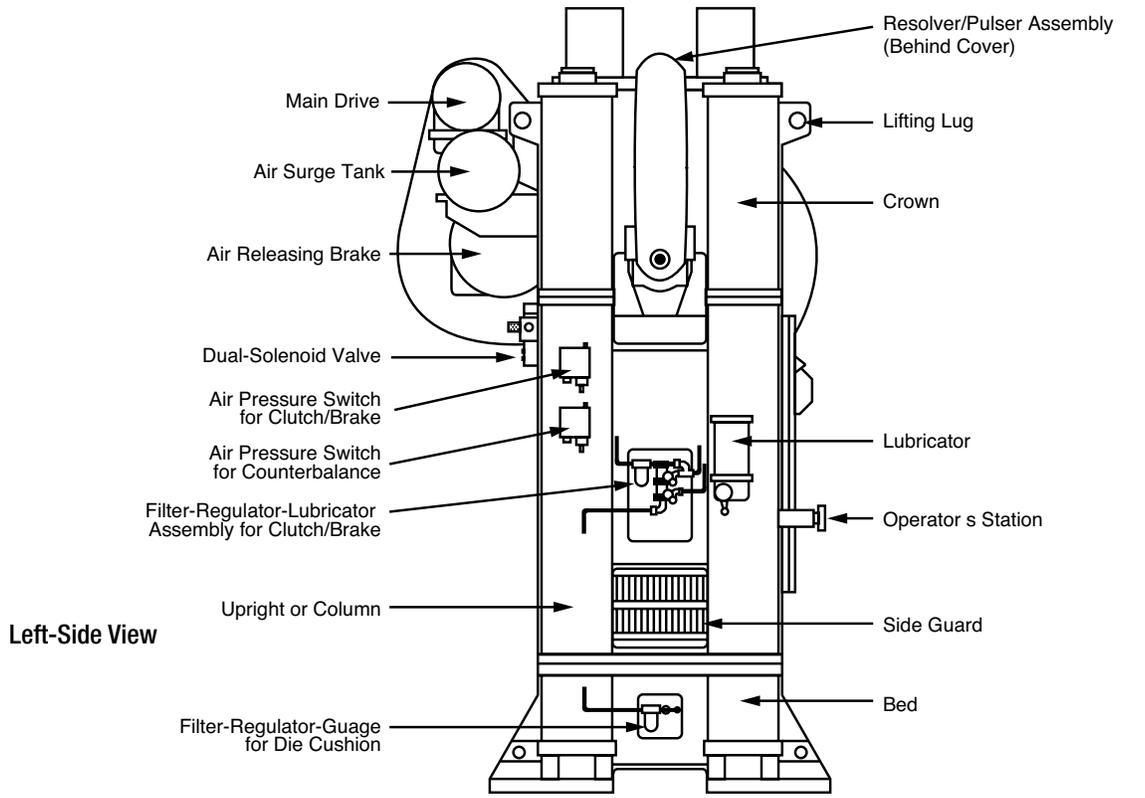
Front View



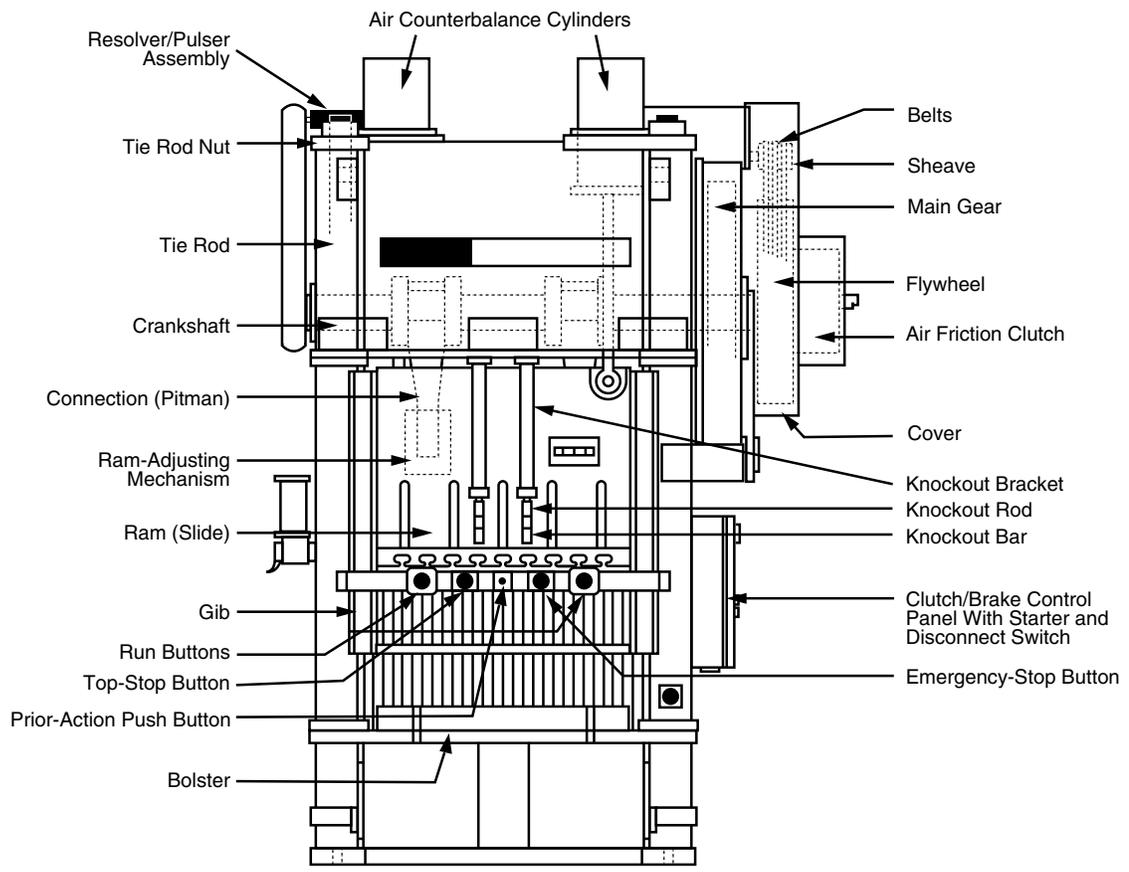
PART-REVOLUTION OBI PRESS



PART-REVOLUTION STRAIGHT-SIDE PRESS



Left-Side View



Front View

CONTROL RELIABILITY

Control reliability is a term used in OSHA standard 29 CFR 1910.217 for mechanical power presses and in the ANSI B11 series of standards for safety of machine tools. A new term coming out in the ANSI standards that equates to control reliability is performance of safety-related functions. These terms deal with the part of the system that controls hazardous motion of a machine.

A much older term previously used for control reliability was fail-safe. Fail-safe was often considered the safe state or condition a machine went to when any and all possible component failure combinations occurred, including multiple and simultaneous failures. This is not possible; therefore, the term fail-safe should not be used to describe control reliability of performance of safety-related functions.

Control reliability should be present to ensure that a failure of the control system or device would not result in the loss of the safety-related functions. Control reliability is not just redundancy of components or a system; it must also include monitoring (checking). The components or systems used to provide safety-related functions require proper design and application. These components or systems include electrical, electronic, pneumatic, or hydraulic systems or devices. They frequently consist of monitored multiple, independent, parallel, or series components, subassemblies, or modules. The reliability of the mechanical portions of the machine relied upon for safety must depend on design, maintenance, proper lubrication, and proper use.

The main purpose of control reliability is to make sure the machine will stop when required in the event of a single component failure within the system. In the event of a component failure, machine actuation must be prevented, a stop command must be given, and reactivation of the machine must be prevented until the failure is corrected or the system or device is manually reset.

Two possible ways, among others, for achieving control reliability of the machine control systems or devices are by the use of:

1. Diverse redundancy with monitoring—two or more dissimilar components, subassemblies, or modules are used and the proper operation of each is verified (monitored) by the other(s) to ensure the performance of the safety functions.
2. Homogeneous redundancy with monitoring—two or more identical components, subassemblies, or modules are used and the proper operation of each is verified (monitored) by the other(s) to ensure the performance of the safety functions.

The selection and integration of the components (relays, valves, etc.), subassemblies, and modules that are designed for safety-related functions must be used when building a machine or integrating equipment to an existing machine.

Numerous details about the safety-related functions must be kept in mind to accomplish control reliability of the machine's control system. The main concern is that the machine's hazardous motion stops when a stop command is given.

Rockford Systems offers control reliable systems in this catalog for mechanically, hydraulically, and pneumatically operated machines.

RISK ASSESSMENT

Every day in industrial plants, machine operators, and setup and maintenance personnel are exposed to potential hazardous situations when running production, changing tools, and repairing machines. They sometimes assume a certain amount of risk around machines, knowingly or unknowingly.

We all take risks in our everyday lives during our normal, daily routines. Obviously, most of us are willing to take these risks to live a normal life. In our litigious society, some people believe the manufacturer of machinery, equipment, and products should be liable for any accidents and personal injuries that occur on machines with the machine's operator(s) assuming no risk. In a perfectly planned and executed environment, this should hold true. However, we know machine safeguards and controls are sometimes bypassed, circumvented, misadjusted, or removed, thus creating additional risks. Machine operators can also make mistakes which can increase risks and cause injury.

For years, several European countries have been conducting risk assessments on industrial machines using the EN-1050 European Normative Standard. Most of these European countries place the safeguarding responsibility on the OEM (original equipment manufacturer). In the United States however, the responsibility for safety is placed upon the user or employer by OSHA. ANSI is trying to distribute this responsibility. They have finalized the B11.TR3:2000 Technical Report entitled Risk Assessment and Risk Reduction—a guideline to estimate, evaluate and reduce risks associated with machine tools. All other ANSI B11 series machine tool safety standards, as revised, will likely refer to this technical report.

To comply with the intent of the ANSI B11.TR3 Technical Report, the OEM, modifier (machine rebuilder, safeguard manufacturer), and the user will be required to work together more closely to determine how to properly protect or safeguard machine operators, and setup and maintenance personnel. They will need to conduct a risk/task hazard analysis and risk assessment of each machine to determine the type of safeguard to apply. A risk assessment will take into consideration several factors including the severity of harm (catastrophic, serious, moderate, or minor), and the probability of occurrence (very likely, likely, unlikely, or remote). A risk cannot be totally eliminated, so the ultimate goal is to lessen the risk until it reaches a tolerable risk level.

RISK ASSESSMENT (CONTINUED)

As an example, a risk assessment may determine the need for a safeguard across the full length of a press brake's die area to safeguard the point of operation. A light curtain may be chosen as the safeguarding device. If the risk level is significant, the light curtain would need to be mounted properly so an operator could not reach over, under, around, or through it to get into the point of operation. Additional guards or barriers may be required on the sides of the press brake. A simple electrically interlocked cable with a warning sign could be applied to the rear of the press brake. In this example, three point-of-operation risk decisions—front, sides and rear of the press brake—have been made. Different risk decisions would have to be made for additional operators.

In industry, tolerable risk level decisions must be made in order to produce a product. Risk assessments and decisions for the methods of safeguarding used on machines are made every day, and continue to be part of every machine requirement for all production, and setup and maintenance tasks. The ANSI B11.TR 3 serves to provide a voluntary methodology for the risk assessment activity and has been described as “the greatest stride forward in the field of safety in the past 20 years.”

MACHINE SAFEGUARDING CHOICES

- I. Point-of-operation safeguarding/metal fabricating machines
 - A. Guards
 1. Die enclosure
 2. Fixed
 3. Interlocked
 4. Adjustable
 - B. Devices
 1. Presence-sensing (light curtains or radio frequency)
 2. Two-hand control
 3. Two-hand trip
 4. Pullback
 5. Restraint
 6. Gates
 7. Drop probes
 - C. Other methods
 1. Distance—safe holding (last resort)
 2. Location
 3. Hostage (see ANSI B11.19)
 4. Safe opening (adjustable stroke, sequential operation, adjustable restrictor)
 5. Part-in-place
 - D. Auxiliary safety equipment
 1. Guards or barriers
 2. Mats
 3. Presence-sensing
 - a. Multiple beam with larger MOS
 - c. Radio frequency
 4. Emergency stop (red)
 - a. Push button (multiple)
 - b. Cable
 - c. Trip bar
 - d. Kick plate
 5. Awareness devices
 - a. Barrier
 - b. Visual
 - c. Audible
 6. Hand-feeding tools
- II. Point-of-operation safeguarding of metal turning machines
 - A. Shields (barrier)—protects employees from rotating machine components, chips & coolant
 1. Metal
 2. Plastic
 - B. Guards
 - C. Devices
 1. Presence-sensing
 2. Two-hand control
 3. Gates
 - III. Perimeter safeguarding (for work stations, see point of operation)
 - A. Guards and barriers (latch-out/reset)
 - B. Presence-sensing (latch-out/reset)
 1. Light curtains
 - C. Mats (latch-out/reset)
 - D. Distance—safe holding (last resort)
 - E. Location
 - IV. Supplemental
 - A. Personal protective equipment
 - B. Color-coding
 - C. Warning signs
 - D. Deadman—hold-to-run
 - E. Training (documented)
 - F. Supervision
 - G. Proper lighting
 - H. Inspecting
 - I. Lockout/tagout (disconnects and valves)
 - J. Safety blocks
 - K. Spring-loaded turnover bars
 - L. Covers for mechanical power-transmission apparatuses
 - V. Control of hazardous motion/control reliability
 - A. Electrical or electronic
 - B. Pneumatic
 - C. Hydraulic
 - VI. Motor stop
 - VII. Motor brake (electronic)
 - VIII. Mechanical condition—inspection procedures
 - A. Weekly with tests
 - B. Periodic/regular
 - IX. Safeguarding during machine setup
 - A. Procedure
 - B. Two-hand
 - C. Lockout/tagout
 - X. Safeguarding during minor repair of die or tooling
 - A. Procedure
 - B. Die-safety block interlocked
 - XI. Safeguarding during maintenance of machine
 - A. Procedure
 - B. Lockout/tagout

SAFETY REQUIREMENTS FOR POWER PRESSES TAKEN FROM OSHA

Any component of the safety system mounted on this press is available from one source:

ROCKFORD SYSTEMS, LLC

OSHA's Code of Federal Regulations can be purchased by contacting:

U.S. Government Printing Office
P.O. Box 371954
Pittsburgh, PA 15250-7954
(202) 512-1800
<http://bookstore.gpo.gov>



OSHA 29 CFR 1910.211, 1910.212, 1910.217, 1910.219, and 1910.147 are included in this catalog for use as a reference when determining safety requirements for bringing machines into compliance with the federal standards.

This information is a comprehensive guide to understanding Federal OSHA (Occupational Safety and Health Administration) and applying its requirements to mechanical power presses and other machines. It is copied verbatim from the Federal Register and contains all pertinent sections of the OSHA standards concerning power presses with which an employer (user) must comply. 29 CFR 1910.212 and 1910.219 can be applied to presses, press brakes and other machines discussed in this catalog as well as lathes, milling machines, etc. Safety standards for these types of machines are available from ANSI (American National Standards Institute). For a copy of the appropriate B11-series standard, see page 3 for the contact information. Be sure to review these standards before updating or installing any equipment on a machine.

If you are unfamiliar with how to properly safeguard the point of operation or how to calculate the safety distance for two-hand control, etc., we offer a series of monthly machine safeguarding seminars to educate the employer/user on the safety requirements. Please see pages 4 through 8 for further details.

Following this section is OSHA standard 29 CFR 1910.147 which contains requirements for the control of hazardous energy (lockout/tagout). This standard covers the servicing and maintenance of machines and equipment where the unexpected energizing or start-up of the machines or equipment, or release of stored energy could cause injury to employees. See page 33 for information on air lockout valves and refer to our Die Safety Blocks catalog for information on die safety blocks.

OSHA 29 CFR 1910.211—DEFINITIONS

AS USED IN 29 CFR 1910.217 AND 1910.219 UNLESS THE CONTENT CLEARLY REQUIRES OTHERWISE, THE FOLLOWING POWER PRESS AND MECHANICAL POWER-TRANSMISSION GUARDING TERMS SHALL HAVE THE FOLLOWING MEANING:

Adjustable barrier guard means a barrier requiring adjustment for each job or die setup.

Antirepeat means the part of the clutch/brake control system designed to limit the press to a single stroke if the tripping means is held operated. Antirepeat requires release of all tripping mechanisms before another stroke can be initiated. Antirepeat is also called single stroke reset or reset circuit.

Authorized person means one to whom the authority and responsibility to perform a specific assignment has been given by the employer.

Automatic feeding means feeding wherein the material or part being processed is placed within or removed from the point of operation by a method or means not requiring action by an operator on each stroke of the press.

Belts include all power transmission belts, such as flat belts, round belts, V-belts, etc., unless otherwise specified.

Belt shifter means a device for mechanically shifting belts from tight to loose pulleys or vice versa, or for shifting belts on cones of speed pulleys.

Belt pole (sometimes called a belt shipper or shipper pole) means a device used in shifting belts on and off fixed pulleys on line or countershaft where there are no loose pulleys.

Bolster plate means the plate attached to the top of the bed of the press having drilled holes or T-slots for attaching the lower die or die shoe.

Brake means the mechanism used on a mechanical power press to stop and/or hold the crankshaft, either directly or through a gear train, when the clutch is disengaged.

Brake Monitor means a sensor designed, constructed, and arranged to monitor the effectiveness of the press braking system.

Clutch means the coupling mechanism used on a mechanical power press to couple the flywheel to the crankshaft, either directly or through a gear train.

Concurrent means acting in conjunction, and is used to describe a situation wherein two or more controls exist in an operated condition at the same time.

Continuous means uninterrupted multiple strokes of the slide without intervening stops (or other clutch control action) at the end of individual strokes.

Control System means sensors, manual input and mode selection elements, interlocking and decision-making circuitry, and output elements to press operating mechanism.

Counterbalance means the mechanism that is used to balance or support the weight of the connecting rods, slide, and slide attachments.

Device means a press control or attachment that:

- (i) Restrains the operator from inadvertently reaching into the point of operation; or
- (ii) Prevents normal press operation if the operator's hands are inadvertently within the point of operation; or
- (iii) Automatically withdraws the operator's hands, if the operator's hands are inadvertently within the point of operation as the dies close.

Die means the tooling used in a press for cutting or forming material. An upper and a lower die make a complete set.

Die builder means any person who builds dies for power presses.

Die enclosure guard means an enclosure attached to the die shoe or stripper, or both, in a fixed position.

Die set means a tool holder held in alignment by guide posts and bushings and consisting of a lower shoe, an upper shoe or punch holder, and guide posts and bushings.

Die setter means an individual who places or removes dies in or from mechanical power presses, and who, as a part of his duties, makes the necessary adjustments to cause the tooling to function properly and safely.

Die setting means the process of placing or removing dies in or from a mechanical power press, and the process of adjusting the dies, other tooling and safeguarding means to cause them to function properly and safely.

Die shoe means a plate or block upon which a die holder is mounted. A die shoe functions primarily as a base for the complete die assembly, and, when used, is bolted or clamped to the bolster plate or the face of slide.

Direct drive means the type driving arrangement wherein no clutch is used; coupling and decoupling of the driving torque is accomplished by energizing and deenergization of a motor. Even though not employing a clutch, direct drives match the operational characteristics of "part revolution clutches" because the driving power may be disengaged during the stroke of the press.

Exposed to contact means that the location of an object is such that a person is likely to come into contact with it and be injured.

Ejector means a mechanism for removing work or material from between the dies.

Face of slide means the bottom surface of the slide to which the punch or upper die is generally attached.

Feeding means the process of placing or removing material within or from the point of operation.

Fixed barrier guard means a die space barrier attached to the press frame.

Flywheels include flywheels, balance wheels, and flywheel pulleys mounted and revolving on crankshaft of engine or other shafting.

Foot control means the foot operated control mechanism designed to be used with a clutch or clutch/brake control system.

Foot pedal means the foot operated lever designed to operate the mechanical linkage that trips a full revolution clutch.

Full-revolution clutch means a type of clutch that, when tripped, cannot be disengaged until the crankshaft has completed a full revolution and the press slide a full stroke.

Gate or movable barrier device means a movable barrier arranged to enclose the point of operation before the press stroke can be started.

Guard means a barrier that prevents entry of the operator's hands or fingers into the point of operation.

Guide post means the pin attached to the upper or lower die shoe, operating within the bushing on the opposing die shoe, to maintain the alignment of the upper and lower dies.

Hand feeding tool means any hand-held tool designed for placing or removing material or parts to be processed within or from the point of operation.

Holdout or restraint device means a mechanism, including attachments for operator's hands, that when anchored and adjusted prevent the operator's hands from entering the point of operation.

Inch means an intermittent motion imparted to the slide (on machines using part revolution clutches) by momentary operation of the “Inch” operating means. Operation of the “Inch” operating means engages the driving clutch so that a small portion of one stroke or indefinite stroking can occur, depending upon the length of time the “Inch” operating means is held operated. “Inch” is a function used by the die setter for setup of dies and tooling, but is not intended for use during production operations by the operator.

Interlocked press barrier guard means a barrier attached to the press frame and interlocked so that the press stroke cannot be started normally unless the guard itself, or its hinged or movable sections, enclose the point of operation.

Jog means an intermittent motion imparted to the slide by momentary operation of the drive motor, after the clutch is engaged with the flywheel at rest.

Knockout means a mechanism for releasing material from either die.

Liftout means the mechanism also known as knockout.

Maintenance runway means any permanent runway or platform used for oiling, maintenance, running adjustment, or repair work, but not for passageway.

Manual feeding means feeding wherein the material or part being processed is handled by the operator on each stroke of the press.

Nip-point belt and pulley guard means a device which encloses the pulley and is provided with rounded or rolled edge slots through which the belt passes.

Operator’s station means the complete complement of controls used by or available to an operator on a given operation for stroking the press.

Part-revolution clutch means a type of clutch that can be disengaged at any point before the crankshaft has completed a full revolution and the press slide a full stroke.

Pinch point means any point other than the point of operation at which it is possible for a part of the body to be caught between the moving parts of a press or auxiliary equipment, or between moving and stationary parts of a press or auxiliary equipment or between the material and moving part or parts of the press or auxiliary equipment.

Point of operation means the area of the press where material is actually positioned and work is being performed during any process such as shearing, punching, forming, or assembling.

Presence-sensing device means a device designed, constructed and arranged to create a sensing field or area and to deactivate the clutch control of the press when an operator’s hand or any other part of his body is within such field or area.

Press means a mechanically powered machine that shears, punches, forms or assembles metal or other material by means of cutting, shaping, or combination dies attached to slides. A press consists of a stationary bed or anvil, and a slide (or slides) having a controlled reciprocating motion toward and away from the bed surface, the slide being guided in a definite path by the frame of the press.

Prime movers include steam, gas, oil, and air engines, motors, steam and hydraulic turbines, and other equipment used as a source of power.

Pullout device means a mechanism attached to the operator’s hands and connected to the upper die or slide of the press, that is designed, when properly adjusted, to withdraw the operator’s hands as the dies close, if the operator’s hands are inadvertently within the point of operation.

Repeat means an unintended or unexpected successive stroke of the press resulting from a malfunction.

Safety block means a prop that, when inserted between the upper and lower dies or between the bolster plate and the face of the slide, prevents the slide from falling of its own deadweight.

Safety system means the integrated total system, including the pertinent elements of the press, the controls, the safeguarding and any required supplemental safeguarding, and their interfaces with the operator, and the environment, designed, constructed and arranged to operate together as a unit, such that a single failure or single operating error will not cause injury to personnel due to point of operation hazards.

Semiautomatic feeding means feeding wherein the material or part being processed is placed within or removed from the point of operation by an auxiliary means controlled by the operator on each stroke of the press.

Sheaves mean grooved pulleys, and shall be so classified unless used as flywheels.

Single stroke means one complete stroke of the slide, usually initiated from a full open (or up) position, followed by closing (or down), and then a return to the full open position.

Single-stroke mechanism means an arrangement used on a full-revolution clutch to limit the travel of the slide to one complete stroke at each engagement of the clutch.

Slide means the main reciprocating press member. A slide is also called a ram, plunger, or platen.

Stop control means an operator control designed to immediately deactivate the clutch control and activate the brake to stop slide motion.

Stripper means a mechanism or die part for removing the parts or material from the punch.

Stroking selector means the part of the clutch/brake control that determines the type of stroking when the operating means is actuated. The stroking selector generally includes positions for Off (Clutch Control), Inch, Single Stroke, and Continuous (when Continuous is furnished).

Sweep device means a single or double arm (rod) attached to the upper die or slide of the press and designed to move the operator’s hands to a safe position as the dies close, if the operator’s hands are inadvertently within the point of operation.

Trip or (tripping) means activation of the clutch to “run” the press.

Turnover bar means a bar used in die setting to manually turn the crankshaft of the press.

Two-hand trip means a clutch actuating means requiring the concurrent use of both hands of the operator to trip the press.

Two-hand control device means a two-hand trip that further requires concurrent pressure from both hands of the operator during a substantial part of the die-closing portion of the stroke of the press.

Unitized tooling means a type of die in which the upper and lower members are incorporated into self-contained units arranged as to hold the die members in alignment.

OSHA 29 CFR 1910.217—MECHANICAL POWER PRESSES

EDITED FOR POWER PRESSES

As taken from Title 29 of the Code of Federal Regulations (CFR), Sections 1910.147, 1910.212, 1910.217, and 1910.219.

Many people find the OSHA standards confusing and difficult to read as published in the Code of Federal Regulations. As an aid to the metal stampers and fabricators, we have rearranged and labeled certain paragraphs and sections to help categorize the subject material. Each paragraph has been identified so that the reader can refer to the

regulations and read the paragraph in context as the government wrote it. No words of the text have been changed; however, this information should never be used in place of the actual standards. We can assume no liability for acts taken as a result of reference to it. We offer this guide for use in analyzing problems and finding solutions for bringing full- and part-revolution mechanical power presses into compliance with the federal regulations.

WHEN MUST THINGS BE DONE?

(A)(4) RECONSTRUCTION AND MODIFICATION

It shall be the responsibility of any person reconstructing, or modifying a mechanical power press to do so in accordance with paragraph (b) of this section.

(A)(5) EXCLUDED MACHINES

Press brakes, hydraulic and pneumatic power presses, bulldozers, hot bending and hot metal presses, forging presses and hammers, riveting machines and similar types of fastener applicators are excluded from the requirements of this section.

CONSTRUCTION OF PRESS AND ITS CONTROLS —FULL REVOLUTION CLUTCHES

(B)(3) MACHINES USING FULL REVOLUTION POSITIVE CLUTCHES

- (i) Machines using full revolution clutches shall incorporate a single stroke mechanism.
- (ii) If the single stroke mechanism is dependent upon spring action, the spring(s) shall be of the compression type, operating on a rod or guided within a hole or tube, and designed to prevent interleaving of the spring coils in event of breakage.

METHODS OF INITIATING PRESS CYCLE

(B)(4) FOOT PEDALS (TREADLE)

- (i) The pedal mechanism shall be protected to prevent unintended operation from falling or moving objects or by accidental stepping onto the pedal.
- (ii) A pad with a nonslip contact area shall be firmly attached to the pedal.
- (iii) The pedal return spring(s) shall be of the compression type, operating on a rod or guided within a hole or tube, and designed to prevent interleaving of spring coils in event of breakage.
- (iv) If pedal counterweights are provided, the path of the travel of the weight shall be enclosed.

(B)(5) HAND OPERATED LEVERS

- (i) Hand-lever-operated power presses shall be equipped with a spring latch on the operating lever to prevent premature or accidental tripping.
- (ii) The operating levers on hand-tripped presses having more than one operating station shall be interlocked to prevent the tripping of the press except by the “concurrent” use of all levers.

(B)(6) TWO-HAND TRIP

See page 108, paragraph (c)(3)(viii).

- (i) A two-hand trip shall have the individual operator's hand controls protected against unintentional operation and have the individual operator's hand controls arranged by design and construction and/or separation to require the use of both hands to trip the press and use a control arrangement requiring concurrent operation of the individual operator's hand controls.
- (ii) Two-hand trip systems on full revolution clutch machines shall incorporate an antirepeat feature.
- (iii) If two-hand trip systems are used on multiple operator presses, each operator shall have a separate set of controls.

OSHA 29 CFR 1910.217—MECHANICAL POWER PRESSES (CONTINUED)

PART REVOLUTION CLUTCHES

(AIR AND MECHANICAL-FRICTION CLUTCHES)

(B)(7) MACHINES USING PART REVOLUTION CLUTCHES

(i) The clutch shall release and the brake shall be applied when the external clutch engaging means is removed, deactivated or deenergized.

Stop control

(ii) A red color stop control shall be provided with the clutch/brake control system. Momentary operation of the stop control shall immediately deactivate the clutch and apply the brake. The stop control shall override any other control, and reactivation of the clutch shall require use of the operating (tripping) means which has been selected.

Press stroking selector

(iii) A means of selecting Off, Inch, Single Stroke, and Continuous (when the continuous function is furnished) shall be supplied with the clutch/brake control to select type of operation of the press. Fixing of selection shall be by means capable of supervision by the employer.

Inch operation

(iv) The "Inch" operating means shall be designed to prevent exposure of the worker's hands within the point of operation by:

(a) Requiring the concurrent use of both hands to actuate the clutch;
OR

(b) Being a single control protected against accidental actuation and so located that the worker cannot reach into the point of operation while operating the single control.

Single stroke - Two-hand control

See page 107, paragraph (c)(3)(vii)

(v) Two-hand controls for single stroke shall conform to the following requirements:

(a) Each hand control shall be protected against unintended operation and arranged by design, construction, and/or separation so that the concurrent use of both hands is required to trip the press.

(b) The control system shall be designed to permit an adjustment which will require concurrent pressure from both hands during the die closing portion of the stroke.

(c) The control system shall incorporate an antirepeat feature.

(d) The control systems shall be designed to require release of all operators' hand controls before an interrupted stroke can be resumed. This requirement pertains only to those single stroke, two-hand controls manufactured and installed on or after August 31, 1971. (Refer to (c)(5)(ii) on page 108.)

(vi) Reserved

Multiple operating stations

(vii) Controls for more than one operating station shall be designed to be activated and deactivated in complete sets of two operators' hand controls per operating station by means capable of being supervised by the employer. The clutch/brake control system shall be designed and constructed to prevent actuation of the clutch if all operating stations are bypassed.

Continuous

(viii) Those clutch/brake control systems which contain both single and continuous functions shall be designed so that completion of continuous circuits may be supervised by the employer. The initiation of continuous run shall require a prior action or decision by the operator in addition to the selection of Continuous on the stroking selector, before actuation of the operating means will result in continuous stroking.

Hand/foot selection

(ix) If foot control is provided, the selection method between hand and foot control shall be separate from the stroking selector and shall be designed so that the selection may be supervised by the employer.

Foot control

(x) Foot operated tripping controls, if used, shall be protected so as to prevent operation from falling or moving objects, or from unintended operation by accidental stepping onto the foot control.

Clutch/brake air valve failure

(xi) The control of air-clutch machines shall be designed to prevent a significant increase in the normal stopping time due to a failure within the operating valve mechanism, and to inhibit further operation if such failure does occur. This requirement shall apply only to those clutch/brake air valve controls manufactured and installed on or after August 31, 1971, but shall not apply to machines intended only for continuous, automatic feeding applications.

(Refer to (c)(5)(iii) on page 108.)

Press drive motor interlock

(xii) The clutch/brake control shall incorporate an automatic means to prevent initiation or continued activation of the Single Stroke or continuous functions unless the press drive motor is energized and in the forward direction.

Engaging method failure

(xiii) The clutch/brake control shall automatically deactivate in event of failure of the power or pressure supply for the clutch engaging means. Reactivation of the clutch shall require restoration of normal supply and the use of the tripping mechanism(s).

Air counterbalance supply

(xiv) The clutch/brake control shall automatically deactivate in event of failure of the counterbalance(s) air supply. Reactivation of the clutch shall require restoration of normal air supply and use of the tripping mechanism(s).

Turnover bar operation

(xv) Selection of bar operation shall be by means capable of being supervised by the employer. A separate pushbutton shall be employed to activate the clutch, and the clutch shall be activated only if the drive motor is deenergized.

OSHA 29 CFR 1910.217—MECHANICAL POWER PRESSES (CONTINUED)

METHODS OF SAFEGUARDING THE POINT OF OPERATION

(C)(1) GENERAL REQUIREMENTS

(i) It shall be the responsibility of the employer to provide and insure the usage of “point-of-operation guards” or properly applied and adjusted point-of-operation devices on every operation performed on a mechanical power press. See Table O-10.

(ii) The requirement of paragraph (c)(1)(i) of this section shall not apply when the point-of-operation opening is one-fourth inch or less. See Table O-10.

(C)(2) POINT OF OPERATION GUARDS

(i) Every point of operation guard shall meet the following design, construction, application, and adjustment requirements:

- (a) It shall prevent entry of hands or fingers into the point of operation by reaching through, over, under or around the guard;
- (b) It shall conform to the maximum permissible openings of Table O-10;
- (c) It shall, in itself, create no pinch point between the guard and moving machine parts;
- (d) It shall utilize fasteners not readily removable by operator, so as to minimize the possibility of misuse or removal of essential parts;
- (e) It shall facilitate its inspection, and
- (f) It shall offer maximum visibility of the point of operation consistent with the other requirements.

(ii) A die enclosure guard shall be attached to the die shoe or stripper in a fixed position.

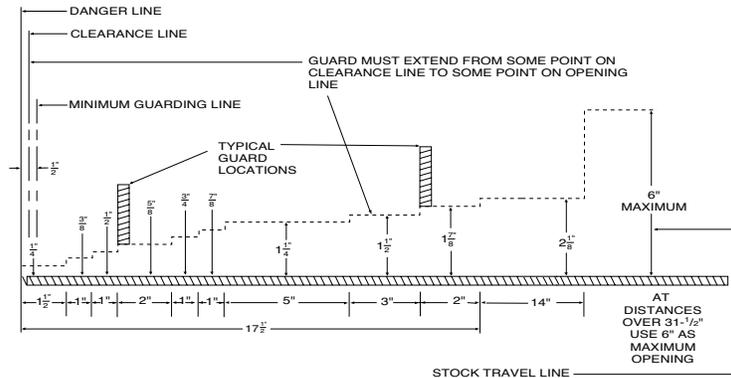
(iii) A fixed barrier guard shall be attached securely to the frame of the press or to the bolster plate.

(iv) An interlocked press barrier guard shall be attached to the press frame or bolster and shall be interlocked with the press clutch control so that the clutch cannot be activated unless the guard itself, or the hinged or movable sections of the guard are in position to conform to the requirements of Table O-10.

(v) The hinged or movable sections of an interlocked press barrier guard shall not be used for manual feeding. The guard shall prevent opening of the interlocked section and reaching into the point of operation prior to die closure or prior to the cessation of slide motion. See paragraph (c)(3)(ii) of this section regarding manual feeding through interlocked press barrier devices.

(vi) The adjustable barrier guard shall be securely attached to the press bed, bolster plate, or die shoe, and shall be adjusted and operated in conformity with Table O-10 and the requirements of this subparagraph. Adjustments shall be made only by authorized personnel whose qualifications include a knowledge of the provisions of Table O-10 and this subparagraph.

(vii) A point of operation enclosure which does not meet the requirements of this subparagraph and Table O-10 shall be used only in conjunction with point-of-operation devices.



Explanation of above diagram:

This diagram shows the accepted safe openings between the bottom edge of a guard and feed table at various distances from the danger line (point of operation).

The clearance line marks the distance required to prevent contact between guard and moving parts.

The minimum guarding line is the distance between the infeed side of the guard and the danger line which is one-half inch from the clearance line.

The various openings are such that for average size hands an operator’s fingers won’t reach the point of operation.

After installation of point-of-operation guards and before a machine is released for operation, a check should be made to verify that the guard will prevent the operator’s hands from reaching the point of operation.

TABLE O-10

Distance of opening from point-of-operation hazard (inches)	Maximum width of opening (inches)
½ to 1½	¼
1½ to 2½	⅜
2½ to 3½	½
3½ to 5½	⅝
5½ to 6½	¾
6½ to 7½	⅞
7½ to 12½	1¼
12½ to 15½	1½
15½ to 17½	1⅞
17½ to 31½	2⅞

This table shows the distances that guards shall be positioned from the danger line in accordance with the required openings.

OSHA 29 CFR 1910.217—MECHANICAL POWER PRESSES (CONTINUED)

(C)(3) POINT OF OPERATION DEVICES

(i) Point of operation devices shall protect the operator by:

(a) Preventing and/or stopping normal stroking of the press if the operator's hands are inadvertently placed in the point of operation; or

(b) Preventing the operator from inadvertently reaching into the point of operation; or withdrawing his hands if they are inadvertently located in the point of operation as the dies close; or

(c) Preventing the operator from inadvertently reaching into the point of operation at all times; or

(d) [Reserved] (formerly sweep device)

(e) Requiring application of both of the operator's hands to machine operating controls and locating such controls at such a safety distance from the point of operation that the slide completes the downward travel or stops before the operator can reach into the point of operation with his hands; or

(f) Enclosing the point of operation before a press stroke can be initiated, and maintaining this closed condition until the motion of the slide has ceased; or

(g) Enclosing the point of operation before a press stroke can be initiated, so as to prevent an operator from reaching into the point of operation prior to die closure or prior to cessation of slide motion during the downward stroke.

Gate or movable barrier device

(ii) A gate or movable barrier device shall protect the operator as follows:

(a) A Type A gate or movable barrier device shall protect the operator in the manner specified in paragraph (c)(3)(i)(f) of this section, and

(b) A Type B gate or movable barrier device shall protect the operator in the manner specified in paragraph (c)(3)(i)(g) of this section.

Presence sensing

(iii) A presence sensing point of operation device shall protect the operator as provided in paragraph (c)(3)(i)(a) of this section, and shall be interlocked into the control circuit to prevent or stop slide motion if the operator's hand or other part of his body is within the sensing field of the device during the downstroke of the press slide.

(a) The devices may not be used on machines using full revolution clutches.

(b) The devices may not be used as a tripping means to initiate slide motion, except when used in total conformance with paragraph (h) of this section. (Paragraph (h) omitted.)

(c) The device shall be constructed so that a failure within the system does not prevent the normal stopping action from being applied to the press when required, but does prevent the initiation of a successive stroke until the failure is corrected. The failure shall be indicated by the system.

(d) Muting (bypassing of the protective function) of such device during the upstroke of the press slide is permitted for the purpose of parts ejection, circuit checking, and feeding.

(e) The safety distance (Ds) from the sensing field to the point of operation shall be greater than the distance determined by the following formula:

$D_s = 63 \text{ inches/second} \times T_s$; where:

D_s = minimum safety distance (inches);

63 inches/second = hand speed constant; and

T_s = stopping time of the press measured at approximately 90° position

of the crankshaft rotation (seconds).

(f) Guards shall be used to protect all areas of entry to the point of operation not protected by the presence sensing device.

Pull-out (pullback)

(iv) The pull-out device shall protect the operator as specified in paragraph (c)(3)(i)(b) of this section and shall include attachments for each of the operator's hands.

(a) Attachments shall be connected to and operated only by the press slide or upper die.

(b) Attachments shall be adjusted to prevent the operator from reaching into the point of operation or to withdraw the operator's hands from the point of operation before the dies close.

(c) A separate pull-out device shall be provided for each operator if more than one operator is used on the press.

(d) Each pull-out device in use shall be visually inspected and checked for proper adjustment at the start of each operator shift, following a new die setup, and when operators are changed. Necessary maintenance or repair or both shall be performed and completed before the press is operated. Records of inspections and maintenance shall be kept in accordance with paragraph (e) of this section.

Sweep

(v) The sweep device may not be used for point-of-operation safeguarding after December 31, 1976.

Holdout or restraint

(vi) A holdout or a restraint device shall protect the operator as specified in paragraph (c)(3)(i)(c) of this section and shall include attachments for each of the operator's hands. Such attachments shall be securely anchored and adjusted in such a way that the operator is restrained from reaching into the point of operation. A separate set of restraints shall be provided for each operator if more than one operator is required on a press.

Two-hand control (part revolution only)

(vii) The two-hand control device shall protect the operator as specified in paragraph (c)(3)(i)(e) of this section.

(a) When used in press operations requiring more than one operator, separate two-hand controls shall be provided for each operator, and shall be designed to require concurrent application of all operators' controls to activate the slide. The removal of a hand from any control button shall cause the slide to stop.

(b) Each two-hand control shall meet the construction requirements of paragraph (b)(7)(v) of this section.

(c) The safety distance (Ds) between each two-hand control device and the point of operation shall be greater than the distance determined by the following formula:

$D_s = 63 \text{ inches/second} \times T_s$; where:

D_s = minimum safety distance (inches);

63 inches/second = hand speed constant; and

T_s = stopping time of the press measured at approximately 90° position of the crankshaft rotation (seconds).

(d) Two-hand controls shall be fixed in position so that only a supervisor or safety engineer is capable of relocating the controls.

OSHA 29 CFR 1910.217—MECHANICAL POWER PRESSES (CONTINUED)

Two-hand trip

(viii) The two-hand trip device shall protect the operator as specified in paragraph (c)(3)(i)(e) of this section.

(a) When used in press operations requiring more than one operator, separate two-hand trips shall be provided for each operator, and shall be designed to require concurrent application of all operator controls to activate the slide.

(b) Each two-hand trip shall meet the construction requirements of paragraph (b)(6) of this section.

(c) The safety distance (Dm) between the two-hand trip and the point of operation shall be greater than the distance determined by the following formula:

$D_m = 63 \text{ inches/second} \times T_m$; where:

D_m = minimum safety distance (inches);

63 inches/second = hand speed constant; and

T_m = the maximum time the press takes for the die closure after it has been tripped (seconds). For full revolution clutch presses with only one engaging point, T_m is equal to the time necessary for one and one-half revolutions of the crankshaft. For full revolution clutch presses with more than one engaging point, T_m shall be calculated as follows:

(d) Two-hand trips shall be fixed in position so that only a supervisor or safety engineer is capable of relocating the controls.

(C)(4) HAND FEEDING TOOLS

Hand feeding tools are intended for placing and removing materials in and from the press. Hand feeding tools are not a point of operation guard or protection device and shall not be used in lieu of the "guards" or devices required in this section.

*(C)(5) ADDED REQUIREMENTS

Additional requirements for safeguarding. Where the operator feeds or removes parts by placing one or both hands in the point of operation, and a two-hand control, presence sensing device or Type B gate or movable barrier (on a part revolution clutch) is used for safeguarding:

(i) The employer shall use a control system and a brake monitor which comply with paragraphs (b)(13) and (14) of this section. This requirement shall be complied with by November 1, 1975;

(ii) The exception in paragraph (b)(7)(v)(d) of this section for two-hand controls manufactured and installed before August 31, 1971 is not applicable under this paragraph (c)(5);

(iii) The control of air clutch machines shall be designed to prevent a significant increase in the normal stopping time due to a failure within the operating valve mechanism, and to inhibit further operation if such failure does occur, where a part revolution clutch is employed. The exception in paragraph (b)(7)(xi) of this section for controls manufactured and installed before August 31, 1971, is not applicable under this paragraph (c)(5).

(B)(13) CONTROL RELIABILITY*

When required by paragraph (c)(5) of this section, the control system shall be constructed so that a failure within the system does not prevent the normal stopping action from being applied to the press when required, but does prevent initiation of a successive stroke until the failure is corrected. The failure shall be detectable by a simple test, or indicated by the control system. This requirement does not apply to those elements of the control system which have no effect on the protection against point of operation injuries.

(B)(14) BRAKE MONITORING*

When required by paragraph (c)(5) of this section, the brake monitor shall meet the following requirements:

(i) Be so constructed as to automatically prevent the activation of a successive stroke if the stopping time or braking distance deteriorates to a point where the safety distance being utilized does not meet the requirements set forth in paragraph (c)(3)(iii)(e) or (c)(3)(vii)(c) of this section. The brake monitor used with the Type B gate or movable barrier device shall be installed in a manner to detect slide top-stop overrun beyond the normal limit reasonably established by the employer;

(ii) Be installed on a press so that it indicates when the performance of the braking system has deteriorated to the extent described in paragraph (b)(14)(i) of this section; and

(iii) Be constructed and installed in a manner to monitor brake system performance on each stroke.

*Applies to part revolution only.

$$T_m = \left[1/2 + \frac{1}{\text{Number of engaging points per revolution}} \right] \times \text{time necessary to complete one revolution of the crankshaft (seconds)}$$

OSHA 29 CFR 1910.217—MECHANICAL POWER PRESSES (CONTINUED)

CONSTRUCTION OF PRESS AND ITS CONTROLS —FOR ALL PRESSES

(B)(1) HAZARDS TO PERSONNEL ASSOCIATED WITH BROKEN OR FALLING MACHINE COMPONENTS

Machine components shall be designed, secured or covered to minimize hazards caused by breakage or loosening and falling or release of mechanical energy (i.e., broken springs).

(B)(2) BRAKES

Friction brakes provided for stopping or holding a slide movement shall be inherently self-engaging by requiring power or force from an external source to cause disengagement. Brake capacity shall be sufficient to stop the motion of the slide quickly and capable of holding the slide and its attachments at any point in its travel.

(B)(8) ELECTRICAL DISCONNECT

(i) A main power disconnect switch capable of being locked only in the Off position shall be provided with every power press control system.

Starter

(ii) The motor start button shall be protected against accidental operation.

(iii) All mechanical power press controls shall incorporate a type of drive motor starter that will disconnect the drive motor from the power source in event of control voltage or power source failure, and require operation of the motor start button to restart the motor when voltage conditions are restored to normal.

Transformer

(iv) All a.c. control circuits and solenoid valve coils shall be powered by not more than a nominal 120-volt a.c. supply obtained from a transformer with an isolated secondary. Higher voltages that may be necessary for operation of machine or control mechanisms shall be isolated from any control mechanism handled by the operator, but motor starters with integral Start-Stop buttons may utilize line voltage control. All d.c. control circuits shall be powered by not more than a nominal 240-volt d.c. supply isolated from any higher voltage.

Ground

(v) All clutch/brake control electrical circuits shall be protected against the possibility of an accidental ground in the control circuit causing false operation of the press.

Control circuit

(vi) All clutch/brake control circuits shall incorporate features to minimize the possibility of an unintended stroke in the event of the failure of a control component to function properly, including relays, limit switches, and static output circuits.

(B)(9) SLIDE COUNTERBALANCE SYSTEMS

(i) Spring counterbalance systems, when used, shall incorporate means to retain system parts in event of breakage.

(ii) Spring counterbalances, when used, shall have the capability to hold the slide and its attachments at midstroke, without brake applied.

(iii) Air counterbalance cylinders shall incorporate means to retain the piston and rod in case of breakage or loosening.

(iv) Air counterbalance cylinders shall have adequate capability to hold the slide and its attachments at any point in stroke, without brake applied.

(v) Air counterbalance cylinders shall incorporate means to prevent failure of capability (sudden loss of pressure) in event of air supply failure.

(B)(10) AIR CONTROLLING EQUIPMENT

Air controlling equipment shall be protected against foreign material and water entering the pneumatic system of the press. A means of air lubrication shall be provided when needed.

(B)(11) HYDRAULIC EQUIPMENT

The maximum anticipated working pressures in any hydraulic system on a mechanical power press shall not exceed the safe working pressure rating of any component used in the system.

(B)(12) PRESSURE VESSELS

All pressure vessels used in conjunction with power presses shall conform to the American Society of Mechanical Engineers Code for Pressure Vessels, 1968 Edition. (Also see 1910.169 Air Receivers.)

DESIGN, CONSTRUCTION, SETTING AND FEEDING OF DIES

(D)(1) GENERAL REQUIREMENTS

The employer shall: (i) use dies and operating methods designed to control or eliminate hazards to operating personnel, and (ii) furnish and enforce the use of hand tools for freeing and removing stuck work or scrap pieces from the die, so that no employee need reach into the point of operation for such purposes.

(D)(2) RESERVED

(D)(3) SCRAP HANDLING

The employer shall provide means for handling scrap from roll feed or random length stock operations. Scrap cutters used in conjunction with scrap handling systems shall be safeguarded in accordance with paragraph (c) of this section and with 1910.219.

OSHA 29 CFR 1910.217—MECHANICAL POWER PRESSES (CONTINUED)

(D)(4) GUIDE POST HAZARD

The hazard created by a guide post (when it is located in the immediate vicinity of the operator) when separated from its bushing by more than one-fourth inch shall be considered as a point of operation hazard and be protected in accordance with paragraph (c) of this section.

(D)(5) UNITIZED TOOLING

If unitized tooling is used, the opening between the top of the punch holder and the face of the slide, or striking pad, shall be safeguarded in accordance with the requirements of paragraph (c) of this section.

(D)(6) TONNAGE, STROKE, AND WEIGHT DESIGNATION

All dies shall be:

- (i) Stamped with the tonnage and stroke requirements; or have these characteristics recorded if these records are readily available to the die setter;
- (ii) Stamped to indicate upper die weight when necessary for air counterbalance pressure adjustment; and
- (iii) Stamped to indicate complete die weight when handling equipment may become overloaded.

(D)(7) DIE FASTENING

Provision shall be made in both the upper and lower shoes for securely mounting the die to the bolster and slide. Where clamp caps or setscrews are used in conjunction with punch stems, additional means of securing the upper shoe to the slide shall be used.

(D)(8) DIE HANDLING

Handling equipment attach points shall be provided on all dies requiring mechanical handling.

(D)(9) DIE SETTING

- (i) The employer shall establish a die setting procedure that will insure compliance with paragraph (c) of this section.
- (ii) The employer shall provide spring loaded turnover bars, for presses designed to accept such turnover bars.
- (iii) The employer shall provide die stops or other means to prevent losing control of the die while setting or removing dies in presses which are inclined.
- (iv) The employer shall provide and enforce the use of safety blocks for use whenever dies are being adjusted or repaired in the press.
- (v) The employer shall provide brushes, swabs, lubricating rolls, and automatic or manual pressure guns so that operators and die setters shall not be required to reach into the point of operation or other hazard areas to lubricate material, punches or dies.

INSPECTION, MAINTENANCE, AND MODIFICATION OF PRESSES

(E)(1) INSPECTION AND MAINTENANCE RECORDS

(i) It shall be the responsibility of the employer to establish and follow a program of periodic and regular inspections of his power presses to insure that all their parts, auxiliary equipment, and safeguards are in a safe operating condition and adjustment. The employer shall maintain a certification record of inspections which includes the date of inspection, the signature of the person who performed the inspection, and the serial number, or other identifier, of the power press that was inspected.

(ii) Each press shall be inspected and tested no less than weekly to determine the condition of the clutch/brake mechanism-antirepeat feature and single stroke mechanism. Necessary maintenance or repair or both shall be performed and completed before the press is operated. These requirements do not apply to those presses which comply with paragraphs (b)(13) and (14) of this section. The employer shall maintain a certification record of inspections, tests and maintenance work which includes the date of the inspection, test or maintenance; the signature

of the person who performed the inspection, test, or maintenance; and the serial number or other identifier of the press that was inspected, tested or maintained.

(E)(2) MODIFICATION

It shall be the responsibility of any person modifying a power press to furnish instructions with the modification to establish new or changed guidelines for use and care of the power press so modified.

(E)(3) TRAINING OF MAINTENANCE PERSONNEL

It shall be the responsibility of the employer to insure the original and continuing competence of personnel caring for, inspecting, and maintaining power presses.

OPERATION OF POWER PRESSES

(F)(1) RESERVED

(F)(2) INSTRUCTION TO OPERATORS

The employer shall train and instruct the operator in the safe method of work before starting work on any operation covered by this section. The employer shall insure by adequate supervision that correct operating procedures are being followed.

(F)(3) WORK AREA

The employer shall provide clearance between machines so that movement of one operator will not interfere with the work of another. Ample room for cleaning machines, handling material, work pieces, and scrap shall also be provided. All surrounding floors shall be kept in good condition and free from obstructions, grease, oil, and water.

(F)(4) OVERLOADING

The employer shall operate his presses within the tonnage and attachment weight ratings specified by the manufacturer.

OSHA 29 CFR 1910.217—MECHANICAL POWER PRESSES (CONTINUED)

REPORTS OF INJURIES TO EMPLOYEES

OPERATING MECHANICAL POWER PRESSES

(g)(1) The employer shall, within 30 days of the occurrence, report to either the Director of the Directorate of Safety Standards Programs, OSHA, U.S. Department of Labor, Washington, D.C. 20210, or the State agency administering plan approved by the Assistant Secretary of Labor for Occupational Safety and Health, all point of operation injuries to operators or other employees. The following information shall be included in the report:

- (i) Employer's name, address and location of the workplace (establishment).
- (ii) Employee's name, injury sustained, and the task being performed (operation, setup, maintenance, or other).
- (iii) Type of clutch used on the press (full revolution, part revolution or direct drive).

(iv) Type of safeguard(s) being used (two-hand control, two-hand trip, pullouts, sweeps or other). If the safeguard is not described in this section, give a complete description.

(v) Cause of the accident (repeat of press, safeguard failure, removing stuck part or scrap, no safeguard provided, no safeguard in use or other).

(vi) Type of feeding (manual with hands in dies or with hands out of dies, semi-automatic, automatic or other).

(vii) Means used to actuate press stroke (foot trip, foot control, hand trip, hand control or other).

(viii) Number of operators required for the operation and the number of operators provided with controls and safeguards.

OSHA 29 CFR 1910.212—GENERAL REQUIREMENTS FOR ALL MACHINES

(a) Machine guarding—(1) Types of guarding. One or more methods of machine guarding shall be provided to protect the operator and other employees in the machine area from hazards such as those created by point of operation, ingoing nip points, rotating parts, flying chips and sparks. Examples of guarding methods are—barrier guards, two-hand tripping devices, electronic safety devices, etc.

(2) General requirements for machine guards. Guards shall be affixed to the machine where possible and secured elsewhere if for any reason attachment to the machine is not possible. The guard shall be such that it does not offer an accident hazard in itself.

(3) Point of operation guarding. (i) Point of operation is the area on a machine where work is actually performed upon the material being processed.

(ii) The point of operation of machines whose operation exposes an employee to injury shall be guarded. The guarding device shall be in conformity with any appropriate standards therefor; or, in the absence of applicable specific standards, shall be so designed and constructed as to prevent the operator from having any part of his body in the danger zone during the operating cycle.

(iii) Special hand tools for placing and removing material shall be such as to permit easy handling of material without the operator placing a hand in the danger zone. Such tools shall not be in lieu of other guarding required by this section, but can only be used to supplement protection provided.

(iv) The following are some of the machines which usually require point of operation guarding:

- (a) Guillotine cutters
- (b) Shears
- (c) Alligator shears
- (d) Power presses
- (e) Milling machines
- (f) Power saws
- (g) Jointers
- (h) Portable power tools
- (i) Forming rolls and calenders

(4) Barrels, containers and drums. Revolving drums, barrels and containers shall be guarded by an enclosure which is interlocked with the drive mechanism, so that the barrel, drum or container cannot revolve unless the guard enclosure is in place.

(5) Exposure of blades. When the periphery of the blades of a fan is less than seven (7) feet above the floor or working level, the blades shall be guarded. The guard shall have openings no larger than one-half (1/2) inch.

(b) Anchoring fixed machinery. Machines designed for a fixed location shall be securely anchored to prevent walking or moving.

OSHA 29 CFR 1910.219—MECHANICAL POWER-TRANSMISSION APPARATUS

(a) General requirements. (1) This section covers all types and shapes of power-transmission belts, except the following when operating at two hundred and fifty (250) feet per minute or less: (i) Flat belts one (1) inch or less in width, (ii) flat belts two (2) inches or less in width which are free from metal lacings or fasteners, (iii) round belts one-half ($\frac{1}{2}$) inch or less in diameter; and (iv) single strand V-belts, the width of which is thirteen thirty-seconds ($\frac{13}{32}$) inch or less.

(2) Vertical and inclined belts (paragraphs (e) (3) and (4) of this section) if not more than two and one-half ($2\frac{1}{2}$) inches wide and running at a speed of less than one thousand (1,000) feet per minute, and if free from metal lacings or fastenings may be guarded with a nip-point belt and pulley guard.

(3) For the textile industry, because of the presence of excessive deposits of lint which constitutes a serious fire hazard, the sides and face sections only of nip-point belt and pulley guards are required, provided the guard shall extend at least six (6) inches beyond the rim of the pulley on the in-running and off-running sides of the belt and at least two (2) inches away from the rim and face of the pulley in all other directions.

(4) This section covers the principal features with which power-transmission safeguards shall comply.

(b) Prime-mover guards—(1) Flywheels. Flywheels located so that any part is seven (7) feet or less above floor or platform shall be guarded in accordance with the requirements of this subparagraph:

(i) With an enclosure of sheet, perforated, or expanded metal, or woven wire;

(ii) With guard rails placed not less than fifteen (15) inches nor more than twenty (20) inches from rim. When flywheel extends into pit or is within twelve (12) inches of floor, a standard toeboard shall also be provided;

(iii) When the upper rim of flywheel protrudes through a working floor, it shall be entirely enclosed or surrounded by a guardrail and toeboard.

(iv) For flywheels with smooth rims five (5) feet or less in diameter, where the preceding methods cannot be applied, the following may be used: A disk attached to the flywheel in such manner as to cover the spokes of the wheel on the exposed side and present a smooth surface and edge, at the same time providing means for periodic inspection. An open space, not exceeding four (4) inches in width, may be left between the outside edge of the disk and the rim of the wheel if desired, to facilitate turning the wheel over. Where a disk is used, the keys or other dangerous projections not covered by disk shall be cut off or covered. This subdivision does not apply to flywheels with solid web centers.

(v) Adjustable guard to be used for starting engine or for running adjustment may be provided at the flywheel of gas or oil engines. A slot opening for jack bar will be permitted.

(vi) Wherever flywheels are above working areas, guards shall be installed having sufficient strength to hold the weight of the flywheel in the event of a shaft or wheel mounting failure.

(2) Cranks and connecting rods. Cranks and connecting rods, when exposed to contact, shall be guarded in accordance with paragraphs (m) and (n) of this section, or by a guardrail as described in paragraph (o)(5) of this section.

(3) Tail rods or extension piston rods. Tail rods or extension piston rods shall be guarded in accordance with paragraphs (m) and (o) of this section, or by a guardrail on sides and end, with a clearance of not less than fifteen (15) nor more than twenty (20) inches when rod is fully extended.

(c) Shafting—(1) Installation. (i) Each continuous line of shafting shall be secured in position against excessive endwise movement.

(ii) Inclined and vertical shafts, particularly inclined idler shafts, shall be securely held in position against endwise thrust.

(2) Guarding horizontal shafting. (i) All exposed parts of horizontal shafting seven (7) feet or less from floor or working platform, excepting runways used exclusively for oiling, or running adjustments, shall be protected by a stationary casing enclosing shafting completely or by a trough enclosing sides and top or sides and bottom of shafting as location requires.

(ii) Shafting under bench machines shall be enclosed by a stationary casing, or by a trough at sides and top or sides and bottom, as location requires. The sides of the trough shall come within at least six (6) inches of the underside of table, or if shafting is located near floor within six (6) inches of floor. In every case the sides of trough shall extend at least two (2) inches beyond the shafting or protuberance.

(3) Guarding vertical and inclined shafting. Vertical and inclined shafting seven (7) feet or less from floor or working platform, excepting maintenance runways, shall be enclosed with a stationary casing in accordance with requirements of paragraphs (m) and (o) of this section.

(4) Projecting shaft ends. (i) Projecting shaft ends shall present a smooth edge and end and shall not project more than one-half the diameter of the shaft unless guarded by nonrotating caps or safety sleeves.

(ii) Unused keyways shall be filled up or covered.

(5) Power-transmission apparatus located in basements. All mechanical power-transmission apparatus located in basements, towers, and rooms used exclusively for power-transmission equipment shall be guarded in accordance with this section, except that the requirements for safeguarding belts, pulleys, and shafting need not be complied with when the following requirements are met:

(i) The basement, tower, or room occupied by transmission equipment is locked against unauthorized entrance.

(ii) The vertical clearance in passageways between the floor and power-transmission beams, ceiling, or any other objects, is not less than five feet six inches (5 ft. 6 in.).

(iii) The intensity of illumination conforms to the requirements of ANSI A11.1-1965 (R-1970).

(iv) [Reserved]

(v) The route followed by the oiler is protected in such manner as to prevent accident.

OSHA 29 CFR 1910.219—MECHANICAL POWER-TRANSMISSION APPARATUS (CONTINUED)

(d) Pulleys—(1) Guarding. Pulleys, any parts of which are seven (7) feet or less from the floor or working platform, shall be guarded in accordance with the standards specified in paragraphs (m) and (o) of this section. Pulleys serving as balance wheels (e.g., punch presses) on which the point of contact between belt and pulley is more than six feet six inches (6 ft. 6 in.) from the floor or platform may be guarded with a disk covering the spokes.

(2) Location of pulleys. (i) Unless the distance to the nearest fixed pulley, clutch or hanger exceeds the width of the belt used, a guide shall be provided to prevent the belt from leaving the pulley on the side where insufficient clearance exists.

(ii) [Reserved]

(3) Broken pulleys. Pulleys with cracks or pieces broken out of rims shall not be used.

(4) Pulley speeds. Pulleys intended to operate at rim speed in excess of manufacturers normal recommendations shall be specially designed and carefully balanced for the speed at which they are to operate.

(e) Belt, rope, and chain drives—(1) Horizontal belts and ropes. (i) Where both runs of horizontal belts are seven (7) feet or less from the floor level, the guard shall extend to at least fifteen (15) inches above the belt or to a standard height (see Table O-12), except that where both runs of a horizontal belt are 42 inches or less from the floor, the belt shall be fully enclosed in accordance with paragraphs (m) and (o) of this section.

(ii) In power plants or power-development rooms, a guardrail may be used in lieu of the guard required by subdivision (i) of this subparagraph.

(2) Overhead horizontal belts. (i) Overhead horizontal belts, with lower parts seven (7) feet or less from the floor or platform, shall be guarded on sides and bottom in accordance with paragraph (o)(3) of this section.

(ii) Horizontal overhead belts more than seven (7) feet above floor or platform shall be guarded for their entire length under the following conditions:

(a) If located over passageways or work places and traveling 1,800 feet or more per minute.

(b) If center to center distance between pulleys is ten (10) feet or more.

(c) If belt is eight (8) inches or more in width.

(iii) Where the upper and lower runs of horizontal belts are so located that passage of persons between them would be possible, the passage shall be either:

(a) Completely barred by a guardrail or other barrier in accordance with paragraphs (m) and (o) of this section; or

(b) Where passage is regarded as necessary, there shall be a platform over the lower run guarded on either side by a railing completely filled in with wire mesh or other filler, or by a solid barrier. The upper run shall be so guarded as to prevent contact therewith either by the worker or by objects carried by him. In power plants only the lower run of the belt need be guarded.

(iv) Overhead chain and link belt drives are governed by the same rules as overhead horizontal belts and shall be guarded in the same manner as belts.

(3) Vertical and inclined belts. (i) Vertical and inclined belts shall be enclosed by a guard conforming to standards in paragraphs (m) and (o) of this section.

(ii) All guards for inclined belts shall be arranged in such a manner that a minimum clearance of seven (7) feet is maintained between belt and floor at any point outside of guard.

4) Vertical belts. Vertical belts running over a lower pulley more than seven (7) feet above floor or platform shall be guarded at the bottom in the same manner as horizontal overhead belts, if conditions are as stated in paragraphs (e)(2)(ii) (a) and (c) of this section.

(5) Cone-pulley belts. (i) The cone belt and pulley shall be equipped with a belt shifter so constructed as to adequately guard the nip point of the belt and pulley. If the frame of the belt shifter does not adequately guard the nip point of the belt and pulley, the nip point shall be further protected by means of a vertical guard placed in front of the pulley and extending at least to the top of the largest step of the cone.

(ii) If the belt is of the endless type or laced with rawhide laces, and a belt shifter is not desired, the belt will be considered guarded if the nip point of the belt and pulley is protected by a nip point guard located in front of the cone extending at least to the top of the largest step of the cone, and formed to show the contour of the cone in order to give the nip point of the belt and pulley the maximum protection.

(iii) If the cone is located less than 3 feet from the floor or working platform, the cone pulley and belt shall be guarded to a height of 3 feet regardless of whether the belt is endless or laced with rawhide.

(6) Belt tighteners. (i) Suspended counterbalanced tighteners and all parts thereof shall be of substantial construction and securely fastened; the bearings shall be securely capped. Means must be provided to prevent tightener from falling, in case the belt breaks.

(ii) Where suspended counterweights are used and not guarded by location, they shall be so encased as to prevent accident.

(f) Gears, sprockets, and chains—(1) Gears. **Gears shall be guarded in accordance with one of the following methods:**

(i) By a complete enclosure; or

(ii) By a standard guard as described in paragraph (o) of this section, at least seven (7) feet high extending six (6) inches above the mesh point of the gears; or

(iii) By a band guard covering the face of gear and having flanges extended inward beyond the root of the teeth on the exposed side or sides. Where any portion of the train of gears guarded by a band guard is less than six (6) feet from the floor a disk guard or a complete enclosure to the height of six (6) feet shall be required.

(2) Hand-operated gears. Paragraph (f)(1) of this section does not apply to hand-operated gears used only to adjust machine parts and which do not continue to move after hand power is removed. However, the guarding of these gears is highly recommended.

(3) Sprockets and chains. **All sprocket wheels and chains shall be enclosed unless they are more than seven (7) feet above the floor or platform. Where the drive extends over other machine or working areas, protection against falling shall be provided. This subparagraph does not apply to manually operated sprockets.**

OSHA 29 CFR 1910.219—MECHANICAL POWER-TRANSMISSION APPARATUS (CONTINUED)

(4) Openings for oiling. When frequent oiling must be done, openings with hinged or sliding self-closing covers shall be provided. All points not readily accessible shall have oil feed tubes if lubricant is to be added while machinery is in motion.

(g) Guarding friction drives. The driving point of all friction drives when exposed to contact shall be guarded, all arm or spoke friction drives and all web friction drives with holes in the web shall be entirely enclosed, and all projecting belts on friction drives where exposed to contact shall be guarded.

(h) Keys, setscrews, and other projections. (1) All projecting keys, setscrews, and other projections in revolving parts shall be removed or made flush or guarded by metal cover. This subparagraph does not apply to keys or setscrews within gear or sprocket casings or other enclosures, nor to keys, setscrews, or oilcups in hubs of pulleys less than twenty (20) inches in diameter where they are within the plane of the rim of the pulley.

(2) It is recommended, however, that no projecting setscrews or oilcups be used in any revolving pulley or part of machinery.

(i) Collars and couplings—(1) Collars. All revolving collars, including split collars, shall be cylindrical, and screws or bolts used in collars shall not project beyond the largest periphery of the collar.

(2) Couplings. Shaft couplings shall be so constructed as to present no hazard from bolts, nuts, setscrews, or revolving surfaces. Bolts, nuts, and setscrews will, however, be permitted where they are covered with safety sleeves or where they are used parallel with the shafting and are countersunk or else do not extend beyond the flange of the coupling.

(j) Bearings and facilities for oiling. All drip cups and pans shall be securely fastened.

(k) Guarding of clutches, cutoff couplings, and clutch pulleys—(1) Guards. Clutches, cutoff couplings, or clutch pulleys having projecting parts, where such clutches are located seven (7) feet or less above the floor or working platform, shall be enclosed by a stationary guard constructed in accordance with this section. A “U” type guard is permissible.

(2) Engine rooms. In engine rooms a guardrail, preferably with toeboard, may be used instead of the guard required by paragraph (k) (1) of this section, provided such a room is occupied only by engine room attendants.

(l) Belt shifters, clutches, shippers, poles, perches, and fasteners—(1) Belt shifters. (i) Tight and loose pulleys on all new installations made on or after August 31, 1971, shall be equipped with a permanent belt shifter provided with mechanical means to prevent belt from creeping from loose to tight pulley. It is recommended that old installations be changed to conform to this rule.

(ii) Belt shifter and clutch handles shall be rounded and be located as far as possible from danger of accidental contact, but within easy reach of the operator. Where belt shifters are not directly located over a machine or bench, the handles shall be cut off six feet six inches (6 ft. 6 in.) above floor level.

(2) Belt shippers and shipper poles. The use of belt poles as substitutes for mechanical shifters is not recommended.

(3) Belt perches. Where loose pulleys or idlers are not practicable, belt perches in form of brackets, rollers, etc., shall be used to keep idle belts away from the shafts.

(4) Belt fasteners. Belts which of necessity must be shifted by hand and belts within seven (7) feet of the floor or working platform which are not guarded in accordance with this section shall not be fastened with metal in any case, nor with any other fastening which by construction or wear will constitute an accident hazard.

(m) Standard guards—general requirements—(1) Materials. (i) Standard conditions shall be secured by the use of the following materials: expanded metal, perforated or solid sheet metal, wire mesh on a frame of angle iron or iron pipe securely fastened to floor or to frame of machine.

(ii) All metal should be free from burrs and sharp edges.

(2) Methods of manufacture. (i) Expanded metal, sheet or perforated metal, and wire mesh shall be securely fastened to frame.

(n) [Reserved]

(o) Approved materials—(1) Minimum requirements. The materials and dimensions specified in this paragraph shall apply to all guards, except horizontal overhead belts, rope, cable or chain guards more than seven (7) feet above floor or platform.

(i) [Reserved]

(a) All guards shall be rigidly braced every three (3) feet or fractional part of their height to some fixed part of machinery or building structure. Where guard is exposed to contact with moving equipment additional strength may be necessary.

(2) Wood guards. (i) Wood guards may be used in the woodworking and chemical industries, in industries where the presence of fumes or where manufacturing conditions would cause the rapid deterioration of metal guards; also in construction work and in locations outdoors where extreme cold or extreme heat make metal guards and railings undesirable. In all other industries, wood guards shall not be used.

(3) Guards for horizontal overhead belts. (i) Guards for horizontal overhead belts shall run the entire length of the belt and follow the line of the pulley to the ceiling or be carried to the nearest wall, thus enclosing the belt effectively. Where belts are so located as to make it impracticable to carry the guard to wall or ceiling, construction of guard shall be such as to enclose completely the top and bottom runs of belt and the face of pulleys.

(ii) [Reserved]

(iii) Suitable reinforcement shall be provided for the ceiling rafters or overhead floor beams, where such is necessary, to sustain safely the weight and stress likely to be imposed by the guard. The interior surface of all guards, by which is meant the surface of the guard with which a belt will come in contact, shall be smooth and free from all projections of any character, except where construction demands it; protruding shallow roundhead rivets may be used. Overhead belt guards shall be at least one-quarter wider than belt which they protect, except that this clearance need not in any case exceed six (6) inches on each side. Overhead rope drive and block and roller-chain-drive guards shall be not less than six (6) inches wider than the drive on each side. In overhead silent chain-drive guards where the chain is held from lateral displacement on the sprockets, the side clearances required on drives of twenty (20) inch centers or under shall be not less than one-fourth inch from the nearest moving chain part, and on drives of over twenty (20) inch centers a minimum of one-half inch from the nearest moving chain part.

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(4) Guards for horizontal overhead rope and chain drives. Overhead-rope and chain-drive guard construction shall conform to the rules for overhead-belt guard.

(5) Guardrails and toeboards. (i) Guardrail shall be forty-two (42) inches in height, with midrail between top rail and floor.

(ii) Posts shall be not more than eight (8) feet apart; they are to be permanent and substantial, smooth, and free from protruding nails, bolts, and splinters. If made of pipe, the post shall be one and one-fourth (1¼) inches inside diameter or larger. If made of metal shapes or bars, their section shall be equal in strength to that of one and one-half (1½) by one and one-half (1½) by three-sixteenths (3/16) inch angle iron. If made of wood, the posts shall be two by four (2 x 4) inches or larger. The upper rail shall be two by four (2 x 4) inches or two one by four (1 x 4) strips, one at the top and one at the side of posts. The midrail may be one by four (1 x 4) inches or more. Where panels are fitted with expanded metal or wire mesh as noted in Table O-12 the middle rails may be omitted. Where guard is exposed to contact with moving equipment, additional strength may be necessary.

(iii) Toeboards shall be four (4) inches or more in height, of wood, metal or of metal grill not exceeding one (1) inch mesh.

(p) Care of equipment—(1) General. All power-transmission equipment shall be inspected at intervals not exceeding 60 days and be kept in good working condition at all times.

(2) Shafting. (i) Shafting shall be kept in alignment, free from rust and excess oil or grease.

(ii) Where explosives, explosive dusts, flammable vapors or flammable liquids exist, the hazard of static sparks from shafting shall be carefully considered.

(3) Bearings. Bearings shall be kept in alignment and properly adjusted.

(4) Hangers. Hangers shall be inspected to make certain that all supporting bolts and screws are tight and that supports of hanger boxes are adjusted properly.

(5) Pulleys. (i) Pulleys shall be kept in proper alignment to prevent belts from running off.

(6) Care of belts.

(i) [Reserved]

(ii) Inspection shall be made of belts, lacings, and fasteners and such equipment kept in good repair.

(7) Lubrication. The regular oilers shall wear tight-fitting clothing. Machinery shall be oiled when not in motion, wherever possible.

OSHA 29 CFR 1910.147—THE CONTROL OF HAZARDOUS ENERGY (LOCKOUT/TAGOUT)

(a) Scope, application and purpose—(1) Scope.

(i) This standard covers the servicing and maintenance of machines and equipment in which the unexpected energizing or start-up of the machines or equipment; or release of stored energy could cause injury to employees. This standard establishes minimum performance requirements for the control of such hazardous energy.

(ii) This standard does not cover the following:

(A) Construction, agriculture and maritime employment;

(B) Installations under the exclusive control of electric utilities for the purpose of power generation, transmission and distribution, including related equipment for communication or metering; and

(C) Exposure to electrical hazards from work on, near, or with conductors or equipment in electric utilization installations, which is covered by Subpart S of this part; and

(D) Oil and gas well drilling and servicing.

(2) Application. (i) This standard applies to the control of energy during servicing and/or maintenance of machines and equipment.

(ii) Normal production operations are not covered by this standard (see Subpart O of this part). Servicing and/or maintenance which takes place during normal production operations is covered by this standard only if:

(A) An employee is required to remove or bypass a guard or other safety device; or

(B) An employee is required to place any part of his or her body into an area on a machine or piece of equipment where work is actually performed upon the material being processed (point of operation) or where an associated danger zone exists during a machine operating cycle.

Note: Exception to paragraph (a)(2)(ii):

Minor tool changes and adjustments, and other minor servicing activities, which take place during normal production operations, are not covered by this standard if they are routine, repetitive, and integral to the use of the equipment for production, provided that the work is performed using alternative measures which provide effective protection (see subpart O of this Part).

(iii) This standard does not apply to the following:

(A) Work on cord and plug connected electric equipment for which exposure to the hazards of unexpected energizing or start-up of the equipment is controlled by the unplugging of the equipment from the energy source and by the plug being under the exclusive control of the employee performing the servicing or maintenance.

(B) Hot tap operations involving transmission and distribution systems for substances such as gas, steam, water or petroleum products when they are performed on pressurized pipelines, provided that the employer demonstrates that (1) continuity of service is essential; (2) shutdown of the system is impractical; and (3) documented procedures are followed, and special equipment is used which will provide proven effective protection for employees.

(3) Purpose. (i) This section requires employers to establish a program and utilize procedures for affixing appropriate lockout devices or tagout devices to energy isolating devices, and to otherwise disable machines or equipment to prevent unexpected energizing, start-up or release of stored energy in order to prevent injury to employees.

(ii) When other standards in this part require the use of lockout or tagout, they shall be used and supplemented by the procedural and training requirements of this section.

(b) Definitions applicable to this section.

Affected employee. An employee whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout or tagout; or whose job requires him/her to work in an area in which such servicing or maintenance is being performed.

Authorized employee. A person who locks or implements a tagout system procedure on machines or equipment to perform the servicing or maintenance on that machine or equipment. An authorized employee and an affected employee may be the same person when the affected employee's duties also include performing maintenance or service on a machine or equipment which must be locked or a tagout system implemented.

“Capable of being locked out.” An energy isolating device will be considered to be capable of being locked out either if it is designed with a hasp or other attachment or integral part to which, or through which, a lock can be affixed, or if it has a locking mechanism built into it. Other energy isolating devices will also be considered to be capable of being locked out, if lockout can be achieved without the need to dismantle, rebuild, or replace the energy isolating device or permanently alter its energy control capability.

Energized. Connected to an energy source or containing residual or stored energy.

Energy isolating device. A mechanical device that physically prevents the transmission or release of energy, including but not limited to the following: a manually operated electrical circuit breaker; a disconnect switch; a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors and, in addition, no pole can be operated independently; a slide gate; a slip blind; a line valve; a block; and any similar device used to block or isolate energy. The term does not include a push button, selector switch, and other control circuit type devices.

Energy source. Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal or other energy.

Hot tap. A procedure used in the repair, maintenance and services activities which involves welding on a piece of equipment (pipelines, vessels or tanks) under pressure, in order to install connections or appurtenances. It is commonly used to replace or add sections of pipeline without the interruption of service for air, gas, water, steam, and petrochemical distribution systems.

Lockout. The placement of a lockout device on an energy isolating device, in accordance with an established procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

Lockout device. A device that utilizes a positive means such as a lock, either key or combination type, to hold an energy isolating device in the safe position and prevent the energizing of a machine or equipment.

OSHA 29 CFR 1910.147—LOCKOUT/TAGOUT (CONTINUED)

Normal production operations. The utilization of a machine or equipment to perform its intended production function.

Servicing and/or maintenance. Workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment. These activities include lubrication, cleaning or unjamming of machines or equipment and making adjustments or tool changes, where the employee may be exposed to the unexpected energizing or start-up of the equipment or release of hazardous energy.

Setting up. Any work performed to prepare a machine or equipment to perform its normal production operation.

Tagout. The placement of a tagout device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

Tagout device. A prominent warning device, such as a tag and a means of attachment, which can be securely fastened to an energy isolating device in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

(c) General—(1) Energy control program. The employer shall establish a program consisting of an energy control procedure and employee training to ensure that before any employee performs any servicing or maintenance on a machine or equipment where the unexpected energizing, start-up or release of stored energy could occur and cause injury, the machine or equipment shall be isolated, and rendered inoperative, in accordance with paragraph (c)(4) of this section.

(2) Lockout/tagout (i) If an energy isolating device is not capable of being locked out, the employer's energy control program under paragraph (c)(1) of this section shall utilize a tagout system.

(ii) If an energy isolating device is capable of being locked out, the employer's energy control program under paragraph (c)(1) of this section shall utilize lockout, unless the employer can demonstrate that the utilization of a tagout system will provide full employee protection as set forth in paragraph (c)(3) of this section.

(iii) After January 2, 1990, whenever major replacement, repair, renovation or modification of machines or equipment is performed, and whenever new machines or equipment are installed, energy isolating devices for such machines or equipment shall be designed to accept a lockout device.

(3) Full employee protection. (i) When a tagout device is used on an energy isolating device which is capable of being locked out, the tagout device shall be attached at the same location that the lockout device would have been attached, and the employer shall demonstrate that the tagout program will provide a level of safety equivalent to that obtained by using a lockout program.

(ii) In demonstrating that a level of safety is achieved in the tagout program which is equivalent to the level of safety obtained by using a lockout program, the employer shall demonstrate full compliance with all tagout-related provisions of this standard together with such additional elements as are necessary to provide the equivalent safety available from the use of a lockout device. Additional means to be considered as part of the demonstration of full employee protection shall include the implementation of additional safety measures such as the removal of an isolating circuit element, blocking of a controlling switch, opening of an extra disconnecting device, or the removal of a valve handle to reduce the likelihood of inadvertent energizing.

(4) Energy control procedure. (i) Procedures shall be developed, documented and utilized for the control of potentially hazardous energy when employees are engaged in the activities covered by this section.

Note: Exception: The employer need not document the required procedure for a particular machine or equipment, when all of the following elements exist: (1) The machine or equipment has no potential for stored or residual energy or reaccumulation of stored energy after shut down which could endanger employees; (2) the machine or equipment has a single energy source which can be readily identified and isolated; (3) the isolation and locking out of that energy source will completely de-energize and deactivate the machine or equipment; (4) the machine or equipment is isolated from that energy source and locked out during servicing or maintenance; (5) a single lockout device will achieve a locked-out condition; (6) the lockout device is under the exclusive control of the authorized employee performing the servicing or maintenance; (7) the servicing or maintenance does not create hazards for other employees; and (8) the employer, in utilizing this exception, has had no accidents involving the unexpected activation or reenergization of the machine or equipment during servicing or maintenance.

(ii) The procedures shall clearly and specifically outline the scope, purpose, authorization rules, and techniques to be utilized for the control of hazardous energy, and the means to enforce compliance including, but not limited to, the following:

(A) A specific statement of the intended use of the procedure;

(B) Specific procedural steps for shutting down, isolating, blocking and securing machines or equipment to control hazardous energy;

(C) Specific procedural steps for the placement, removal and transfer of lockout devices or tagout devices and the responsibility for them; and

(D) Specific requirements for testing a machine or equipment to determine and verify the effectiveness of lockout devices, tagout devices, and other energy control measures.

(5) Protective materials and hardware. (i) Locks, tags, chains, wedges, key blocks, adapter pins, self-locking fasteners, or other hardware shall be provided by the employer for isolating, securing or blocking of machines or equipment from energy sources.

(ii) Lockout devices and tagout devices shall be singularly identified; shall be the only device(s) used for controlling energy; shall not be used for other purposes; and shall meet the following requirements:

(A) Durable. (1) Lockout and tagout devices shall be capable of withstanding the environment to which they are exposed for the maximum period of time that exposure is expected.

(2) Tagout devices shall be constructed and printed so that exposure to weather conditions or wet and damp locations will not cause the tag to deteriorate or the message on the tag to become illegible.

(3) Tags shall not deteriorate when used in corrosive environments such as areas where acid and alkali chemicals are handled and stored.

(B) Standardized. Lockout and tagout devices shall be standardized within the facility in at least one of the following criteria: Color; shape; or size; and additionally, in the case of tagout devices, print and format shall be standardized.

(C) Substantial—(1) Lockout devices. Lockout devices shall be substantial enough to prevent removal without the use of excessive force or unusual techniques, such as with the use of bolt cutters or other metal cutting tools.

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(2) Tagout devices. Tagout devices, including and their means of attachment, shall be substantial enough to prevent inadvertent or accidental removal. Tagout device attachment means shall be of a non-reusable type, attachable by hand, self-locking, and non-releasable with a minimum unlocking strength of no less than 50 pounds and having the general design and basic characteristics of being at least equivalent to a one-piece, all-environment-tolerant nylon cable tie.

(D) Identifiable. Lockout devices and tagout devices shall indicate the identity of the employee applying the device(s).

(iii) Tagout devices shall warn against hazardous conditions if the machine or equipment is energized and shall include a legend such as the following: Do Not Start, Do Not Open, Do Not Close, Do Not Energize, Do Not Operate.

(6) Periodic inspection. (i) The employer shall conduct a periodic inspection of the energy control procedure at least annually to ensure that the procedure and the requirements of this standard are being followed.

(A) The periodic inspection shall be performed by an authorized employee other than the one(s) utilizing the energy control procedure being inspected.

(B) The periodic inspection shall be designed to correct any deviations or inadequacies observed.

(C) Where lockout is used for energy control, the periodic inspection shall include a review, between the inspector and each authorized employee, of that employee's responsibilities under the energy control procedure being inspected.

(D) Where tagout is used for energy control, the periodic inspection shall include a review, between the inspector and each authorized and affected employee, of that employee's responsibilities under the energy control procedure being inspected, and the elements set forth in paragraph (c)(7)(ii) of this section.

(ii) The employer shall certify that the periodic inspections have been performed. The certification shall identify the machine or equipment on which the energy control procedure was being utilized, the date of the inspection, the employees included in the inspection, and the person performing the inspection.

(7) Training and communication. (i) The employer shall provide training to ensure that the purpose and function of the energy control program are understood by employees and that the knowledge and skills required for the safe application, usage, and removal of energy controls are required by employees. The training shall include the following:

(A) Each authorized employee shall receive training in the recognition of applicable hazardous energy sources, the type and magnitude of the energy available in the workplace, and the methods and means necessary for energy isolation and control.

(B) Each affected employee shall be instructed in the purpose and use of the energy control procedure.

(C) All other employees whose work operations are or may be in an area where energy control procedures may be utilized, shall be instructed about the procedure, and about the prohibition relating to attempts to restart or reenergize machines or equipment which are locked out or tagged out.

(ii) When tagout systems are used, employees shall also be trained in the following limitations of tags:

(A) Tags are essentially warning devices affixed to energy isolating devices, and do not provide the physical restraint on those devices that is provided by a lock.

(B) When a tag is attached to an energy isolating means, it is not to be removed without authorization of the authorized person responsible for it, and it is never to be bypassed, ignored or otherwise defeated.

(C) Tags must be legible and understandable by all authorized employees, affected employees, and all other employees whose work operations are or may be in the area, in order to be effective.

(D) Tags and their means of attachment must be made of materials which will withstand the environmental conditions encountered in the workplace.

(E) Tags may evoke a false sense of security, and their meaning needs to be understood as part of the overall energy control program.

(F) Tags must be securely attached to energy isolating devices so that they cannot be inadvertently or accidentally detached during use.

(iii) Employee retraining.

(A) Retraining shall be provided for all authorized and affected employees whenever there is a change in their job assignments, a change in machines, equipment or processes that present a new hazard, or when there is a change in the energy control procedures.

(B) Additional retraining shall also be conducted whenever a periodic inspection under paragraph (c)(6) of this section reveals, or whenever the employer has reason to believe, that there are deviations from or inadequacies in the employee's knowledge or use of the energy control procedures.

(C) The retraining shall reestablish employee proficiency and introduce new or revised control methods and procedures, as necessary.

(iv) The employer shall certify that employee training has been accomplished and is being kept up to date. The certification shall contain each employee's name and dates of training.

(8) Energy isolation. Implementation of lockout or the tagout system shall be performed only by authorized employees.

(9) Notification of employees. Affected employees shall be notified by the employer or authorized employee of the application and removal of lockout devices or tagout devices. Notification shall be given before the controls are applied, and after they are removed from the machine or equipment.

(d) Application of control. The established procedure for the application of energy control (implementation of lockout or tagout system procedures) shall cover the following elements and actions and shall be done in the following sequence:

(1) Preparation for shutdown. Before an authorized or affected employee turns off a machine or equipment, the authorized employee shall have knowledge of the type and magnitude of the energy, the hazards of the energy to be controlled, and the method or means to control the energy.

(2) Machine or equipment shutdown. The machine or equipment shall be turned off or shut down using the procedures required by this standard. An orderly shutdown must be utilized to avoid any additional or increased hazard(s) to employees as a result of equipment deenergization.

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(3) Machine or equipment isolation. All energy isolating devices that are needed to control the energy to the machine or equipment shall be physically located and operated in such a manner as to isolate the machine or equipment from the energy source(s).

(4) Lockout or tagout device application. (i) Lockout or tagout devices shall be affixed to each energy isolating device by authorized employees.

(ii) Lockout devices, where used, shall be affixed in a manner that will hold the energy isolating devices in a “safe” or “off” position.

(iii) Tagout devices, where used, shall be affixed in such a manner as will clearly indicate that the operation or movement of energy isolating devices from the “safe” or “off” position is prohibited.

(A) Where tagout devices are used with energy isolating devices designed with the capability of being locked, the tag attachment shall be fastened at the same point at which the lock would have been attached.

(B) Where a tag cannot be affixed directly to the energy isolating device, the tag shall be located as close as safely possible to the device, in a position that will be immediately obvious to anyone attempting to operate the device.

(5) Stored energy. (i) Following the application of lockout or tagout devices to energy isolating devices, all potentially hazardous stored or residual energy shall be relieved, disconnected, restrained, and otherwise rendered safe.

(ii) If there is a possibility of reaccumulation of stored energy to a hazardous level, verification of isolation shall be continued until the servicing or maintenance is completed, or until the possibility of such accumulation no longer exists.

(6) Verification of isolation. Prior to starting work on machines or equipment that have been locked out or tagged out, the authorized employee shall verify that isolation and deenergization of the machines or equipment have been accomplished.

(e) Release from lockout or tagout. Before lockout or tagout devices are removed and energy is restored to the machine or equipment, procedures shall be followed and actions taken by the authorized employee(s) to ensure the following:

(1) The machine or equipment. The work area shall be inspected to ensure that nonessential items have been removed and to ensure that machine or equipment components are operationally intact.

(2) Employees. (i) The work area shall be checked to ensure that all employees have been safely positioned or removed.

(ii) Before lockout or tagout devices are removed and before machines or equipment are energized, affected employees shall be notified that the lockout or tagout devices have been removed.

(3) Lockout or tagout devices removal. Each lockout or tagout device shall be removed from each energy isolating device by the employee who applied the device. Exception to paragraph (e)(3): when the authorized employee who applied the lockout or tagout device is not available to remove it, that device may be removed under the direction of the employer, provided that specific procedures and training for such removal have been developed, documented and incorporated into the employer’s energy control program. The employer shall demonstrate that the specific procedure provides equivalent safety to the removal of the device by the authorized employee who applied it. The specific procedure shall include at least the following elements:

(i) Verification by the employer that the authorized employee who applied the device is not at the facility;

(ii) Making all reasonable efforts to contact the authorized employee to inform him/her that his/her lockout or tagout device has been removed; and

(iii) Ensuring that the authorized employee has this knowledge before he/she resumes work at that facility.

(f) Additional requirements (1) Testing or positioning of machines, equipment or components thereof. In situations in which lockout or tagout devices must be temporarily removed from the energy isolating device and the machine or equipment energized to test or position the machine, equipment or component thereof, the following sequence of actions shall be followed.

(i) Clear the machine or equipment of tools and materials in accordance with paragraph (e)(1) of this section;

(ii) Remove employees from the machine or equipment area in accordance with paragraph (e)(2) of this section;

(iii) Remove the lockout or tagout devices as specified in paragraph (e)(3) of this section;

(iv) Energize and proceed with testing or positioning;

(v) De-energize all systems and reapply energy control measures in accordance with paragraph (d) of this section to continue the servicing and/or maintenance.

(2) Outside personnel (contractors, etc.). (i) Whenever outside servicing personnel are to be engaged in activities covered by the scope and application of this standard, the on-site employer and the outside employer shall inform each other of their respective lockout or tagout procedures.

(ii) The on-site employer shall ensure that his/her personnel understand and comply with restrictions and prohibitions of the outside employer’s energy control procedures.

(3) Group lockout or tagout. (i) When servicing and/or maintenance is performed by a crew, craft, department or other group, they shall utilize a procedure which affords the employees a level of protection equivalent to that provided by the implementation of a personal lockout or tagout device.

(ii) Group lockout or tagout devices shall be used in accordance with the procedures required by paragraph (c)(4) of this section including, but not necessarily limited to, the following specific requirements:

(A) Primary responsibility is vested in an authorized employee for a set number of employees working under the protection of a group lockout or tagout device (such as an operations lock);

(B) Provision for the authorized employee to ascertain the exposure status of individual group members with regard to the lockout or tagout of the machine or equipment; and

(C) When more than one crew, craft, department, etc., is involved, assignment of overall job-associated lockout or tagout control responsibility to an authorized employee designated to coordinate affected work forces and ensure continuity of protection; and

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(D) Each authorized employee shall affix a personal lockout or tagout device to the group lockout device, group lockbox, or comparable mechanism when he or she begins work, and shall remove those devices when he or she stops working on the machine or equipment being serviced or maintained.

(4) Shift or personnel changes. Specific procedures shall be utilized during shift or personnel changes to ensure the continuity of lockout or tagout protection, including provision for the orderly transfer of lockout or tagout devices between offgoing and oncoming employees, to minimize exposure to hazards from the unexpected energizing, start-up of the machine or equipment, or release of stored energy.

Note: The following Appendix to §1910.147 serves as a nonmandatory guideline to assist employers and employees in complying with the requirements of this section, as well as to provide other helpful information. Nothing in the Appendix adds to or detracts from any of the requirements of this section.

APPENDIX A—TYPICAL MINIMAL LOCKOUT OR TAGOUT SYSTEM PROCEDURES

GENERAL

Lockout is the preferred method of isolating machines or equipment from energy sources. To assist employers in developing a procedure which meets the requirements of the standard, however, the following simple procedure is provided for use in both lockout or tagout programs. This procedure may be used when there are limited number or types of machines or equipment or there is a single power source. For more complex systems, a more comprehensive procedure will need to be developed, documented, and utilized.

LOCKOUT (OR TAGOUT) PROCEDURE FOR (NAME OF COMPANY).

PURPOSE

This procedure establishes the minimum requirements for the lockout or tagout of energy isolating devices. It shall be used to ensure that the machine or equipment is isolated from all potentially hazardous energy, and locked out or tagged out before employees perform any servicing or maintenance activities where the unexpected energizing, start-up or release of stored energy could cause injury (Type(s) and Magnitude(s) of Energy and Hazards).

RESPONSIBILITY

Appropriate employees shall be instructed in the safety significance of the lockout (or tagout) procedure (Name(s)/Job Title(s) of employees authorized to lockout or tagout). Each new or transferred affected employee and other employees whose work operations are or may be in the area shall be instructed in the purpose and use of the lockout or tagout procedure (Name(s)/Job Title(s) of affected employees and how to notify).

PREPARATION FOR LOCKOUT OR TAGOUT

Make a survey to locate and identify all isolating devices to be certain which switch(es), valve(s) or other energy isolating devices apply to the equipment to be locked or tagged out. More than one energy source (electrical, mechanical or others) may be involved. (Type(s) and Location(s) of energy isolating means.)

SEQUENCE OF LOCKOUT OR TAGOUT SYSTEM PROCEDURE

(1) Notify all affected employees that a lockout or tagout system is going to be utilized and the reason therefor. The authorized employee shall know the type and magnitude of energy that the machine or equipment utilizes and shall understand the hazards thereof.

(2) If the machine or equipment is operating, shut it down by the normal stopping procedure (depress stop button, open toggle switch, etc.).

(3) Operate the switch, valve, or other energy isolating device(s) so that the equipment is isolated from its energy source(s). Stored energy (such as that in springs, elevated machine members, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure, etc.) must be dissipated or restrained by methods such as repositioning, blocking, bleeding down, etc. (Type(s) of Stored Energy-methods to dissipate or restrain.)

(4) Lockout and/or tagout the energy isolating devices with assigned individual lock(s) and tag(s) (Method(s) Selected; i.e., locks tags, additional safety measures).

(5) After ensuring that no personnel are exposed, and as a check on having disconnected the energy sources, operate the push button or other normal operating controls to make certain the equipment will not operate (Type(s) of Equipment checked to ensure disconnections).

CAUTION: Return operating control(s) to “neutral” or “off” position after the test.

(6) The equipment is now locked out or tagged out.

RESTORING MACHINES OR EQUIPMENT TO NORMAL PRODUCTION OPERATIONS

(1) After the servicing and/or maintenance is complete and equipment is ready for normal production operations, check the area around the machines or equipment to ensure that no one is exposed.

(2) After all tools have been removed from the machine or equipment, guards have been reinstalled and employees are in the clear, remove all lockout or tagout devices. Operate the energy isolating devices to restore energy to the machine or equipment.

PROCEDURE INVOLVING MORE THAN ONE PERSON

In the preceding steps, if more than one individual is required to lockout or tagout equipment, each shall place his/her own personal lockout device or tagout device on the energy isolating device(s). When an energy isolating device cannot accept multiple locks or tags, a multiple lockout or tagout device (hasp) may be used. If lockout is used, a single lock may be

used to lockout the machine or equipment with the key being placed in a lockout box or cabinet which allows the use of multiple locks to secure it. Each employee will then use his/her own lock to secure the box or cabinet. As each person no longer needs to maintain his or her lockout protection, that person will remove his/her lock from the box or cabinet. (Name(s)/Job Title(s) of employees authorized for group lockout or tagout.)

OSHA 29 CFR 1910.147—LOCKOUT/TAGOUT (CONTINUED)

BASIC RULES FOR USING LOCKOUT OR TAGOUT SYSTEM PROCEDURE

All equipment shall be locked out or tagged out to protect against accidental or inadvertent operation when such operation could cause injury to personnel. Do not attempt to operate any switch, valve, or other energy isolating device where it is locked or tagged out.

LOCKOUT (OR TAGOUT) PROCEDURE

Entry No. (Description)

1. Name of Company
2. Type(s) and Magnitude(s) of energy and hazards
3. Name(s)/Job Title(s) of employees authorized to lockout or tagout
4. Name(s)/Job Title(s) of affected employees and how to notify
5. Type(s) and Location of energy isolating means
6. Type(s) of Stored Energy-methods to dissipate or restrain
7. Method(s) Selected i.e., locks, tags, additional safety measures, etc.
8. Type(s) of Equipment checked to ensure disconnections
9. Name(s)/Job Title(s) of employees authorized for group lockout or tagout

STD 1-7.3 LOCKOUT/TAGOUT

OSHA Instruction STD 1-7.3 (issued September 11, 1990)— Inspection Procedures and Interpretive Guidance is for 29 CFR 1910.147, The Control of Hazardous Energy (commonly referred to as OSHA's Lockout/Tagout Standard).

The purpose of STD 1-7.3 is to establish policies and provide clarification to ensure uniform enforcement of the Lockout/Tagout Standard. STD 1-7.3 also provides for the acceptance of "alternative procedures" in the servicing and maintenance of sophisticated and complex equipment such as that found in the petroleum and chemical industries.

The following is an outline of highlights from STD 1-7.3. This outline is intended to single out some of the new information which was not included in 29 CFR 1910.147. Reference must be made to the entire STD 1-7.3 to ensure complete compliance.

UNDER LETTER I. INTERPRETIVE GUIDANCE

1. Scope (f)(1) provides an explanation of cord and plug connected equipment by defining when the (unplugged) plug is under the exclusive control of the employee performing the servicing and/or maintenance. Listed are the following three options:

- 1) plug is physically in the possession of the employee
- 2) in arm's reach and in line of sight of the employee
- 3) if the employee has affixed a lockout/tagout device on the plug

Scope (f)(2) requires that the company lockout/tagout procedures specify the acceptable procedure for handling cord and plug connected equipment. 2. Procedures (c) states that "similar machines and/or equipment (such as those using the same type and magnitude of energy and the same or similar types of controls) can be covered with a single written procedure."

3. Lockout versus Tagout (a) states that "OSHA has determined that lockout is a surer means of ensuring deenergization of equipment than tagout, and that it is the preferred method." (over tagout)

4. Employees and Training (b) states that "employees who exclusively perform functions related to normal production operations, and who perform servicing and/or maintenance under the protection of normal machine safeguarding, need only be trained as "affected" (rather than "authorized") employees even if tagout procedures are used." (See I.1.d. and I.1.e. of this instruction.)

5. Periodic Inspection by the Employer (a)(3) states that "energy control procedures used less frequently than once a year need be inspected only when used."

6. Equipment Testing or Positioning (no changes from 1910.147)

7. Group Lockout/Tagout states that "group lockout/tagout procedures shall be tailored to the specific industrial operation and may be unique in the manner that employee protection from the release of hazardous energy is achieved. Irrespective of the situation, the requirements of this generic standard specify that each employee performing maintenance or servicing activities shall be in control of hazardous energy during his/her period of exposure."

(a) Group operations normally require that a lockout/tagout program be implemented which ensures that each authorized employee is protected from the unexpected release of hazardous energy by his/her personal lockout/tagout device(s). No employee may affix the personal lockout/tagout device of another employee. Various group lockout/tagout procedures discussed in Appendix C provide for

each authorized employee's use of his/her personal lockout/tagout device(s).

(b) One of the most difficult problems addressed by the standard involves the servicing and maintenance of complex equipment. Such equipment is frequently used in the petrochemical and chemical industries. Acceptable group lockout/tagout procedures for complex equipment are discussed further in Appendix C.

The following is the explanation for potentially hazardous stored energy or residual energy which might reaccumulate:

8. Compliance with Group Lockout/Tagout (e)(2) "Monitoring may be accomplished, for example, by observation or with the aid of a monitoring device which will sound an alarm if a hazardous energy level is being approached."

(h) In regards to group lockout/tagout operations, "... a master tag is a personal tagout device if each employee personally signs on and signs off on it and if the tag clearly identifies each authorized employee who is being protected by it."

SUBPART J. CLASSIFICATION OF VIOLATIONS

1. A deficiency in the employer's energy control program and/or procedure that could contribute to a potential exposure capable of producing serious physical harm or death shall be cited as a serious violation.

2. The failure to train "authorized," "affected," and "other" employees as required for their respective classifications should normally be cited as a serious violation.

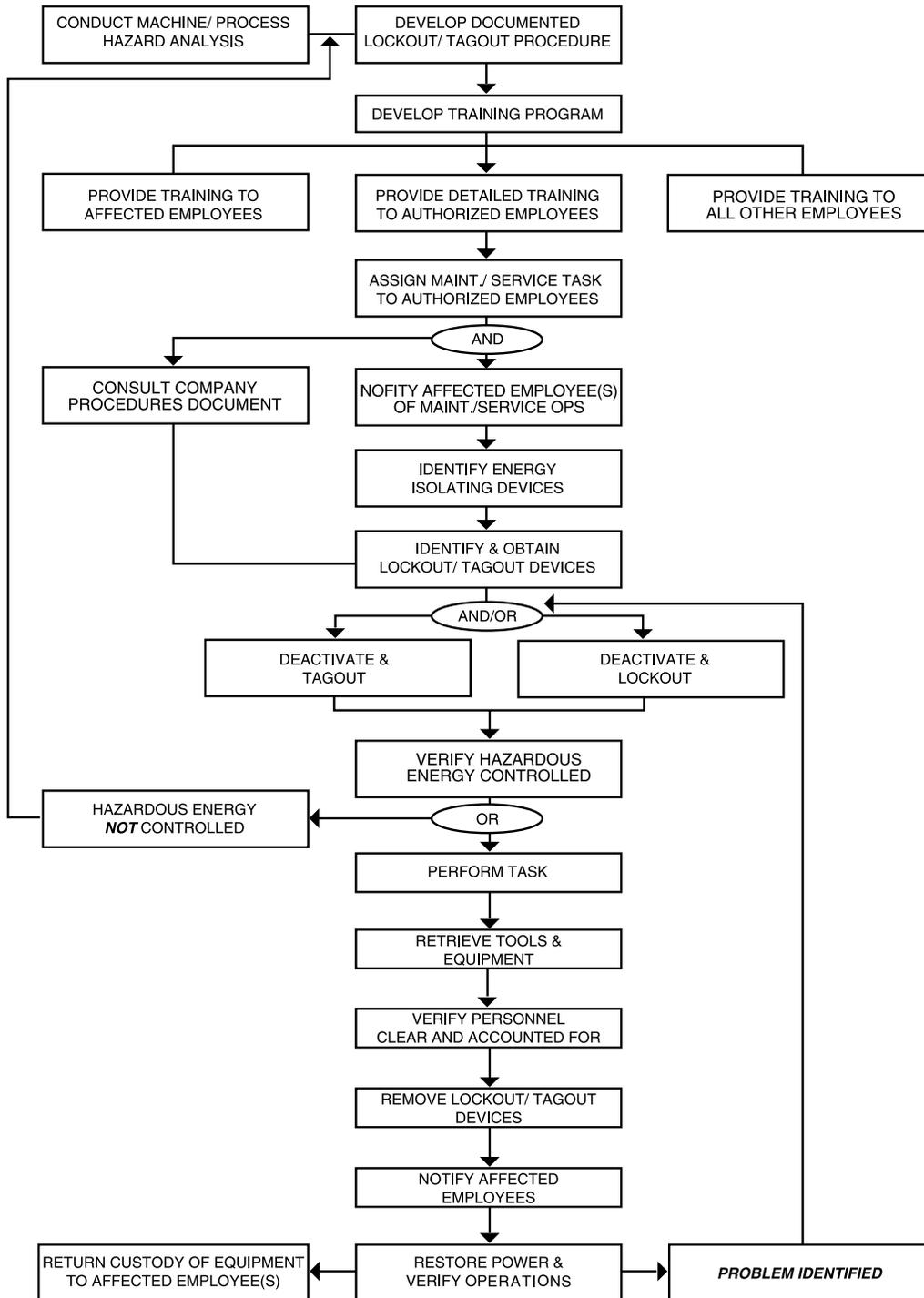
3. Paperwork deficiencies in lockout/tagout programs where effective lockout/tagout work procedures are in place shall be cited as other-than-serious.

STD 1-7.3 LOCKOUT/TAGOUT (CONTINUED)

APPENDIX B

This flow diagram does not constitute the exclusive or definitive means of complying with the standard in any particular situation and is presented solely as an aid.

EXAMPLE—FUNCTIONAL FLOW DIAGRAM FOR IMPLEMENTATION OF LOCKOUT / TAGOUT REQUIREMENTS



STD 1-7.3 LOCKOUT/TAGOUT (CONTINUED)

APPENDIX C

A. NORMAL PRODUCTION OPERATIONS

1. Safeguarding of servicing/maintenance workers can be ensured by:
 - a. Effective machine safeguarding in compliance with Subpart O [machine guarding requirements—see (A) (2)].
 - b. Compliance with 29 CFR 1910.147 (Lockout/Tagout) in situations where the normal production operation safeguards are rendered ineffective or do not protect the servicing/maintenance worker.
2. Routine and repetitive activities are not covered by this standard if alternative measures provide effective protection from the hazards associated with unexpected energizing. Compliance with the machine guarding requirements of Subpart O is an example of such alternative measures.
3. Examples of routine maintenance/servicing which can often be done under the protection of “production-mode safeguarding” are: lubricating, draining sumps, servicing of filters, and inspection for leaks and/or mechanical malfunction.

Examples that are not considered to be normal routine maintenance functions and would therefore trigger the need for lockout/tagout are: replacement of machine or process equipment components such as valves, gauges, linkages, support structure, etc.
4. It is explained that some of the safeguarding alternatives presented in ANSI B11.19 can be used to provide protection while clearing minor jams and performing other minor servicing functions. The two safeguarding alternatives mentioned are interlocked barrier guards and presence sensing devices.

B. GROUP LOCKOUT/TAGOUT

Example procedures are given to illustrate the implementation of a group lockout/tagout procedure involving many energy isolating devices and/or many servicing/maintenance personnel. Several examples are given involving authorized employees who affix personal lockout/tagout devices in a group lockout/tagout setting.

1. Definitions.

The following new definitions for group lockout/tagout are given:

- a. **Primary Authorized Employee** is the authorized employee who exercises overall responsibility for adherence to the company lockout/tagout procedure.
- b. **Principle Authorized Employee** is an authorized employee who oversees or leads a group of servicing/maintenance workers (e.g. plumbers, carpenters, electricians, metal workers, mechanics).
- c. **Job-Lock** is a device used to ensure the continuity of energy isolation during a multi-shift operation. It is placed upon a lock-box. A key to the job-lock is controlled by each assigned primary authorized employee from each shift.
- d. **Job-Tag with Tab** is a special tag for tagout of energy isolating devices during group lockout/tagout procedures. The tab of the tag is removed for insertion into the lock-box. The company procedure would require that the tagout job-tag cannot be removed until the tab is rejoined to it.

- e. **Master Lockbox** is the lockbox into which all keys and tabs from the lockout or tagout devices securing the machine or equipment are inserted and which would be secured by a “job-lock” during multi-shift operations.
- f. **Satellite Lockbox** is a secondary lockbox or lockboxes to which each authorized employee affixes his/her personal lock or tag.
- g. **Master Tag** is a document used as an administrative control and accountability device. This device is normally controlled by the operations department personnel and is a personal tagout device if each employee personally signs on and signs off on it, and if the tag clearly identifies each authorized employee who is being protected by it.
- h. **Work Permit** is a control document which authorizes specific tasks and procedures to be accomplished.

2. Organization.

A sample “basic organizational structure” is outlined to explain the relationship between and responsibilities of the primary authorized employee, principal authorized employee, authorized employees, and equipment operators.

3. Examples of Procedures for Group Lockout/Tagout.

Examples are presented for the various methods of lockout/tagout using lockbox procedures.

- a. Four procedures (Type A, Type B, Type C, Type D) address circumstances ranging from a small group of servicing/maintenance employees during a one-shift operation to a comprehensive operation involving many workers over a longer period. They are:
 - (1) **Type A.** Each authorized employee places his/ her personal lock or tag upon each energy isolating device and removes it upon departure from that assignment. Each authorized employee verifies or observes the deenergization of the equipment.
 - (2) **Type B.** Under a lockbox procedure, a lock or job-tag with tab is placed upon each energy isolation device after deenergization. The key(s) and removed tab(s) are then placed into a lockbox. Each authorized employee assigned to the job then affixes his/her personal lock or tag to the lockbox. As a member of a group, each assigned authorized employee verifies that all hazardous energy has been rendered safe. The lockout/tagout devices cannot be removed or the energy isolating device turned on until the appropriate key or tab is matched to its lock or tag.
 - (3) **Type C.** After each energy isolating device is locked/tagged out and the keys/tabs placed into a master lockbox, each servicing/maintenance group “principal” authorized employee places his/her personal lock or tag upon the master lockbox. Then each principal authorized employee inserts his/her key into a satellite lockbox to which each authorized employee in that specific group affixes his/ her personal lock or tag. As a member of a group, each assigned authorized employee verifies that all hazardous energy has been rendered safe. Only after the servicing/maintenance functions of the specific sub-group have been concluded and the personal locks or tags of the respective employees have been removed from the satellite lockbox can the principal authorized employee remove his/her lock from the master lockbox.

STD 1-7.3 LOCKOUT/TAGOUT (CONTINUED)

(4) Type D. During operations to be conducted over more than one shift (or even many days or weeks), a system such as described here might be used. Single locks/tags are affixed upon a lockbox by each authorized employee as described at Type B or Type C above. The master lockbox is first secured with a job-lock before subsequent locks by the principal authorized employees are put in place on the master lockbox. The job-lock may have multiple keys if they are in the sole possession of the various primary authorized employees (one on each shift). As a member of a group, each assigned authorized employee verifies that all hazardous energy has been rendered safe. In this manner, the security provisions of the energy control system are maintained across shift changes while permitting reenergization of the equipment at any appropriate time or shift.

b. Normal group lockout/tagout procedures require the affixing of individual lockout/tagout devices by each authorized employee to a group lockout device, as discussed in paragraph B.3.a. of this appendix. However, in the servicing and maintenance of sophisticated and complex equipment, such as process equipment in petroleum refining, petroleum production, and chemical production, there may be a need for adaptation and modification of normal group lockout/tagout procedures in order to ensure the safety of the employees performing the servicing and maintenance. To provide greater worker safety through implementation of a more feasible system, and to accommodate the special constraints of the standard's requirement for ensuring employees a level of protection equivalent to that provided by the use of a personal lockout or tagout device, an alternative procedure may be implemented if the company documentation justifies it. Lockout/tagout, blanking, blocking, etc., is often supplemented in these situations by the use of work permits and a system of continuous worker accountability. In evaluating whether the equipment being serviced or maintained is so complex as to necessitate a departure from the normal group lockout/tagout procedures (discussed in paragraph B.3.a.), to the use of an alternative procedure, the following factors (often occurring simultaneously) are some of those which must be evaluated: physical size and extent of the equipment being serviced/maintained; the relative inaccessibility of the energy isolating devices; the number of employees performing the servicing/maintenance; the number of energy isolating devices to be locked/tagged out; and the interdependence and interrelationship of the components in the system or between different systems.

(1) "Once the equipment is shut down and the hazardous energy has been controlled, maintenance/servicing personnel, together with operations personnel, must verify that the isolation of the equipment is effective . . ."

(2) (Fifteen) specific issues related to the control of hazardous energy in complex process equipment are described . . . in a typical situation which could be found at any facility."

c. "It should be noted that the purpose of the lockout/tagout standard is to reduce the likelihood of worker injuries and fatalities during servicing/maintenance operations . . ."

OTHER SERVICES OFFERED BY ROCKFORD SYSTEMS

OSHA 29 CFR 1910.147—LOCKOUT/TAGOUT REQUIREMENTS

According to OSHA 29 CFR 1910.147, The control of hazardous energy (lockout/tagout), all employers must develop a complete hazardous control program by January 2, 1990. To assist employers in accomplishing this, Rockford Systems covers this subject in our machine safeguarding seminar. Students are instructed on lockout/tagout procedures and taught the OSHA regulations for lockout/tagout.

This subject is taught through the use of classroom discussions, visual aids and handouts, including OSHA 29 CFR 1910.147, STD 1-7.3—Inspection Procedures and Interpretive Guidance for 29 CFR 1910.147—The Control of Hazardous Energy.



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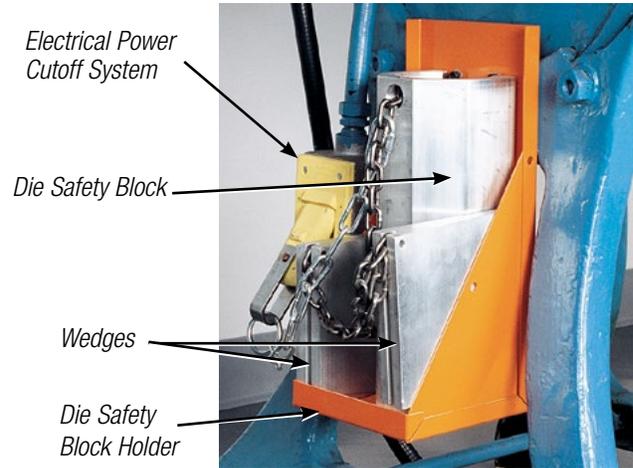
According to OSHA 29 CFR 1910.217, "The employer shall provide and enforce the use of safety blocks for use whenever dies are being adjusted or repaired in the press." They are not required during die setting unless die blocks are included in your die setting procedure. They also satisfy the lockout/tagout requirements for isolating mechanical energy.

Die safety blocks are placed between the die punch and holder with the machine stroke up. They are rated to support a static load. The static load represents the combined weight of the press ram, ram components (ram-adjust assembly and connection rod[s] or pitman arm[s]), and the upper die.

In some applications, as many as four safety blocks may be required. This is determined by the size of the press bed and the weight the blocks must support. On larger presses, the total slide weight must then be distributed among the quantity of safety blocks required.

The ram is usually adjustable; therefore, wedges or the adjustable screw device is offered to provide a proper fit. If the die takes up most of the space on the die set, it may be difficult to find a place to insert the block. To avoid accidentally stroking the press or leaving the safety block in the die after use, an electrical power cut-off interlock system should be used.

Note: Electrical interlocking of die safety blocks to the machine's motor and control circuits is required by ANSI B11.19.



U-Shaped Safety Block in Holder With Wedges and Electrical Power Cutoff System

ALUMINUM DIE SAFETY BLOCK SYSTEM

This high-strength die safety block is lightweight and comes in several sizes. The unique shape and mechanical properties of the 6063-T5 material have been calculated according to stringent structural aluminum design analysis standards to provide high strength.

To determine the number of die safety blocks required, the static load each die safety block will support, and the length of each block, please follow the instructions below and on the next page.

1. Determining the static load the die safety block(s) will support:

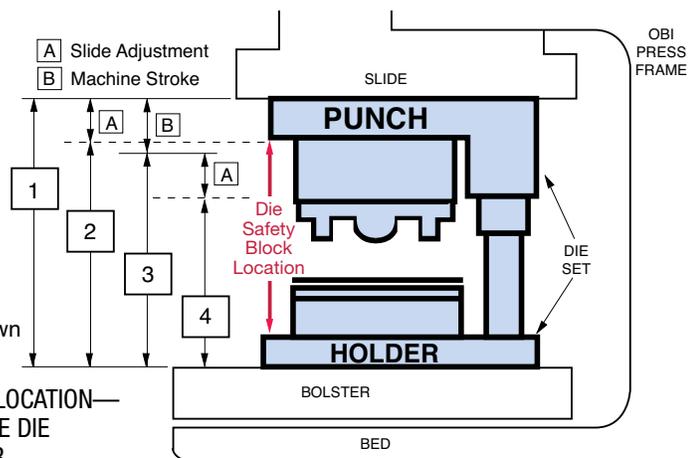
The actual static load that the die safety block(s) will support is determined by adding the actual weights of the press slide and slide components (ram-adjustment assembly, connection rod[s] or pitman arm[s], and the upper die).

If this weight cannot be determined, an approximate static load can be calculated using the information and formulas on the next page.

SHUT HEIGHT, [3] (DIE SPACE), ON MECHANICAL POWER PRESSES AND LOCATION OF SLIDE (BETWEEN [1] AND [2]) WHEN APPLYING DIE SAFETY BLOCKS

- [1] S.U.A.U. - Stroke Up - Adjustment Up
 - [2] S.U.A.D. - Stroke Up - Adjustment Down
 - [3] S.D.A.U. - Stroke Down - Adjustment Up
- SHUT HEIGHT**
- [4] S.D.A.D. - Stroke Down - Adjustment Down

DIE SAFETY BLOCK LOCATION—
PLACE BETWEEN THE DIE
PUNCH AND HOLDER.



Allow 2000 pounds of static load for each cubic foot displaced in the press bed area (front to back x right to left) multiplied by the shut height (die space) of the press. *Note: When using this formula, the calculated approximated static load has a safety factor of two (2).*

FORMULAS:

$$\frac{\text{Press Bed Area (sq in)} \times \text{Shut Height (in)}}{\text{Cubic Inches/Cubic Feet (Constant)}} = \text{Cubic Feet Displaced}$$

$$(1728 \text{ cu in/cu ft})$$

Cubic feet displaced x 2000 lb/cubic foot = Total Static Load

EXAMPLE:

(Press Bed Area) (Shut Height)

$$\frac{48 \text{ in by } 96 \text{ in} \times 24 \text{ in}}{1728 \text{ cu in/cu ft}} = \frac{110,592}{1728} = 64 \text{ cu ft}$$

64 cubic feet displaced x 2000 lb/cu ft = 128,000 lb static load

2. Determining the Die Safety Block Length

With the machine at the top of its stroke; stroke up — adjustment up (S.U.A.U. – see previous page), measure the space between the upper and lower die set plates (not the distance between the bolster and slide). This gives the maximum safety block length. To determine the stroke up — adjustment down (S.U.A.D. – see previous page) measurement, subtract the ram adjustment from the S.U.A.U. figure. This provides the minimum length of the die safety block.

Total Length of Die Safety Block Required _____”

EXCEPTIONS

A. If wedges will be used, subtract 1½” maximum. This is an allowance for variation in the stopping point of the crankshaft or adjustment of the ram.

Total Length of Die Safety Block Required _____”

B. When an adjustable screw is added to an octagonal safety block, the minimum length of the aluminum portion of the safety block is as follows:

For small and medium safety blocks

2½” plus the size of the adjustable screw device

For large safety blocks

3” plus the size of the adjustable screw device

When an adjustable screw device is added to an octagonal safety block and the screw is all the way inside of the safety block, **it will add 2” to the overall length of small and medium safety blocks and 2½” to the overall length of large safety blocks.** Therefore, subtract 2” for small or medium blocks and 2½” for large blocks to determine the length of the aluminum portion of the die block.

Example: If the minimum overall length of the small or medium safety block required is 10½” with any size adjustable screw device, the aluminum portion of the safety block would be 8½” (10½” - 2” = 8½”).

Example: If the minimum overall length of the large safety block required is 16” with any size adjustable screw device, the aluminum portion of the safety block would be 13½” (16” - 2½” = 13½”).

Total Length of the Aluminum Portion of the Die Safety Block _____”

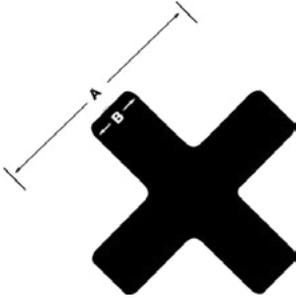
3. Determining the Size of the Die Safety Block

The size of the die safety block (small, medium, large) is determined by one or both of the following factors:

A. The size of the block itself and the area available in the die. (See static load charts.)

B. The static load capacity of the block (small, medium, large) versus the total static load being supported. (See static load charts.)

X-SHAPED SAFETY BLOCKS



	SMALL	LARGE
A	4"	5¾"
B	1"	1¼"

	WEIGHT OF BLOCKS
SMALL	0.681 lb/in
LARGE	1.250 lb/in

To determine the number of safety blocks required, the static load each safety block will support, and the length of each block, please refer to pages 2-3.

The X-shaped safety blocks can be furnished four different ways:

- Cut to length with a hole and pin for an interlock chain or wedges
- Cut to length only
- In a nine-foot length
- Cut to length with a hole and pin for an interlock chain or wedges and a base plate installed (order base plate separately; see page 6)

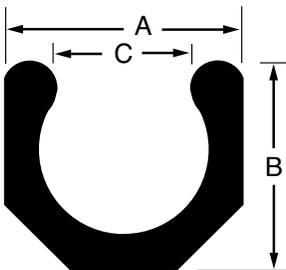
BLOCK LENGTH	MAXIMUM APPROXIMATE STATIC LOAD PER BLOCK IN POUNDS (TONS)*	
	SMALL	LARGE
1"-24"	97,000 (48)	203,000 (101)
24½"-30"	90,000 (45)	189,000 (94)
30½"-36"	86,000 (43)	171,000 (85)
36½"-42"	84,000 (42)	169,000 (84)
42½"-48"	73,000 (36)	165,000 (82)
48½"-54"	71,000 (35)	146,000 (73)
54½"-60"	69,000 (34)	144,000 (72)

*The approximate static loads shown in this chart have a built-in safety factor of two.

WAY FURNISHED†	SMALL	LARGE
	PART NO.	PART NO.
A	KTS609	KTS610
B	KTS605	KTS606
C	KTS608	KTS608
D	KTS635	KTS636

†Powder coating available on request—please consult the factory.

U-SHAPED SAFETY BLOCKS



	SMALL	MEDIUM	LARGE
A	4⅝"	5½"	6¾"
B	4"	4⅞"	5½"
C	2⅝"	3¼"	4¼"

	WEIGHT OF BLOCKS
SMALL	0.638 lb/in
MEDIUM	0.879 lb/in
LARGE	1.17 lb/in

To determine the number of safety blocks required, the static load each safety block will support, and the length of each block, please refer to pages 2-3.

The U-shaped safety blocks can be furnished three different ways:

- Cut to length with a hole and pin for an interlock chain or wedges
- Cut to length only
- In a nine-foot length

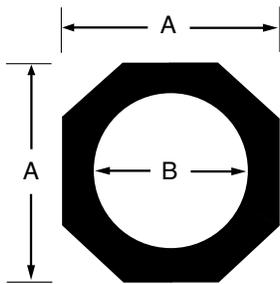
BLOCK LENGTH	MAXIMUM APPROXIMATE STATIC LOAD PER BLOCK IN POUNDS (TONS)*		
	SMALL	MEDIUM	LARGE
1"-24"	88,500 (44)	126,000 (63)	169,500 (84)
24½"-30"	87,000 (43)	123,000 (61)	166,000 (83)
30½"-36"	84,000 (42)	120,500 (60)	162,000 (81)
36½"-42"	81,500 (40)	117,500 (58)	159,000 (79)
42½"-48"	79,000 (39)	114,000 (57)	156,000 (78)
48½"-54"	76,500 (38)	112,000 (56)	152,000 (76)
54½"-60"	74,000 (37)	108,500 (54)	148,500 (74)

*The approximate static loads shown in this chart have a built-in safety factor of two.

WAY FURNISHED†	SMALL	MEDIUM	LARGE
	PART NO.	PART NO.	PART NO.
A	KTS561	KTS562	KTS563
B	KTS564	KTS565	KTS566
C	KTS554	KTS555	KTS556

†Powder coating available on request—please consult the factory.

OCTAGONAL SAFETY BLOCKS



	SMALL	MEDIUM	LARGE
A	5 $\frac{5}{8}$ "	5 $\frac{1}{2}$ "	6 $\frac{3}{4}$ "
B	3 $\frac{1}{2}$ "	4 $\frac{1}{4}$ "	5 $\frac{1}{4}$ "

WEIGHT OF BLOCKS	
SMALL	0.833 lb/in
MEDIUM	1.12 lb/in
LARGE	1.58 lb/in

To determine the number of safety blocks required, the static load each safety block will support, and the length of each block, please refer to pages 2-3.

The octagonal safety blocks can be furnished four different ways:

- Cut to length with a hole and pin for an interlock chain and with an adjustable screw device and/or base plate installed (order adjustable screw device and/or base plate separately; see below and page 6)
- Cut to length with a hole and pin for an interlock chain or wedges
- Cut to length only
- In a nine-foot length

MAXIMUM APPROXIMATE STATIC LOAD PER BLOCK IN POUNDS (TONS)*

BLOCK LENGTH	SMALL	MEDIUM	LARGE
1"-24"	190,000 (95)	275,500 (137)	289,500 (144)
24 $\frac{1}{2}$ "-30"	173,000 (86)	258,000 (129)	258,000 (129)
30 $\frac{1}{2}$ "-36"	169,500 (84)	244,000 (122)	245,000 (122)
36 $\frac{1}{2}$ "-42"	164,500 (82)	232,000 (116)	234,500 (117)
42 $\frac{1}{2}$ "-48"	158,000 (79)	226,500 (113)	223,500 (111)
48 $\frac{1}{2}$ "-54"	155,500 (77)	226,000 (113)	211,000 (105)
54 $\frac{1}{2}$ "-60"	155,000 (77)	218,500 (109)	210,500 (105)

*The approximate static loads shown in this chart have a built-in safety factor of two.

	SMALL	MEDIUM	LARGE
WAY FURNISHED†	PART NO.	PART NO.	PART NO.
A	KTS589	KTS590	KTS591
B	KTS592	KTS593	KTS594
C	KTS595	KTS596	KTS597
D	KTS599	KTS600	KTS601

†Powder coating available on request—please consult the factory.

ADJUSTABLE SCREW DEVICE—FOR USE WITH OCTAGONAL SAFETY BLOCKS ONLY

This heavy-duty steel screw device is added to the octagonal shaped safety blocks. These screws are needed to prevent any space between the block and die when various dies are used or when the slide is adjusted.

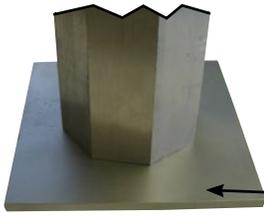


Note: If an adjustable screw device is mounted to an octagonal safety block, you must use the approximate static loads shown in the chart. This is because the adjustable screw devices will not hold as heavy a static load as the octagonal safety blocks by themselves.

ADJUSTABLE SCREW DEVICE			
OCTAGONAL SAFETY BLOCK SIZE	INCHES OF ADJUSTMENT	PART NO.	MAXIMUM APPROXIMATE STATIC LOAD PER ADJUSTABLE SCREW DEVICE IN POUNDS (TONS)*
SMALL	2"	KTS574	106,000 (53)
	4"	KTS584	102,500 (51)
	6"	KTS625	98,500 (49)
	8"	KTS626	94,500 (47)
	10"	KTS627	91,000 (45)
MEDIUM	2"	KTS575	73,000 (36)
	4"	KTS585	70,000 (35)
	6"	KTS628	67,000 (33)
	8"	KTS629	64,000 (32)
	10"	KTS630	61,000 (30)
LARGE	6"	KTS598	189,000 (94)
	8"	KTS631	181,000 (90)
	10"	KTS632	174,000 (87)
	12"	KTS624	167,000 (83)

*The approximate static loads shown in this chart have a built-in safety factor of two.

SAFETY BLOCK BASE



This safety block base can be added to U-shaped, octagonal-shaped, and X-shaped safety blocks. The base adds stability to help prevent the die block from tipping over. Available in 1/2" thick steel or aluminum.

Safety Block Base

STEEL BASES FOR U-SHAPED AND OCTAGONAL-SHAPED SAFETY BLOCKS		
PART NO.	DESCRIPTION	DIMENSIONS
STL053	MINI BASE	6" X 6"
STL049	SMALL BASE	8 $\frac{1}{8}$ " X 8 $\frac{1}{8}$ "
STL050	MEDIUM BASE	9 $\frac{1}{2}$ " X 9 $\frac{1}{2}$ "
STL051	LARGE BASE	10 $\frac{3}{4}$ " X 10 $\frac{3}{4}$ "

STEEL BASES FOR X-SHAPED SAFETY BLOCKS		
PART NO.	DESCRIPTION	DIMENSIONS
STL057	SMALL X-BASE	4" X 4"
STL058	LARGE X-BASE	6" X 6"

ALUMINUM BASES FOR OCTAGONAL-SHAPED SAFETY BLOCKS		
PART NO.	DESCRIPTION	DIMENSIONS
KTS638	SMALL BASE	6" X 6"
KTS640	MEDIUM BASE	8" X 8"
KTS641	LARGE BASE	10" X 10"

ALUMINUM BASES FOR X-SHAPED SAFETY BLOCKS		
PART NO.	DESCRIPTION	DIMENSIONS
KTS637	SMALL X-BASE	4" X 4"
KTS639	LARGE X-BASE	6" X 6"

SAFETY WEDGES

These wedges prevent hazardous movement of the press slide if a space is created between the block and die when various dies are used or when the slide is adjusted. All cut-to-length wedges are furnished with a 24" chain. Available in aluminum or hardwood.



Two-Piece Aluminum Safety Wedges

SAFETY WEDGES FOR SAFETY BLOCKS	
PART NO.	DESCRIPTION
KTS571	6" ALUMINUM WEDGE FOR SMALL BLOCKS
KTS572	7" ALUMINUM WEDGE FOR MEDIUM BLOCKS
KTS573	8" ALUMINUM WEDGE FOR LARGE BLOCKS
KTS570	ALUMINUM WEDGE MATERIAL IN A 9' LENGTH
KTS642	HARDWOOD WEDGE FOR ALL BLOCK SIZES

HOLDERS

These holders are designed to accept U-shaped, octagonal, X-shaped, and adjustable safety blocks. They are constructed of heavy-gauge steel and painted safety orange. The holders attach easily to the machine with two 1/4" fasteners. A strap is furnished with each holder to keep the block in place. Safety wedges can also be stored in the holders.



HOLDERS	
PART NO.	DESCRIPTION
KTS003	8" X 8" X 14"
KTS005	10 $\frac{1}{2}$ " X 10 $\frac{1}{2}$ " X 14"
KTS019	10 $\frac{1}{2}$ " X 10 $\frac{1}{2}$ " X 24"
KTS020	12" X 12" X 30"

LIFTING HANDLE—PART NO. KTS633

The aluminum lifting handle is a convenient option for all safety blocks that are used frequently.



ELECTRICAL INTERLOCK SYSTEMS

According to ANSI B11.19, safety blocks "shall be interlocked with the machine to prevent actuation of hazardous motion of the machine." The following interlock systems will satisfy this requirement. The interlock must be interfaced into the control system so that when the plug is pulled, the power to the main drive motor and control is disconnected. If the machine has a mechanical energy source, such as a flywheel, it must come to rest before the die block can be inserted. The interlock system is available in a yellow plug with one contact or an orange plug with two contacts. The interlock system includes the plug, a 24" long chain, a receptacle, and an electrical mounting box.

Part No. KTS518

One-contact interlock system with 24" chain

Part No. KTS533

Two-contact interlock system with 24" chain



KTS518

**WARNING LABELS—
PART NO. KST323 ENGLISH
PART NO. KST323S—SPANISH**

The warning label illustrated to the right is provided with all safety blocks and should be affixed directly to each safety block. If a safety block is not tall enough for the label to fit, affix it to a prominent location on the machine. All personnel operating or working around the machine must be required to read, understand, and adhere to all warnings on this label. If the label becomes destroyed or unreadable, it **MUST** be replaced. Contact the factory immediately for a replacement label and do not operate the equipment until the warning label is in place.



MAXIMUM LOAD LABEL—PART NO. KST330

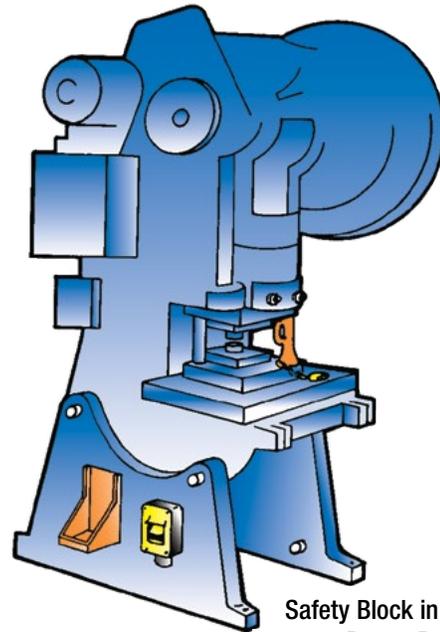
The maximum load label shown to the right is provided with all safety blocks and is affixed directly to each safety block. If the label becomes destroyed or unreadable, contact the factory for a replacement label. The maximum load in tons should be written legibly on the label in permanent marker based on the maximum load chart.



ADJUSTABLE DIE SAFETY BLOCKS



These adjustable safety blocks feature a tough malleable-iron bell-bottom base, a convenient handle for lifting, and precision-cut acme threads for easy adjustment and extra rigidity. The adjusting screw can be easily adjusted up or down by hand. Turning holes are also provided in the screw neck to facilitate the use of a turning bar, if required.



Safety Block in Use on a Power Press

PART NO.	CAPACITY IN TONS	LENGTH CLOSED	+ SCREW ADJUSTMENT	+ LENGTH SCREW ADJUSTMENT UP	BASE DIAMETER	WEIGHT IN POUNDS	SAFETY BLOCK HOLDER PAR NO.
KTS522	10	12¾"	7¼"	20"	6½"	13	KTS003
KTS523	20	9½"	2¾"	12¼"	6⅝"	18	KTS003
KTS524	20	11½"	4½"	16"	6⅝"	22	KTS003
KTS525	20	17½"	9½"	27"	7¾"	35	KTS005
KTS526	24	11¾"	3¼"	15"	7¼"	31	KTS005
KTS527	24	15¾"	6½"	22¼"	7⅝"	40	KTS005
KTS528	24	21¾"	12"	33¼"	9¼"	56	KTS005



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MACHINE SAFEGUARDING SEMINARS

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Quotes from Past Participants

- *The seminar has a lot of information on the safety of presses. Anyone with a press operation needs to attend*
- *It was what I expected*
— *very informative*
- *Instructors are very knowledgeable*
- *I thoroughly enjoyed the seminar and picked up a lot of very valuable information*
- *Excellent presentation*
- *Best training I've had in years*
- *The hands-on experience was great*
- *This seminar is, perhaps, the most comprehensive coverage that I have heard on this subject. The course is a "must" for anyone involved in machinery guarding or operational set-up*

ROCKFORD SYSTEMS' QUALIFICATIONS

For many years Rockford Systems has been educating corporations throughout the world on machine safeguarding. Every year, hundreds of people attend these seminars. Participants come from a variety of areas including manufacturing, distribution, aerospace, insurance, government, and consulting. They include safety directors, plant managers, maintenance and engineering personnel, setup people, safety specialists, loss-control engineers, and safety consultants. Seminar instructors are very knowledgeable and have many years of experience in the machine tool industry.

MACHINE SAFEGUARDING SEMINAR OVERVIEW

According to safety standards, when a machine creates a hazard to operators and other employees in the machine area, it must be safeguarded. Rockford Systems offers a machine safeguarding seminar to teach people in positions of responsibility how to safeguard the point of operation and other machine hazards to meet these safety standards.

This 2½-day seminar explains how to interpret the performance language of both OSHA (Occupational Safety and Health Administration) and ANSI (American National Standards Institute) standards. Specific machine safeguarding situations are also discussed. Another section of the machine safeguarding seminar provides basic safeguarding guidelines for other metalworking machines using the ANSI B11-series safety standards.

Seminars combine classroom discussion with demonstrations of machines under power. Hands-on experience with these machines and visual aids, including slides and videos, are also used. These teaching methods enable the participants to interpret the OSHA and ANSI standards as they relate to their specific machine applications and production requirements.

DAY-TO-DAY OUTLINE OF SAFEGUARDING SEMINAR

Day 1 8:00 a.m. to 5:00 p.m.

- Welcome, Introduction, and Objectives of Seminar
- Brief History of ANSI, OSHA, and NFPA-79
- Risk Reduction
- OSHA 29 CFR 1910.211, Definitions
- OSHA 29 CFR 1910.212, General Requirements for All Machines and Auxiliary Equipment
- OSHA 29 CFR 1910.217 Mechanical Power Presses
- ANSI B11.1-2009 Mechanical Power Presses
- Full-Revolution-Clutch Identification and Control Requirements
- Part-Revolution-Clutch Identification and Control Requirements
- Control Reliability and Brake Monitoring
- Electrical Component Requirements (NFPA-79)
- Hand-Feeding Tools
- Point-Of-Operation Safeguarding—Guards, Devices, Methods
- Design, Construction, Setting, and Feeding of Dies
- Inspection and Maintenance Records
- Instruction to Operators
- Reports of Injuries
- Mechanical Power-Transmission Apparatus (OSHA 1910.219)

Day 2 8:00 a.m. to 5:00 p.m.

- ANSI B11.2 Hydraulic Power Presses
- ANSI B11.3 Power Press Brakes
- ANSI B11.4 Shears
- ANSI B11.5 Iron Workers
- ANSI B11.6 Lathes (Manually Operated)
- ANSI B11.7 Cold Header and Cold Formers
- ANSI B11.8 Drilling, Milling, and Boring Machines
- ANSI B11.9 Grinding Machines
- ANSI B11.10 Metal Sawing Machines
- ANSI B11.11 Gear Cutting Machines
- ANSI B11.12 Roll Forming and Roll Bending Machines
- ANSI B11.13 Automatic Screw/Bar and Chucking Machines
- ANSI B11.14 Coil Slitting Machines/Systems Withdrawn—See ANSI B11.18
- ANSI B11.15 Pipe, Tube, and Shape Bending Machines
- ANSI B11.16 Metal Powder Compacting Presses
- ANSI B11.17 Horizontal Hydraulic Extrusion Presses
- ANSI B11.18 Coil Processing Slitting/Blanking
- ANSI B11.19 Safeguarding Methods (Criteria)
- ANSI B11.20 Integrated Manufacturing (Cells)
- ANSI B11.21 Machine Tools/Laser (Cutting)
- ANSI B11.22 CNC Turning Centers and Lathes
- ANSI B11.23 Machining Centers—CNC Mills, Drills, Boring
- ANSI B11.24 Transfer Machines
- ANSI/SPI B151.1 Horizontal (Plastic Injection Molding Machines)

Day 2 (Continued)

- BS ISO 14137 and JIS B6360 Electrical Discharge (EDM) Machines
- ANSI B152.1 Hydraulic Die Casting Presses
- ANSI/RIA R15.06—1999 & 2012 Robots and Large Work Envelopes
- OSHA 1910.147 Control of Hazardous Energy Lockout/Tagout

Day 3 8:00 a.m. to 10:00 a.m.

- Machine Demonstrations

SEMINAR MATERIALS

Each person attending this seminar receives a variety of information regarding machine safeguarding which includes reprints of the following:

- OSHA 29 CFR 1910.211, 1910.212, 1910.217, and 1910.219
- Charts and graphs for future reference
- Safeguarding product catalogs
- U.S. Department of Labor memorandums
- Mechanical Power Press Safety Information Card
- Safety Distance Guide Slide Chart
- Folding, Metal OSHA Guard-Opening Scale
- Laminated function-testing checklists for safeguards

SEMINAR REGISTRATION FORM



2½-Day "Machine Safeguarding" Seminar

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City _____ State/Province/Region _____ ZIP/Postal Code _____

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Name _____ Title/Position _____

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