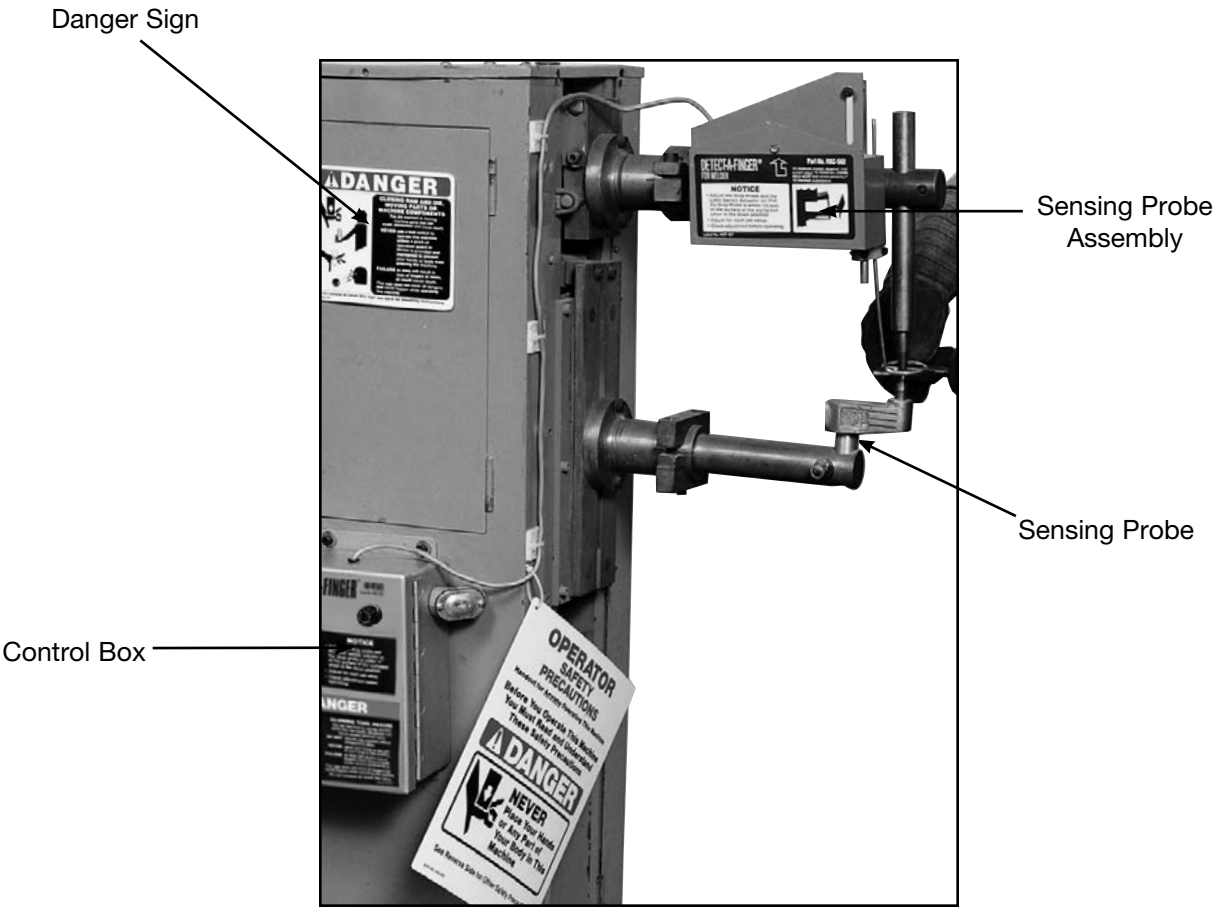
ROCKFORD SYSTEMS, LLC

INSTALLATION MANUAL FOR
DETECT-A-FINGER® DROP PROBE DEVICE FOR RESISTANCE-TYPE SPOT WELDERS



IMPORTANT: PLEASE REVIEW THIS ENTIRE PUBLICATION BEFORE INSTALLING, OPERATING OR MAINTAINING THIS DEVICE.

5795 Logistics Parkway • Rockford Systems, LLC, Illinois 61109-2695 • Toll-Free 1-800-922-7533 • Phone 815-874-7891
Fax 815-874-6144 • Web Site www.rockfordsystems.com • E-Mail customerservice@rockfordsystems.com
Instruction Manual No. KSL-022

Safety Precautions

DANGER **DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.**

This safety alert symbol identifies important safety messages in this manual. When you see this symbol, be alert to the possibility of personal injury, and carefully read the message that follows.

CAUTION **CAUTION used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.**

Efficient and safe machine operation depends on the development, implementation and enforcement of a safety program. This program requires, among other things, the proper selection of point-of-operation guards and safety devices for each particular job or operation, a thorough safety training program for all machine personnel, that includes instruction on the proper operation of the machine, the point-of-operation guards and safety devices on the machine, and a regularly scheduled inspection and maintenance program.

Rules and procedures covering each aspect of your safety program should be developed and published both in an operator's safety manual, as well as in prominent places throughout the plant and on each machine. Some rules or instructions which must be conveyed to your personnel and incorporated into your program include:

DANGER **Never place your hands or any part of your body in this machine.**

DANGER **Never operate this machine without proper eye, face and body protection.**

Never operate this machine unless you are fully trained, instructed, and have read the instruction manual.

Never operate this machine if it is not working properly – stop operating and advise your supervisor immediately.

Never use a foot switch to operate this machine unless a point-of-operation guard or device is provided and properly maintained.

Never operate this machine unless two-hand trip, two-hand control or presence sensing device is installed at the proper safety distance. Consult your supervisor should you have any questions regarding the proper safety distance.

Never tamper with, rewire or bypass any control or component on this machine.

A company's safety program must involve everyone in the company, from top management to operators, since only as a group can any operational problems be identified and resolved. It is everyone's responsibility to implement and communicate the information and material contained in catalogs and instruction manuals to all persons involved in machine operation. If a language barrier or insufficient education would prevent a person from reading and understanding various literature available, it should be translated, read or interpreted to the person, with assurance that it is understood.

FOR MAINTENANCE AND INSPECTION ALWAYS REFER TO THE OEM's (ORIGINAL MACHINE MANUFACTURER'S) MAINTENANCE MANUAL OR OWNER'S MANUAL. If you do not have an owner's manual, please contact the original equipment manufacturer.

Safety References

OSH ACT AND FEDERAL REGULATIONS

Since the enclosed equipment can never overcome a mechanical deficiency, defect or malfunction in the machine itself, OSHA (Occupational Safety and Health Administration) has established certain safety regulations that the employers (users) must comply with so that the machines used in their plants, factories or facilities are thoroughly inspected and are in first-class operating condition before any of the enclosed equipment is installed.

1. U.S. Government—An Act—Public Law 91-596, 91st Congress, S. 2193, December 29, 1970:

Duties

SEC. 5. (a) Each employer—

(1) SHALL FURNISH TO EACH OF HIS EMPLOYEES EMPLOYzMENT AND A PLACE OF EMPLOYMENT WHICH ARE FREE FROM RECOGNIZED HAZARDS THAT ARE CAUSING OR ARE LIKELY TO CAUSE DEATH OR SERIOUS PHYSICAL HARM TO HIS EMPLOYEES;

(2) shall comply with occupational safety and health standards promulgated under this Act.

(b) Each employee shall comply with occupational safety and health standards and all rules, regulations, and orders issued pursuant to this Act which are applicable to his own actions and conduct.

2. OSHA 29 CFR Sections that an employer (user) must comply with include:

1910.211 Definitions.

1910.212 General requirements for all machines.

1910.217 Mechanical power presses.

1910.219 Mechanical power-transmission apparatus.

3. OSHA 29 CFR 1910.147 The control of hazardous energy (lockout/tagout).

4. OSHA Publication

"General Industry Safety and Health Regulations Part 1910," Code of Federal Regulations, Subpart O

This publication can be obtained by contacting:
U.S. GOVERNMENT PRINTING OFFICE
P.O. BOX 979050
St. Louis, MO 63197-9000
(202) 512-1800

ANSI SAFETY STANDARDS FOR MACHINES

The most complete safety standards for machine tools are published in the ANSI (American National Standards Institute) B11 series. The following is a list of each ANSI B11 Standard available at the printing of this publication.

B11–2008	General Safety Requirements
B11.1	Mechanical Power Presses
B11.2	Hydraulic Power Presses
B11.3	Power Press Brakes
B11.4	Shears
B11.5	Iron Workers
B11.6	Lathes
B11.7	Cold Headers and Cold Formers
B11.8	Drilling, Milling, and Boring Machines
B11.9	Grinding Machines
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 (Now see ANSI B11.18)
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 Safeguarding
B11.20	Integrated Manufacturing Systems
B11.21	Lasers
B11.22	CNC Turning Machines
B11.23	Machining Centers
B11.24	Transfer Machines
B11.TR1	Ergonomic Guidelines
B11.TR2	Mist Control Considerations
B11.TR3	Risk Assessment
B11.TR4	Programmable Electronic Systems (PES/PLC)
B11.TR5	Sound Level Measurement Guidelines
B11.TR7	Risk Assessment
R15.06	Robotic Safeguarding
B15.1	Mechanical Power Transmission Apparatus
B56.5	Guided Industrial Vehicles and Automated Function of Manned Industrial Vehicles
B65.1	Printing Press Systems
B65.2	Binding and Finishing Systems
B65.5	Stand-Alone Patten Presses
B151.1	Horizontal (Plastic) Injection Molding Machines
B152.1	Hydraulic Die Casting Presses
B154.1	Rivet Setting Machines
B155.1	Packaging Machinery
01.1	Woodworking Machinery

These standards can be purchased by contacting:

ANSI—American National Standards Institute
25 West 43rd Street
New York, New York 10036
Phone: (212) 642-4900
www.ansi.org

(Continued on next page.)

NATIONAL SAFETY COUNCIL SAFETY MANUALS

Other good references for safety on machine tools are the National Safety Council's Safety Manuals. These manuals are written by various committees including the Power Press, Forging and Fabricating Executive Committee. Copies of the following publications are available from their library:

- Power Press Safety Manual - 5th Edition
- Safeguarding Concepts Illustrated - 7th Edition
- Forging Safety Manual

These manuals can be obtained by contacting:

National Safety Council
1121 Spring Lake Drive
Itasca, IL 60143-3201
1-800-621-7615
www.nsc.org

OTHER SAFETY SOURCES

National Institute of Occupational Safety and Health (NIOSH)
4676 Columbia Parkway
Cincinnati, OH 45226
Toll-Free: 1-800-35-NIOSH (1-800-356-4674)
Phone: (513) 533-8328
www.cdc.gov/niosh

OTHER SAFETY SOURCES (continued)

Robotic Industries Association (RIA)
900 Victors Way, Suite 140
P.O. Box 3724
Ann Arbor, MI 48106
Phone: (734) 994-6088
www.roboticsonline.com

NEMA (National Electrical Manufacturers Association)
1300 North 17th Street, Suite 1847
Rosslyn, VA 22209
Phone: (703) 841-3200
www.nema.org

NFPA (National Fire Protection Association)
1 Batterymarch Park
Quincy, MA 02269-9101
Phone: (617) 770-3000
www.nfpa.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.

Warranty, Disclaimer and Limitation of Liability

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. ROCKFORD SYSTEMS LLC'S OBLIGATION UNDER THIS WARRANTY IS EXPRESSLY AND EXCLUSIVELY LIMITED to repairing or replacing such products which are returned to it within the warranty period with shipping charges prepaid and which will be disclosed as defective upon examination by Rockford Systems, LLC. This warranty will not apply to any product which will have been subject to misuse, negligence, accident, restriction and 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.

DISCLAIMER

The foregoing Warranty is made in lieu of all other warranties, expressed or implied, and of all other liabilities and obligations on the part of Rockford Systems, LLC, including any liability for negligence, strict liability, or otherwise, and any implied warranty of merchantability or fitness for a particular purpose is expressly disclaimed.

LIMITATION OF LIABILITY

Under no circumstances, including any claim of negligence, strict liability, or otherwise, shall Rockford Systems, LLC be liable for any incidental or consequential damages, or any loss or damage resulting from a defect in the product of Rockford Systems, LLC.

Operator Safety Precautions Sign

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 this machine which could result in the 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. **Never** use a foot switch to operate this machine unless a point-of-operation guard, shield, or device is provided and properly maintained.
4. **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.
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 understand all operating instructions. Make sure you know how the machine works and how it is controlled.
7. **Never** operate this machine until you test the machine with its guard or safety device before you start or restart 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.
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. **Never** operate this machine with pullbacks (if furnished) unless they are adjusted properly for you. Have your supervisor demonstrate that when the ram descends, the pullbacks will pull fingers clear of any pinch points. Always wear your wristlets properly and securely.
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. Obtain, read, and follow these instructions.
11. **Never** operate this machine unless two-hand trip, two-hand control, or presence-sensing device (if furnished) is installed correctly and at the proper safety distance. Consult your supervisor if you have any questions regarding the proper safety distance.
12. **Never** operate this machine unless the light curtain (if furnished) is interfaced into the machine control system properly. Only mute during the non-hazardous part of the machine cycle; blanking should be discouraged.
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 auxiliary 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 daydream) 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 this machine unless power is off and locked out, flywheel is at rest, safety blocks are used between dies, and all energy (electrical, air, hydraulic, etc.) are in a zero state.
19. **Always** be prepared if 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 apparatus (flywheels, 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 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.

Front

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 this machine which could result in the 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. **Never** use a foot switch to operate this machine unless a point-of-operation guard, shield, or device is provided and properly maintained.
4. **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.
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 understand all operating instructions. Make sure you know how the machine works and how it is controlled.
7. **Never** operate this machine until you test the machine with its guard or safety device before you start or restart 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.
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. **Never** operate this machine with pullbacks (if furnished) unless they are adjusted properly for you. Have your supervisor demonstrate that when the ram descends, the pullbacks will pull fingers clear of any pinch points. Always wear your wristlets properly and securely.
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. Obtain, read, and follow these instructions.
11. **Never** operate this machine unless two-hand trip, two-hand control, or presence-sensing device (if furnished) is installed correctly and at the proper safety distance. Consult your supervisor if you have any questions regarding the proper safety distance.
12. **Never** operate this machine unless the light curtain (if furnished) is interfaced into the machine control system properly. Only mute during the non-hazardous part of the machine cycle; blanking should be discouraged.
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 auxiliary 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 daydream) 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 this machine unless power is off and locked out, flywheel is at rest, safety blocks are used between dies, and all energy (electrical, air, hydraulic, etc.) are in a zero state.
19. **Always** be prepared if 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 apparatus (flywheels, 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 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.

Back

Accompanying this equipment is an 8½" x 11" operator safety precautions sign, Part No. KSC-000, for anyone operating the machine where this equipment will be installed. These precautions are to be given to all operators, including setup people, maintenance personnel and supervisors.

This sign should also be attached to the machine, readily accessible and visible to the operator. (A hole in the corner of this precautions sign is provided for attaching purposes.) Additional copies of these precautions are available. Please call, write, fax, or use the order form found on a later page in this manual.

When a language barrier or insufficient education prevents a person from reading or understanding the contents of this operator safety precautions sign, you should either translate this information or have it read or interpreted to the person. Make sure that the person understands the information. To order this sign in Spanish, use Part No. KSC-000S; in French, use Part No. KSC-000F.

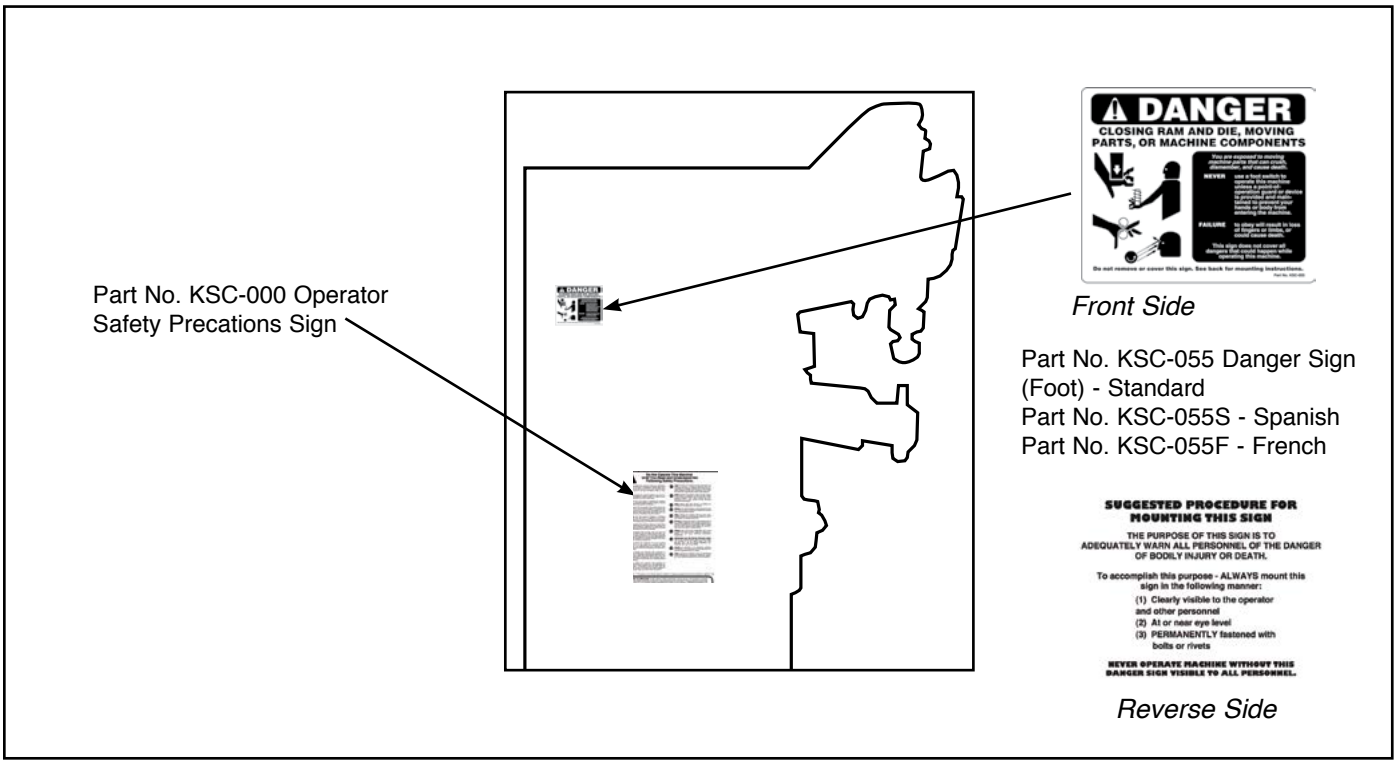
These precautions must be reviewed daily.

Danger Sign(s) to be Mounted on Machine

Accompanying this equipment is a 5" x 6" polyethylene danger sign, Part No. KSC-055. This sign MUST BE PERMANENTLY MOUNTED IN A PROMINENT LOCATION on the machine where this equipment is installed. This sign must be in a LOCATION THAT IS EASILY VISIBLE to the operator, setup person, or other personnel who work on or around this machine. ALWAYS mount this sign with bolts or rivets when installing the enclosed equipment.

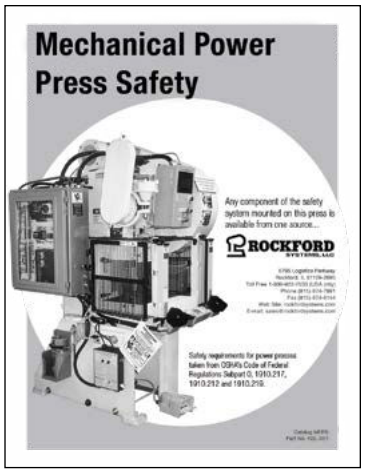
If any danger sign becomes destroyed or unreadable, the sign **must** be replaced immediately. Contact factory for replacement danger sign(s).

Never operate this machine unless the danger sign(s) is in place.



"Mechanical Power Press Safety" Booklet

A copy of Booklet No. MPPS (*Mechanical Power Press Safety*) is available upon request. This booklet is copied verbatim from the CFR (Code of Federal Regulations) and contains all relevant sections of the OSHA standards concerning power presses with which an employer (user) must comply. The enclosed equipment must be installed, used and maintained to meet these standards. Specifically, any time a foot switch is used, a suitable **point-of-operation safeguard or device must be used** to prevent bodily injury. In addition, **every press must be provided with a point-of-operation safeguard!** Please review this booklet before installing the enclosed equipment. If you are unfamiliar with these detailed safety regulations, which include regulations on safeguarding the point of operation properly, you may want to attend our regularly scheduled machine safeguarding seminars. To obtain detailed information about these training seminars, please call, fax, write, or check our Web site. Our telephone, fax number, Web site, and mailing address are on the front cover of this manual.



General Overview

The purpose of the Detect-A-Finger® Drop Probe Device is to effectively reduce accidents on applications where the operator's fingers may enter the point of operation. The components of this system are a sensing probe shaped to fit over or around the workpiece, a drop-probe assembly, and a control box. When the operator initiates a weld cycle, the sensing probe is released and drops by gravity over or around the workpiece. If the operator's fingers are still in the danger area, the sensing probe cannot reach its preset down position and the welder is prevented from cycling. Conversely, if no obstruction prevents the sensing probe from dropping, then as soon as it reaches its preset down position, the control unit will allow the welder to cycle.

The control unit is ruggedly built to assure continued successful operation under adverse operating conditions usually found around this type of machinery. For additional safety, the control relay in the control unit (when properly wired into the machine system) will prevent cycling of the machine accidentally or intentionally. This can be confirmed by moving the sensing probe manually without actuating the operating means.

Components in the System

- Control box
- Drop-probe assembly
- Sensing probe (2)—to be formed by user
- Sensing probe clamp
- Danger signs

Additional components that may be required

- Disconnect switch
- Transformer
- Lockout valve
- Foot switch

For mechanically operated welders:

- Air cylinder assembly
- Solenoid air valve
- Air filter-regulator-guage and lubricator assembly

Specifications

Detect-a-Finger® Assembly—RKC-500

CONTROL BOX

Input voltage	115 ± 15% VAC, 50/60Hz
Operating current	0.6 Amps typical
Weight	approx. 8.5 lb

SENSING PROBE ASSEMBLY

Input voltage	24 ± 15% VAC, 50/60Hz (supplied from control box)
Operating current	3.0 Amps typical
Duty cycle	25% (10-second max. continuous on-time)
Stroke	1.63 (1⅝) inches maximum
Mechanical life	Rotary solenoid–100 million operations
Weight	approx. 3.5 lb

SENSING PROBE (UNFORMED)

Wire size	.156 dia. x 18 inches long
Material	Aluminum rod (standard)
Total weight	approx.0.5 lb (probe and clamp)

Preliminary Steps Before Installation

Before proceeding with the installation of the enclosed equipment, you should undertake the following preliminary steps.

1. Read and make sure you understand this entire installation manual.
2. Refer to the front cover, other line drawings and photos, then make a sketch of your installation to plan the location of the enclosed equipment on the machine.
3. **Please make sure the machine is in first-class condition.** Before starting any installation, it is essential that the machine is thoroughly inspected. Be sure all mechanical components and all collateral equipment are in first-class operating condition. Your inspection should be done according to the machine manufacturer's installation and maintenance instruction manual. If you have any doubts or questions concerning the condition of the machine, contact the machine manufacturer for assistance. **Repair or replace all parts not operating properly before proceeding.**

Inspection and maintenance programs must be established and implemented to keep machines in first-class condition. Safety programs must include thorough inspections of each machine on a weekly basis and records kept of these inspections. Any part of the machine that is worn, damaged or is not operating properly must be replaced immediately or repaired before the machine is used.

4. Verify that the machine is in first-class condition and operating properly; shut off all power to the machine. Padlock all electrical and pneumatic energy in the off position and do not actuate the machine again until the installation of all package components has been completed. Lockout/tagout energy isolation procedures must always be practiced and enforced.

The operator must be protected from all hazards. All applicable sections of OSHA Section 1910.212 must be complied with on all machines where this equipment is installed.

The Detect-A-Finger® controls are applicable on most types of resistance welders. The function of the Detect-A-Finger® device, when properly installed, adjusted and maintained, is to keep the operator from inadvertently cycling the machine with fingers in the point of operation. This control only provides an interface between the foot switch and the welder controller which will not allow stroke initiation unless the area being probed is cleared of all obstructions. To accomplish this protection, the Detect-A-Finger® must be properly installed on the machine and the device must be properly maintained and adjusted by the user. A properly designed sensing probe must be used and additional sensing probe safeguarding must be provided where applicable. This device does not protect the operator if fingers are placed above the sensing probe.

Before starting any installation work, it is imperative the welder be inspected to exhibit proper operation. Run the welder in a normal operating sequence to determine proper operation. Do not install the Detect-A-Finger® on a welder that does not function properly. When the welder is operating satisfactorily, shut off the power with the disconnect switch and do not operate the welder again until installation is complete. Use of a lockout device and padlock on the disconnect handle must be used during this period.

The maintenance and inspection section in this manual cannot be all-inclusive for maintaining welders. Always refer to the original welder manufacturer's maintenance manuals or owner's manual. If you do not have an owner's manual, please contact the welder manufacturer.

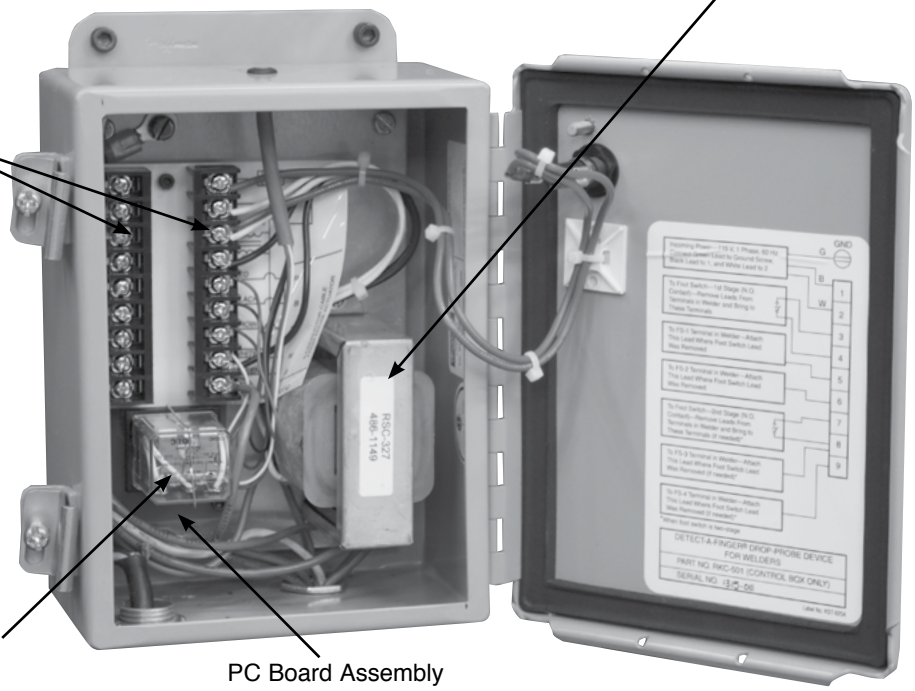
NOTE: The Detect-A-Finger® does not change the operation of the machine. This interface only interrupts the foot switch signal. If this welder is capable of continuous operation while the foot switch is held, then an interface will be required to have the sensing probe drop before each cycle of the welder.

Control Box

The RKC-500 series Detect-A-Finger® system control box is housed in a NEMA enclosure (approximately 6¼" wide by 9½" high by 4½" deep) and consists of a through-the-door fuse holder, relay, terminal strips, transformer, and PC board assembly. Mount the control box in a convenient location—the area around the control box should be kept clear and be easily accessible for wiring and maintenance.

All electrical power to the machine must be off before mounting, wiring, or servicing the control box.

Fuse and Fuse Holder



Transformer

Terminal Strips

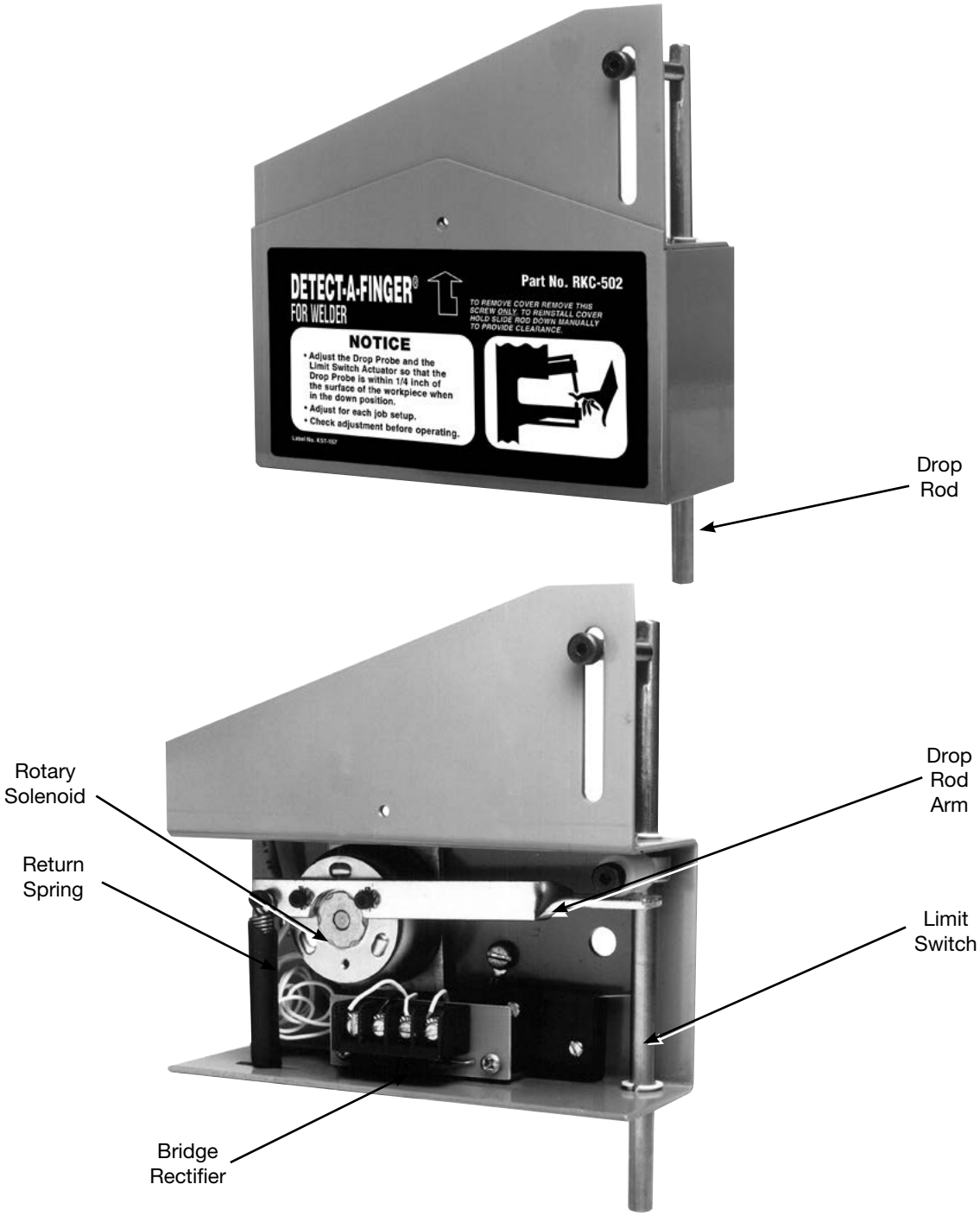
Relay

PC Board Assembly

Sensing Probe Assembly

The drop rod is allowed to drop by gravity when the rotary solenoid is energized. The action arm return spring returns this assembly when the power is removed. The DC voltage for the rotary solenoid is obtained from a full-wave bridge rectifier. The drop rod is guided in nylon bearings for long life and smooth operation. The limit switch actuates the control relay in the control box at the end of the drop rod stroke.

Mount the sensing probe assembly as far forward as possible to allow for adjustments and electrode maintenance, and to provide for minimum angle of the sensing probe. This position will also contribute to a long mechanical life of the device since it minimizes the side loading on the drop rod bearings.

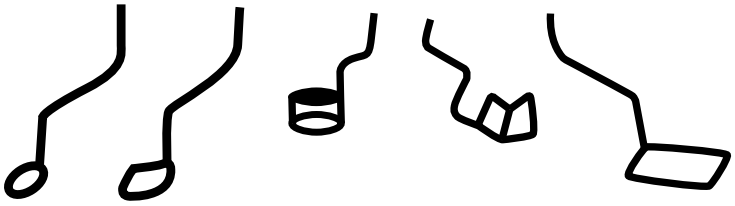


Sensing Probe

Two 18-inch pieces of 5⁄32 (.156) inch diameter aluminum rods are furnished with each Detect-A-Finger®. Other materials or custom made configurations may also be used. The only restriction is the total weight of the probe assembly (including the clamp). The action-arm return spring is capable of returning 0.5 pounds maximum. The user must determine and form the best shape to accommodate the particular part being run. This device must be designed, constructed and arranged to create a protected area, and to prevent engagement of the machine. In pneumatic and hydraulic-powered machines, this device must prevent energizing of the control valve when an operator's finger or other part of the body is within the hazardous area.

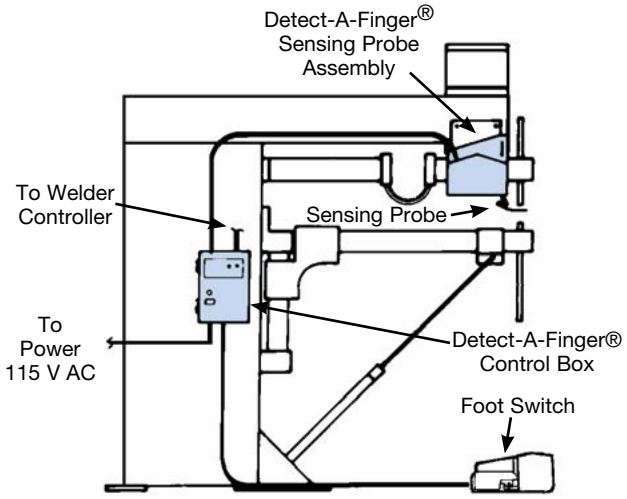
The bottom of the drop rod, in its full down position, should barely clear the workpiece. This location allows for final positioning. If special mounting brackets are fabricated, they must be able to support the sensing probe assembly and withstand any shock and vibration that may be encountered during machine operation. Be sure to insulate any and all special brackets from the electrodes.

Examples of how the drop-probe rods can be fabricated

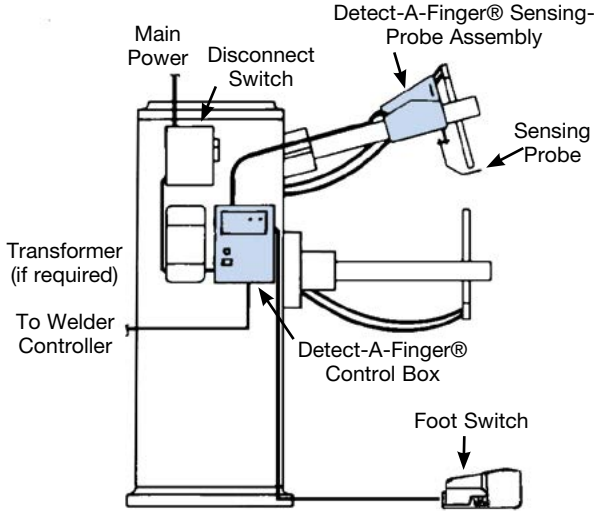


TYPICAL APPLICATIONS

PRESS-TYPE RESISTANCE WELDER



ROCKER-ARM-TYPE RESISTANCE WELDER



Other Components That May Be Required

Main Power Disconnect Switch

A main power disconnect switch may have been supplied in the package shipment. This switch is designed to disconnect the primary voltage to the machine and lock it out. Refer to the enclosed wiring schematics for proper wiring of this switch.

OSHA regulation 1910.217 (b)(8), ANSI standards B11.1 and B11.3 require that:
A main power disconnect switch capable of being locked in the off position shall be provided with every control system.

If the machine already has a main power disconnect switch, it must be checked for the locking off and lockout feature. Some switches use construction which can be easily altered mechanically to comply with this requirement. If this is not possible, or an electrical disconnect switch is not provided, then you must obtain and install a proper disconnect switch. Please contact Rockford Systems, LLC if a disconnect switch is needed.

Transformer—Part No. RSF-021

An enclosed transformer—Part No. RSF-021—may have been supplied with this shipment. This enclosed transformer is a 100-VA, 230/460-V primary and a 115-V fused secondary unit. The fuse is 1 A, 230 V and it is accessible from the outside of the transformer housing.

Air lockout valve

(If furnished—See enclosed manual KSL-098)

An air lockout valve is usually attached to the inlet end of a filter-regulator-lubricator assembly. This three-way valve is operated with the manual movement of a slide that opens and closes the valve. The valve can only be locked out when the slide is in the closed position. Downstream air is automatically exhausted when the valve is locked out.

Air Lockout Valve

Foot Switch (If furnished—See enclosed manual KSL-001)

Foot Switch
Part No. CTD-011

To meet OSHA and ANSI safety requirements, a foot switch must be protected from unintentional operation. This foot switch pedal is protected on the top and both sides by the cast cover and the front is protected by the hinged flap. Always follow the wiring schematics for proper wiring connection and be sure to maintain the foot switch in first-class condition.

It is the responsibility of the employer (user) to always provide an appropriate guard and/or device to prevent bodily injury whenever a foot switch is used to initiate a machine cycle.

The guard and/or device must be properly installed, used, and maintained. The safeguard must prevent personnel from receiving bodily injuries.

Other Components That May Be Required For Mechanically Operated Welders

Most welders are controlled electrically, pneumatically or mechanically; if not, other components may be required. Review this section for typical applications of the Detect-A-Finger®. Accessory equipment and components, such as solenoid air valves or air cylinders are available from Rockford Systems for your convenience. If you require assistance on the application of such components, please contact the factory.

Mechanical to Electro-Pneumatic Conversion—Convert from mechanical operation by removing the treadle and replacing it with an air cylinder. The cylinder bore and stroke (push or pull type) can be determined from actual machine measurements and the location of attachment to the welder linkage. The air cylinder is controlled by a 3-way normally closed 120 VAC solenoid air valve. Adjustable flow control valves may be employed to smooth the welder arm movement and a filter-regulator-lubricator and pressure gauge assembly is also required. The Detect-A-Finger® controls the solenoid air valve.

RCL Series Air Cylinders (If furnished—See enclosed manual KSL-096)

One of the following pull-type air cylinders may be adequate to operate the welder:
Single-acting spring-return air cylinders are usually supplied with a swivel-clevis mount as standard. Other special cylinders, such as clevis mount, flange mount (either end) or foot mount are also available. They can be push-type (spring inside cylinder), or pull-type (spring on cylinder rod, as illustrated above). The main consideration must be that the cylinder is a single-acting spring-return type (not double acting) to meet best safety practices. When mounting the cylinder, be sure it is secured in such a manner that it will not vibrate loose, bind or rub on some other part of the machine.

	RCL-001	RCL-002	RCL-003
Machine Size (Tons)	¼ to 7	8 to 35	36 to 70
Size (Bore x Stroke)	1⅛" x 1"	1½" x 1"	2" x 2"
Pull Force (@ 75 PSI)	50 lb	100 lb	200 lb
NPT Port Size	¼"	¼"	¼"

Pull-Type Air Cylinder

zThe assembly consists of the cylinder, two mounting feet, mounting pin, drive yoke, drive pin, and yoke lock nut. This assembly is illustrated at the bottom of page 14. Locate this assembly on the machine so that the feet can be mounted to a convenient surface. The yoke should be attached to the welder linkage, and the air inlet should be oriented toward the air solenoid valve location.

The air cylinder should be mounted in the most logical position to operate the welder linkage most efficiently. **The main requirement in locating the cylinder assembly, is that the piston rod will have a straight, in-line pull (or push) when attached to the operating linkage. When applying an air cylinder to the machine, make sure that the cylinder rod, yoke or any moving parts will not bind after installation.** Adjust so that the air cylinder bottoms at the end of each stroke. The air cylinder will operate in any position. The operating linkage may be connected to the air cylinder by any convenient means. Be sure the rod stroke is not too long because it could cause jackknifing of the cylinder. If this is a concern shorter stroke cylinders are available. Too much air pressure may damage the operating linkage. Please consider these points when installing any air cylinder.

Make certain that the drive yoke and lock nut are located approximately halfway down on the threaded portion of the piston rod in order to provide for either up or down adjustment when necessary. Attach one end of the flexible rubber hose in the threaded cylinder inlet port and tighten firmly.

Note: Threaded air joints do not generally require sealant; however, "Teflon" tape may be used to prevent leakage.

Other Components That May Be Required For Mechanically Operated Welders (continued)

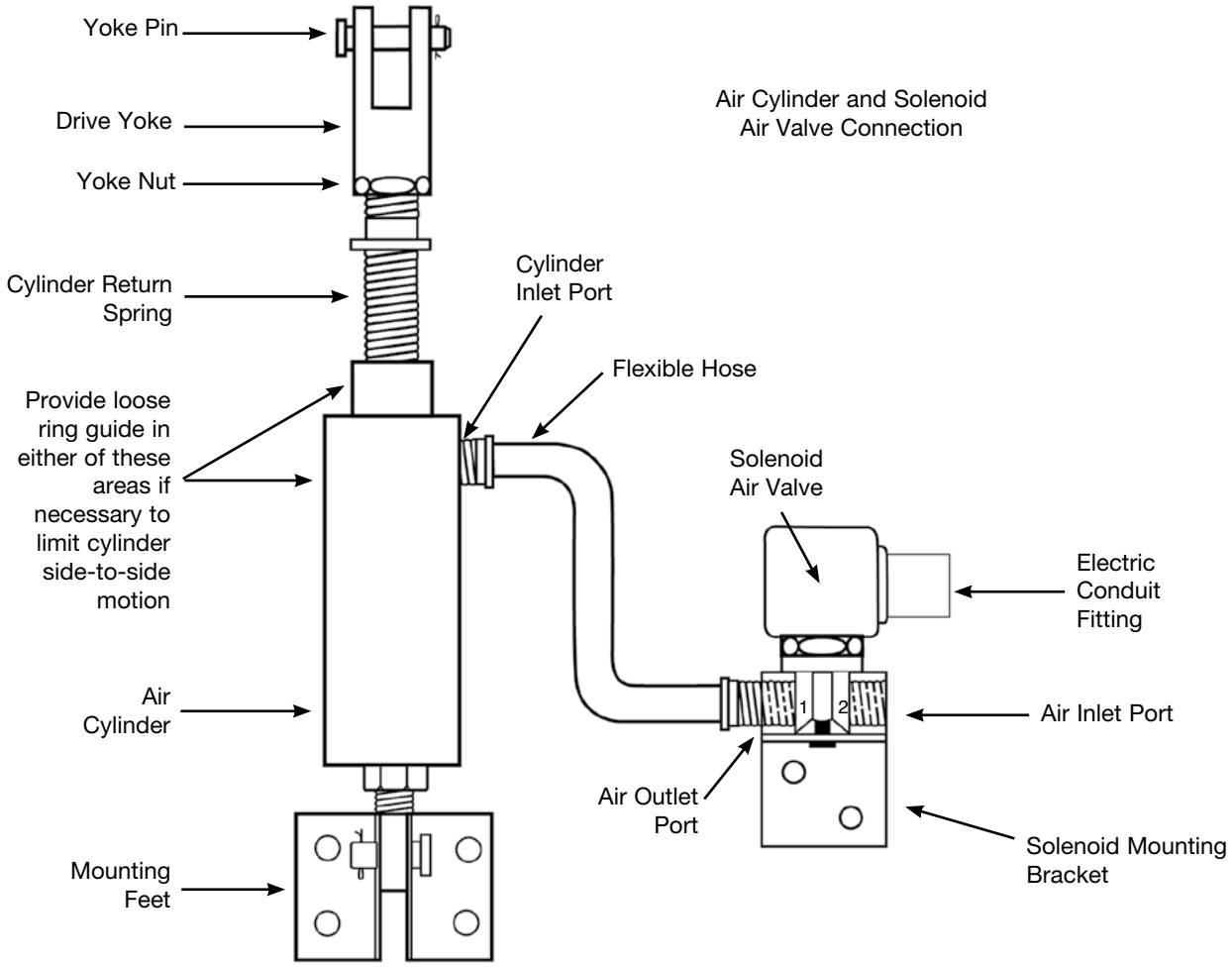
Solenoid AiR Valve Assembly (If furnished—See enclosed manual KSL-151)

Solenoid Air Valve Assembly Part No. RCD-006

The solenoid air valve is a three-way, normally closed, quick exhaust type. This assembly consists of the electric air solenoid valve, steel mounting bracket, and flexible hose. Assemble the mounting bracket to the base of the valve and orient this assembly so that the air outlet port (marked "1" on the valve body) points toward the air cylinder and is within reach of the flexible hose. Next attach this hose to the No. 1 port of the solenoid valve and mount the valve assembly on the machine allowing sufficient flexibility to accommodate cylinder movement. (See diagram below.) **It is extremely important to use the rubber hose provided for the connection between the solenoid valve and the air cylinder. It provides the necessary flexibility, size and length for proper exhaust of cylinder air, all of which are required for successful machine operation.**

Mount the solenoid valve assembly in a vertical position. The electrical conduit fitting can be easily adjusted to face in any horizontal direction by loosening the hex nut at the top and turning the enclosure. Retighten this nut after locating the fitting. Saddle-clamp type terminals are provided on the solenoid for wiring.

Exhaust air muffler must be kept clean at all times. Never operate machine unless muffler is clean.

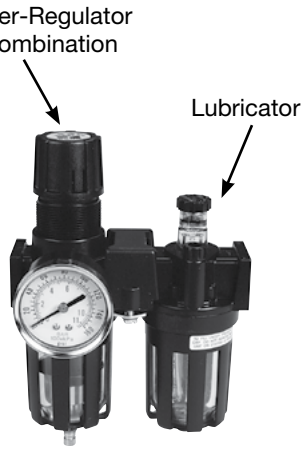


Other Components That May Be Required For Mechanically Operated Welders (continued)

Filter-regulator-lubricator (frl) assembly (If furnished—See enclosed manual KSL-208)

The filter cleans air that goes to the solenoid air valve (and air cylinder, if furnished). The regulator and gauge are used to adjust air pressure. The lubricator keeps the solenoid air valve or the air cylinder (if required) properly lubricated.

The filter-regulator unit with one threaded pipe plug, lubricator, gauge, mounting bracket, and a connector or nipple are shipped together.



Filter-Regulator-Lubricator Assembly
Part No. RCL-043

Unpack the filter-regulator unit and install the connector between the filter-regulator-lubricator (see arrow for air flow direction). Tighten this assembly and position the two units with both bowls in alignment. Be sure to check air flow direction and the location of the valve to avoid excessive piping.

Choose an appropriate location on the machine for mounting this assembly. If possible, it should be accessible from floor level.

Install the pressure gauge in the threaded port opposite the mounting surface and plug the unused port. Attach the mounting bracket to the machine and then mount the FRL assembly using the lock nut supplied.

The length of the air line run is not critical; however, the port and pipe sizes should be maintained.

Fill the lubricator with a good quality lubricant (see OEM's specifications) to the level indicated by the maximum fill line on the transparent reservoir. **Do not overfill**. When the machine is cycled, the lubricator drip rate may be adjusted according to the instruction manual. Please check the machine owner's manual for proper specifications for oil, if required. Some clutch and brake assemblies do not require lubrication.

The air filter must be kept clean at all times. Never operate the machine unless the air filter is clean.

The lubricator must not be filled while under pressure.

Regulate the air pressure high enough to develop sufficient pull (or push) to operate the welder mechanically. **Never apply more than 145 PSI.**
Bring shop air supply to the welder. Connect the air supply at the threaded opening, indicated as **In** by the direction arrow on the filter-regulator. Maintain minimum ¼" pipe size.

Important—Blow air line clear of all dirt, scale, etc., before connecting filter. Drain water out of filter bowl when filled. If bowl fills with water in a short period of time, install a larger filter in your main air supply line leading to the welder.

It is recommended that a manual shut-off valve be installed in the main line ahead of the filter-regulator-lubricator assembly and close to the welder for convenience and lockout.

Other Installation Considerations

PIPING

1. An air lockout valve must be installed in the air line usually just before the filter-regulator-lubricator assembly to meet OSHA 29 CFR 1910.147 Lockout/tagout requirements. However, a separate lockout valve could be furnished for each air system on the machine such as counterbalance, clutch/brake, air cylinder, and blow-off.
2. From the lockout valve, connect at the In threaded opening of the filter-regulator. Try to maintain an appropriate pipe size throughout for proper air flow. Connect the piping to the ports using teflon tape on the male threads only. Do not allow tape to enter the interior of the filter-regulator-lubricator, valve, or air cylinder. Before applying air pressure, make sure the filter and regulator bowls are at least hand tight.
3. Most approved pipe or hose can be used on the welder. Make sure the size is consistent throughout the system in order to avoid restriction. Keep air runs as short as possible.
4. See enclosed filter-regulator-lubricator (FRL) assembly Manual No. KSL-208 for additional details.

CAUTION

All air components require clean air. Blow all lines clean of water, dirt, scale, etc., before making final connection. Drain water from filter bowl regularly. Should this bowl refill in a short period of time, it may indicate the need for a larger filter in the main air supply line or an air line dryer system. The air filter must be kept clean at all times. Never operate the machine unless the air filter is clean and water is drained.

WIRING

National Electrical Code and NFPA 79 practices are usually followed for wiring the system, which includes color-coding and the use of numbered wire markers on both ends of every wire. The size of wire depends on local ordinance—number 14 stranded copper wire with an approved insulation is recommended.

DO NOT USE SOLID WIRE.

1. Install and wire the main disconnect switch (unless one already exists) using black wire. Follow wiring instructions shown on the electrical schematics. Make certain this switch is capable of being locked in the off position only. Complete wiring diagrams are provided for connecting all controls and components properly. The foot switch should be installed so it is readily available to the machine operator.
2. Bring 120 V AC 3-wire service to the Detect-A-Finger® control box. Ground should be connected to the green ground screw. Connect the hot side of 120 V AC to terminal 1. Connect the common to terminal 2. If 120 V AC is not available on the welder, then a transformer must be incorporated to step down the line voltage. This transformer must be rated in accordance with load requirements.
3. Connect the foot switch as follows:
   Single stage—NO contact to terminals 3 and 4
   Two stage—NO contact of 1st stage to terminals 3 and 4
   NO contact (NC held open) of 2nd stage to terminals 7 and 8
   Connect a green wire from the ground terminal in the foot switch to the green ground screw in the Detect-A-Finger® control box.
4. Connect the welder controller—terminal 5 to FS-1 and terminal 6 to FS-2. If two stage, connect terminal 8 to FS-3 and terminal 9 to FS-4.
5. Connect the sensing probe assembly—connect the 5-conductor cable provided between the color-coded terminals shown on the wiring diagram. W White, R Red, B Black, BR Brown, G Green Ground Wire

Note: The drop rod when activated will drop and then, if probe area is clear, the welder will cycle and the drop rod will return immediately without releasing the foot switch. If the drop rod needs to stay down until the foot switch is released, a jumper may be placed between the R and BR terminals.

Operating Procedure

1. Apply power. If the power does not come on, check that the main disconnect switch is on, fuse is connected, and check for proper wiring.
2. Measure the incoming voltage at terminals 1 and 2. It should be 115 V AC ± 15%. Shut off power for the next step.
3. The sensing probe should be in position over the workpiece and formed to protect the required area. Move the drop rod manually to the point where the limit switch (in the control box) is actuated and locate the sensing probe to be no more than 1⁄4 inch above the workpiece. Check this adjustment periodically and before every setup.
4. Reapply power—the welder should be ready to cycle. Depress the foot switch. The Detect-A-Finger® rotary solenoid should energize, permitting the drop rod to drop until the limit switch is actuated. The limit switch now energizes the control relay and the relay contacts close, energizing the welder controller or operating device (solenoid). The welder electrodes should close thus permitting the parts to be welded.

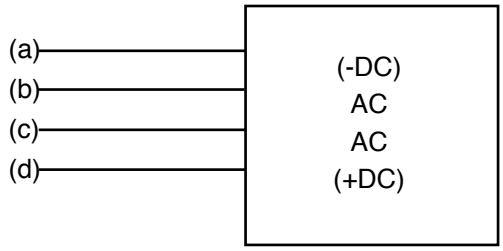
Troubleshooting
Voltage Measurement Troubleshooting

SYMPTOM	TEST POINTS	READING	PROBLEM
"Power On" Indicator Will Not Light	Terminal 1-2	0 60 V AC	No primary power. Transformer wired for 460 V AC, 230 applied.
		230 V AC	Transformer wired for 230 V AC, 460 applied.
		115 V AC	Proper voltage applied, continue.
	Terminal 2 to wire common with fuse and light to door	0	Fuse blown, replace.
		115 VAC	Defective lamp, replace.
"Power On" Indicator is Lit, Rotary Solenoid Will Not Energize	Terminal 3-W	0	Transformer defective, replace.
		24 V AC	Proper voltage, continue.
	Terminal 4-W with foot switch depressed	0	Foot switch defective or improperly connected, locate problem and correct.
		24 V AC	Proper voltage, continue.
	Terminal BR-W with foot switch depressed and sensing probe held up	0	Relay contact (N.C.) defective, replace relay.
		24 V AC	Proper voltage—bridge rectifier or rotary solenoid defective. See resistance measurement section.
No Power Rotary Solenoid Will Not Energize "Power On" Rotary Solenoid Energizes, Welder Will Not Cycle	Terminal R-W with foot switch depressed	0	Limit switch not being actuated or limit switch defective. Replace limit switch.
		24 VAC	Proper voltage—relay coil open.
	Disconnect FS1 and 2 from Terminals 5 and 6.		
	Terminals 5-6 (Single stage)	Carefully check continuity with test light or ohmmeter when the foot switch is depressed. The relay contact should close. If not, replace relay. If the relay contact closes properly, the problem is with the welder operating device or wiring is defective. Check continuity with an ohmmeter. Reconnect FS1 and 2.	
"Power On" Rotary Solenoid Energizes, Welder 1st Stage (Squeeze) Operates, 2nd Stage (Weld) Will Not Function	Disconnect FS3 and 4 from Terminals 8 and 9.		
	Terminals 7-9 and 7-8 (2nd stage)	Carefully check continuity with test light or ohmmeter when the foot switch is depressed. The relay contact (Terminals 7-9) should close. The foot switch contact (Terminals 7-8) should close. If not, replace the defective component. If these contacts (Terminals 8-9) close properly, the problem is with the welder controller. Reconnect FS3 and 4.	

Troubleshooting

Resistant Measurement Troubleshooting

TERMINAL		RESISTANCE OHMS
From	To	
a	b	700
b	a	∞
a	c	700
c	a	∞
d	b	∞
b	d	700
d	c	∞
c	d	700



Power off with components not connected.

Bridge Rectifier, Terminal Identification

Readings may vary slightly from meter to meter. However, the trend established between infinity (∞) and the lower readings must remain consistent throughout the test. Any unusual reading means the bridge rectifier is defective and must be replaced.

Transformer: Primary - 20 Ohms approx.

Secondary - 2 Ohms approx.

Rotary Solenoid - Resistance 7.72 Ohms.

AC solenoid air valves of the type usually supplied by Rockford Systems, LLC have approximately

100 Ohms DC resistance.

Replacement Parts

REPLACEMENT PARTS FOR CONTROL BOX RKC-501

Part No.	Description
RFT-017	Relay
RSC-327	Transformer
RTY-003	Fuse 1 Amp
FTL-020	PC Board

REPLACEMENT PARTS FOR SENSING PROBE ASSEMBLY RKC-502

Part No.	Description
CMF-108	Rotary Solenoid
FKC-101	Spring
CMC-020	Limit Switch
FTL-020	PC Board

REPLACEMENT KITS

Part No.	Description
FCT-042	Hardware Mounting Kit
FCT-044	Drop Rod Assembly Repair Kit
FCT-041	Sensing Probe and Clamp

SECTION 5—ORDER FORM FOR SIGNS & LITERATURE—RMA FORM

Detect-A-Finger® Drop Probe Device-Welder

ORDER FORM FOR SIGNS AND LITERATURE

This instruction manual references signs and literature available for your machines. This order form is for your convenience to order additional signs and/or literature as needed. (This order form is part of your installation manual so please make a copy of it when ordering.)

Company _____

Address _____

City _____ State _____ Zip _____

Phone _____ Fax _____

Name _____ Purchase Order No. _____ Date _____

Part No.	Description	Quantity Required
KSL-022	Instruction Manual—Detect-A-Finger® For Welder	_____
KSC-000	Operator Safety Precautions Sign—Metalforming (English)	_____
KSC-000S	Operator Safety Precautions Sign—Metalforming (Spanish)	_____
KSC-000F	Operator Safety Precautions Sign—Metalforming (French)	_____
KSC-055	Danger Sign (Closing Ram and Die) 5” x 6” (English)	_____
KSC-055S	Danger Sign (Closing Ram and Die) 5” x 6” (Spanish)	_____
KSC-055F	Danger Sign (Closing Ram and Die) 5” x 6” (French)	_____
KSL-051	*Mechanical Power Press Safety* Booklet	_____

For prices and delivery, please use address, phone or fax number listed on the front cover of this manual.

Your Signature _____ Date _____

RETURN MATERIALS AUTHORIZATION REQUEST FORM

To return material for any reason contact the sales department in our organization at 1-800-922-7533 for an RMA Number. All return materials shipments must be prepaid. Complete this form and send with material to 5795 Logistics Parkway, Rockford, IL 61109. Make sure the RMA Number is plainly identified on the outside of the shipping container.

Company _____

Address _____

City _____ State _____ Zip _____

Phone _____ Fax _____

Contact Name _____ Representative _____

Items Authorized To Return on RMA No. _____ Original Invoice No. _____ Date _____

Part No. _____ Serial No. _____ Description _____

Service Requested: ☐ Full Credit ☐ 25% Restocking ☐ Repair & Return ☐ Warranty Replacement

Reason for return (describe in detail): _____

Return Materials Authorized By _____ Date _____