ROCKFORD SYSTEMS, LLC

INSTRUCTION MANUAL FOR
STM(STOP-TIME Measuring) Device

IMPORTANT: PLEASE REVIEW THIS ENTIRE PUBLICATION BEFORE OPERATING OR MAINTAINING THE STOP-TIME MEASURING DEVICE.

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Manual No. KSL-220

SECTION 1—TABLE OF CONTENT

Stop-Time Measurement Device

SAFETY PRECAUTIONS

⚠ DANGER **Danger is used to indicate the presence of a hazard which WILL cause SEVERE personal injury if the warning is ignored.**

" ⚠ " **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.**

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 and a thorough safety training program for all machine personnel. This program should include instruction on the proper operation of the machine, instruction on 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 and instructed and unless you 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 by pass 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 EQUIPMENT MANUFACTURER'S) MAINTENANCE MANUAL OR OWNER'S MANUAL. If you do not have an owner's manual, please contact the original equipment manufacturer.**

OSHA'S 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. 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 employment 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'S CODE OF FEDERAL REGULATIONS, SUBPART O, THAT AN EMPLOYER (USER) MUST COMPLY WITH INCLUDE:

Section 1910.211 Definitions
Section 1910.212 (a) General Requirements for all Machines
Section 1910.217 Mechanical Power Presses
Section 1910.219 (b)(1) Mechanical Power-Transmission Apparatus (Fly wheel and Gear Covers)

3. OSHA'S 29 CODE OF FEDERAL REGULATIONS, SUBPART J 1910.147 THE CONTROL OF HAZARDOUS ENERGY (LOCKOUT/TAGOUT)

4. OSHA'S PUBLICATIONS

General Industry Safety and Health Regulations Part 1910," Code of Federal Regulations,Subpart O
"Concepts and Techniques of Machine Safeguarding, "OSHA 3067, Revised 1992

These publications can be acquired by contacting:

US Department of Labor
Occupational Safety and Health Administration
Washington, DC 20210
(202) 219-5257

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.

B11.1	Mechanical Power Presses
B11.2	Hydraulic Presses
B11.3	Power Press Brakes
B11.4	Shears
B11.5	Ironworkers
B11.6	Lathes
B11.7	Cold Headers and Cold Formers
B11.8	Drilling, Milling and Boring
B11.9	Grinding Machines
B11.10	Sawing Machines
B11.11	Gear Cutting Machines
B11.12	Roll Forming and Roll Bending
B11.13	Automatic Screw/Bar and Chucking
B11.14	Coil Slitting Machines
B11.15	Pipe, Tube and Shape Bending
B11.16	Metal Powder Compacting Presses
B11.17	Horizontal Hydraulic Extrusion Presses
B11.18	Coil Processing Systems
B11.19	Performance Criteria for the Design, Construction, Care and Operation of Safeguards as Referenced in the Other B11 Machine Tool Safety Standards
B11.20	Safety Requirements for Manufacturing Systems/Cells
B11.21	Lasers
B11.22	CNC Turning Machines
B11.23	Machine Centers
B11/TR1	Ergonomic Considerations for the Design, Installation and Use of Machine Tools
B11/TR2	Mist Control
B11/TR3	Hazard ID and Control
B11/TR4	Control Reliability

These standards can be purchased by contacting:

American National Standards Institute, Inc.
11 West 42nd Street
New York, New York 10036
(212) 642-4900

OR

AMT- (Association of Manufacturing Technology)
7901 Westpark Drive
McLean, Virginia 22102-4269
(703) 827-5211

NATIONAL SAFETY COUNCIL SAFETY MANUALS AND DATA SHEETS

Other good references for safety on machine tools are the National Safety Council's Safety Manuals and Data Sheets. These manuals and data sheets are written by various committees including the Power Press, Forging and Fabricating Executive Committee. The following publications are available for all types of machines:

MANUALS

Power Press Safety Manual - 4th Edition
Safeguarding Concept Illustrations - 6th Edition
Forging Safety Manual

DATA SHEETS

Bench and Pedestal Grinding Wheel Operations 1 2304-0705
Boring Mills, Horizontal Metal 12304-0269
Boring Mills, Vertical 12304-0347
Coated Abrasives 12304-0452
Cold Shearing Billets and Bars in the Forging Industry 12304-0739
Degreasing (Liquid), Small Metal Parts 12304-0537
Dies, Setup and Removal of Forging Hammer 12304-0716
Drill Presses, Metalworking 12304-0335
Drills, Portable Reamer 12304-0497
Drop Hammers, Steam 12304-0720
Electrical Controls for Mechanical Power Presses 12304-0624
Forging Hammer Dies, Setup and Removal of 12304-0716
Forging Presses, Mechanical 12304-0728
Gear-Hobbing Machines 12304-0362
Handling Materials in the Forging Industry 12304-0551
Kick (Foot) Presses 12304-0363
Lathes, Engine 12304-0264
Milling Machines, Metalworking 12304-0364
Planers, Metal 12304-0383
Power Press (Mechanical) Point-of-Operation Safeguarding, Concepts of 12304-0710
Power Press Point-of-Operation Safeguarding: Two-Hand Control and Two-Hand Tripping Devices 12304-0714
Power Press Point-of-Operation Safeguarding: Type A and B Movable Barrier Devices 12304-0712
Power Press Point-of-Operation Safeguarding: Point-of-Operation Guards 12304-0715
Power Press Point-of-Operation Safeguarding: Presence Sensing Devices 12304-0711
Power Press Point-of-Operation Safeguarding: Pullbacks and Restraint Devices 12304-0713
Power Presses (Mechanical), Inspection and Maintenance of 12304-0603
Power Presses (Mechanical), Removing Piece parts from Dies in 12304-0534
Power Press, Setting Up and Removing Dies 12304-0211 Press Brakes 12304-0419
Robots 12304-0717
Saws, Metal (Cold Working) 12304-0584
Shapers, Metal 12304-0216
Shears, Alligator 12304-0213
Shears, Squaring, Metal 12304-0328
Upsetters, 12304-0721

These manuals and data sheets can be purchased by contacting:
National Safety Council, 1121 Spring Lake Drive
Itasca, IL 60143-3201, (630) 285-1121

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.

"MECHANICAL POWER PRESS SAFETY" BOOKLET

A copy of Booklet No. MPPS "Mechanical Power Press Safety" is available on request. This booklet is copied verbatim from the Federal Register and contains all pertinent sections of the OSHA Regulations concerning power presses with which an employer (user) must comply. The enclosed equipment must be installed, used and maintained to meet these regulations. Specifically, any time a foot switch is used, a suitable point-of-operation guard or device must be used to prevent bodily injury. Moreover, every press must be provided with point-of-operation safeguarding! If you are unfamiliar with these detailed safety regulations that include proper safeguarding of the point of operation or how to calculate the safety distance for light curtains or two-hand control, you may want to attend our regularly scheduled monthly seminars. To obtain additional detailed information about these training seminars, please call, fax, email, or write. Our address, telephone and fax numbers, and email address are on the front cover of this manual.

OSHA REGULATIONS AND ANSI STANDARDS

Electrical, pneumatic, or hydraulic equipment can never overcome a mechanical deficiency, defect or malfunction in the machine. OSHA (Occupational Safety and Health Administration) has established certain regulations for employers (users) to ensure that the machines used in their plants, factories or facilities are thoroughly inspected and are in first-class operating condition before safeguards are installed.

Before installing a light curtain or two-hand control, be sure that the applicable OSHA Regulations and the ANSI (American National Standards Institute) standards have been read and understood. For example, if a light curtain or two-hand control is going on a mechanical power press (punch press) with a part revolution clutch, the following are the requirements from OSHA:

SUBPART O, 1910.217, (C)(3)(III) PRESENCE SENSING DEVICES

(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).

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

D_S = 63 inches/second x 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). (See chart on next page.)

Note: When using a light curtain, please add the response time of the light curtain to the above formula.

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

(Continued on next page.)

OSHA REGULATIONS AND ANSI STANDARDS (continued)

(c)(3)(vii) 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 (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 inches/second x 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.

Single Stroke - Two-Hand Control

(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).)

Safety Distance Chart for the OSHA Formula Only

For quick, easy reference for the safety distance, refer to the chart below. Before the mounting location of the presence sensing device (light curtain) or two-hand control can be determined, the stopping time (T_S) of the press must be obtained. We suggest that this time be measured with a stop-time Measurement Device. Consult factory for information on portable stop-time devices or for stop-time devices that can be built into the control.

T_S = Stopping Time (seconds); D_S = Safety Distance (inches).

Table 1.1

T_S	D_S*	T_S	D_S*	T_S	D_S*	T_S	D_S*
.055	3-1/2"	.190	12"	.325	20-1/2"	.460	29"
.063	4"	.198	12-1/2"	.333	21"	.468	29-1/2"
.072	4-1/2"	.206	13"	.341	21-1/2"	.476	30"
.079	5"	.214	13-1/2"	.349	22"	.484	30-1/2"
.087	5-1/2"	.222	14"	.357	22-1/2"	.492	31"
.095	6"	.230	14-1/2"	.365	23"	.500	31-1/2"
.103	6-1/2"	.238	15"	.373	23-1/2"	.507	32"
.111	7"	.246	15-1/2"	.380	24"	.515	32-1/2"
.119	7-1/2"	.253	16"	.388	24-1/2"	.523	33"
.126	8"	.261	16-1/2"	.396	25"	.531	33-1/2"
.134	8-1/2"	.269	17"	.404	25-1/2"	.539	34"
.142	9"	.277	17-1/2"	.412	26"	.547	34-1/2"
.150	9-1/2"	.285	18"	.420	26-1/2"	.555	35"
.158	10"	.293	18-1/2"	.428	27"	.563	35-1/2"
.166	10-1/2"	.301	19"	.436	27-1/2"	.571	36"
.174	11"	.309	19-1/2"	.444	28"		
.182	11-1/2"	.317	20"	.452	28-1/2"		

**Based on the 63 inches/second hand speed constant.*

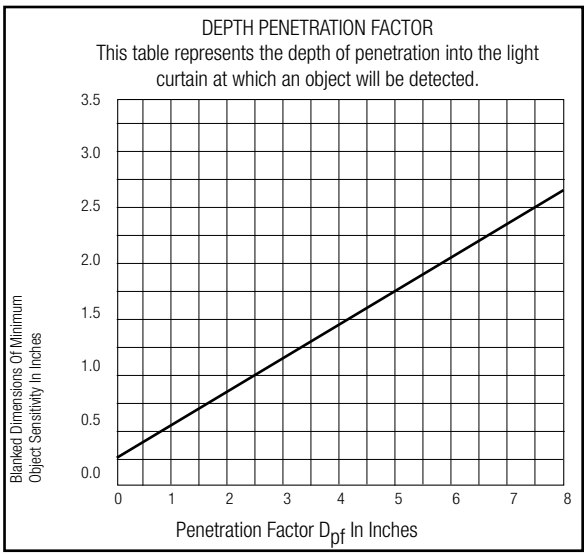
(Continued on next page.)

OSHA REGULATIONS AND ANSI STANDARDS (continued)

ANSI B11.1-1988 Safety Distance Formula for Presence Sensing Devices

According to the ANSI (American National Standards Institute) B11.1-1988, the total stopping time of the press (for presence sensing devices) should include the total response time of the presence sensing device, as stated by the manufacturer, the response time of the interface, the response time of the control system, the time it takes the press to cease slide motion, and the added time for brake monitoring (Tbm). The following formula should be used when calculating the safety distance to meet the ANSI Safety Standard:

$D_s = K (T_s + T_c + T_r + T_{bm}) + D_{pf}$ where:
K = the hand speed constant = 63 inches/second.
T_s = the stop-time of the press measured from the final deenergized control element, usually the air valve.
T_c = the response time of the control.
Note: T_s + T_c are usually measured by a stop-time measuring device.
T_r = the response time of the presence sensing device and its interface, if any, as stated by the manufacturer or
T_{bm} = the additional time allowed by the brake monitor before it detects stop-time deterioration.
D_{pf} = the added distance due to the penetration factor. The minimum object sensitivity is stated by the manufacturer. If beam blank-outs or floating window features are used,these figures should be added to the object sensitivity figure. No increase in safety distance is required for fixed-channel blanking applications if the blanked area is entirely occupied by the material or fixtures.



ANSI B11.1-1988 Safety Distance Formula for Two-Hand Control

According to ANSI B11.1-1988, the total stopping time of the press (for two-hand control) should include the total response time of the control system and the time it takes the press to cease slide motion. The following formula can be used when calculating the safety distance:

$D = K (T_s + T_c + T_{bm})$ where:
K = the hand speed constant = 63 inches/second.
T_s = the stop-time of the press measured from the final deenergized control element, usually the air valve.
T_c = the response time of the control.
Note: T_s+ T_c are usually measured by a stop-time measuring device.
T_{bm} = the additional time allowed by the brake monitor before it detects stop-time deterioration.
Note: When the press stroke STOP command or stopping performance monitor (brake monitor) timer or angle setting is changed, the safety distance should be recalculated.

OSHA REGULATIONS AND ANSI STANDARDS (continued)

On part revolution clutch presses, the clutch/brake control must have control reliability and brake monitoring (stop-performance monitor). The following are the requirements of OSHA:

(b)(13) Control reliability. When required by paragraph (c)(5), 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, 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 when used with the Type "B"gate or movable barrier must 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.

DESCRIPTION OF THE STM DEVICE

Preliminary Steps to Follow Before Using The Device

Before using the enclosed equipment, make sure to follow these preliminary steps.

1. Read and make sure you understand this entire Instruction Manual. Refer to the various photos and line drawings found throughout the manual, if necessary.

2. This STM (stop-time measuring) device has been carefully inspected and tested before shipment. Unpack the instrument and perform a visual inspection. After this inspection, open the instrument case and remove the accessories stored inside.

General Description and Overview

The STM (stop-time measurement) 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 and hydraulic presses or 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 find the stopping time of a machine before installing safeguarding devices such as a two-hand control or a presence sensing device (light curtain or radio frequency). It can also be used to determine the safety distance when installing and maintaining safety mats, emergency-stop devices and guard interlocks. 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.

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 stop signal must be 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.

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 or millimeters. The safety distance is usually based on the hand-speed constant of 63 inches(1.6 meters)/second. For mechanical power presses, the OSHA formula multiplies the hand-speed constant (63 inches/second) x the stopping time of the machine at 90°of crankshaft rotation. When using this formula, the reaction time of either ergonomic touch palm buttons or a presence sensing device should be added to the stopping time to calculate the proper safety distance.

(Continued on next page.)

Stop-Time Measurement Device

The formula found in the ANSI B11.1 Standard (Mechanical Power Presses) uses the stopping time measured during the hazardous portion of the stroke, plus the reaction time of ergonomic touch palm buttons or the existing presence sensing device (if either or both exist), plus the additional time or distance allowed by the brake monitor (stopping performance monitor). If a presence sensing device is the safeguard used, its minimum object sensitivity is also used to add additional distance to the calculated safety distance.

Components of the STM Device

The device consists of three major components:

1. the meter which is the processor containing the electronics and displays.
2. the position and velocity sensor which detects motion.
3. the hand-held actuator which automatically releases or pushes a button or other device on the machine. This actuator is preassembled for use with two-hand controls (see Figure 3.1 on page 14).It can also be used to operate the flag when presence sensing devices are used as the safeguarding method. If the hand-held actuator will be used with presence sensing devices, the push button plate and foot pad must be removed and the flag added (see photo 2.5 on page 13).

Other STM components and literature provided with this device are the presence sensing flag, wall transformer, hard and soft carrying case, and instruction manual. Optional equipment available includes a wheel encoder (for machines that stop beyond bottom or top dead center and for rotating machines), and a printer with cord for permanently recording measurements.

Operation of the STM Device

Prior to using the STM device, the battery should be fully charged. Open the carrying case and plug the hand-held actuator and sensor into the labeled receptacles on the meter. Set the sensor on the bed of the machine and attach the magnet and cable to the slide or other reciprocating machine component. With power to the meter, inch the machine to a point in the cycle where the stop signal is to be given and program this position. Bring the machine back to its start position and cock the hand-held actuator. Using the hand-held actuator,on one two-hand control and your free hand on the other, push down on the machine's actuating means(palm buttons) to start the machine cycle. When the machine cycle reaches the programmed stop point, the hand-held actuator releases the palm button, generating a stop signal. After the machine stops, the meter displays the stopping time in milliseconds and the safety distance in inches or millimeters. For complete step-by-step instructions, please refer to page 20.

When using the cable-operated sensor, the STM stops timing just before bottom dead center or top dead center (depending upon selection of measurement for downstroke or upstroke) on mechanical power presses and press brakes. This happens because of the linear motion of the slide. If the machine coasts beyond bottom or top dead center, the stop signal must be given sooner in the cycle or a tachometer must be used. Most machines that have high torque and fast-acting brakes will stop in time to provide accurate readings. To improve a machine's stopping ability, numerous improvements can be made to a mechanical power pressor press brake to provide faster stopping times such as:

- installing new brake lining(s)
- installing new brake spring(s)
- relocating the dual valve closer to the clutch and brake to exhaust air quicker
- having a properly sized dual valve for the application
- having properly sized air piping or hoses
- making sure the dual valve muffler is clean, unclogged, and working properly
- making proper air counterbalance adjustments based on the upper die weight.

(Continued on next page.)

SPECIFICATIONS

STM Meter

Dimensions.....8" Lx 3-1/2" H x 5" D
(200 x 135 x 100 mm)
Power Supply Input.....12 VDC @ 500mA
15V wall transformer
Operating Time.....approximately 10 hours
Display.....2 lines, 16 characters
back lit LCD
Memory.....128 kByte
Outputs.....Actuator, RS 232
Inputs.....Sensor, power

Actuator

Auto hand.....8-5/8"Lx 1-3/8"H x 1-3/8"D
Power Supply.....5 - 15 VDC
(from STM meter)

Weight

Total weight without printer.....8-1/2 lbs

Sensor

Dimensions....5-1/8" Lx 2-1/2" D x 2" H
Fixture.....Magnetic pads
Stroke Length of Cable.....45"

Printer (optional)

Method.....Pin
Paper Width.....2"
Characters.....24 per line
Interface.....RS 232
Power Supply 5VDC (from STM meter)

Part No. DCL-040 includes meter, sensor, hand-held actuator, presence sensing flag, wall transformer, carrying case, and instruction manual

OPTIONAL ACCESSORIES

Part No. DCL-036 printer with RS-232 plug and cord

(Continued on next page.)

METER

The meter is the main portion of the STM system. The front face of the meter has all the inputs and outputs. The screen displays the data that is necessary to use the STM. The three buttons below the display screen guide you through the programming menus as described on pages 16 - 26 of this manual.

The actuator plugs into the upper left receptacle and the sensor plugs into the lower left receptacle. The RS-232 port on the upper right is for a computer or printer. The power receptacle on the lower right is for power and recharging the battery.

To recharge the battery inside the meter, plug the transformer into a 120 volt duplex outlet. A solid green light indicates that the battery is charging. A flashing green light indicates when charging is done. When the battery is low, the display indicates “Low Battery” and allows 5 - 10 minutes of further testing.

To provide a longer life for the battery, completely discharge the battery before recharging. This can be accomplished in the MM TEST FUNCTION AND SERVICE section on page 21.

SENSOR

The sensor is the component that has two magnets; one on the cable that attaches to the reciprocating machine component (ram), and one that is attached to the bottom of the sensor enclosure to hold it in position. The cord and plug attach to the meter.

ACTUATOR

The actuator is a hand-held component that either releases or actuates a button or other initiating means on a machine. It also operates the flag which can interrupt a presence sensing device. The cord and plug attach to the meter.

(Continued on next page.)

FLAG

The flag attaches to the front of the actuator and is held in position by a set screw. Before inserting the flag, remove the pushbutton plate and the support foot. Use the allen wrench provided (located in the bottom of the actuator) to loosen and tighten the set screws.

PRINTER

The printer plugs into the RS-232 port on the front of the meter with the furnished cord and plug. No other power supply is needed. Select YES in the **PM PRINT VALUES** sub menu to activate the printer. Refer to page 23 in the **MM PRINT MANAGER** programming section of this manual for details.

SOFTWARE FLOWCHART

Refer to page 16 of this manual for the software flowchart. Next, refer to the Programming Section of this manual (pages 16 - 26) for details on each MM (Main Menu).

DEFINITIONS

Actuator – An electro-mechanical device which will **push** a palm button switch (typically a **stop** switch) or **release** a palm button switch (typically using an **inch** control or one of the two-hand controls on the machine) to initiate stopping when the sensor signals the proper point in the cycle to begin the test.

Flag – A device that will, when connected to the actuator and held just outside the sensing field of a presence sensing device, initiate a stop signal by blocking the sensing zone at the proper point in the stroke of the machine.

Hand Speed Constant – The generally agreed upon speed at which the operator's hands move toward the point of operation. Defined by OSHA as 63 inches per second.

Milliseconds (ms) – 1/1000 of a second (0.001 sec.)

OSHA or ANSI Safety Distance Formula – See pages 6 - 8 for details.

Point of Operation – The pinch point created by die or tool closure, guide pins, etc., closest to the operator.

Presence Sensing Device – A radio frequency,photo-electric (light curtain) or other device that will detect the presence of an object. These devices are usually mounted in a way that creates an electrical control stop signal when its field of sensitivity is interrupted.

Safety Distance (D_S) – The OSHA or ANSI required minimum distance between the operator's two-hand controls, presence sensing device, safety mat, emergency-stop device, guard interlock, and the point-of-operation hazard.

Sensor – A transducer that converts position, length, or distance into an electrical signal proportional to cable extension or retraction rate. This is done by converting linear motion into rotary motion.

SPM (Start Point of Measurement) – The point in the stroke where an automatic stop signal is given (usually on the downstroke of a power press or press brake).

Stop-Time (T_S) – The total time (measured in milliseconds) required to stop a machine.

Stopped Velocity – The ram velocity at the time the unit stops measuring.

BENCH TEST

Before using this STM device on a reciprocating machine, it can be bench tested. Your hand and arm can simulate the action of the ram or platen. Follow the step-by-step procedures in the next section for this test. Stopping times and safety distance will vary due to the inaccuracies in your arm movement.

USING THE STOP-TIME DEVICE

Before using this device, be sure that the battery is fully charged. The green indicator light will flash when it is fully charged.

An option is to use the STM device while it is plugged into a 120V duplex outlet. Plug the wall transformer into the outlet and the other end into the power port on the meter. Plug the actuator and sensor into the appropriate receptacles.

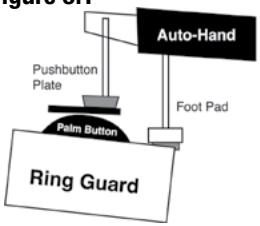
The meter can be removed or it can remain in the carrying case. For convenience, when testing several machines, you may want to leave the device in the case. Using the shoulder strap, you can test the machines without setting the device down. This may be very helpful in the industrial environment. Remove the sensor from the carrying case and place it on the bed or bolster of the machine. Never place the sensor where the dies can close on it.

With the machine at top dead center of crankshaft rotation or at top of stroke, place the magnet, which is on the end of the cable, on the ram or platen. Pull the cable out slowly and do not let it go. If the cable snaps back into the sensor, it could cause damage. Make sure the cable is free of any obstructions.

Photo 3.2

When checking the stopping time of a machine which has two-hand controls, the actuator is used. This actuator is designed to release or actuate the run button. Make sure the support foot and pushbutton plate are installed properly

Figure 3.1



The actuator must be cocked before using it for the test. Place the cocked actuator over one of the two-hand controls, while putting the other hand over the second two-hand control.

Operate both controls simultaneously. When testing the machine, the actuator releases at 90°(OSHA) causing the machine to stop.

Note: This actuator can also be used to push the emergency-stop button.

(Continued on next page.)

USING THE ACTUATOR WITH THE FLAG

The flag is designed for use with the actuator to test the entire control loop on machines equipped with photo-electric presence sensing devices (light curtains).

The object of this type of test is to initiate machine stopping by interrupting the presence sensing device. That is, place an obstruction in the sensing area of the device which will cause the device to actuate, thus stopping the machine. In this way, the response time of the entire "safeguarding system"from the device, through the machine electrical control circuit, valves, air exhaust, clutch release brake effectiveness are included in the resulting stop-time test (hydraulic and pneumatic machines do not stop in the same manner).

To install the flag on the actuator, remove the pushbutton plate and the support foot from the actuator with the allen wrench provided. Attach the flag to the actuator and tighten with the allen wrench.

Note: Make sure the flag is installed so the felt material will interrupt the sensing field of the light curtain. Hold the actuator just outside the sensing area of the light curtain.

When the actuator releases,the flag should penetrate the sensing area, initiating the machine stop signal.

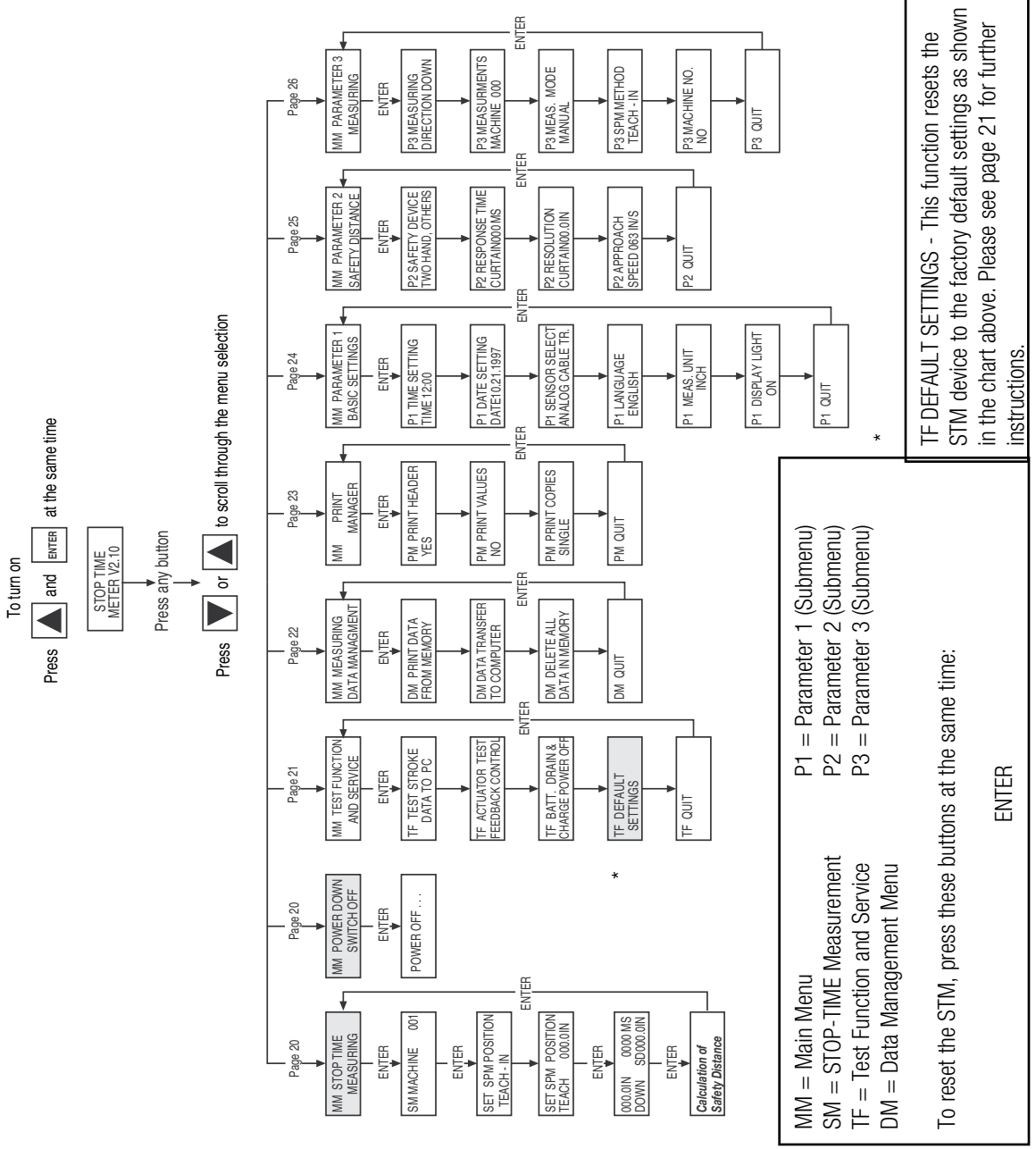
When the machine is cycled and reaches the 90°position in the stroke, a stop signal is initiated which energizes the actuator releasing the flag into the sensing area.

In order to get accurate readings, make sure the ram or plate has not closed completely, and that the machine has not gone through the bottom of the stroke (after the machine has stopped).

The displayed stopping time includes the presence sensing device, the machine control and brake response time.

Machines using presence sensing devices have other mandated control requirements (control reliability and brake monitors, for example) which should be in place and operating properly when testing the machine for its stopping time.

Note: When using the flag to check the stopping time of the machine, do not add the response time of the light curtain in the **MM PARAMETER 2 SAFETY DISTANCE** setting Submenu **P2 RESPONSE** Time.


To turn on
Press
and
ENTER
at the same time
STOP TIME METER V2.10
Press any button
Press
or
to scroll through the menu selection
Page 20
MM STOP TIME MEASURING
ENTER
SM MACHINE 001
ENTER
SET SPM POSITION TEACH - IN
ENTER
SET SPM POSITION TEACH 000.0IN
ENTER
000.0IN 0000 MS DOWN SD000.0IN
ENTER
Calculation of Safety Distance
Page 20
MM POWER DOWN SWITCH OFF
ENTER
POWER OFF . . .
Page 21
MM TEST FUNCTION AND SERVICE
ENTER
TF TEST STROKE DATA TO PC
ENTER
TF ACTUATOR TEST FEEDBACK CONTROL
ENTER
TF BATT. DRAIN & CHARGE POWER OFF
ENTER
TF DEFAULT SETTINGS
ENTER
TF QUIT
Page 22
MM MEASURING DATA MANAGMENT
ENTER
DM PRINT DATA FROM MEMORY
ENTER
DM DATA TRANSFER TO COMPUTER
ENTER
DM DELETE ALL DATA IN MEMORY
ENTER
DM QUIT
Page 23
MM PRINT MANAGER
ENTER
PM PRINT HEADER YES
ENTER
PM PRINT VALUES NO
ENTER
PM PRINT COPIES SINGLE
ENTER
PM QUIT
Page 24
MM PARAMETER 1 BASIC SETTINGS
ENTER
P1 TIME SETTING TIME 12:00
ENTER
P1 DATE SETTING DATE10.21.1997
ENTER
P1 SENSOR SELECT ANALOG CABLE TR.
ENTER
P1 LANGUAGE ENGLISH
ENTER
P1 MEAS. UNIT INCH
ENTER
P1 DISPLAY LIGHT ON
ENTER
P1 QUIT
Page 25
MM PARAMETER 2 SAFETY DISTANCE
ENTER
P2 SAFETY DEVICE TWO HAND, OTHERS
ENTER
P2 RESPONSE TIME CURTAIN000MS
ENTER
P2 RESOLUTION CURTAIN00.0IN
ENTER
P2 APPROACH SPEED 063 IN/S
ENTER
P2 QUIT
Page 26
MM PARAMETER 3 MEASURING
ENTER
P3 MEASURING DIRECTION DOWN
ENTER
P3 MEASURMENTS MACHINE 000
ENTER
P3 MEAS. MODE MANUAL
ENTER
P3 SPM METHOD TEACH - IN
ENTER
P3 MACHINE NO. NO
ENTER
P3 QUIT
*
*
MM = Main Menu
SM = STOP-TIME Measurement
TF = Test Function and Service
DM = Data Management Menu
P1 = Parameter 1 (Submenu)
P2 = Parameter 2 (Submenu)
P3 = Parameter 3 (Submenu)
To reset the STM, press these buttons at the same time:
ENTER
TF DEFAULT SETTINGS - This function resets the STM device to the factory default settings as shown in the chart above. Please see page 21 for further instructions.

The object of the STM device is to check the stopping time of a machine. This time is then used in a safety distance formula to determine the proper safety distance of safeguarding devices from the point-of-operation hazard. The two most common safeguarding devices that require this are two-hand controls and presence sensing devices. On most machines where the STM device will be used, there will be a down movement of the ram,slide, or platen on a mechanical or hydraulic power press or press brake. On mechanical power presses, OSHA requires that the stop signal be given at the 90°position of crankshaft rotation (at the halfway point in the downstroke). ANSI requires the use of the highest velocity in the hazardous portion of the stroke. See details of the OSHA and ANSI formulas on pages 6 - 8 of this manual.

Figure 5.1 - Crankshaft Rotation

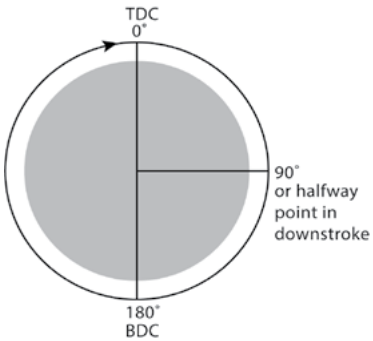
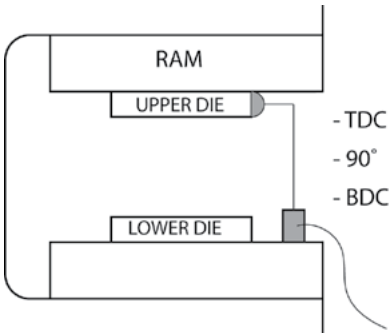


Figure 5.2 - Mechanical Power Press



In the **MM PARAMETER 3 MEASURING** programming menu, submenu **P3 SPM METHOD** there are three choices:

TEACH-IN (factory setting) - With the cable and magnet attached to the slide, inch the machine to the start point of measurement(using the OSHA formula, this is at 90°position of crankshaft rotation or at the halfway point in the downstroke on mechanical power presses). Next, enter this point to give the stop signal. (Refer to the **MM STOP-TIME MEASURING** section on page 20 for details.)

MANUAL- The start point of the measurement can be set manually. This is done in the MM **STOP-TIME MEASURING** program using the ▲ or ▼ buttons and scrolling to the position where the sensor is to provide a stop signal to the meter.

TEST STROKE- Cycle the machine with the cable and magnet attached to the ram. The meter will automatically decide where the highest velocity is in the cycle and provide the stop signal accordingly. This should only be used on machines with eccentric drives, no ton machines with constant velocity.

Note: Regardless of which method of testing is selected, if the machine that is being tested has a crankshaft, and if the crankshaft rotates beyond BDC (bottom dead center), the readings will not be accurate. If the stopping point is at 90°, move the stopping point higher in the stroke so that the machine stops before BDC.

ON/OFF

To turn the meter **ON**, press the ▲ button and **ENTER** button at the same time. The display wills how **STOP-TIME METER** DELTA T V2.07. Press any button and then use the ▲ or ▼ buttons to scroll through for menu selections.

To turn the device **OFF**,scroll to the **MM POWER DOWN SWITCH OFF**. Press **ENTER. POWER OFF**. . . is displayed and the device shuts off. The STM device will automatically shut down after 10 minutes if it is not being used

(Continued on next page.)

MM STOP-TIME MEASURING

This function is used for measurement testing. See page 20 for step-by-step instructions.

MM POWER DOWN SWITCH OFF

This function manually turns the meter off. Seepage 20 for step-by-step instructions.

MM TEST FUNCTION AND SERVICE

(See page 21 for step-by-step instructions.)

TF TEST STROKE: The test stroke is used to obtain the highest strokes per minute. Start at TDC(Top Dead Center) and press **ENTER**. When prompted, perform a single stroke. The STM unit will measure the highest velocity point in the stroke. This point will then be used to take sub sequent measurements when **P3 SPM METHOD** is set to **TEST STROKE.**

TF ACTUATOR TEST FEEDBACK CONTROL: This function provides the STM unit with the response time of the actuator. This function is performed only once when the actuator is new, or if there are mechanical changes to the actuator.

TF BATT. DRAIN & CHARGE: This function powers down the STM unit and depletes any remaining charge on the batteries. The batteries should then be recharged. While the battery is discharging, the LED light will flash slowly (two-second intervals). A solid green light indicates the device is charging. When the device is done recharging, the LED light will flash quickly (one-second intervals). This procedure should be performed each time the battery is recharged to lengthen the life of the battery.

TF DEFAULT SETTINGS: Performing this function restores the factory default settings for all program variables. (See pages 16 and 21.)

MM MEASURING DATA MANAGEMENT

(See page 22 for step-by-step instructions.)

DM PRINT DATA FROM MEMORY: This function provides power to the printer when it is connected to the RS-232 port on the front of the unit. This function also prints the header information and/or the data stored in memory.

DM DATA TRANSFER TO COMPUTER: This function was not supported at the printing of this manual.

(Software Ver. 2.07.)

DM DELETE ALL DATA IN MEMORY: This function clears all measurement data that is currently in memory.

MM PRINT MANAGER

(See page 23 for step-by-step instructions.)

PM PRINT HEAD: This function turns on the print header setting. Setting this variable to YES adds the header information to the top of each machine printout.

PM PRINT VALUES: This function turns on the print values setting. Setting this variable to YES enables the printer. To print data, see **MM MEASURING DATA MANAGEMENT** on page 22 for details.

PM PRINT COPIES: This function provides the choice of printing single or double copies.(See page 24 for step-by-step instructions.)

MM PARAMETER 1 BASIC SETTINGS

P1 TIME SETTING: This function is used to set the time.

P1 DATE SETTING: This function is used to set the date.

P1 SENSOR SELECT: This function is used to set the sensor type. The standard (default) setting for this variable is **ANALOG CABLE TR.** Do not change this setting unless a digital sensor is connected.

P1 MEAS. UNIT: This function is used to set the calculated measurements in inches or metric. The standard (default) setting for this variable is **INCH**.

P1 DISPLAY LIGHT: This function is used to turn the display backlight on or off. Turn the light **ON** when operating in low ambient light conditions.

Continued on next page.)

MM PARAMETER 2 SAFETY DISTANCE (See page 25 for step-by-step instructions.)

P2 SAFETY DEVICE METHOD: This function determines how the stop-time measuring actuator will stop the machine. **TWO-HAND, OTHERS** is used when the STM test is performed with the actuator depressing the initiating means. The **LIGHT CURTAIN** setting is used when the STM test is performed with the flag attached to the actuator. The flag is used to interrupt the sensing field of the light curtain. If a **LIGHT CURTAIN** is used, the light curtain **RESPONSE TIME** and **RESOLUTION** (Minimum Object Sensitivity) should be entered as described below.

P2 APPROACH SPEED: This function determines the hand speed constant value used in the stop-time measuring calculation. The factory setting is 63 IN/S (inches/second), using the OSHA formula as shown on page 7.

P2 RESPONSE TIME: When the **P2 SAFETY DEVICE METHOD** is set to **LIGHT CURTAIN**, the light curtain response time is programmed in this setting for use in the stop-time measuring calculation. If the flag on the actuator is used to interrupt the light curtain and stop the machine, enter 00.0 because the response time of the light curtain will automatically be measured.

P2 RESOLUTION: When the **P2 SAFETY DEVICE METHOD** is set to **LIGHT CURTAIN**, the depth penetration factor (based on the minimum object sensitivity) is required when using the ANSI safety distance formula as shown on page 8. If using the OSHA formula, do the same as ANSI, even though this added distance is not part of the formula.

MM PARAMETER 3 MEASURING (See page 26 for step-by-step instructions.)

P3 MEASURING DIRECTION: This function determines if the stop-time measuring actuator stops the machine on the downstroke or on the upstroke. The downstroke is usually used to determine the safety distance. The upstroke stopping time may be useful when adjusting the counterbalance.

When in the **P3 SPM METHOD** (described below)and using either the **MANUAL** or **TEACH IN** mode,the actuator can be released either the first or the second time the cable sensor reaches the start point of the measurement, stopping the slide motion at approximately 90°or 270°.

P3 MEASUREMENTS MACHINE 000: This function determines the number of measurements that will be taken per machine. The factory setting of 000 allows unlimited measurements but does not store any data. To set the number of tests per machine, select a number between **001-010**. A maximum of 10 tests per machine (maximum of 30 machines) may be taken. Data will only be stored when a number between **001-010** is selected. After the selected number of tests are completed, the device starts measurements for the next machine.

P3 MEAS. MODE: This function determines the method used to advance to the next measurement within the **MM STOP-TIME MEASURING** menu. In the manual mode, the user must press **ENTER** to advance to the next step in the measuring process. In the automatic mode, after taking an STM reading, the unit will automatically advance to the next measurement after counting down through the preset time (see page 26 to adjust time).

P3 SPM METHOD: This function determines at what point in the stroke the test will be performed. This is referred to as the start point of measurement.

In the **TEACH-IN** mode, the start point of measurement is entered into the STM unit at a specific point in the **MM STOP-TIME MEASURING** menu. The cable sensor must be at the desired start point of measurement when **ENTER** is pressed.

In the **MANUAL** mode, the operator enters the stroke length when prompted in the **MM STOP-TIME MEASURING** menu.

In the **TEST STROKE** mode, the highest SPM (Strokes Per Minute) of the crankshaft on the down-stroke is measured.

P3 MACHINE NO/MACHINE ID: This function determines if a machine ID No. will be required. If this is set to **YES**, a prompt for the machine ID No. appears on the screen in the **MM STOP-TIME MEASURING** menu. If this variable is set to NO(factory setting), each machine is referred to by a sequential No. and a machine ID No. is not required.

Continued on next page.)

MM STOP-TIME MEASURING

Press **ENTER** to go into the submenu.
The display reads:

SM MACHINE 001

Press **ENTER.** **(GO TO ✱)**

OPTION

If machine ID yes was selected in the **MM PARAMETER 3 MEASURING** section, the display reads:

SM MACHINE 001 ID– – – – – – – – –

An ID number must be entered. Press **ENTER** to bring the cursor under the first character. Use the ▲ and ▼ buttons to scroll through numbers (0 - 9), letters (A- Z), and symbols (. - + # and blank space). Press **ENTER** to confirm each choice and to go to the next character. Repeat the procedure for all eight characters.
Press **ENTER** to go to the next setting.

✱ The display reads:

SET SPM POSITION
TEACH-IN

Attach the cable and magnet to the ram and inch the ram, platen, etc., to the position where a stop signal is required. (On mechanical power presses and according to OSHA requirements, this setting is at the 90°position of crankshaft rotation, or at the halfway point in the downstroke. Consult other standards for different settings.)
Press **ENTER.**
The display reads:

SET SPM POSITION
TEACH 000.0IN

** Press **ENTER**.
The display reads:

000.0IN 0000MS
DOWN SD000.0IN

Bring the ram to top dead center of crankshaft rotation or to full open position. Cock the hand-held actuator.

Press **ENTER**.
The display reads:

000.0IN 0000MS
WAIT SD000.0IN

A **START** message will appear. Start the stroke of the machine using both hands. In one hand use the hand-held actuator to depress one of the run/inch buttons with the round pushbutton plate on the actuator (see Photo 3.3 on page 14). The actuator will release and cause the stroke or cycle to be interrupted which will stop the movement of the ram.
The display reads the calculated safety distance and stopping time:

004.5IN 0250MS
001 SD015.75IN

These numbers indicate the calculation of the measurement: **IN** is the set point of the sensor; **MS** is the stopping time in milliseconds; **001** is the test number; **SD** is the safety distance in inches.
To take another measurement on the same machine, return to ****** at the bottom of the previous column. Since the factory setting is **000**, unlimited measurements may be taken per machine, however no data will be stored. To change the factory setting, go to **MM PARAMETER 3 MEASURING, P3 MEASUREMENTS/MACHINE 000** (see page 26 for instructions).

If an unusual measurement is displayed, press the ▼ button to repeat that measurement. **SKIP** will appear on the display and a new measurement can then be taken. When all measurements are complete, press **ENTER** to return to **MM STOP-TIME MEASURING**.

MM POWER DOWN SWITCH OFF

The display reads:

MM POWER DOWN; SWITCH OFF

Press **ENTER** to shut down the meter.
The display reads:

POWER OFF . . .

The device automatically shuts off.

(Continued on next page.)

MM TEST FUNCTION AND SERVICE

Press **ENTER** to go into the submenu.

TF TEST STROKE

The display reads:

TF TEST STROKE DATA TO PC

Press **ENTER** to perform the test stroke.

Press ▼ to go to the next setting.

TF ACTUATOR TEST

The display reads:

TF ACTUATOR TEST FEEDBACK CONTROL

Press **ENTER**.

The display reads:

TF ACTUATOR TEST START. . . .

The display automatically reads:

TF ACTUATOR TEST DELAY XXX MS.

(XXX = the displayed delay time)

Press ▼ twice to go to the next setting.

TF BATT. DRAIN & CHARGE

The display reads:

TF BATT. DRAIN & CHARGE POWER OFF

Plug the wall transformer into a 120V duplex outlet and the other end into the power port on the meter. Press **ENTER** to shut down the meter.

The display reads:

POWER OFF. . .

The device shuts down automatically and begins the recharging process.

OR

Press ▼ to go to the next setting.

TF DEFAULT SETTINGS

The display reads:

TF DEFAULT SETTINGS

Press **ENTER** to access default settings. The display reads:

TF DEFAULT SETTINGS? NO

Use the ▲ or ▼ buttons to toggle between **NO** and **YES.**

To choose **NO**, press **ENTER** when it is displayed. The display reads:

TF DEFAULT SETTINGS

Press ▼ to go to the next setting (see **TF QUIT** below).

To choose **YES** and return to factory settings, press **ENTER** when it is displayed. The display briefly reads:

TF DEFAULT CARRIED OUT

The display automatically returns to the start-up menu.

Press ▼ to go to the next **MM** setting that requires programming or go to the **MM STOP-TIME MEASURING** program to do a test.

TF QUIT

The display reads:

TF QUIT

Press **ENTER** to quit the Test Function submenu and return to MM **TEST FUNCTION AND SERVICE.**

Press the ▲ or ▼ buttons to go to the next MM setting that requires programming or go to the **MM STOP-TIME MEASURING** program to do a test.

(Continued on next page.)

MM MEASURING DATA MANAGEMENT

Press **ENTER** to go into the submenu.

DM PRINT DATA

The display reads:

DM PRINT DATA FROM MEMORY

Press **ENTER**

The display reads:

MEASURING 001

ID– – – – – – – – –

Press **ENTER**

The display reads:

MEASURING 001

WAIT 045S

The headings will print as the seconds count down to 0. When the headings are finished printing, the display reads:

DM PRINT DATA FROM MEMORY

The measurement results will automatically print.

Press ▼ to go to the next setting.

If no information was entered, the display reads:

NO DATA IN MEMORY

Press ▼ twice to go to the next setting.

DM DATA TRANSFER

The display reads:

DM DATA TRANSFER TO COMPUTER

Press **ENTER** to transfer data to a computer. If no data was entered, the display reads:

NO DATA IN MEMORY

Press ▼ twice to go to the next setting.

DM DELETE ALL DATA IN MEMORY

The display reads:

DM DELETE ALL DATA IN MEMORY

Press **ENTER.** The display reads:

DM DELETE ALL

DELETE ALL? NO

Press the ▲ or ▼ buttons to toggle between **YES** and **NO.**

To choose **NO,** press **ENTER** when it is displayed. The display reads:

DM DELETE ALL DATA IN MEMORY

Press ▼ to go to the next setting (see **DM QUIT** below).

To choose **YES**, press **ENTER** when it is displayed. The display briefly reads:

CARRIED OUT

The display automatically returns to the start-up menu. Press the ▲ or ▼ buttons to go to the next MM setting that requires programming or go to the **MM STOP-TIME MEASURING** program to do a test.

DM QUIT

The display reads:

DM QUIT

Press **ENTER** to quit the **DM** submenu and to return to the MM **MEASURING DATA MANAGEMENT.**

Press the ▲or▼ buttons to go to the next **MM** setting that requires programming or go to the **MM STOP-TIME MEASURING** program to do a test.

(Continued on next page.)

MM PRINT MANAGER

Press **ENTER** to go into the submenu.

PM PRINT HEAD

The display reads:

PM PRINT HEADER YES

This is the factory setting. Press **ENTER** to change the setting to **NO**.

Press ▼ to go to the next setting.

PM PRINT VALUES

The display reads:

PM PRINT VALUES NO

This is the factory setting.

Press **ENTER** to change the setting to **YES**.

Press ▼ to go to the next setting.

PM PRINT COPIES

The display reads:

PM PRINT COPIES SINGLE

This is the factory setting. Press **ENTER** to change the setting to **DOUBLE.**

Press ▼ to go to the next setting.

PM QUIT

The display reads:

PM QUIT

Press **ENTER** to quit the **PM** submenu and return to **MM PRINT MANAGER.**

Press the ▲ or ▼ buttons to go to the next **MM** setting that requires programming or go to the **MM STOP-TIME MEASURING** program to do a test.

(Continued on next page.)

MM PARAMETER 1
BASIC SETTINGS

Press **ENTER** to go into the submenu.

P1 TIME SETTING

The display reads:

P1 TIME SETTING TIME 12:00

Press **ENTER** to bring the cursor to the first digit. Use the ▲ and ▼ buttons to scroll through the numbers. Press **ENTER** to confirm your choice and to go to the next digit. After confirming all digits, press **ENTER** until the cursor no longer shows. The time is now set.

Press ▼ to go to the next setting.

P1 DATE SETTING

The display reads:

P1 DATE SETTING DATE 11.09.1997

The date is displayed numerically by the month,day, and year. Press **ENTER** to bring the cursor to the first digit. Use the ▲ and ▼ buttons to scroll through the numbers. Press **ENTER** to confirm your choice and to go to the next digit. After confirming all digits, press **ENTER** until the cursor no longer shows. The date is now set.

Press ▼ to go to the next setting.

P1 SENSOR SELECT

The display reads:

P1 SENSOR SELECT ANALOG CABLE TR.

This is the factory setting. To change the factory setting, press **ENTER** and the display reads:

P1 SENSOR SELECT DIGITAL CABLE TR

Press ▼ to go to the next setting.

P1 LANGUAGE

The display reads:

P1 LANGUAGE ENGLISH

This is the factory setting. To change the factory setting, press **ENTER** and the display reads:

P1 SPRACHE DEUTSCH

Press ▼ to go to the next setting.

P1 MEAS. UNIT

The display reads:

P1 MEAS. UNIT INCH

This is the factory setting. To change the factory setting from inches to millimeters, press **ENTER** and the display reads:

P1 MEAS. UNIT MM

Press ▼ to go to the next setting.

P1 DISPLAY LIGHT

The display reads:

P1 DISPLAY LIGHT ON

This is the factory setting. To change the factory setting, press **ENTER** and the display reads:

P1 DISPLAY LIGHT OFF

Press ▼ to go to the next setting.

P1 QUIT

The display reads:

P1 QUIT

Press **ENTER** to quit the Parameter 1 submenu and to return to the **MM PARAMETER 1 BASIC SETTINGS**.

Press the ▲ or ▼ buttons to go to the next MM setting that requires programming or go to the **MM STOP-TIME MEASURING** program to do a test.

(Continued on next page.)

MM PARAMETER 2 SAFETY DISTANCE

Press **ENTER** to go into the submenu.

P2 SAFETY DEVICE METHOD

The display reads:

P2 SAFETY DEVICE METHOD TWO-HAND, OTHERS

This is the factory setting. To change the factory setting, press **ENTER** and the display reads:

P2 SAFETY DEVICE METHOD

LIGHT CURTAIN (If this setting is chosen, follow the ALTERNATE SETTING PROGRAMMING in the right column.)

Press ▼ to go to the next setting.

P2 APPROACH SPEED (Hand Speed Constant)

The display reads:

P2 APPROACH SPEED 063 IN/S

This is the factory setting. To change the factory setting, press **ENTER** and the display reads:

P2 APPROACH SPEED 079 IN/S

Press **ENTER** again and the display reads:

P2 APPROACH SPEED 087 IN/S

Continue to press **ENTER** until the desired setting is displayed. Press ▼ to select it and go to the next setting.

P2 QUIT

The display reads:

P2 QUIT

Press **ENTER** to quit the Parameter 2 submenu and to return to the M**M PARAMETER 2 SAFETY DISTANCE.**

Press the ▲ or ▼ buttons to go to the next **MM** program that requires programming or go to the **MM STOP-TIME MEASURING** program to do a test.

ALTERNATE SETTING PROGRAMMING

After selecting **P2 SAFETY DEVICE LIGHT CURTAIN**, press ▼ to go to the next setting.

P2 RESPONSE TIME

The display reads:

P2 RESPONSE TIME CURTAIN 000MS

This is the factory setting for the response time. To change the factory setting, press **ENTER**. The display reads:

P2 RESPONSE TIME CHANGE 000MS

Use the ▲ or ▼ buttons to scroll through the numbers **000 - 255 MS**. Press **ENTER** at the desired selection and the display reads:

P2 RESPONSE TIME CURTAIN XXXMS

(XXX = the programmed response time)

Press ▼ to go to the next setting.

P2 RESOLUTION (Minimum Object Sensitivity)

The display reads:

P2 RESOLUTION CURTAIN 00.0IN

This is the factory setting. To change the factory setting, press **ENTER**. The display reads:

P2 RESOLUTION CHANGE 00.0IN

Use the ▲ or ▼ buttons to scroll through the numbers **00.0 - 10.0 IN**. Press **ENTER** at the desired selection. The display again reads:

P2 RESOLUTION CURTAIN XX.XIN

(XX.X = the programmed resolution)

Press ▼ to go to the next setting.

P2 APPROACH SPEED - See instructions in left column.

(Continued on next page.)

MM PARAMETER 3 MEASURING

Press **ENTER** to go into the submenu.

The display reads:

P3 MEASURING DIRECTION DOWN

This is the factory setting. To change the factory setting, press **ENTER**. The display reads:

P3 MEASURING DIRECTION UP

Press ▼ to go to the next setting.

P3 MEASUREMENTS

The display reads:

P3 MEASUREMENTS/MACHINE 000

This is the factory setting that allows unlimited measurements per machine with no data stored. To change the factory setting, press **ENTER**. The display reads:

P3 MEASUREMENTS CHANGE 000

Use the ▲ and ▼ buttons to scroll through the numbers **001 - 010**. Press **ENTER** at the desired selection. The display reads:

P3 MEASUREMENTS MACHINE XXX

(XXX = the programmed test number)

Press ▼ to go to the next setting.

P3 MEAS. MODE

The display reads:

P3 MEAS. MODE MANUAL

This is the factory setting. To change the factory setting, press **ENTER**. The display reads:

P3 MEAS. MODE AUTOMATIC

Press the ▼ button. The display reads:

P3 AUTO M. MODE DELAY 005S

This is the factory setting. To change the factory setting, press **ENTER**. The display reads:

P3 AUTO M. MODE CHANGE 005S

Use the ▲ and ▼ buttons to scroll through the numbers **000 - 255**. Press **ENTER** at the desired selection. The display reads:

P3 AUTO M. MODE DELAY XXXS

(XXX = the programmed test number)

Press ▼ to go to the next setting.

P3 SPM METHOD

The display reads:

P3 SPM METHOD TEACH-IN

This is the factory setting. To change the factory setting, press **ENTER.** The display reads:

P3 SPM METHOD MANUAL

Press **ENTER** again and the display reads:

P3 SPM METHOD TEST STROKE

Continue to press **ENTER** until the desired setting is displayed. Press ▼ to select it and go to the next setting.

P3 MACHINE NO(number)/MACHINE ID

The display reads:

P3 MACHINE NO (number) NO

This is the factory setting. To change the factory setting, press **ENTER.** The display reads:

P3 MACHINE NO (number) YES

If **YES** is chosen here, when the **MM STOP-TIME MEASURING** menu is displayed, there will be a prompt to enter a machine ID number (see page 20).

Press ▼ to go to the next setting.

P3 QUIT

The display reads:

P3 QUIT

Press **ENTER** to quit the Parameter 3 submenu and to return to the **MM PARAMETER 3 MEASURING**.

Press the ▲ or ▼ buttons to go to the next MM program that requires programming or go to the **MM STOP-TIME MEASURING** program to do a test.

Table 6.1

Display Message	Cause/Solution
MEMORY FULL	The data for 30 machines is in memory (10 measurements/machine). Print or transfer data in **MM MEASURING DATA MANAGEMENT** section and delete all data after this step is complete.
NO DATA IN MEMORY	There is no data available. Perform measurement tests and data will be stored in memory.
ACTUATOR FEED BACK OVERFLOW	The actuator is defective or the delay time is not correct. Carry out an actuator test in the M**M TEST FUNCTION AND SERVICE** section and try another measurement test. If this message continues, recharge the battery.
MEASURING DEVICE DOES NOT ACCEPT ANY COMMANDS	Press all three function operation buttons simultaneously to reboot
OTHER FAILURES	Reset factory default settings in **MM TEST FUNCTION AND SERVICE**. Delete all measurement data in the **MM MEASURING DATA MANAGEMENT** section.
STORED DATA SHOWS INCORRECT FORMATTING	Delete all measurement data in the **MM MEASURING DATA MANAGEMENT** section.
PRINTER SHOWS MISTAKES PRINTER OR ACTUATOR IS NOT WORKING CORRECTLY	Check the cable connection.
LOW BATTERY	Charge the battery.

SECTION 7—REPLACEMENT PARTS

Part No.	Description
DCL-034	STOP-TIME meter
DCL-043	Sensor
DCL-044	Actuator
DCL-045	Flag
DCL-046	Sensor base magnet
DCL-047	Magnet for ram attachment

Part No.	Description
DCL-048	Allen wrench
DCL-049	Actuator spacer
DCL-050	Actuator pushbutton plate
DCL-051	Printer
DCL-052	Cord and plug for printer
DCL-053	Insturction label

SECTION 8—RETURN MATERIALS AUTHORIZATION & ORDER FORM

Stop-Time Measurement Device

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 R.M.A. number. All returned materials shipments must be prepaid. Complete this form and send with material to 5795 Logistics Parkway, Rockford, Illinois 61109. Make sure the R.M.A. 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 R.M.A. 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 _____

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-220	Installation Manual	
KSL-051	Booklet - “Mechanical Power Press Safety”	
FAB	Catalog - “Safeguarding Fabricating Machines”	
SFM	Catalog - “Shields For Machinery”	

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

Your Signature _____ Date _____