



*The Trusted Choice for Machine Safety*



# CONTROL SYSTEMS

FOR PRESSES & PRESS BRAKES

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## INTRODUCTION

1. **An Act—Public Law 91-596, 91st Congress, S. 2193, December 29, 1970, Duties, Section 5(a)(1)(2)(b)**
2. **OSHA 29 CFR sections that an employer (user) must comply with include:**
3. **OSHA 29 CFR 1910.147 The control of hazardous energy (lockout/tagout).**
4. **OSHA 29 CFR 1910.301-1910.399 Electrical**

### ANSI Publications

B11.0	Risk Assessment for Machine Safety
B11.1	Mechanical Power Presses
B11.2	Hydraulic Power Presses
B11.3	Power Press Brakes
B11.4	Shears
B11.5	Iron Workers
B11.6	Manual Lathes
B11.7	Cold Headers and Formers
B11.8	Manual Drilling, Milling, and Boring
B11.9	Grinding Machines (and abrasive wheels)
B11.10	Metal Sawing Machines
B11.11	Gear and Spline Cutting Machines
B11.12	Roll Forming and Roll Bending Machines
B11.13	Automatic Screw, Bar and Chucking Machines
B11.14	Withdrawn See B11.18-2006
B11.15	Pipe, Tube, and Shape Bending Machines
B11.16	Metal Powder Compacting Presses
B11.17	Horizontal Hydraulic Extrusion Presses
B11.18	Coil Processing Systems
B11.19	Performance Criteria for Risk Reduction Measures
B11.20	Integrated Manufacturing Systems
B11.21	Machine Tools Laser Cutting
B11.22	Numerically Controlled Lathes
B11.23	Machining Centers
B11.24	Transfer Machines
B11.25	Large Machines (<2M Travel Axis)
ANSI/RIA R15.06	Safeguarding Industrial Robots
NFPA 79	Electrical Standard for Industrial Machinery
ASME B20.1-2012	Safety Standards for Conveyors
B11.TR1	Ergonomics (Machine Tools)
B11.TR2	Mist Control (Metal Working Fluids)
B11.TR3	Risk Assessment/Risk Reduction
B11.TR4	PLC/PES Programmable Logic Controllers
B11.TR5	Sound Level Measurements
B11.TR6	Safety Control Systems for Machines
B11.TR7	Design for Lean Manufacturing
B15.1	Mechanical Power Transmission Apparatus
B65.1	Printing Press Systems
B65.2	Binding and Finishing Systems
B65.5	Stand-Alone Platen Presses
B151.1	Horizontal (Plastic) Injection Molding Machines
B152.1	Hydraulic Die Casting Presses
B154.1	Rivet Setting Machines
B155.1	Packaging and Packaging-Related Converting Machinery
01.1	Woodworking Machinery

These standards can be purchased by contacting:

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

Another good reference for safety on machine tools is the following publication from the National Safety Council:

Safeguarding Concepts Illustrated—7th Edition

This publication can be purchased by contacting:

National Safety Council  
1121 Spring Lake Drive  
Itasca, IL 60143-3201  
1-800-621-7615 • [www.nsc.org](http://www.nsc.org)

Other sources that can be used for reference include:

### 1. NFPA 79, Electrical Standard for Industrial Machinery

### 2. NEC (National Electrical Code) Handbook

These can be purchased by contacting:

National Fire Protection Association  
1 Batterymarch Park  
Quincy, MA 02169  
(617) 770-3000 • [www.nfpa.org](http://www.nfpa.org)

### 3. NEMA (National Electrical Manufacturers Association)

1300 North 17th Street, Suite 1752  
Rosslyn, VA 22209  
(703) 841-3200 • [www.nema.org](http://www.nema.org)

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

## MECHANICAL POWER PRESS CONTROL SYSTEMS

Each mechanical power press must be looked at as an individual system. This system consists of, but is not limited to, the frame, all mechanical parts, clutch and brake assemblies, electrical or electronic systems, hydraulic systems, pneumatic systems, tooling or dies (present and future), tool or die setup, safeguarding, material handling, maintenance requirements, size or configuration of workpiece, and most importantly, production requirements.

### OSHA STANDARDS

The controls and safeguarding systems offered in this section of the catalog will help the user of mechanical power presses (punch presses) meet or exceed OSHA 29 CFR 1910.212, 1910.217, 1910.219, 1910.147 and ANSI B11.1 safety standards as we interpret them. OSHA's Code of Federal Regulations can be purchased by contacting:

#### U.S. Government Printing Office

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

### ANSI STANDARDS

There are several references available on press safety; however, most industries use the ANSI (American National Standards Institute) B11.1 standard for the best safety practice on power presses. This standard can be purchased by contacting:

#### ANSI

American National Standards Institute, Inc.  
25 West 43rd Street, 4th Floor  
New York, New York 10036  
(212) 642-4900  
[www.ansi.org](http://www.ansi.org)

### TYPES OF CLUTCHES ON PRESSES

Most power presses have one of two types of clutches:

1. **Full Revolution** (sometimes referred to as a mechanical clutch)
2. **Part Revolution**, classified in two categories:
  - Air Clutch
  - Mechanical-Friction Clutch

### CONDITION OF THE PRESS

The equipment offered in this catalog can neither cure nor overcome a malfunctioning machine or prevent a mechanical defect or failure of a component part thereof, nor prevent a repeat or unintended stroke (cycle) resulting from a mechanical malfunction, defect or failure of the machine itself.

For example, on mechanical power presses, a brake monitoring system can only detect a gradual deterioration of the brake on the press, not a catastrophic mechanical failure in the clutch/brake mechanism.



It is essential that the machine be thoroughly inspected and that all mechanical, electrical, pneumatic, and hydraulic components and systems, including all collateral equipment, be in first-class operating condition before any equipment is installed. A maintenance and inspection program must be established and implemented to keep machines in your plant in first-class condition. This program must include regular periodic inspections of each machine to ensure that, among other things, (i) the clutch and brake mechanism, mechanical linkages, and air counterbalances are operating and used properly; (ii) there is no dirt or water in the air lines; and (iii) the machine is operating at its proper speed (RPM or SPM). Any part of the machine that is worn, damaged, or not operating correctly must immediately be replaced or repaired before the machine is used.

## MECHANICAL POWER PRESS CONTROL SYSTEMS

### SAFETY CONSIDERATIONS ON PRESSES

Referencing OSHA 29 CFR 1910.217(d)(1), it states: “The employer shall (i) use dies and operating methods designed to control or eliminate hazards to operating personnel, and (ii) furnish and enforce the use of hand tools for freeing and removing stuck work or scrap pieces from the die, so that no employee need reach into the point of operation for such purposes.”

### BASIC REQUIREMENTS

When updating presses to comply with the indicated safety standards, there are five basic requirements that must always be considered. They are:

1. **Safeguarding (Refer to Catalogs Safeguarding Devices & EX-AL)**
2. **Controls (pp. 7-46)**
3. **Disconnects (pp. 10, 11, 23, 27, 38, 45, and Safety Shields catalog)**
4. **Starters (pp. 10, 11, 23, 27, 38, 45, and Safety Shields catalog)**
5. **Covers (Refer to [www.rockfordsystems.com](http://www.rockfordsystems.com) for mechanical motion covers)**

This introduction and subsequent pages in this catalog will provide information on safety requirements in the above areas.

### SAFEGUARDING

The following are OSHA-recognized methods for safeguarding the point of operation on mechanical power presses:

#### PART REVOLUTION

1. Barrier Guard (Refer to EX-AL catalog)
2. Two-Hand Control (pp. 18-46)
3. Presence-Sensing Device (Refer to Safeguarding Devices catalog)
4. Pullback (Not offered by Rockford Systems)
5. Restraint (Refer to Safeguarding Devices catalog)
6. Type A or B Gate (Refer to Safeguarding Devices catalog)

#### FULL REVOLUTION

1. Barrier Guard (Refer to EX-AL catalog)
2. Two-Hand Trip (pp. 7-17)
3. Pullback (Not offered by Rockford Systems)
4. Restraint (Refer to Safeguarding Devices catalog)
5. Type A Gate (Refer to Safeguarding Devices catalog)

When safeguarding, please keep in mind that the sides and back of the point of operation must also be safeguarded to protect the operator and other employees.

OSHA's safety distance formula for two-hand control, two-hand trip, and presence-sensing devices can be found on pages 107-108 of this catalog. Refer to our Safeguarding Devices catalog for ANSI's safety distance formulas.

### CONTROLS

Controls are furnished according to the type of press: full revolution or part revolution. Please see later pages detailing these requirements for further explanation.

### ELECTRICAL AND LOCKOUT REQUIREMENTS

A press system requires a proper disconnect switch, motor starter, transformer (for reducing the voltage to 120 V or less), and an air lockout valve.

When applying any of the standard control boxes offered in this catalog, a 120-V coil must exist or be changed in the present magnetic starter on the press. If a press has a manual starter, it must be replaced with a magnetic-type starter. The standard and custom control boxes are furnished with a multi-tap transformer for various primary voltages.

### COVERS

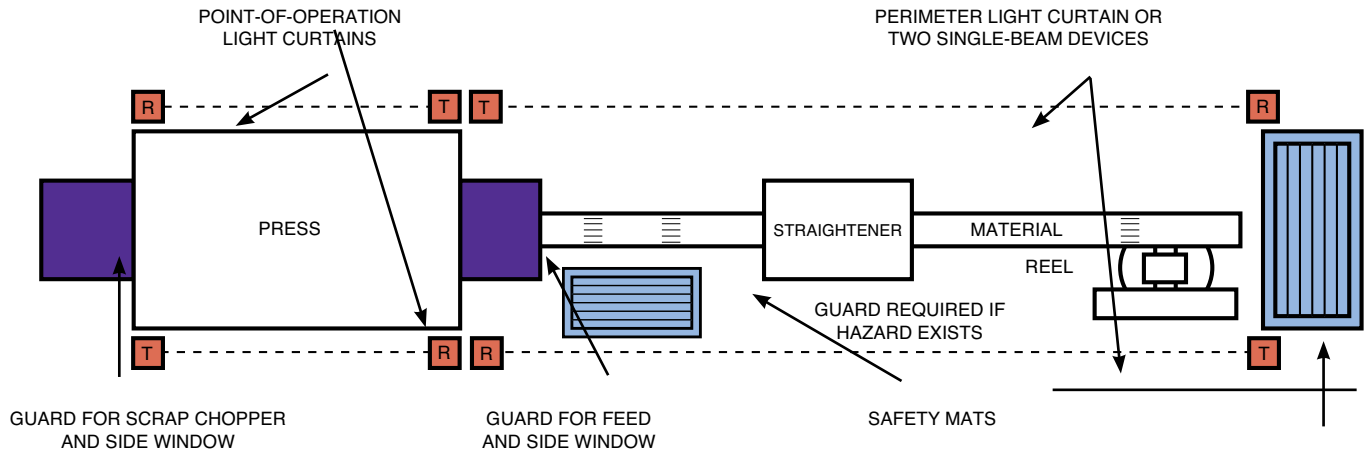
Mechanical power-transmission apparatus include components on a machine or auxiliary equipment including shafts, crankshafts, splines, pulleys, sprockets, rolls, flywheels, gears, and couplings. These components can create hazards to personnel who work on or around the machines. They must be covered in accordance with OSHA 29 CFR 1910.219 and ANSI B15.1. All apparatuses that create a hazard must be guarded (covered) if at or below a seven-foot level from the floor or platform. This is usually done by the user, either by modifying existing guards, by contacting a local sheet-metal fabricator to make a new cover, or refer to our Web site at [www.rockfordsystems.com](http://www.rockfordsystems.com) for mechanical motion covers.

### AUXILIARY SAFEGUARDING

Auxiliary safeguarding is used for additional protection from injuries for all personnel in the machine area. It is used in conjunction with primary safeguarding devices. Auxiliary safeguarding also involves the guarding of other components or hazardous openings on machines. One of these hazards is created by auxiliary feeding equipment used with some power presses. Auxiliary equipment includes various types of feeds, shuttles, magazines, stackers, indexing tables, straighteners, reels, cradles, recoilers, scrap choppers, iron hands, robots, etc.

Auxiliary safeguards include such items as point-of-operation side barriers when light curtains are used, pressure-sensitive safety mats, workpiece tables, or horizontal light curtains. An additional set of light curtains can be used horizontally to prevent an operator or other persons from standing between the vertical plane of light and the point-of-operation hazard. Please remember that light curtains can only be used on part-revolution presses.

## MECHANICAL POWER PRESS CONTROL SYSTEMS



### STRAIGHT-SIDE PRESS ARRANGED FOR AUTOMATIC FEEDING

The two most commonly used safeguards for presses equipped with automatic feeds are guards and presence-sensing devices (light curtains). These safeguards are detailed in our machine safeguarding devices catalog—Safeguarding Devices catalog. When considering either of these safeguards, arrange them to protect the point of operation as well as the feed. This may require the guard to extend to the right or left of the bolster on OBI presses. If a scrap chopper is furnished, the guarding must also be extended to safeguard it. If a feed and scrap chopper are on the sides of straight-side presses, the feed, scrap chopper, and window openings also need to be safeguarded.

When protecting operators and other employees in the press area from hazards created by straighteners, pay-off reels, cradles, iron hands, robots, etc., the perimeter or work envelope of this auxiliary equipment can be safeguarded as illustrated above. This is usually accomplished with guards, presence-sensing devices, safety mats, or a combination of these safeguards.

When protecting these areas, keep in mind that access may be required for changing coils and removing scrap, blanks, etc.

Danger signs, used for warning, can be mounted on the machine in a position that is readily visible to the operator, setup person, or other personnel. Hand tools are another auxiliary safeguard often used when feeding and retrieving small workpieces or removing scrap from the die area. Hand tools by themselves are not a point-of-operation safeguarding device.

When using a light curtain, the mounting brackets for the transmitter and receiver may have to be modified to include safeguarding of the feed. The light curtain's plane of light commonly protects only the front of the press. Additional guards or mirrors that reflect the light curtain's plane of light are needed to safeguard the sides and back of the machine.

When safeguarding presses equipped with shuttles, magazines, stackers, indexing tables, etc., the previously discussed safeguards can be used. This assumes that the press is operating in either the continuous or automatic single-stroke mode of operation. If the press is single-stroked by overt operator action, other safeguards such as two-hand control, pullback devices, restraints, or gate devices could be used. The back and sides of the point of operation must always be protected as well.

## AIR AND HYDRAULIC PRESSES

Two-hand-control packages for air presses and other air-operated machines and devices can be reviewed in our machine safeguarding devices catalog—Safeguarding Devices catalog.

Controls for hydraulic presses are also available. Two-hand control is usually furnished along with other point-of-operation safeguarding. Please see pages 51-57 for further details.

## FULL-REVOLUTION-CLUTCH PRESS CONTROL SYSTEMS

### OSHA 29 CFR 1910.211 DEFINITION

“Full-Revolution Clutch” means a type of clutch that, when tripped, cannot be disengaged until the crankshaft has completed a full revolution and the press slide a full stroke.

All of the full-revolution-clutch press control systems are furnished with two-hand trip that can be used as a point-of-operation safeguard—refer to pages 104, 107, 108, or Safeguarding Devices catalog for detailed information on the safety requirements for two-hand trip. Various other types of guards or devices may be more desirable, such as barrier guards, pullbacks, restraints, or type A gates. For these guards and devices, please refer to our barrier and perimeter guarding systems catalog—EX-AL catalog, and our machine safeguarding devices catalog—Safeguarding Devices catalog.

### FULL-REVOLUTION CLUTCH

The full-revolution-clutch press was designed to make one full machine cycle (stroke) or crankshaft revolution after each engagement of the mechanical pin, collar, or rolling key.

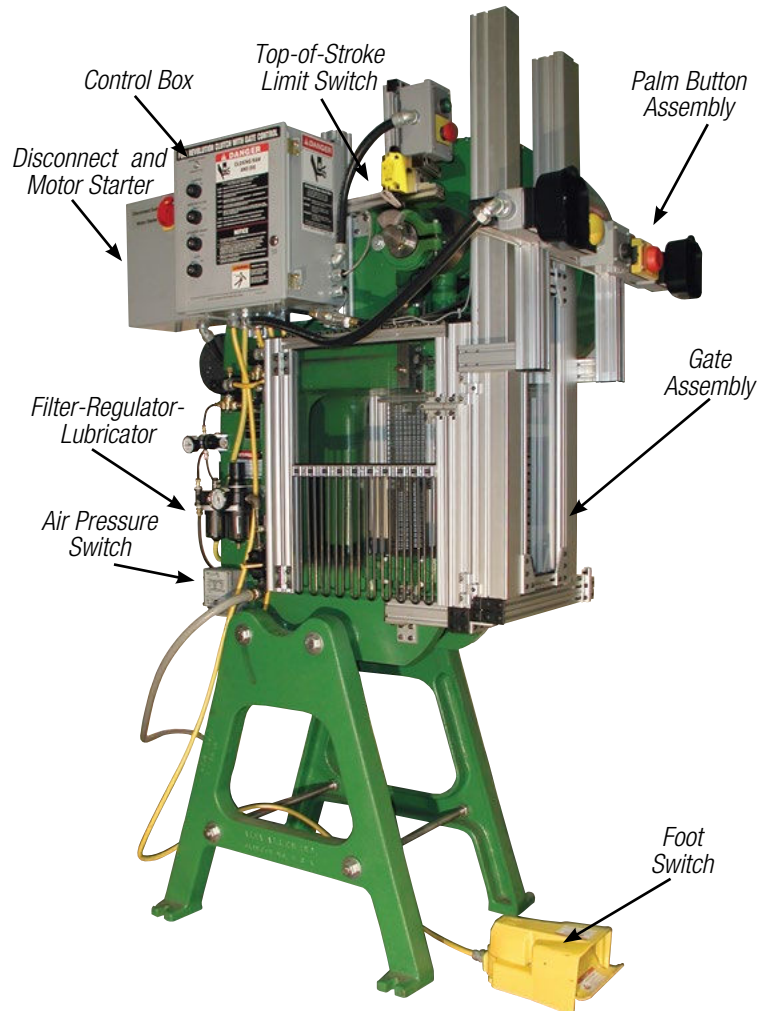
On full-revolution presses, the main concern of the clutch control is that it has single-stroke capability if the press is single-stroked. This means that if the actuating means, such as the palm buttons or foot switch, is held operated through an entire stroke, the press will stop at its normal TDC (top dead center) stopping position, barring any mechanical catastrophic failures.

This section includes trip-control systems which provide single-stroke capability, a requirement of both OSHA and ANSI. These systems also provide two-hand trip which can be used as a point-of-operation safeguarding device when mounted at the proper safety distance.

Full-revolution single-stroke trip-control systems provide other modes of operation, such as continuous-on-demand, foot-maintained continuous, automatic single stroke, and two-hand motor jog for die setup and maintenance requirements.

Two-hand motor jog is used when the die or tooling is being set up in the press, with the flywheel at rest. It allows the designated setup person to engage the clutch and jog the motor in order to bring the slide down to BDC (bottom dead center). Usually when the slide is in this position of crankshaft rotation (BDC), a die is removed and another is set up.

Three reasons to install a trip-control system on full-revolution-clutch presses that may already have single-stroke mechanisms are: 1) the two-hand motor jog feature, 2) the ease of operating a foot switch versus a mechanical foot treadle, and 3) two-hand trip eliminates the



**Full-Revolution Press With Trip Control System and Gate**

*Not shown are the air cylinder and the monitored dual-solenoid air valve on the opposite side of the press.*

foot pedal/treadle operation.

In addition to providing single-stroke capability with a trip-control system, all full-revolution presses require a safeguarding system. The following are OSHA-recognized methods for safeguarding the point of operation on full-revolution-clutch mechanical power presses:

1. Barrier Guard (Refer to EX-AL catalog)
2. Two-Hand Trip (Refer to this section)
3. Pullback (Not offered by Rockford Systems)
4. Restraint (Refer to Safeguarding Devices catalog)
5. Type A Gate (Refer to Safeguarding Devices catalog)

## FULL-REVOLUTION-CLUTCH PRESS CONTROL SYSTEMS

When safeguarding, please keep in mind that the sides and back of the point of operation must also be safeguarded to protect the operator and other employees.

OSHA's safety distance formula for two-hand trip can be found on page 108 of this catalog. Refer to the graph below for a guideline in determining two-hand trip safety distance.

Other safety considerations on a full-revolution- clutch press are the main power disconnect switch, magnetic motor starter, and covers for the flywheel, gears, etc.

### CONTROL SYSTEMS

A full-revolution control system consists of:

1. A control box (pp. 9-11)
- 2a. Individual components (pp. 12-14)  
OR
- 2b. Component packages (pp. 15-16)
3. An air cylinder (p. 17)
4. An air lockout valve (p. 14 or 33)

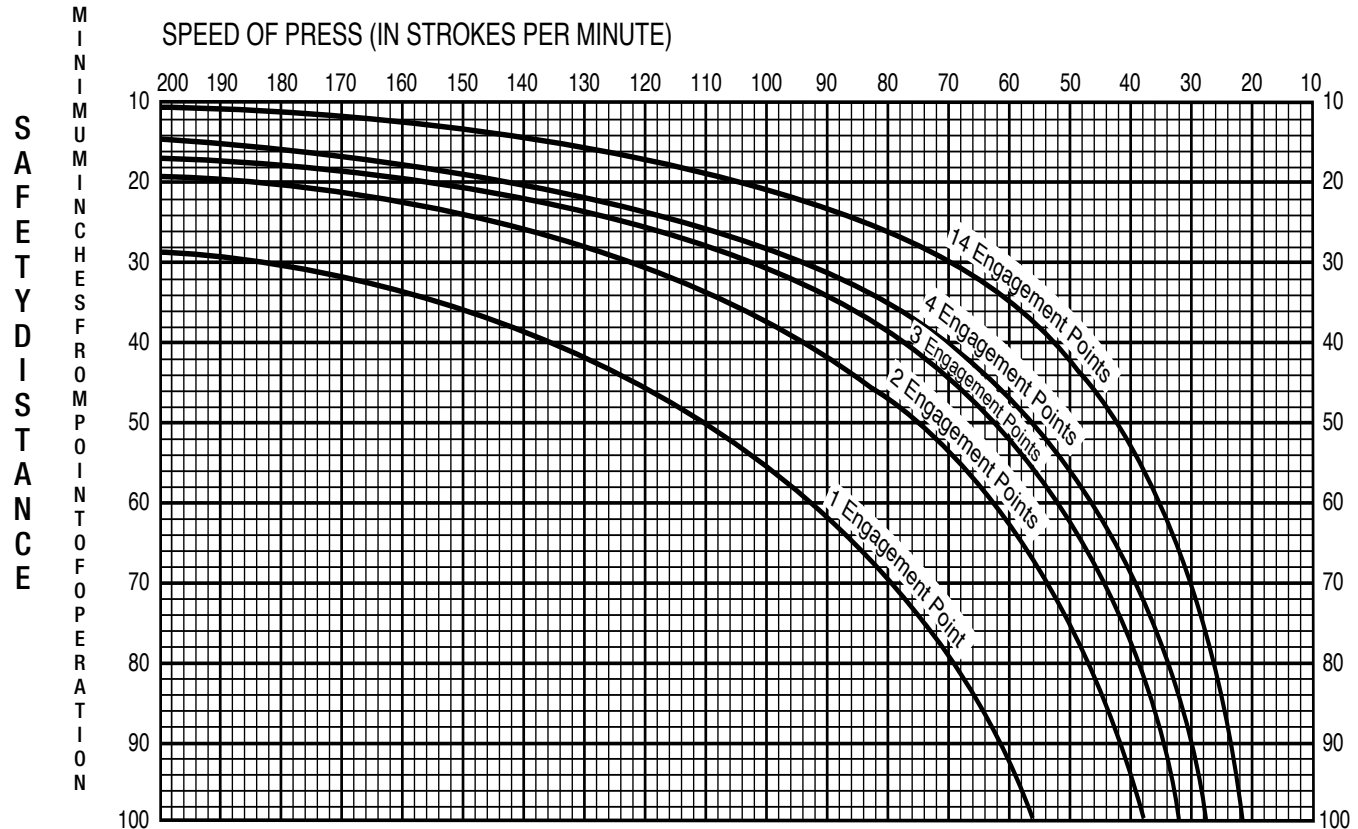
Components in the control system can include a palm button assembly, a foot switch, a monitored dual-solenoid air valve, a filter-regulator-lubricator assembly, an air pressure switch, an air lockout valve, a cam and mounting strap assembly, and a limit switch assembly. The components for these systems will vary depending on the actuating means and the modes of operation that are chosen.

### SELECTING A CONTROL SYSTEM

1. To order a control system, determine which control box is required. Choose a control from pages 9-10.
2. Determine which components meet your mode-of-operation requirements. This depends on your production requirements. To simplify this step, component packages are available. See pages 15-16.
3. Select an appropriate air cylinder. Air cylinders are available in a variety of sizes and configurations to fit the specific machine application. See page 17.
4. Add an air lockout valve, if required. See page 14 or 33.

### TWO-HAND TRIP SAFETY DISTANCE CHART

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





# STANDARD FULL-REVOLUTION CONTROL



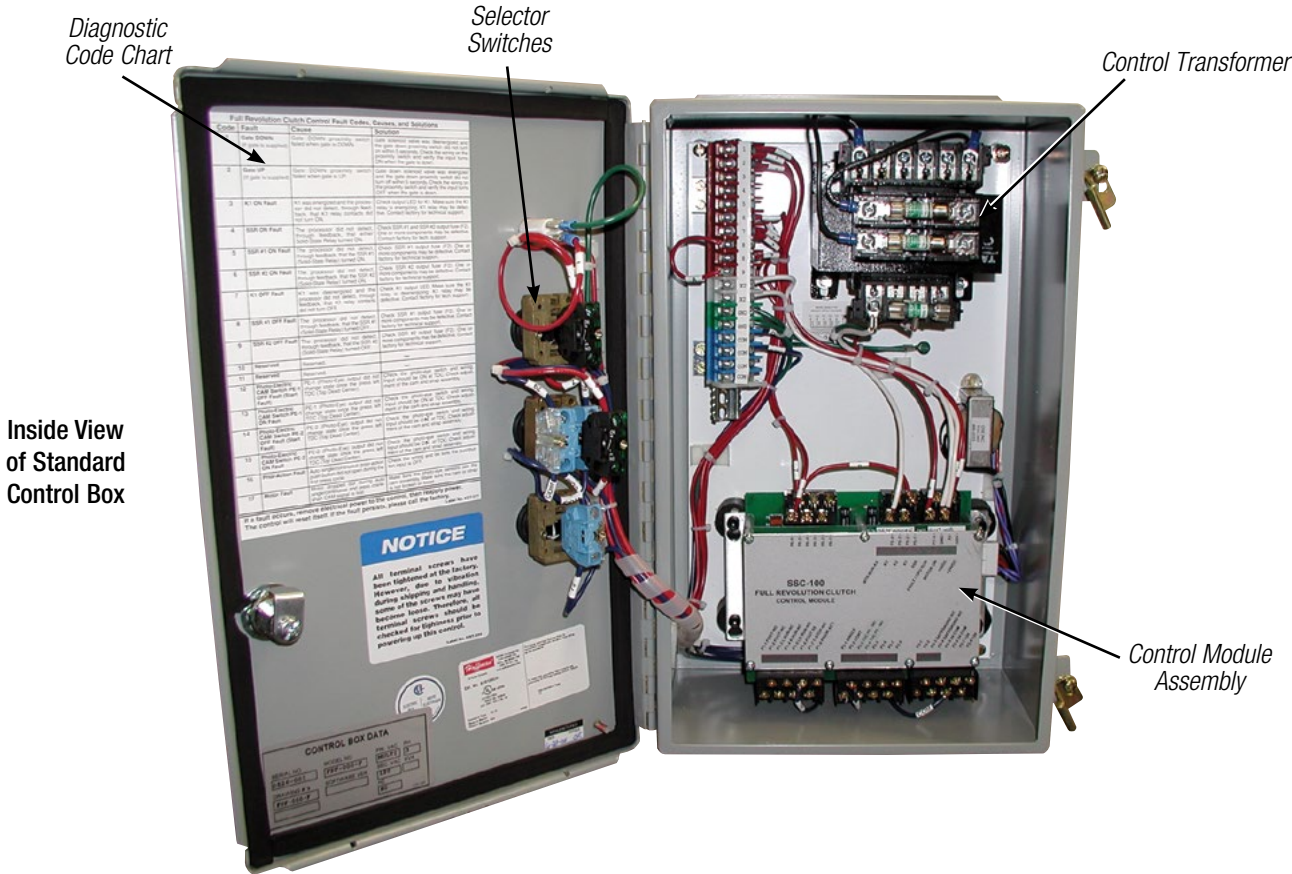
Standard Control Box (FPF000F Shown)

The electro-pneumatic trip-control system is designed for use on full-revolution-clutch mechanical power presses. It is designed and built to comply with OSHA 29 CFR 1910.217 and ANSI B11.1 and B11.19. This control updates full-revolution-clutch presses that do not presently have single-stroke capability. It can also be a replacement for existing trip-control systems.

This control is an economic, full-featured microprocessor-based press trip control. The system uses a microprocessor to cross-check and monitor the control relays. In the event of a control malfunction, further operation is prevented. See page 111 for details on control reliability.

The multi-tap transformer has a 115-, 208-, 230-, 460-, and 575-V primary, 115V secondary, and 100-VA rating. This control must be wired in to a motor starter that has a 115V operating coil. This provides primary power to the clutch control and to the control box for the two-hand motor jog mode of operation.

The standard control box is housed in a 16" x 10" x 6" NEMA 12 enclosure. The ground indicator light and operator controls are located on the front of the enclosure door. The motor controls are usually located in a remote station.



Inside View of Standard Control Box

## STANDARD FULL-REVOLUTION CONTROL (CONTINUED)

### STANDARD MODES OF OPERATION

- Two-hand motor jog
- Two-hand single stroke
- Two-hand “walk-away” continuous\*
- Foot single stroke
- Foot-maintained continuous\*
- Automatic single stroke\*
- Continuous-on-demand\*

\*Requires a remote prior-action station.

### FEATURES

- Single-stroke capability operation
- Two-hand antirepeat
- Two-hand trip as a point-of-operation safeguard
- Two-hand anti-tie down and concurrent operation
- Controls all types of full-revolution clutches
- Redundant-logic system microprocessor
- Provisions for electrically interlocking safety devices
- Isolated microprocessor logic power supply
- Redundantly monitored solid-state relay/captive-contact relay output for trip solenoid(s)
- Saddle-clamp circuit board terminal strips
- Supports redundant, self-checking solenoid valves
- Fused SSR (solid-state relay) outputs
- Type A gate interface

## CUSTOM FULL-REVOLUTION CONTROL

Full-revolution-clutch custom control boxes and packages are available to fit your particular press room needs. A custom control box contains the standard control module and components as described on pages 9-10 plus the following:

- main power disconnect switch
- main drive motor starter
- ram-adjust motor starter (if required)

These boxes are furnished with an IEC through-the-door main power fused disconnect switch and an IEC magnetic motor starter (with push buttons). A reversing ram-adjust motor starter with selector and push buttons may also be included. They are prewired and built into a larger NEMA 12 enclosure.

Operator controls are located on the front of the enclosure door. The motor controls can be located in a remote station or on the enclosure door.

NEMA-style disconnect switches and motor starters, and brand-name components specified by our customers are also available. To ensure the starter(s) and disconnect are sized properly, please check horsepower for the main drive motor and slide adjust motor (if furnished) on the press, as well as full-load amps, and primary voltage to the press. After obtaining this information, please go to the chart on page 11 to determine the proper custom control box part number. Follow directions 1-7 to determine the correct part number.



Full-Revolution Custom Control Box With Clutch Control, Disconnect Switch, and Motor Starter

# SELECTING A FULL-REVOLUTION-CLUTCH PRESS CONTROL

To determine the 8-digit configured part number for the full-revolution control required, follow directions 1-7 below and use the information in the **PART NUMBERING SYSTEM CHART** below.

1. The first 2 digits for all full-revolution controls are FP.
2. The 3rd digit determines the modes of operation required.
3. The 4th digit determines the size of the disconnect switch, if provided, in the control enclosure. Zero (0) indicates no disconnect switch provided.
4. The 5th and 6th digits determine the size and type of nonreversing motor starter, if provided, in the control enclosure. Zeros (00) in both positions indicate no motor starter provided.
5. The 7th digit determines the location of the operator controls.
7. The 8th digit will indicate the type of modifier provided: i.e., main drive motor control operators remote.



The sample shown, FPF112-F5, indicates that the custom full-revolution-clutch control box will provide two-hand single stroke, two-hand motor jog, two-hand continuous, foot single stroke, and foot-maintained continuous modes of operation. There will be an IEC 30A disconnect switch and an IEC 18-A nonreversing main drive motor starter without ram adjust. All operator controls will be on the door of the enclosure with the exception of the main drive motor operators which will be located remote.

FULL-REVOLUTION CONTROL PART NUMBERING SYSTEM CHART																																																																	
<p style="text-align: center;"><b>SYSTEM TYPE PRODUCT CATEGORY</b></p> <p>FP — Full-Revolution Control</p> <p style="text-align: center;"><b>MODES OF OPERATION</b></p> <p>A — Two-hand single stroke, two-hand motor jog, two-hand “walk-away” continuous, foot single stroke, foot-maintained continuous, automatic single stroke, and continuous-on-demand. Remote station LLD406* is required.</p> <p>G — Two-hand single stroke, two-hand motor jog, two-hand “walk-away” continuous, foot single stroke, foot-maintained continuous, and a type A gate interface. Remote station LLD400* is required.</p> <p>H — Two-hand single stroke, two-hand motor jog, and two-hand “walk-away” continuous. Remote station LLD400* is required.</p> <p>F — Two-hand single stroke, two-hand motor jog, two-hand “walk-away” continuous, and foot single stroke and foot-maintained continuous. Remote station LLD400* is required.</p> <p style="text-align: center;"><b>DISCONNECT SWITCH SIZE—IEC (PLUS MAXIMUM MAIN MOTOR FLA)</b></p> <p>0 — No Disconnect Switch</p> <p>1 — 30A Disconnect — 1- to 20-FLA Main Drive Motor</p> <p>2 — 60-A Disconnect — 21- to 40-FLA Main Drive Motor</p> <p>3 — 100-A Disconnect — 41- to 66-FLA Main Drive Motor</p> <p>4 — 200-A Disconnect — 67- to 133-FLA Main Drive Motor</p> <p>5 — 400-A Disconnect — 134- to 266-FLA Main Drive Motor</p> <p style="text-align: center;"><b>NONREVERSING MAIN MOTORS TARTER WITH OR WITHOUT RAM ADJUS</b></p> <p>0 — No Starter</p> <p>1 — Nonreversing Main Motor Starter without Ram Adjust</p> <p>3 — Nonreversing Main Motor Starter with 12-A Ram Adjust</p> <p>4 — Nonreversing Main Motor Starter with 18-A Ram Adjust</p> <p>5 — Nonreversing Main Motor Starter with 25-A Ram Adjust</p>	<p style="text-align: center;"><b>MODIFIER</b></p> <p>-- — Blank, No Modifier</p> <p>5 — Main Motor Operators Remote**</p> <p>6 — Ram-Adjust Operators Remote**</p> <p>7 — Main Motor and Ram-Adjust Operators Remote**</p> <p style="text-align: center;"><b>CONFIGURATION &amp; OPERATOR LOCATION</b></p> <p>F — All Operators on Door of Enclosure</p> <p style="text-align: center;"><b>MAIN MOTOR STARTER SIZE</b></p> <p>0 — No Starter</p> <p style="text-align: center;"><b>IEC</b></p> <p>1 — 12 A</p> <p>2 — 18 A</p> <p>3 — 25 A</p> <p>4 — 32 A</p> <p>5 — 40 A</p> <p>6 — 50 A</p> <p>7 — 65 A</p> <p>8 — 80 A</p> <p>9 — 95 A</p> <p>A — 115 A</p> <p>B — 185 A</p> <p>C — 265 A</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th colspan="4" style="text-align: center;">Motor Horsepower Chart—3 Phase</th> </tr> <tr> <th></th> <th>208 V</th> <th>230 V</th> <th>460 V</th> <th>575 V</th> </tr> </thead> <tbody> <tr> <td>2</td> <td>2</td> <td>3</td> <td>7.5</td> <td>7.5</td> </tr> <tr> <td>5</td> <td>5</td> <td>5</td> <td>10</td> <td>10</td> </tr> <tr> <td>7.5</td> <td>7.5</td> <td>10</td> <td>15</td> <td>15</td> </tr> <tr> <td>10</td> <td>10</td> <td>10</td> <td>20</td> <td>20</td> </tr> <tr> <td>15</td> <td>15</td> <td>15</td> <td>30</td> <td>40</td> </tr> <tr> <td>20</td> <td>20</td> <td>20</td> <td>50</td> <td>50</td> </tr> <tr> <td>25</td> <td>30</td> <td>30</td> <td>60</td> <td>75</td> </tr> <tr> <td>30</td> <td>30</td> <td>30</td> <td>60</td> <td>75</td> </tr> <tr> <td>30</td> <td>40</td> <td>40</td> <td>75</td> <td>100</td> </tr> <tr> <td>50</td> <td>60</td> <td>60</td> <td>125</td> <td>150</td> </tr> <tr> <td>75</td> <td>100</td> <td>100</td> <td>200</td> <td>200</td> </tr> </tbody> </table>	Motor Horsepower Chart—3 Phase					208 V	230 V	460 V	575 V	2	2	3	7.5	7.5	5	5	5	10	10	7.5	7.5	10	15	15	10	10	10	20	20	15	15	15	30	40	20	20	20	50	50	25	30	30	60	75	30	30	30	60	75	30	40	40	75	100	50	60	60	125	150	75	100	100	200	200
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75	100	100	200	200																																																													

\*Required if two-hand continuous, foot-maintained continuous, automatic single stroke, and/or continuous-on-demand modes of operation are used.

\*\*See page 50 for remote motor control operator stations or Safety Shields catalog.

## INDIVIDUAL COMPONENTS

The components for these full-revolution control systems will vary depending on the actuating means and the modes of operation that are chosen. To simplify this, component packages are available. Please see pages 15-16 for part numbers and descriptions of the component packages. The control system can include the following components.

### 1/4" MONITORED DUAL-SOLENOID AIR VALVE

**Part No. RCD140\***

This three-way, 1/4" monitored dual-solenoid air valve is ideal for operating air cylinders on full-revolution presses. This dual valve is pneumatically checked. To assist in installation, this valve has a common electrical connector for both solenoids with a 12-foot cord.

### 1/4" FILTER-REGULATOR-LUBRICATOR ASSEMBLY (FRL)

**Part No. RCL043\***

This assembly is needed to meet the OSHA and ANSI requirements. This FRL assembly filters, regulates, and lubricates the air going through it. This filtered and lubricated air then goes to the solenoid air valve assembly and air cylinder. The regulator should be adjusted so just enough air pressure reaches the air cylinder to operate the clutch. This assembly includes a gauge, coupling, and steel mounting bracket.

### AIR PRESSURE SWITCH

**Part No. CTD062\***

This air pressure switch is needed to meet the OSHA and ANSI requirements. The air pressure switch monitors low pressure to either the air cylinder air supply or ram counterbalance systems. The pressure switch must be set so if the air pressure operating the components is not adequate, or if the air pressure suddenly drops, the press becomes inoperable.

### CAM AND STRAP ASSEMBLY

**Part No. CML002\***

A cast-aluminum cam and adjustable stainless-steel strap are furnished so the cam can easily be mounted on the crankshaft extension. The strap is adjustable up to 6" diameter and is locked in place by tightening the screw.

*Note: Drilling or tapping the end of the crankshaft is not required. All that is required to install it is to slip the cam and strap assembly on the crankshaft, line it up with the top-of-stroke limit switch assembly, and tighten. See next page.*

*\*Included in a component package on pages 15-16.*

Cv (Flow Rate)	
Inlet	1.3
Outlet	1.2
Exhaust	2.4



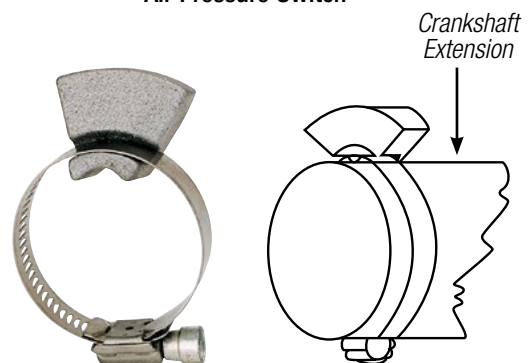
1/4" Monitored Dual-Solenoid Air Valve



Filter-Regulator-Lubricator Assembly



Air Pressure Switch



Cam and Strap Assembly

**INDIVIDUAL COMPONENTS (CONTINUED)**

**TOP-OF-STROKE LIMIT SWITCH ASSEMBLY**

**Part No. CMK103\***

This top-of-stroke limit switch assembly with a 25' cord is actuated by the cam mounted on the crankshaft and is specifically selected for this application. The top-of-stroke limit switch provides dual force-guided contacts to provide the signals when the machine is in the single stroke mode of operation. If the machine does not stop at top dead center, or if the switch assembly malfunctions, becomes improperly adjusted, or the mounting becomes jarred loose, the control will not allow a successive stroke.

A mounting bracket for the limit switch assembly is not furnished. To purchase the EX-AL™ mounting bracket material shown in the photo, please contact Rockford Systems at 1-800-922-7533.



**Top-of-Stroke Limit Switch Mounted Above Cam and Strap Assembly on the Crankshaft**

**PALM BUTTON ASSEMBLIES**

To meet OSHA and ANSI safety requirements, the two run/jog buttons must be protected against accidental operation (with ring guards) and separated to require the use of both hands to operate them. They also must be mounted at the proper safety distance, if they will be used as a safeguard. The electrical contact arrangement of the following buttons is 1 NO and 1 NC.

**Part No. CTL502\***

This palm button assembly consists of two black run/inch buttons (with ring guards), a red emergency-stop button, and a yellow top-stop button. Mounting boxes are furnished with each button. The red and yellow palm buttons each have 1 NO and 1 NC arrangement. The red button is on a yellow-covered mounting box and is equipped with a mechanical latch to meet NFPA 79.



**Part No. CTL502**

**Part No. CTL507\***

This palm button assembly consists of two black run/inch buttons (with ring guards), and a red emergency-stop button (for press applications without the continuous mode of operation). Mounting boxes are furnished with each button. The red palm button is on a yellow-covered mounting box and has 1 NO and 1 NC arrangement plus a mechanical latch to meet NFPA 79.



**Part No. CTL507**

See page 87-88 for other palm button assembly options.

**FOOT SWITCH**

**Part No. CTD011\* & CTD088**

To meet OSHA and ANSI safety requirements, a foot switch must be protected from unintentional operation. The foot switch pedal (on the inside) is protected on the top and both sides by the cast cover and the front is protected by the hinged flap. This flap must be raised by the operator's toe before allowing the foot to enter the switch. When the hinged flap is in the down position, it is also mechanically interlocked with the operating pedal. The contact arrangement is 1 NO and 1 NC.



**Foot Switch CTD011**



**Foot Switch CTD088**

\*Included in a component package on page 15-16.

## INDIVIDUAL COMPONENTS (CONTINUED)

### PRIOR-ACTION STATION FOR CONTINUOUS

Part No. LLD400\*

This remote prior-action station is **required** for the continuous or maintained-continuous mode of operation. If a component package is not supplied with the control box, this station must be ordered. The button is furnished separately in an enclosure so it can be mounted in a convenient location on the front of the press. The NEMA 12 enclosure size is 3½" x 4½" x 3½".



Prior-Action Station for Continuous

### PRIOR-ACTION STATION FOR AUTOMATIC SINGLE STROKE OR CONTINUOUS-ON-DEMAND

Part No. LLD406\*

This prior-action station is **required** for the automatic single-stroke or the continuous-on-demand mode of operation. These modes of operation are only available with the FPA control box. This prior-action push-button station can also be used for either the two-hand "walk-away" or the foot-maintained-continuous mode of operation.

This station is furnished with a three-position keyed selector switch for automatic single/off/continuous-on-demand. It also has an illuminated prior-action push button. If a component package is not supplied with the control box, this station must be ordered separately. It is furnished in its own enclosure so it can be mounted in a convenient location on the front of the press. The NEMA 12 enclosure size is 5¼" x 4" x 3¼".



Prior-Action Station for Automatic Single Stroke or Continuous-On-Demand

### BAR/RUN STATION

Part No. LLD404

This remote bar/run station can be used in conjunction with a manual turnover bar when setting dies in the press. The flywheel must have holes in the periphery for insertion of a spring-loaded turnover bar\*\* (or the flywheel can be manually turned when the flywheel cover is removed). The remote station includes a three-position selector switch for bar/off/run, and one push button used for energizing the dual-solenoid air valve to engage the clutch and release the brake. The flywheel must be at rest (static) when engaging the clutch. After the clutch is engaged, the die setup person can manually turn the flywheel with a spring-loaded turnover bar (see page 86). The enclosure size is 5¼" x 3" x 3¼".



Bar/Run Station

### ¼" AIR LOCKOUT VALVE

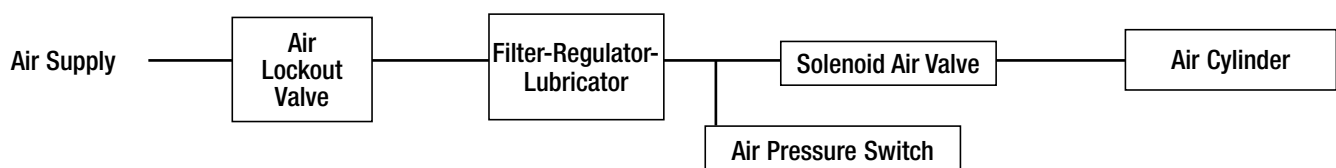
Part No. RCD071

This three-way valve is operated with the manual movement of a slide that opens and closes the valve. This valve shuts off air at the press and then bleeds off downstream air. This lockout is not included in the component packages listed on pages 15-16 and must be ordered separately. Different styles and valve sizes are available; please see page 35.



Air Lockout Valve

### Pneumatic System on Full-Revolution-Clutch Power Press



\*Included in a component package on pages 15-16.

\*\*For a spring-loaded turnover bar, see page 86.

## COMPONENT PACKAGE ORDERING INFORMATION

### SELECTING A COMPONENT PACKAGE

Determine which modes of operation and actuating means you require. Use the following charts to select the component package you require.

#### MODES OF OPERATION AVAILABLE:

- H—Two-Hand Single Stroke
- F—Foot Single Stroke
- M—Foot-Maintained Continuous
- J—Two-Hand Motor Jog
- C—Two-Hand “Walk-Away” Continuous
- A—Automatic Single Stroke
- A—Continuous-On-Demand

### Modes of Operation

COMPONENT PACKAGE SELECTION CHART						
Component Package	H	F	M	J	C	A
<b>FNH011</b>	X			X		
<b>FNH012</b>	X			X	X	
<b>FNH112</b>	X			X	X	X
<b>FNF012</b>	X	X		X		
<b>FNF013</b>	X	X	X	X		
<b>FNF014</b>	X	X	X	X	X	
<b>FNF114</b>	X	X	X	X	X	X

### COMPONENT PACKAGES USED WITH FPH, FPF, OR FPG CONTROL BOXES

PACKAGE NO. FNH011		HJ
TWO-HAND SINGLE STROKE AND MOTER JOG		
PART NO.	DESCRIPTION	
<b>RCD140</b>	1/4" Dual-Solenoid Air Valve	
<b>RCL043</b>	1/4" Filter-Regulator-Lubricator Assembly	
<b>CTD062</b>	Air Pressure Switch	
<b>CML002</b>	Cam and Strap Assembly	
<b>CMK103</b>	Top-of-Stroke Limit Switch Assembly	
<b>CTL507</b>	Palm Button Assembly (3-button assembly)	

PACKAGE NO. FNH012		HJ-C
TWO-HAND SINGLE STROKE, MOTER JOG, AND TWO-HAND CONTINUOUS		
PART NO.	DESCRIPTION	
<b>RCD140</b>	1/4" Dual-Solenoid Air Valve	
<b>RCL043</b>	1/4" Filter-Regulator-Lubricator Assembly	
<b>CTD062</b>	Air Pressure Switch	
<b>CML002</b>	Cam and Strap Assembly	
<b>CMK103</b>	Top-of-Stroke Limit Switch Assembly	
<b>CTL502</b>	Palm Button Assembly (4-button assembly)	
<b>LLD400</b>	Continuous Prior-Action Station	

### COMPONENT PACKAGES USED WITH FPA CONTROL BOXES

PACKAGE NO. FNH112		HJ-CA
TWO-HAND SINGLE STROKE, MOTER JOG, TWO-HAND CONTINUOUS, AUTO SINGLE STROKE, AND CONTINUOUS-ON-DEMAND		
PART NO.	DESCRIPTION	
<b>RCD140</b>	1/4" Dual-Solenoid Air Valve	
<b>RCL043</b>	1/4" Filter-Regulator-Lubricator Assembly	
<b>CTD062</b>	Air Pressure Switch	
<b>CML002</b>	Cam and Strap Assembly	
<b>CMK103</b>	Top-of-Stroke Limit Switch Assembly	
<b>CTL502</b>	Palm Button Assembly (4-button assembly)	
<b>LLD406</b>	Automatic Prior-Action Station	

PACKAGE NO. FNF114		HFMJ-CA
TWO-HAND & FOOT SWITCH SINGLE STROKE, FOOT MAINT. CONTINUOUS, MOTER JOG, TWO-HAND CONTINUOUS, AUTO SINGLE, AND CONTINUOUS-ON-DEMAND		
PART NO.	DESCRIPTION	
<b>RCD140</b>	1/4" Dual-Solenoid Air Valve	
<b>RCL043</b>	1/4" Filter-Regulator-Lubricator Assembly	
<b>CTD062</b>	Air Pressure Switch	
<b>CML002</b>	Cam and Strap Assembly	
<b>CMK103</b>	Top-of-Stroke Limit Switch Assembly	
<b>CTL502</b>	Palm Button Assembly (4-button assembly)	
<b>CTD011</b>	Foot Switch Yellow	
<b>LLD406</b>	Automatic Prior-Action Station	

Note: For control box selection, see pages 9-11. For air cylinder selection, see page 17, and for lockout valve, see page 14.

## COMPONENT PACKAGE ORDERING INFORMATION (CONTINUED)

### COMPONENT PACKAGES USED WITH PPF OR FPG CONTROL BOXES

PACKAGE NO. FNF012		HFJ
TWO-HAND & FOOT SWITCH SINGLE STROKE AND MOTER JOG		
PART NO.	DESCRIPTION	
RCD140	1/4" Dual-Solenoid Air Valve	
RCL043	1/4" Filter-Regulator-Lubricator Assembly	
CTD062	Air Pressure Switch	
CML002	Cam and Strap Assembly	
CMK103	Top-of-Stroke Limit Switch Assembly	
CTL507	Palm Button Assembly (3-button assembly)	
CTD011	Foot Switch Yellow	

PACKAGE NO. FNF013		HFMJ
TWO-HAND & FOOT SWITCH SINGLE STROKE, FOOT MAINTAINED CONTINUOUS, AND MOTER JOG		
PART NO.	DESCRIPTION	
RCD140	1/4" Dual-Solenoid Air Valve	
RCL043	1/4" Filter-Regulator-Lubricator Assembly	
CTD062	Air Pressure Switch	
CML002	Cam and Strap Assembly	
CMK103	Top-of-Stroke Limit Switch Assembly	
CTL507	Palm Button Assembly (3-button assembly)	
CTD011	Foot Switch Yellow	
LLD400	Continuous Prior-Action Station	

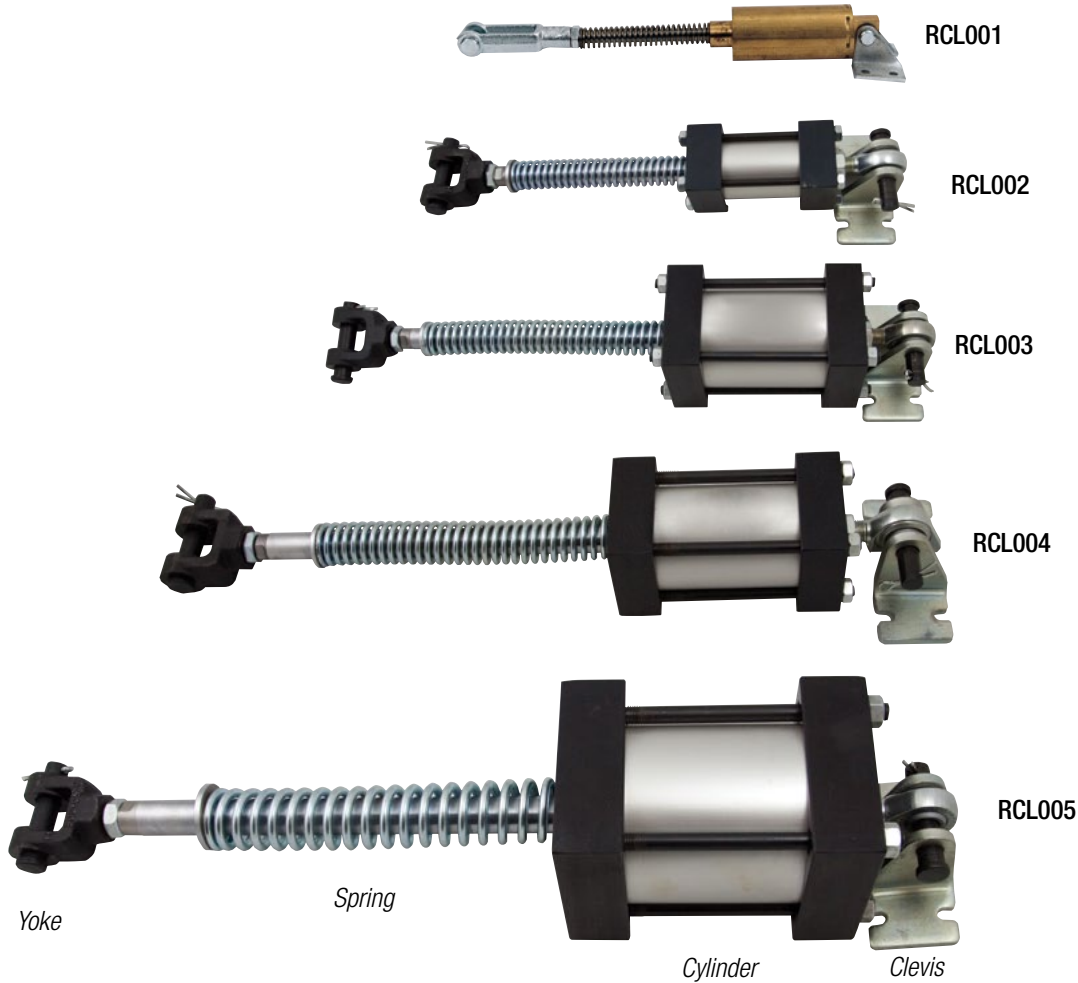
PACKAGE NO. FNF014		HFMJ-C
TWO-HAND & FOOT SWITCH SINGLE STROKE, FOOT MAINTAINED CONTINUOUS, MOTER JOG, AND TWO-HAND CONTINUOUS		
PART NO.	DESCRIPTION	
RCD140	1/4" Dual-Solenoid Air Valve	
RCL043	1/4" Filter-Regulator-Lubricator Assembly	
CTD062	Air Pressure Switch	
CML002	Cam and Strap Assembly	
CMK103	Top-of-Stroke Limit Switch Assembly	
CTL502	Palm Button Assembly (4-button assembly)	
CTD011	Foot Switch Yellow	
LLD400	Continuous Prior-Action Station	

Note: For control box selection, see pages 9-11. For air cylinder selection, see page 17, and for lockout valve, see page 14.



# AIR CYLINDERS

ALL ILLUSTRATED CYLINDERS ARE PULL-TYPE/SPRING RETURN



An air cylinder must be ordered separately using a specific part number. It is required to complete the control system. The air cylinder is attached to the clutch operating rod in order to trip the press. Normally, single-acting, pull-type/spring-return air cylinders are required. The return spring on the cylinder rod is compression type and is designed to prevent interleaving to meet OSHA and ANSI standards. A clevis mounting arrangement is furnished to attach the cylinder to the press frame. A rod, yoke, and pin assembly for ease in connecting to the existing clutch operating rod is standard on all cylinders. Push-type/spring-return and longer or shorter stroke air cylinders are also available. To determine the proper size or type of air cylinder, check the linkage where the cylinder will be inserted. Please consult the factory for any special requirements.

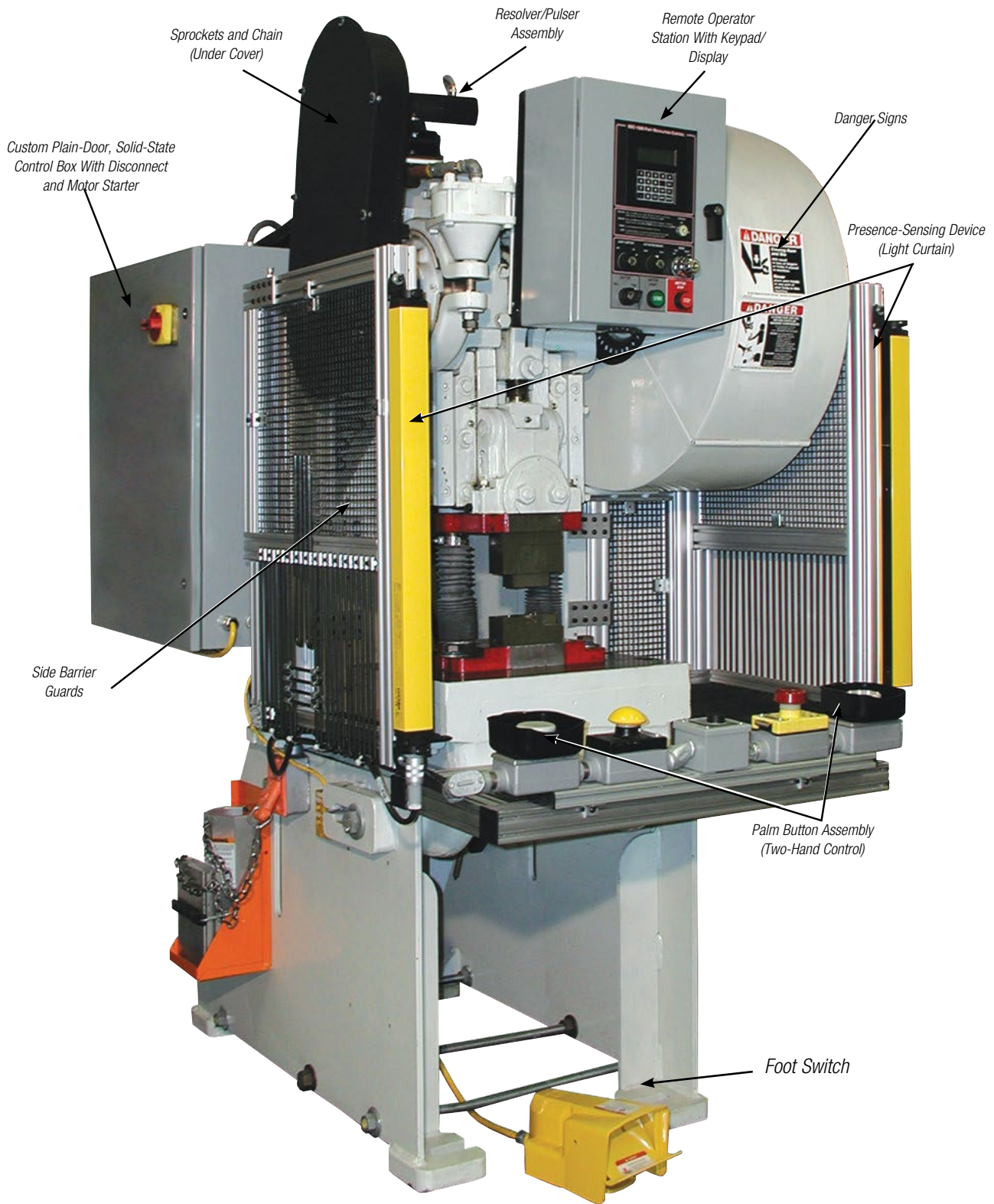
**Standard Pull Type**

	RCL001	RCL002	RCL003	RCL004	RCL005
<b>PRESS SIZE (TONS)</b>	1/4 to 7	8 to 35	36 to 70	71 to 125	126 to 200
<b>SIZE (BORE X STROKE)</b>	1-1/2" x 1"	1-1/2" x 1"	2" x 2"	2-1/2" x 2"	3" x 2"
<b>PULL FORCE (@ 74 PSI)</b>	50 lb	100 lb	200 lb	300 lb	500 lb
<b>NPT PORT SIZE</b>	1/4"	1/4"	1/4"	1/4"	3/8"

**Standard Push Type**

	RCL022	RCL023	RCL024	RCL025
<b>PRESS SIZE (TONS)</b>	8 to 35	36 to 70	71 to 125	126 to 200
<b>SIZE (BORE X STROKE)</b>	1-1/2" x 1"	2" x 2"	2-1/2" x 2"	3" x 2"
<b>PULL FORCE (@ 74 PSI)</b>	100 lb	200 lb	300 lb	500 lb
<b>NPT PORT SIZE</b>	1/4"	1/4"	1/4"	3/8"

## SAFEGUARDED PART-REVOLUTION-CLUTCH PRESS



A Part-Revolution-Clutch Press With Clutch/Brake Control and a Presence-Sensing Device and Two-Hand Control as Safeguards

## SSC1500 PRESS CONTROL

### PART-REVOLUTION CLUTCH

The majority of part-revolution presses have an air-applied clutch and an air-released brake. They are designed to trap air in a chamber or tube. When compressed air is put into these chambers or tubes, the clutch is engaged and the brake is released. The press then starts a cycle. To stop the press, the opposite takes place. A part-revolution-clutch press can be engaged and disengaged at any position of crankshaft rotation or revolution.

Occasionally older mechanical-friction-clutch presses are found in plants and are still being used. Sometimes press brakes with mechanical-friction clutches are used as power presses. These press brakes and the older mechanical-friction-clutch presses can be updated by adding a properly sized air cylinder to the part-revolution control packages that are offered. See pages 75-76 for these air cylinders.

Due to the many detailed OSHA requirements on part-revolution-clutch presses, most existing clutch/brake control systems on presses do not meet safety standards and regulations if they were installed prior to 1971. Most of these presses do not have control reliability and brake monitoring.

The part-revolution-clutch/brake control-reliable systems in this catalog are designed to stop the press and render it inoperable if there is a single component failure in the control system. This is done by minimizing the use of static-condition components and using critical, redundant components that are checked. Microprocessors or relays of special construction are used in this type of reliable control system (see page 99). The clutch/brake control systems offered here are furnished with a built-in, two-hand control safeguarding device.

In addition to the clutch/brake control meeting the requirements of the safety standards, all part-revolution presses require a safeguarding device or guard (barrier) to protect people that operate, set up, and maintain these machines.

The following are OSHA- and ANSI-recognized methods for safeguarding the point of operation on part-revolution-clutch mechanical power presses:

1. Barrier guard (EX-AL catalog)
2. Presence-sensing device (Safeguarding Devices catalog)
3. Two-hand control (Refer to this section)
4. Pullback (Not offered by Rockford Systems)
5. Restraint (Safeguarding Devices catalog)
6. Type A or B gate (Safeguarding Devices catalog)

When safeguarding, please keep in mind that the sides and back of the point of operation must also be safeguarded to protect the operator and other employees.

OSHA's safety distance formula for two-hand control, two-hand trip, and presence-sensing devices can be found on pages 107-108 of this catalog. Refer to our Safeguarding Devices catalog for ANSI's safety distance formulas.

Other considerations on a part-revolution-clutch press are the main power disconnect switch, magnetic motor starter, covers for the flywheel, gears, etc.

### PART-REVOLUTION CONTROL SYSTEMS

A part-revolution control system consists of:

1. A control box (pp. 19-27)
  - 2a. Individual components (pp. 28-35)
- OR
- 2b. Component packages (pp. 34-35)

We offer a variety of control boxes that can be furnished to meet your specific requirements. The SSC1500 solid-state control box version is available as follows:

1. Standard clutch/brake control
2. Custom clutch/brake control which includes a fused disconnect switch and magnetic motor starter
3. Special clutch/brake control
4. Remote operator style

### SELECTING A CONTROL SYSTEM

1. To order a complete control system which includes control reliability and brake monitoring, determine which style control box is required.

A **standard** control box includes the clutch/brake control and transformer.



Standard Control

## SSC1500 PRESS CONTROL

### SELECTING A CONTROL SYSTEM (CONTINUED)

The clutch/brake control can also be furnished in a plain-door enclosure, as a subpanel, or as a module kit. The plain-door control requires a remote operator station. Subpanels and module kits are furnished without the enclosure; module kits include the primary internal components of the control only. Subpanels and module kits must be installed into an existing enclosure by qualified personnel. The subpanel or module kit also requires a remote operator station or a keypad/display kit.

A custom control box includes a main power disconnect switch and magnetic motor starter in the same enclosure as the clutch/brake control. A reversing ram-adjust motor starter may also be included.

Special control boxes can include either a standard or custom clutch/brake control that requires modification for any special requirements. This can be an interface of auxiliary equipment, such as a lube system, a light curtain interface for a non-Rockford light curtain, or components specified by the end user, such as NEMA starters and disconnects.

Remote operator-style control boxes include the clutch/brake control and are designed to be mounted close to the operator. A control transformer must be supplied separately or the existing transformer must be reused.

2. The CMS115 resolver/pulser assembly is always required with any of the SSC1500 controls.

3. After determining the style of control box, determine the location of the operator controls, indicator lights, and the keypad/display. Please remember these components should be installed in a convenient location for the operator. These components can be supplied as follows:

1. On the front of the enclosure
2. In a remote operator station
3. In a control bar
4. In a console
5. Loose for installation in an existing box

4. Determine which other components are required (dual-solenoid air valve, air pressure switches, etc.). If existing components comply with the safety requirements, they can be reused with the control box that is furnished. If the components do not comply, complete component packages are available. Please see pages 34-35.



Plain-Door Control

Remote Operator Station



Custom or Special Control With Remote Operator Station



Remote Operator-Style Control

### SSC1500 STANDARD PRESS CONTROL

The SSC1500 control is designed for use on part-revolution-clutch power presses. It is designed and built to comply with OSHA 29 CFR 1910.217, and ANSI B11.1 and B11.19. These controls can update or replace existing relay-based control systems, found in user's plants; they can also be furnished for new or rebuilt presses.

This control includes control reliability (see page 111), motion detection with a time-based brake monitor, light curtain interface, and diagnostics (eight user-programmable inputs). It also includes batch and stroke counters with preset, a total counter, and a hard-wired emergency-stop master control relay.

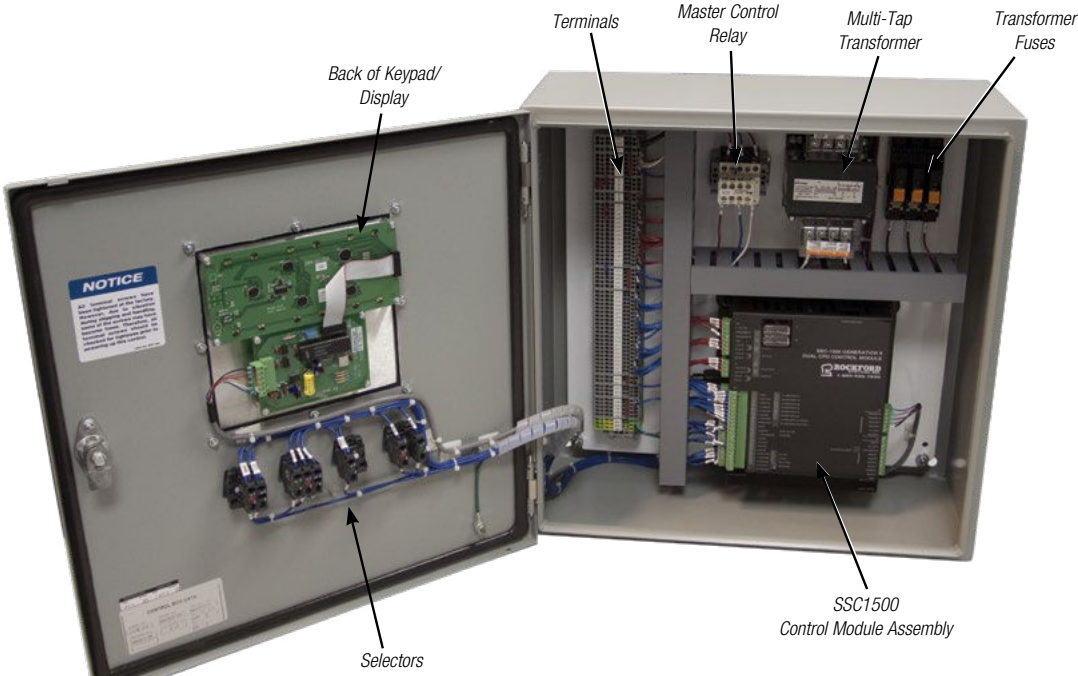
The SSC1500 is an economic, full-featured, dual-microprocessor-based control system. The system uses redundant inputs from devices such as palm buttons, foot switches, and a light curtain(s). The system output to the dual-solenoid air valve is provided by two (2) safety relays with force-guided contacts. These output relays are independently controlled and cross-checked by the microprocessors. This allows control-reliable operation of the outputs in the event of a single control component failure. Each microprocessor also has its own logic power supply. This decreases the possibility of simultaneous control failure because of a fault within the power supply system. Timing and motion detection of the crankshaft is accomplished by the resolver/pulsar assembly.

The standard control box is a 20" x 20" x 8" NEMA 12 enclosure with the operator controls and keypad/display mounted in the door, as illustrated above.

If a starter or disconnect is required in the same enclosure as the standard SSC1500 control, see page 23, SSC1500 custom controls. If a separate starter or disconnect, or combination starter disconnect is required, refer to our Safety Shields catalog.



Standard Control Box (PRC-000-FW Shown)



Inside View of Standard Control Box

## SSC1500 STANDARD PRESS CONTROL (CONTINUED)

### STANDARD MODES OF OPERATION

- Off
- Two-hand inch (regular, timed, or top-stop)
- Two-hand single stroke
- Foot single stroke
- Two-hand “walk-away” continuous
- Continuous-on-demand
- Automatic single stroke
- Two-hand-maintained continuous
- Foot-maintained continuous
- One-hand or foot trip single stroke  
(use with light curtain or interlocked guard only)

### FEATURES

- Meets and exceeds OSHA 29 CFR 1910.217 and ANSI B11.1 and B11.19
- Provides two-hand control safeguarding device
- Redundant/cross-checking microprocessors
- Redundant microprocessor logic power supplies
- Redundant solenoid relays
- 4-line x 20-character LCD (liquid crystal display) with 20-key operator interface
- Wide range of input power supply — 85-to 135-VAC
- Absolute resolver/pulsar with sync sensor for timing and motion detection
- Time-based brake monitor with programmable warning and fault set points
- Stop-time measurement test
- 6 user-programmable 24-V DC static diagnostic inputs
- Part-in-place 24-V DC input
- 2 user-programmable 24-V DC static or cyclic die protection inputs
- 7-digit stroke and batch counters with preset, and a 7-digit total counter
- Automatic variable-speed top-stop adjustment  
(for continuous mode only)
- Light curtain interface(s) with off/on selector
- Light curtain mute during the nonhazardous portion of the stroke
- 4 PLS (programmable limit switch) outputs—2 on/off angles, or 1 timed off, or 1 counted output per PLS (or 3 PLS outputs and 1 auxiliary output with 1 contact)
- Information displayed when the machine is in operation: angle, speed, batch counter, stroke counter, mode of operation, and stop time
- Display of text in English or Spanish

### KEYPAD/DISPLAY

The keypad/display is used to enter setup information, monitor machine operation, and display messages to the user. The keypad/display has a 4-line x 20-character LCD (liquid crystal display) with 20 keys for entering information and programming. As standard, this keypad/display is mounted in the control box. For operator convenience, it can be furnished in a remote enclosure up to a maximum of 150' from the SSC1500 control module (see page 27).

Information displayed during the machine run cycle includes:

- Angle
- Speed
- Batch Counter
- Stroke Counter
- Mode
- Stop Time

### PROGRAMMING

The SSC1500 press control has eight (8) user-programmable inputs (6 static-type and 2 static- or cyclic-type inputs) that can be programmed for equipment monitoring or other user-defined functions. All inputs are 24-V DC selectable current-sinking or sourcing inputs.

There are three parameters that can be programmed for the six static-type inputs, and five parameters that can be programmed for the two static- or cyclic-type inputs. The three parameters are input logic, stop type, and fault message; the five parameters are input logic, stop type, fault message, open angle, and close angle. They can be assigned to each input from the list below. When a fault condition is detected, the machine will top stop or emergency stop, and the assigned message will be displayed. This feature helps when troubleshooting common fault conditions.

### FAULT MESSAGE LIST:

Clutch/Brake Air Fault	Left Side Guard Open
Counterbalance Air Fault	Right Side Guard Open
Dual Solenoid Fault	Feeder Fault
Clutch Valve Fault*	Load Monitor Fault
Brake Valve Fault*	Safety Block Interlock
Lube Fault	Shut Height Fault
High Lube Pressure	Variable Speed Drive Fault
Low Lube Pressure	Die Protection Fault**
Low Lube Level	Short Feed Fault**
Main Motor Overload	Part Ejection Fault**
Ram-Adjust Motor Overload	Stock Buckle Fault**
Lube Motor Overload	End of Stock Fault**
Auxiliary Motor Overload	Pilot Pin Fault**
Guard Interlock Open	Part Input #1**
Front Guard Open	Part Input #2**
Rear Guard Open	Part Input #3**

*\*Only used on machines that have a split clutch and brake, and two dual valves have been furnished.*

*\*\*Messages typically used for die protection.*



Example of the Main Run Screen on the Keypad/Display With Selector Switches

## SSC1500 CUSTOM PRESS CONTROL



SSC1500 Custom Control Box

Part-revolution-clutch SSC1500 custom control boxes are also available to house the clutch/brake controls, disconnect switch, motor starters, and any other electrical components to fit your press room needs. A custom control box contains the standard control module and components as described on pages 21-22 plus the following:

- main power disconnect switch
- main drive motor starter
- ram-adjust motor starter (if required)

These boxes are furnished with an IEC through-the-door main power fused disconnect switch and an IEC magnetic motor starter (with push buttons). A reversing ram-adjust motor starter with selector and push buttons may also be included. They are prewired and built into a NEMA 12 enclosure.

Operator controls and the keypad/display are located on the front of the door, or a plain-door control or subpanel can be furnished. If a plain-door custom control or a subpanel custom control is ordered, a remote operator station or keypad/display kit is required. See ordering information on page 26.

NEMA-style disconnect switches and motor starters, and brand-name components specified by our customers are also available.

To ensure the starter(s) and disconnect are sized properly, please check horsepower for the main drive motor and slide adjust motor (if furnished) on the press, as well as full-load amps, and primary voltage to the press. After obtaining this information, please go to the chart on page 27 to determine the proper custom control box part number. Make sure the proper suffix (F, P, S, K, C, X, Y, or Z) is in the part number. Follow directions 1-6 to determine the correct part number.

Example of part numbering system: The press requires a plain-door control and a 60-A disconnect switch (based on the full-load amp formula). It has a 10-HP motor, a reversing 32-A main motor starter without ram adjust, voltage is 230 V, and has a C4000 standard light curtain interface. The part number to order is PRC-224-PW. A remote operator station (Part No. LLD1506G2) is required for this plain-door control—see page 26.

## SSC1500 REMOTE OPERATOR-STYLE CONTROL BOXES

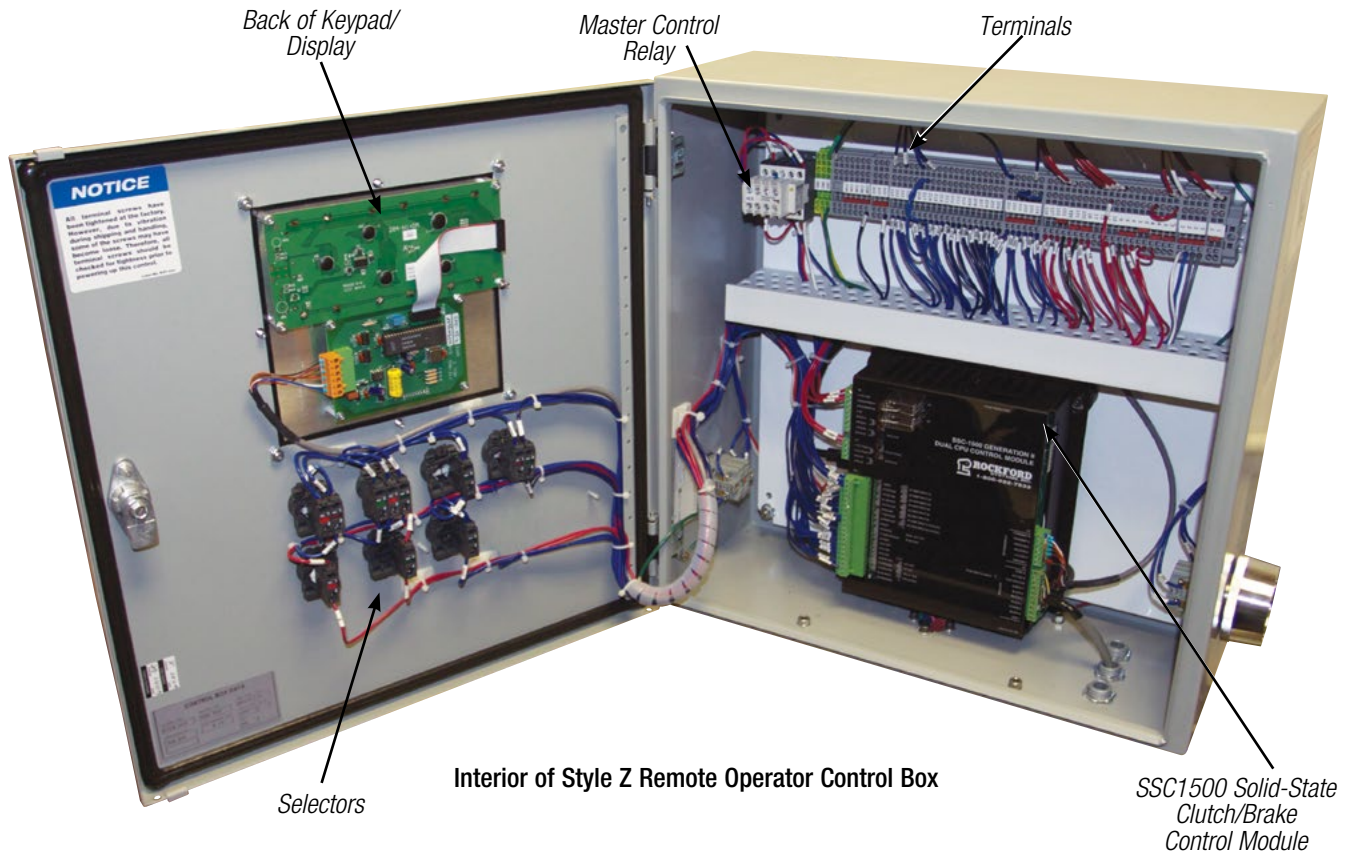
These remote operator-style clutch/brake control boxes include the same features and modes of operation as the standard SSC1500 control boxes described on pages 21-22. **However, they do not have a control transformer.** These control boxes are designed to be located on the front of the machine near the operator.

These controls are for applications where the machine's existing magnetic motor starter, fused disconnect switch, and control transformer meet the safety requirements and can be reused. If the existing control transformer cannot be reused or a new control transformer is required, please contact the factory.

The three standard remote operator-style control boxes available have the keypad/display and all operators on the door (front) of the 20" x 20" x 8" enclosure. Please see the next page for the three styles available.



**Style Z Remote Operator Control Box**  
*Clutch/Brake Control and Operators In One Box*



**Interior of Style Z Remote Operator Control Box**

*SSC1500 Solid-State  
Clutch/Brake  
Control Module*



**SSC1500 REMOTE OPERATOR-STYLE CONTROL BOXES (CONTINUED)**



**STYLE X INCLUDES:**

- Keypad/display
- Program off/on selector switch
- Mode selector switch
- Actuating means selector switch
- Light curtain off/on selector switch
- Internal clutch/brake control module, master control relay, and terminals



**STYLE Y INCLUDES:**

- Keypad/display
- Program off/on selector switch
- Mode selector switch
- Actuating means selector switch
- Light curtain off/on selector switch
- Internal clutch/brake control module, master control relay, and terminals
- Prior-action push button
- Self-latching emergency-stop button
- Top-stop button



**Style Z Includes:**

- Keypad/display
- Program off/on selector switch
- Mode selector switch
- Actuating means selector switch
- Light curtain off/on selector switch
- Internal clutch/brake control module, master control relay, and terminals
- Prior-action push button
- Self-latching emergency-stop button
- Top-stop button
- Two guarded run/inch buttons located on the sides of the enclosure

## CONTROL MODULE KIT—PART NO. PRC-000-KW

A control module kit allows the end user to update the clutch/brake control of a press with minimum equipment costs. The kit is supplied without the control enclosure, panel, control transformer, control fuse, terminal strips, wire duct, and wiring.

A set of electrical prints is supplied to show typical wiring and all mounting dimensions are provided in order for a qualified person to install the control module kit. The minimum area required on an existing control panel to install this kit is 18" H x 18" W x 6" D.

This control module kit includes the control module, master control relay, shock mounts, fasteners, suppressors, danger labels, and electrical prints.

The SSC1500 control can be furnished as a subpanel that includes everything in the standard control as described on pages 21-22 except for the enclosure. The area needed to mount the subpanel inside an existing control box is 18½" H x 18½" W x 6" D. See page 27 to determine the part number for the module kit or subpanel. A keypad/display kit is required unless a remote operator station is used (see below).

If the continuous mode of operation is used, a prior-action station, Part No. LLD1500, is required. See page 31.



## KEYPAD/DISPLAY KIT—PART NO. LLD1513G2

The keypad/display kit can be used with any of the control boxes or the control module kit. This kit includes the keypad/display, a program off/on selector switch, a light curtain off/on selector switch, a hand/foot selector switch, an off/inch/single/continuous selector switch, and 25' of cable. Additional push buttons and nameplates for motor starters, etc., can be furnished depending on the features required. The area needed to mount the keypad/display kit is 10" H x 10½" W x 3½" D.

A resolver/pulsar assembly and cable, Part No. CMS115, is required with any of the control selections. See page 28 for further details on this component.



## REMOTE OPERATOR STATIONS

For operator convenience, a remote operator station can be furnished for use with a plain-door control box, plain-door custom control box, or control module kit. The remote operator station contains the keypad/display, program off/on selector switch, and other selector switches and push buttons as required.

Remote operator stations are available in a standard format or can be customized to meet any requirements. Select from the following remote operator stations or contact the factory with your special requirements.



Remote Operator Station  
Part No. LLD1504G2

### REMOTE OPERATOR STATIONS

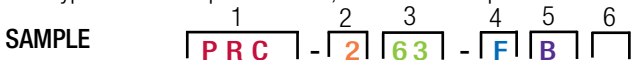
FEATURES	PART NO. LLD1504G2	PART NO. LLD1505G2	PART NO. LLD1506G2	PART NO. LLD1507G2	PART NO. LLD1508G2
KEYPAD/DISPLAY	X	X	X	X	X
PROGRAM OFF/ON SELECTOR SWITCH	X	X	X	X	X
OFF/INCH/SINGLE/CONTINUOUS SELECTOR SWITCH	X	X	X	X	X
HAND/FOOT SELECTOR SWITCH	X	X	X	X	X
LIGHT CURTAIN OFF/ON SELECTOR SWITCH	X	X	X	X	X
MAIN MOTOR START AND STOP PUSH BUTTONS		X	X	X	X
MAIN MOTOR FORWARD/REVERSE SELECTOR SWITCH			X		X
RAM-ADJUST OFF/ON SELECTOR SWITCH				X	X
RAM RAISE PUSH BUTTON				X	X
RAM LOWER PUCH BUTTON				X	X
<b>A</b> <b>D</b> <b>D</b> LIGHT CURTAIN BLANKING SELECTOR SWITCHES <i>(Use part # at right in place of part # above)</i>	LLD1544 G2	LLD1520 G2	LLD1521 G2	LLD1522 G2	LLD1523 G2

If any of the above remote operator stations are required without the enclosure, please consult the factory.

# SELECTING AN SSC1500 PART-REVOLUTION PRESS CONTROL

TO DETERMINE THE 8- OR 9-DIGIT CONFIGURED PART NUMBER FOR THE PART-REVOLUTION CONTROL REQUIRED, FOLLOW DIRECTIONS 1-6 BELOW AND USE THE INFORMATION IN THE PART NUMBERING SYSTEM CHART BELOW.

1. The first 3 digits for all SSC1500 part-revolution controls are PRC.
2. The 4th digit determines the size of the disconnect switch, if provided, in the control enclosure. Zero (0) indicates no disconnect switch provided.
3. The 5th and 6th digits determine the size and type of motor starter(s), if provided, in the control enclosure. Zeros (00) in both positions indicate no motor starter(s) provided.
4. The 7th digit determines the location of the operator controls, or if it is a style X, Y, or Z control without the control transformer.
5. The 8th digit is for the type of light curtain interface provided.
6. The 9th digit (if required) will indicate the type of modifier provided: i.e., motor control operators remote.



The sample shown, PRC-263-FB, indicates that the custom part-revolution control box with a Banner light curtain interface will contain an IEC 60-A disconnect switch, an IEC 25-A reversing main drive motor starter, and an IEC 12-A reversing ram-adjust motor starter. The keypad/display and all operators will be located on the door of the enclosure.

SSC1500 PRESS CONTROL PART NUMBERING SYSTEM CHART																																																																							
<b>PRC</b>	<b>- X X X - X X X</b>																																																																						
<b>SYSTEM TYPE PRODUCT CATEGORY</b>	<b>MODIFIER</b>																																																																						
PRC — SSC1500 Press Control	-- — Blank, No Modifier 5 — Main Motor Operators Remote* 6 — Ram-Adjust Operators Remote* 7 — Main Motor and Ram-Adjust Operators Remote*																																																																						
<b>DISCONNECT SWITCH SIZE—IEC (PLUS MAXIMUM MAIN MOTOR FLA)</b>	<b>LIGHT CURTAIN OPTIONS**</b>																																																																						
0 — No Disconnect Switch 1 — 30A Disconnect — 1- to 20-FLA Main Drive Motor 2 — 60-A Disconnect — 21- to 40-FLA Main Drive Motor 3 — 100-A Disconnect — 41- to 66-FLA Main Drive Motor 4 — 200-A Disconnect — 67- to 133-FLA Main Drive Motor 5 — 400-A Disconnect — 134- to 266-FLA Main Drive Motor	B — Banner Light Curtain C — C4000 Advanced With LC Operators on Door V — C4000 Advanced With LC Operators Remote W — C4000 Standard																																																																						
<b>REVERSING/NONREVERSING MAIN MOTOR STARTERS WITH OR WITHOUT RAM ADJUST</b>	<b>CONFIGURATION &amp; OPERATOR LOCATION</b>																																																																						
0 — No Motor Starters 1 — Nonreversing Main Motor Starter Without Ram Adjust 2 — Reversing Main Motor Starter Without Ram Adjust 3 — Nonreversing Main Motor Starter With 12-A Ram Adjust 4 — Nonreversing Main Motor Starter With 18-A Ram Adjust 5 — Nonreversing Main Motor Starter With 25-A Ram Adjust 6 — Reversing Main Motor Starter With 12-A Ram Adjust 7 — Reversing Main Motor Starter With 18-A Ram Adjust 8 — Reversing Main Motor Starter With 25-A Ram Adjust	F — Keypad/Display and all Operators on Door of Enclosure P — Keypad/Display and all Operators Remote (Plain Door) S — Subpanel Only—Without Enclosure, Keypad/Display, and Operators K — Kit With Module and Master Control Relay Only—Without Enclosure, Subpanel, Transformer, Keypad/Display, and Operators C — Console X — Same as F (above) Without Control Transformer Y — Same as F (above) Without Control Transformer but With E-Stop, Top Stop, and Prior Action on the Enclosure Z — Same as F (above) Without Control Transformer but With E-Stop, Top Stop, Prior Action, and Two (2) Guarded Run/Inch Buttons on the Enclosure																																																																						
<b>MAIN MOTOR STARTER SIZE</b>																																																																							
0 — No Starter IEC																																																																							
1 — 12 A 2 — 18 A 3 — 25 A 4 — 32 A 5 — 40 A 6 — 50 A 7 — 65 A 8 — 80 A 9 — 95 A A — 115 A B — 185 A C — 265 A	<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th colspan="5">Motor Horsepower Chart—3 Phase</th> </tr> <tr> <th></th> <th>208 V</th> <th>230 V</th> <th>460 V</th> <th>575 V</th> </tr> </thead> <tbody> <tr><td>2</td><td>2</td><td>3</td><td>7.5</td><td>7.5</td></tr> <tr><td>5</td><td>5</td><td>5</td><td>10</td><td>10</td></tr> <tr><td>5</td><td>7.5</td><td>7.5</td><td>15</td><td>15</td></tr> <tr><td>7.5</td><td>10</td><td>10</td><td>20</td><td>20</td></tr> <tr><td>10</td><td>10</td><td>10</td><td>30</td><td>30</td></tr> <tr><td>15</td><td>15</td><td>15</td><td>30</td><td>40</td></tr> <tr><td>20</td><td>20</td><td>20</td><td>50</td><td>50</td></tr> <tr><td>25</td><td>30</td><td>30</td><td>60</td><td>75</td></tr> <tr><td>30</td><td>30</td><td>30</td><td>60</td><td>75</td></tr> <tr><td>30</td><td>40</td><td>40</td><td>75</td><td>100</td></tr> <tr><td>50</td><td>60</td><td>60</td><td>125</td><td>150</td></tr> <tr><td>75</td><td>100</td><td>100</td><td>200</td><td>200</td></tr> </tbody> </table>	Motor Horsepower Chart—3 Phase						208 V	230 V	460 V	575 V	2	2	3	7.5	7.5	5	5	5	10	10	5	7.5	7.5	15	15	7.5	10	10	20	20	10	10	10	30	30	15	15	15	30	40	20	20	20	50	50	25	30	30	60	75	30	30	30	60	75	30	40	40	75	100	50	60	60	125	150	75	100	100	200	200
Motor Horsepower Chart—3 Phase																																																																							
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50	60	60	125	150																																																																			
75	100	100	200	200																																																																			
	*See page 48 for remote motor control operator stations or Safety Shields catalog. **Additional light curtain interface options are available upon request — contact Rockford Systems at 1-800-922-7533.																																																																						

## SSC1500 AND SSC3000 PRESS INDIVIDUAL COMPONENTS

### RESOLVER/PULSER ASSEMBLY

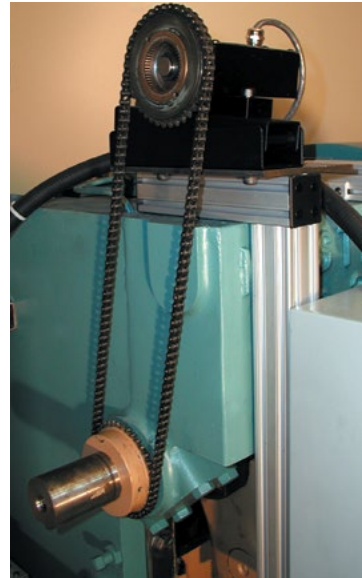
Part No. CMS115\*—40' Cable

Part No. CMS115-100—100' Cable

An absolute resolver/pulser timing device is required with the SSC1500 control to provide the angular position and velocity/motion information of the machine crankshaft to the control. The resolver is a highly accurate and repeatable device which uses an internally mounted photoelectric sensor and disk to verify the position of the crankshaft.

The resolver/pulser timing device is contained in a rugged, heavy-duty housing with a spring-compression base. The spring base helps isolate the resolver from shock load and vibration that are common occurrences on presses. This provides longer life for the components inside the enclosure. The spring base also functions as a drive chain tightener. This resolver/pulser assembly can also be furnished without the spring base when a direct-coupling drive is encountered. Please consult the factory.

The 3/4" diameter steel drive shaft with keyway is mounted in sealed ball bearings. This results in a rugged resolver assembly for press applications. The resolver/pulser is furnished with a 40' cable (or optional 100' cable) that connects to the drive assembly and wires in to the control box. The cable can be cut to length and wired to terminals.



**Resolver/Pulser Assembly on Press**  
*(Sprocket and chain cover has been removed for photo)*

### SPROCKET ASSEMBLY

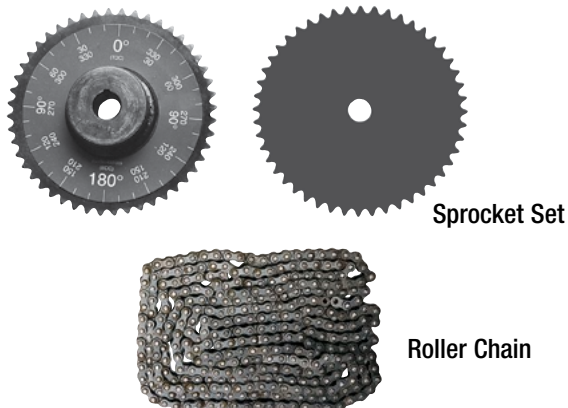
Part No. CML000\*

A sprocket set consists of two sprockets. One fits on the 3/4" shaft of the CMS115 resolver/pulser assembly; the other sprocket is for mounting to the end of the press crankshaft. These 48-tooth sprockets are designed to accept ANSI No. 35 roller chain.

### ROLLER CHAIN

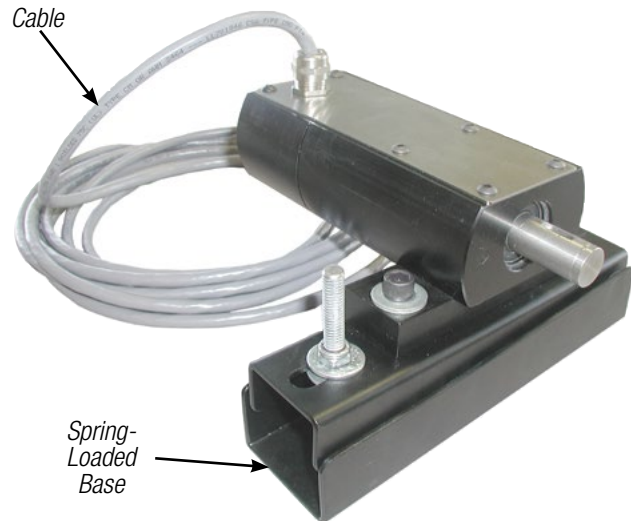
Part No. CMS515\*

ANSI No. 35 roller chain and master link is 10 feet long for driving the above sprockets.



**Sprocket Set**

**Roller Chain**



**Resolver/Pulser Assembly**

*\*Included in a component package on page 34 or page 35.*

**SSC1500 AND SSC3000 PRESS INDIVIDUAL COMPONENTS (CONTINUED)**

**MONITORED DUAL-SOLENOID AIR VALVE**

1/2" INLET / 1/2" OUTLET PORT — Part No. RCL652  
(for 10- to 25-ton presses)

1/2" INLET / 3/4" OUTLET PORT — Part No. RCL654\*  
(for 26- to 100-ton presses)

This three-way cross flow, series/parallel air valve includes an air pressure electrical output monitor and muffler. Air is put into the clutch and brake when the dual-solenoid air valve is electrically energized. When it is de-energized, the air is dumped through the muffler from the clutch and brake.

This valve consists of two main parts: the piloted monitor assembly and the valve body assembly. The two main valve elements move simultaneously during normal operation. If these elements should fail to move simultaneously, the internal spool shifts, inhibiting further machine operation. The pressure switch will provide a signal to the control system to indicate a fault condition. A reset button on the side of the valve can be used to reset the valve if an accidental valve fault is detected.

AVERAGE CV (FLOW RATE)		
PART NO.	PORTS 1 TO 2	PORTS 2 TO 3
RCL652	2.8	6.7
RCL654	2.8	6.7



Monitored Dual-Solenoid Air Valve

**MONITORED DUAL-SOLENOID AIR VALVE WITH RESET BUTTON**

1" INSET / 1" OUTLET PORT — Part No. RCL656  
(for 101- to 300-ton presses)

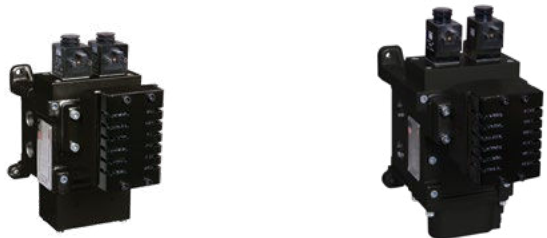
1 1/2" INLET / 2" OUTLET PORT — Part No. RCL658  
(for 301- to 1000-ton presses)

This cross flow, series/parallel air valve includes an air pressure electrical output and muffler. The separate reset button provides a remote reset at floor level if the valve latches out when an accidental air valve fault is detected. This valve is used for the clutch/brakes on large presses which require larger air volume capacity.

This valve assembly consists of a pilot, monitor, valve body, and junction box. It operates on the same principles as the 1/2" and 3/4" valves described above.

*NOTE: If the clutch and brake are split, two valves may be required to provide good stopping times.*

AVERAGE CV (FLOW RATE)		
PART NO.	PORTS 1 TO 2	PORTS 2 TO 3
RCL656	4.63	12.55
RCL658	20.22	53.68



RCL654

RCL656



RCL658

**FRL (FILTER-REGULATOR-LUBRICATOR)**

This assembly is required to meet the OSHA and ANSI standards. This FRL assembly filters, regulates, and lubricates the air going through it. This filtered and lubricated air then goes to the dual-solenoid air valve assembly and clutch/brake. The regulator should be adjusted to meet the original equipment manufacturer's requirements. The assembly includes a gauge, coupling, and a steel mounting bracket. The FRL assembly can be used for any air-operated device on the press including the counterbalance or die cushion.



RCL044—1/2"

RCL045—3/4"

RCL046—1" & RCL047—1 1/2"

*\*Included in a component package on page 34 or page 35.*

## SSC1500 AND SSC3000 PRESS INDIVIDUAL COMPONENTS (CONTINUED)

### AIR PRESSURE SWITCH

Part No. CTD062\*

This air pressure switch monitors low pressure to either the clutch/brake air supply or slide counterbalance systems. Each system requires an air pressure switch. The pressure switch must be set so if the air pressure operating the component goes below a predetermined amount, the press becomes inoperable.

Each air pressure switch's low level setting is based on each application and the machine manufacturer's recommendations. The contact arrangement is 1 NO and 1 NC.



Air Pressure Switch

### CHECK VALVE FOR COUNTERBALANCE SYSTEM

(not included in any component package on page 34 or page 35)

A check valve is required to meet the OSHA and ANSI standards. It maintains counterbalance surge tank pressure in the event of a sudden loss of air pressure. It is installed in the air line going to the tank. Please check the size of the air line going to the tank to determine the proper size valve.

*Note: Press must have a counterbalance system with a surge tank to properly apply a check valve.*



Check Valve

### PALM BUTTON ASSEMBLY

To meet OSHA and ANSI safety standards, the two run/inch buttons must be protected against accidental operation (ring guards) and separated to require the use of both hands to operate them. They must also be mounted at the proper safety distance, if they will be used as a safeguard. The contact arrangement of these buttons is 1 NO and 1 NC.

Part No. CTL502\*

This palm button assembly consists of two black run/inch buttons (with ring guards), a red emergency-stop button, and a yellow top-stop button. Mounting boxes are furnished with each button. The red and yellow palm buttons each have 1 NO and 1 NC arrangement. The red button is on a yellow-covered mounting box and is equipped with a mechanical latch to meet NFPA 79.

PART NO. RCD061—1/2"

PART NO. RCD062—3/4"

PART NO. RCD063—1"

PART NO. RCD064—1 1/2"

PART NO. RCD065—2"



Part No. CTL502

Part No. CTL507\*

This palm button assembly consists of two black run/inch buttons (with ring guards), and a red emergency-stop button (for press applications without the continuous mode of operation). Mounting boxes are furnished with each button. The red palm button is on a yellow-covered mounting box and has 1 NO and 1 NC arrangement plus a mechanical latch to meet NFPA 79.



Part No. CTL507

Palm buttons can also be furnished in a control bar along with push buttons and selector switches. Please see pages 49-50 for control bars, and pages 87-88 for other palm button assembly options.

\*Included in a component package on page 34 or page 35.

**SSC1500 PRESS INDIVIDUAL COMPONENTS (CONTINUED)**

**FOOT SWITCH**

**Part No. CTD011\* & CTD088**

This foot switch is protected from unintentional operation. A die-cast cover protects the top and both sides, and the front is protected by a hinged flap. The flap must be lifted with the toe before the foot may enter the switch. The electrical contact arrangement is 1 NO and 1 NC.



**Foot Switch CTD011**



**Foot Switch CTD088**

**PRIOR-ACTION STATION**

**Part No. LLD1500\***

This prior-action station has a push button that must be depressed and released by the operator before depressing the actuating means in order to initiate the continuous mode of operation. This type of continuous mode of operation is sometimes referred to as “walk-away” continuous. This steel enclosure is 3½” x 3¼” x 3¼”. This prior-action station is also required when using the continuous-on-demand, automatic single-stroke, two-hand-maintained continuous, or foot-maintained continuous mode of operation. These modes of operation are furnished as standard features in the SSC1500 control.



**Prior-Action Station**

**SUPERVISORY CONTROL STATION**

**Part No. LLD1501**

**Part No. LLD283\***

**(required when a USC000 is used—see next page)**

When two or more palm button or foot switch operating stations are required on one machine, one supervisory control station is required at each operator station. This remote control station consists of an off/on keyed selector switch and a station on indicator light. The on position allows the operator to use that station, and the off position deactivates only that station. The enclosure size is 5¼” x 3” x 3¼”.



**Supervisory Control Station**

**BAR/RUN STATION (not included in any component package on page 34 or page 35)**

**Part No. LLD1502**

This remote bar/run station can be used in conjunction with a manual turnover bar when setting dies in the press. The flywheel must have holes in the periphery for insertion of a spring-loaded turnover bar\*\* (or the flywheel can be manually turned when the flywheel cover is removed). The remote station includes a three-position selector switch for bar/off/run, and one push button used for energizing the dual-solenoid air valve to engage the clutch and release the brake. The flywheel must be at rest (static) when engaging the clutch. After the clutch is engaged, the die setup person can manually turn the flywheel with a spring-loaded turnover bar (see page 86). The enclosure size is 5¼” x 3” x 3¼”.



**Bar/Run Station**

*\*Included in a component package on page 34 or page 35.  
\*\*For a spring-loaded turnover bar, see page 86.*

## SSC1500 PRESS INDIVIDUAL COMPONENTS (CONTINUED)

### MULTIPLE-OPERATOR JUNCTION BOX

Part No. USC000\*

When multiple operator stations are required, this junction box is furnished separately for wiring up to four (4) operator stations. This junction box interfaces palm button assemblies/control bars and foot switches, and will not allow the press to run if palm buttons or a foot switch is actuated without its supervisory control station on. A lighted push button with nameplate indicates a fault condition of an operator station. The button is pushed to reset. The enclosure size is 16" x 14" x 6".



Multiple-Operator Junction Box

### CRANKSHAFT ANGLE DISPLAY

Part No. FTL055

The optional crankshaft angle display is a unit that shows the angular position of the crankshaft for mechanical power presses. The crankshaft position is shown both graphically (with red LEDs in a circle) and numerically (with a large, red, three-digit LED). The large display can be easily seen which helps with setup, removal of stuck workpieces, or for assistance during emergency extraction procedures.

### FEATURES

- Large LED numerical display and circular LED graphic display can be easily seen
- 6" x 6" x 2" enclosure
- Mounts easily
- Supplied with 25' of cable for connection to the control
- Helps satisfy the requirements of Canadian Standard CSA Z142-02, Code for Power Press Operation: Health, Safety, and Guarding Requirements, for indication of crank angle position



Crankshaft Angle Display  
Mounted on a Mechanical Power Press

\*Included in a component package on page 34 or page 35.



## LOCKOUT VALVES (not included in any component packages on pages 34 or 35)

### SLIDE-OPERATED VALVE

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



PART NO.	PORT SIZE IN-OUT	BAR
RCD071	1/4"	250

### MANUAL VALVE

This manually operated valve shuts off air flow when a machine needs to be locked out. To shut off and exhaust air in the line, the handle is pushed in. This causes the pressurized supply of air to be blocked, and the downstream air in the line is exhausted through the exhaust port and muffler at the bottom of the valve. The valve can be padlocked in the off position. The valve is furnished with a muffler. Port sizes available for air flow are 3/4" and 1".



PART NO.	PORT SIZE		PSI	BAR
	IN-OUT	EXH.		
RCD076	3/4"	1-1/4"	15-50	1-10
RCD077	1"	1-1/4"	15-50	1-10

### MANUAL PILOT VALVE

This manually operated pilot valve is used in larger air systems. It is available for port sizes of 1 1/2" and 2 1/2". It operates in a similar manner as the manual valve. By pushing the handle in or out, it controls pilot pressure to a piston which opens or closes the valve's inlet poppet. It is designed to be locked only in the off position. This valve is furnished with a muffler.



PART NO.	PORT SIZE		PSI	BAR
	IN-OUT	EXH.		
RCD078	1-1/2"	1-1/2"	15-150	1-10
RCD079	2-1/2"	2-1/2"	30-150	2-10

### EEZ-ON VALVE

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



PART NO.	PORT SIZE		PSI	BAR
	IN-OUT	EXH.		
RCD121	1/2"	3/4"	30-150	2-10
RCD122	3/4"	3/4"	30-150	2-10

## SELECTING AN SSC1500 PRESS COMPONENT PACKAGE

To complete the SSC1500 control system, component packages are available. Component packages are listed in the charts below and on the next page. These packages can be furnished with:

- A STANDARD CONTROL    • A CUSTOM CONTROL    • A CONSOLE CONTROL    • A SPECIAL CONTROL
- A REMOTE OPERATOR-STYLE CONTROL    • A SUBPANEL    • A CONTROL MODULE KIT

To select the proper component package to go with your control box, determine your requirements below:

- A** MODES OF OPERATION AND ACTUATING MEANS REQUIRED.
- B** NUMBER OF OPERATOR STATIONS REQUIRED.
- C** NUMBER OF AIR PRESSURE SWITCHES REQUIRED.

<b>A</b> Modes of operation: Inch, Single, and Continuous (Hand or Foot)				
<b>B</b> ONE OPERATOR STATION			<b>B</b> TWO OPERATOR STATIONS	
MODES OF OPERATION TO BE USED	<b>C</b> ONE AIR PRESSURE SWITCH	<b>C</b> TWO AIR PRESSURE SWITCHES	<b>C</b> ONE AIR PRESSURE SWITCH	<b>C</b> TWO AIR PRESSURE SWITCHES
<b>SSC1500 Control Box</b>	TNR-000-SSP Standard Component Package	TNR-001-SSP Component Package	TNR-002-SSP Component Package	TNR-003-SSP Component Package
<ul style="list-style-type: none"> <li>• Two-Hand Inch</li> <li>• Two-Hand Single Stroke</li> <li>• Foot Single Stroke</li> <li>• Two-Hand Continuous</li> </ul>	<b>COMPONENTS REQUIRED IN ADDITION TO THOSE LISTED IN STANDARD PACKAGE AT LEFT</b>			
		CTD062 Air Pressure Switch (For Counterbalance)	CTL502 Palm Button Assembly CTD011 Foot Switch LLD283 Supervisory Control Station (2) USC000 Multiple Operator Junction Box	CTD062 Air Pressure Switch (For Counterbalance) CTL502 Palm Button Assembly CTD011 Foot Switch LLD283 Supervisory Control Station (2) USC000 Multiple Operator Junction Box
<b>A</b> Modes of operation: Inch, Single, and Continuous (Hand Only)				
<b>B</b> ONE OPERATOR STATION			<b>B</b> TWO OPERATOR STATIONS	
MODES OF OPERATION TO BE USED	<b>C</b> ONE AIR PRESSURE SWITCH	<b>C</b> TWO AIR PRESSURE SWITCHES	<b>C</b> ONE AIR PRESSURE SWITCH	<b>C</b> TWO AIR PRESSURE SWITCHES
<b>SSC1500 Control Box</b>	TNC-000-SSP Standard Component Package	TNC-001-SSP Component Package	TNC-002-SSP Component Package	TNC-003-SSP Component Package
<ul style="list-style-type: none"> <li>• Two-Hand Inch</li> <li>• Two-Hand Single Stroke</li> <li>• Two-Hand Continuous</li> </ul>	<b>COMPONENTS REQUIRED IN ADDITION TO THOSE LISTED IN STANDARD PACKAGE AT LEFT</b>			
	CMS115 Resolver/Pulsar Timing Device With 40' Cable and Plug CML000 Sprockets (Set of 2) CMS515 10' ANSI No. 35 Roller Chain RCL654 ¼" Dual-Solenoid Air Valve RCL045 ¾" Filter-Regulator-Lubricator Assembly CTD062 Air Pressure Switch (For Clutch/Brake) CTL502 Palm Button Assembly LLD1500 Prior-Action Station	CTD062 Air Pressure Switch (For Counterbalance)	CTL502 Palm Button Assembly LLD283 Supervisory Control Station (2) USC000 Multiple Operator Junction Box	CTD062 Air Pressure Switch (For Counterbalance) CTL502 Palm Button Assembly LLD283 Supervisory Control Station (2) USC000 Multiple Operator Junction Box

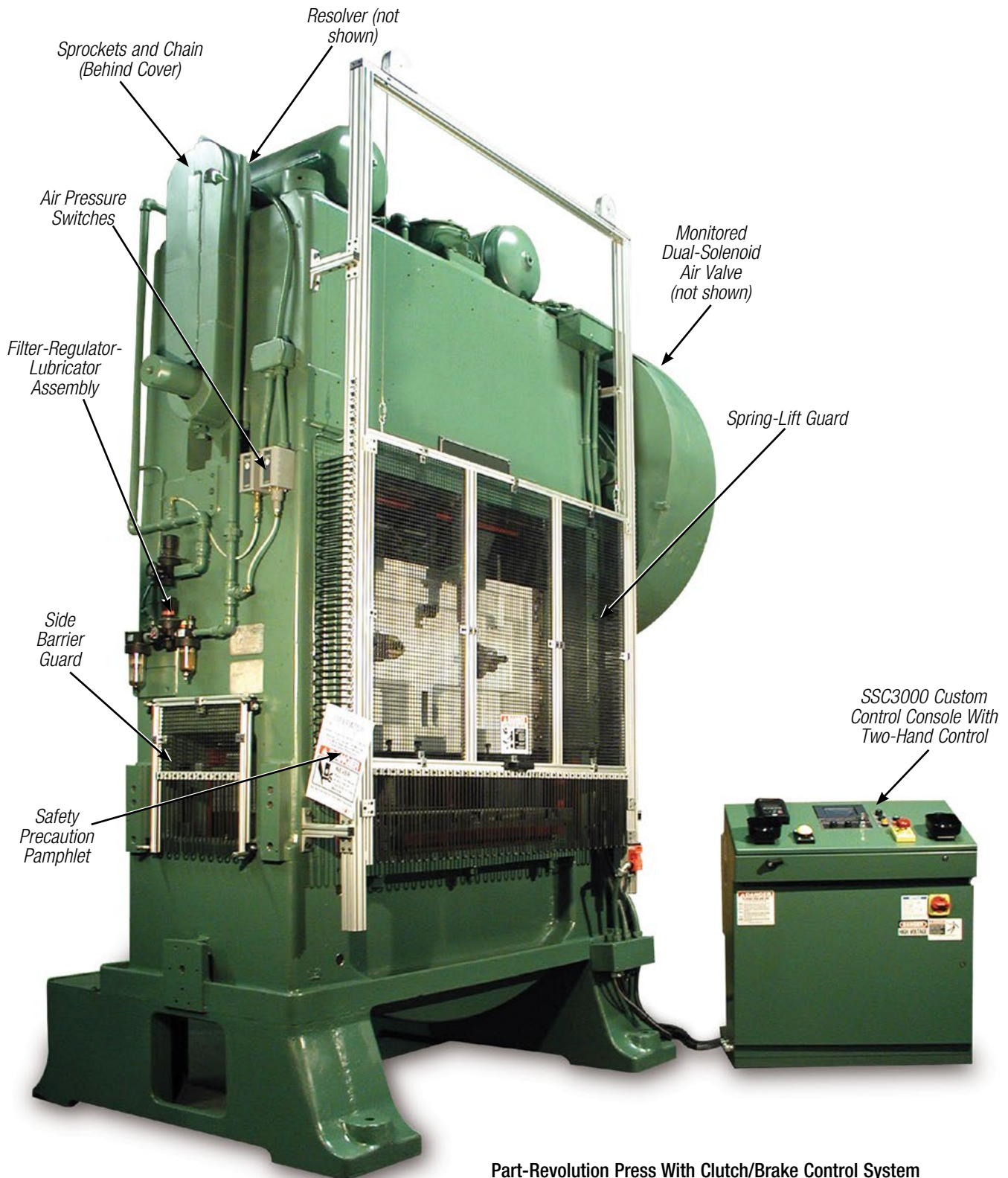
For light curtains, mounting brackets, and barrier guards for the sides of the point of operation, see Safeguarding Devices catalog.

## SELECTING AN SSC1500 PRESS COMPONENT PACKAGE (CONTINUED)

<b>A Modes of operation: Inch and Single (Hand or Foot)</b>				
<b>B ONE OPERATOR STATION</b>			<b>B TWO OPERATOR STATIONS</b>	
<b>MODES OF OPERATION TO BE USED</b>	<b>C ONE AIR PRESSURE SWITCH</b>	<b>C TWO AIR PRESSURE SWITCHES</b>	<b>C ONE AIR PRESSURE SWITCH</b>	<b>C TWO AIR PRESSURE SWITCHES</b>
<b>SSC1500 Control Box</b>	<b>TNK-000-SSP Standard Component Package</b>	<b>TNK-001-SSP Component Package</b>	<b>TNK-002-SSP Component Package</b>	<b>TNK-003-SSP Component Package</b>
<ul style="list-style-type: none"> <li>• Two-Hand Inch Stroke</li> <li>• Two-Hand Single Stroke</li> <li>• Foot Single Stroke</li> </ul>	CMS115 Resolver/Pulser Timing Device With 40' Cable and Plug CML000 Sprockets (Set of 2) CMS515 10' ANSI No. 35 Roller Chain RCL654 ¾" Dual-Solenoid Air Valve RCL045 ¾" Filter-Regulator-Lubricator Assembly CTD062 Air Pressure Switch (For Clutch/Brake) CTL507 Palm Button Assembly CTD011 Foot Switch	<b>COMPONENTS REQUIRED IN ADDITION TO THOSE LISTED IN STANDARD PACKAGE AT LEFT</b>		
		CTD062 Air Pressure Switch (For Counterbalance)	CTL507 Palm Button Assembly CTD011 Foot Switch LLD283 Supervisory Control Station (2) USC000 Multiple Operator Junction Box	CTD062 Air Pressure Switch (For Counterbalance) CTL507 Palm Button Assembly CTD011 Foot Switch LLD283 Supervisory Control Station (2) USC000 Multiple Operator Junction Box
<b>A Modes of operation: Inch and Single (Hand Only)</b>				
<b>B ONE OPERATOR STATION</b>			<b>B TWO OPERATOR STATIONS</b>	
<b>MODES OF OPERATION TO BE USED</b>	<b>C ONE AIR PRESSURE SWITCH</b>	<b>C TWO AIR PRESSURE SWITCHES</b>	<b>C ONE AIR PRESSURE SWITCH</b>	<b>C TWO AIR PRESSURE SWITCHES</b>
<b>SSC1500 Control Box</b>	<b>TNF-000-SSP Standard Component Package</b>	<b>TNF-001-SSP Component Package</b>	<b>TNF-002-SSP Component Package</b>	<b>TNF-003-SSP Component Package</b>
<ul style="list-style-type: none"> <li>• Two-Hand Inch Stroke</li> <li>• Two-Hand Single Stroke</li> </ul>	CMS115 Resolver/Pulser Timing Device With 40' Cable and Plug CML000 Sprockets (Set of 2) CMS515 10' ANSI No. 35 Roller Chain RCL654 ¾" Dual-Solenoid Air Valve RCL045 ¾" Filter-Regulator-Lubricator Assembly CTD062 Air Pressure Switch (For Clutch/Brake) CTL507 Palm Button Assembly	<b>COMPONENTS REQUIRED IN ADDITION TO THOSE LISTED IN STANDARD PACKAGE AT LEFT</b>		
		CTD062 Air Pressure Switch (For Counterbalance)	CTL507 Palm Button Assembly LLD283 Supervisory Control Station (2) USC000 Multiple Operator Junction Box	CTD062 Air Pressure Switch (For Counterbalance) CTL507 Palm Button Assembly LLD283 Supervisory Control Station (2) USC000 Multiple Operator Junction Box
<b>Console Application Only</b>	<b>A Modes of operation: Inch, Single, and Continuous (Hand Only)</b>			
	<b>B ONE OPERATOR STATION</b>			<b>B TWO OPERATOR STATIONS</b>
	<b>MODES OF OPERATION TO BE USED</b>	<b>C ONE AIR PRESSURE SWITCH</b>	<b>C TWO AIR PRESSURE SWITCHES</b>	<b>C TWO AIR PRESSURE SWITCHES</b>
<b>SSC1500 Control Box</b>	<b>TNX-000-SSP Standard Component Package</b>	<b>TNX-001-SSP Component Package</b>	<b>TNX-002-SSP Component Package</b>	<b>TNX-003-SSP Component Package</b>
<ul style="list-style-type: none"> <li>• Two-Hand Inch Stroke</li> <li>• Two-Hand Single Stroke</li> <li>• Two-Hand Continuous</li> </ul>	CMS115 Resolver/Pulser Timing Device with 40' Cable and Plug CML000 Sprockets (Set of 2) CMS515 10' ANSI No. 35 Roller Chain RCL654 ¾" Dual-Solenoid Air Valve RCL045 ¾" Filter-Regulator-Lubricator Assembly CTD062 Air Pressure Switch (For Clutch/Brake)	<b>COMPONENTS REQUIRED IN ADDITION TO THOSE LISTED IN STANDARD PACKAGE AT LEFT</b>		
		CTD062 Air Pressure Switch (For Counterbalance)	CTL502 Palm Button Assembly LLD283 Supervisory Control Station USC000 Multiple Operator Junction Box	CTD062 Air Pressure Switch (For Counterbalance) CTL502 Palm Button Assembly LLD283 Supervisory Control Station USC000 Multiple Operator Junction Box

For light curtains, mounting brackets, and barrier guards for the sides of the point of operation, see catalog *Safeguarding Devices* catalog.

**SAFEGUARDED PART-REVOLUTION PRESS WITH SSC3000 PRESS AUTOMATION CONTROL**



**Part-Revolution Press With Clutch/Brake Control System  
With Point-of-Operation Guards**

## SSC3000 STANDARD CONTROL



**Standard SSC3000 Control Box (PACG2-P100-VAABCXXX Shown)**

The SSC3000 solid-state press automation control is designed for use on part-revolution-clutch mechanical power presses. The SSC3000 is a rack-mounted modular control system with expandable options. These expandable options permit changes to be made, or features to be added or deleted as press requirements change. If additional features are required, plug-in cards and/or additional equipment can be added.

The basic design allows the user or OEM (original equipment manufacturer) to apply automation to mechanical power presses. The automation is usually applied to primary machines that operate in modes of continuous, automatic single stroke, or continuous-on-demand. This control can also be applied to presses that operate in the single-stroke mode of operation to perform manual secondary jobs that may be required to run automatic modes later.

The standard control box is in a 30" x 30" x 10" NEMA 12 enclosure with the operator controls and touch screen/display located in a remote operator station. The standard automation control rack is furnished with a power supply module and a Main CPU (central processing unit) Card.

The rack is designed to hold eight additional cards for expandable options. These card options include: Clutch/Brake Control, PLS (programmable limit switch), Die Protection, Load Monitor, and Angle Display.

Timing functions of the SSC3000 press automation control system are generated from a rotary resolver/pulsar assembly. This gives absolute position of the crankshaft (rotary) position.

If a starter or disconnect is required in the same enclosure as the standard SSC3000 control, see page 40, SSC3000 custom control box. If a separate starter or disconnect, or combination starter disconnect is required, refer to our Safety Shields catalog.

## SSC3000 CUSTOM CONTROL

A part-revolution-clutch SSC3000 custom control box is also available to fit your particular press room needs. This control includes the same features and modes of operation as the standard SSC3000 control box described on the previous page.

A custom SSC3000 solid-state press automation control box includes a multi-tap transformer, modular control rack with power supply, and a



**Custom SSC3000 Control Box  
(PACG2-P264-WAXXXXXXX Shown)**

Main CPU Card. It is furnished with an IEC through-the-door main power fused disconnect switch, an IEC magnetic motor starter(s) for the main drive motor and, a motor starter for the ram-adjust motor, if applicable. The operator controls and the touch screen/display can be located on the door, or they can be located in a remote operator station for use with a plain-door custom control box. NEMA disconnect switches and starters are also available.

To ensure the starter(s) and disconnect are sized properly, please check horsepower for the main drive motor and ram-adjust motor (if furnished) on the press, as well as full-load amps, and primary voltage to the press. After obtaining this information, please go to page 45 to determine the proper custom control box part number. Follow directions 1-7 to obtain the correct part number.

## SSC3000 MODULAR CONTROL RACK KIT



**PACG2-K000-XXXXXXX Shown**

The modular control rack kit can be furnished when the existing control enclosure is retained. The minimum area required on an existing control panel inside the control box to install the rack kit is 15" H x 18" W x 10" D. This kit includes a master control relay, the modular control rack, a power supply, and a Main CPU Card. A dual CPU press Clutch/ Brake Controller Card and other expandable card options can be added (see pages 42-44). A complete sign package, installation manual, instructions, and electrical diagrams are furnished.

## SSC3000 TOUCH SCREEN/DISPLAY KIT



**Touch Screen/Display Kit—LLD3023G2**

The touch screen/display kit includes the touch screen/display, an off/program/run selector, a mode selector, an actuating means selector, and a light curtain off/on selector switch, and 25' of cable. The space required to mount the touch screen/display kit is 12" H x 10" W x 3" D. A remote operator station can also be furnished that has the touch screen/display kit in an enclosure. See the next page for choices of operator stations.

### SSC3000 REMOTE OPERATOR STATIONS

A remote operator station or operator kit—containing the touch screen/display, off/program/run selector switch, other selector switches, and push buttons as required—is always necessary with the press automation control system.

Remote operator stations or kits are available in a standard format or can be customized to meet any requirements. Select from the following or contact the factory with your special requirements. If the Clutch/Brake Controller Card is not provided as a part of the press automation control system, contact the factory for a special remote operator station.



Standard Remote Operator Station  
Part No. LLD3004G2

### SSC3000 REMOTE OPERATOR STATIONS

FEATURES	PART NO. LLD3004 G2	PART NO. LLD3005 G2	PART NO. LLD3006 G2	PART NO. LLD3007 G2	PART NO. LLD3008 G2	PART NO. LLD3009 G2	PART NO. LLD3010 G2	PART NO. LLD3011 G2	PART NO. LLD3012 G2	PART NO. LLD3023 G2
ENCLOSURE	X	X	X	X	X					
TOUCH SCREE/DISPLAY	X	X	X	X	X	X	X	X	X	X
OFF/PROGRAM/RUN SELECTOR SWITCH	X	X	X	X	X	X	X	X	X	X
MODE OF OPERATION SELECTOR SWITCH	X	X	X	X	X	X	X	X	X	X
ACTUATING MEANS SELECTOR SWITCH	X	X	X	X	X	X	X	X	X	X
LIGHT CURTAIN OFF/ON SELECTOR SWITCH	X	X	X	X	X	X	X	X	X	X
MAIN MOTOR START & STOP PUSH BUTTONS		X	X	X	X	X	X	X	X	
MAIN MOTORE FORWARD/ REVERSE SELECTOR			X		X		X		X	
RAM-ADJUST OFF/ON SELECTOR SWITCH				X	X			X	X	
LIGHT CURTAIN BLANKING SELECTOR SWITCHES <i>(Use part # at right in place of part # above)</i>	LLD3031 G2	LLD3032 G2	LLD3033 G2	LLD3034 G2	LLD3035 G2	LLD3036 G2	LLD3037 G2	LLD3038 G2	LLD3039 G2	LLD3040 G2

An additional light curtain off/on selector switch can be added to the above operator stations or kits. The additional selector switch is used when two independent light curtain systems are required. Please consult the factory.

## SSC3000 BASIC SYSTEM FEATURES

### MODULAR RACK DESIGN

The SSC3000 press automation control consists of a modular control rack with power supply and a Main CPU (central processing unit) Card. The control rack is mounted to the panel with shock/vibration mounts and measures 9½” H x 17½” W x 6” D. This modular rack is designed with additional slots for adding expandable card options to provide the automation features you need for your press.

### MAIN CPU CARD

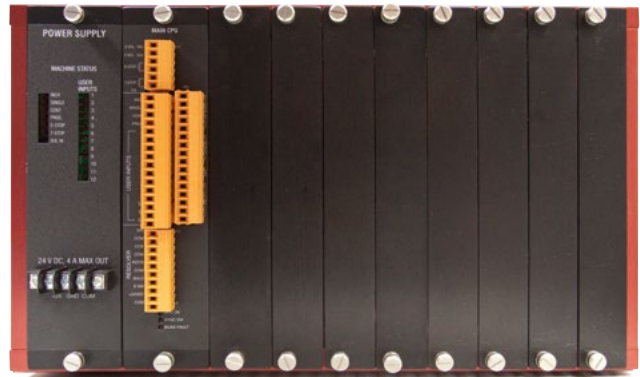
#### Part No. FRL-318

The SSC3000 press automation control Main CPU Card provides all the main processing for the base automation system. There are red and green LEDs (light-emitting diodes) that allow for visual indication of control operation and the status of inputs and outputs. All LED names are indicated on the cover of the Main CPU Card.

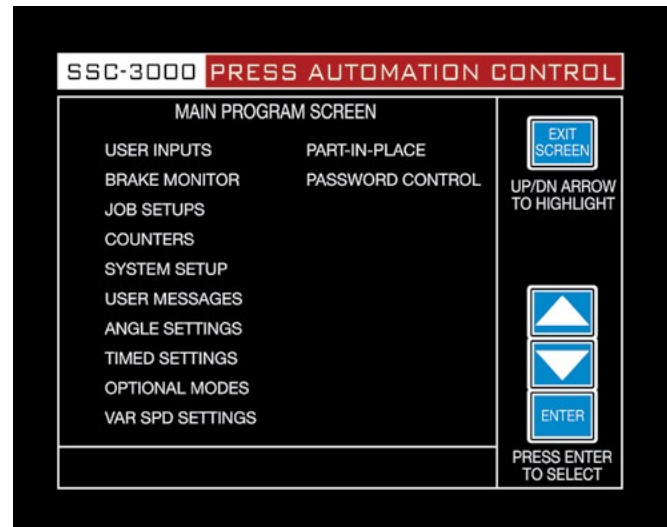
### Main CPU Card Features

#### User Inputs

Twelve (12) programmable user inputs are dedicated to machine diagnostics. They can be programmed for equipment monitoring or other user-defined functions. After programming the 12 inputs, the current status of these inputs can be displayed on the touch screen. When a fault condition is detected, the machine will top stop or emergency stop, and the assigned message will be displayed on the touch screen from the list below. An additional ten (10) user-defined messages can be added to this list.



Main Control Rack With Power Supply and Main CPU Card



Example of Main Program Screen

### Standard User Input Fault Messages

Clutch/Brake Air Fault	Lube Motor Overload	Variable Speed Drive Fault
Counterbalance Air Fault	Auxiliary Motor Overload	Die Protection Fault**
Dual Solenoid Fault	Guard Interlock Open	Short Feed Fault**
Clutch Valve Fault*	Front Guard Open	Part Ejection Fault**
Brake Valve Fault*	Rear Guard Open	Stock Buckle Fault**
Lube Fault	Left Side Guard Open	End of Stock Fault**
High Lube Pressure	Right Side Guard Open	Pilot Pin Fault**
Low Lube Pressure	Feeder Fault	Part Input #1**
Low Lube Level	Load Monitor Fault	Part Input #2**
Main Motor Overload	Safety Block Interlock	Part Input #3**
Ram-Adjust Motor Overload	Shut Height Fault	

\*Used when two valves are furnished for split clutch/brake

\*\*Messages typically used for die protection



## **SSC3000 BASIC SYSTEM FEATURES (CONTINUED)**

### **MAIN CPU CARD FEATURES (CONTINUED)**

#### **TIME-BASED BRAKE MONITOR**

A time-based programmable brake monitor (stopping performance monitor) with both warning and fault setpoints is included.

#### **STM (STOP-TIME MEASUREMENT) TEST**

The control includes a stop-time measurement test. This is used for establishing and maintaining the proper safety distance when applying two-hand control or light curtains as the safeguarding method.

#### **100-JOB SETUP MEMORY**

Up to 100 job setups can be stored in memory allowing for quick changeover from die to die. The die number, description, PLS outputs, die protection inputs, load monitor settings, servo feed, and counter information can be saved for each job.

#### **COUNTERS**

The batch and stroke counters can be used for die maintenance, quality control checks, or part bin exchanges. Each of these counters has a programmable preset and when it reaches the preset, the machine will top stop. The counters and presets are also saved in job memory. There is also a total counter which has security code protection. All of these counters can be displayed on the touch screen.

#### **SYSTEM SETUP**

The system setup screen is used to automatically zero the resolver, set the motion reference threshold, automatically set the sync switch position, and set the SPM (strokes per minute) range.

#### **USER MESSAGES**

Up to 10 user-defined programmable messages can be added to the general fault message list. These customized messages can be used with all user inputs and die protection inputs. The messages can be alphanumeric up to 24 characters.

#### **PASSWORD CONTROL**

The password control screen is used to enter a supervisor security code, an operator security code, and to assign the level of security code protection—none, operator, or supervisor. The security code is user-programmed up to 5 alphanumeric characters.

## SSC3000 EXPANDABLE OPTIONS

### DUAL CPU PRESS CLUTCH/BRAKE CONTROL CARD Part No. FTL319

The Dual CPU Press Clutch/Brake Control Card is designed to comply with OSHA 29 CFR 1910.217, and ANSI B11.1 and B11.19. This is accomplished by a redundant cross-checking, active dual-microprocessor control system. The system uses redundant inputs from devices such as palm buttons, foot switches, and light curtains. The system output to the solenoid valve(s) is provided by two monitored 24-V force-guided output relays. These primary safety output relays are independently controlled and cross-checked by the microprocessors. This allows control-reliable operation of the outputs in the event of a single control component failure. Each microprocessor also has its own logic power supply. This decreases the possibility of simultaneous control failure because of a fault within the power supply system. All inputs and outputs are optically isolated for electrical noise immunity. The Clutch/Brake Control Card also provides angle settings, timed settings, optional modes, variable speed settings, and a part-in-place input.

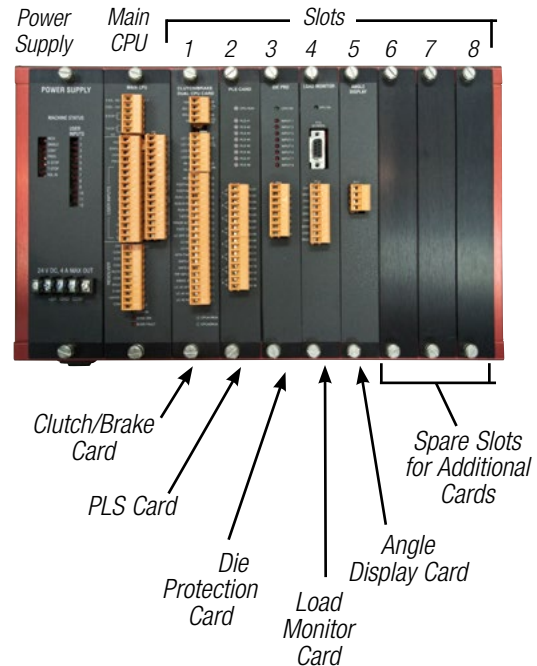
Angular position of the crankshaft is provided by a single absolute resolver/pulsar. A photoelectric sensor in the rotary timing device provides a synchronous signal which verifies the angular position.

*Note: Please furnish the electrical schematics if special feeding or transfer equipment will be used on the press when the Dual CPU Press Clutch/Brake Card is used.*

### STANDARD MODES OF OPERATION

- Two-hand inch (regular or timed)
- Two-hand single stroke
- Foot single stroke
- Two-hand “walk-away” continuous
- Continuous-on-demand
- Automatic single stroke
- Two-hand-maintained continuous
- Foot-maintained continuous
- One-hand or foot trip single stroke (use with light curtain or interlocked guard only)

### Control Rack With Cards and Card Slot Covers



### PLS (PROGRAMMABLE LIMIT SWITCH) CARD Part No. FTL320

The 8-Output PLS Card is designed to provide user-programmable outputs that can be used to sequence events during the press stroke. Up to two 8-Output PLS Cards can be used for a total of 16 outputs. All outputs have depluggable terminal strips with LED (light-emitting diode) indicators for easy installation and maintenance. The programmed PLS settings for each die are stored in job memory for QDC (quick die change).

PLS outputs can be used for automatic operations such as lube mist, air blow off, or feed initiation. Each output has a programmable on and off angle.

The outputs can also be programmed to turn off after a preset period of time in hundredths of a second. This “timed output” setting overrides any off angle setting.

A counter for counted output can also be programmed for auxiliary devices, such as lube or oil systems. This counter can be interfaced to the PLS Card to provide an output signal when the counter setting is reached. For example, if an oil mist is required every three cycles, the counter setting is set to 3 strokes. When the counter reaches 3 strokes, the PLS output turns on and the oil mist is sprayed over the workpiece or die. The counter is then reset, and the cycle starts over.

## SSC3000 EXPANDABLE OPTIONS (CONTINUED)

### DIE PROTECTION CARD

#### Part No. FTL321

The 8-Input Die Protection Card is designed to provide user-programmable inputs that monitor static or cyclic events during the press stroke. Up to three 8-Input Die Protection Cards can be used for a total of 24 inputs. The 24-V DC inputs have individual jumpers that set each input to current sinking or sourcing. All inputs have depluggable terminal strips with LED indicators for easy installation and maintenance.

The die protection inputs can be used for equipment monitoring, die protection, or other user-defined functions. Five (5) parameters can be programmed for each input: logic, stop type, open angle, close angle, and fault message. Ten (10) user-defined messages exist at the end of the user-programmable fault list. These ten messages can be edited by the user via the programmable options in the main program screen.

### ANGLE DISPLAY CARD

#### Part No. FTL323

The Angle Display Card is used in conjunction with the crankshaft angle display described below. The crankshaft angle display unit must be purchased in addition to the angle display card.

### CRANKSHAFT ANGLE DISPLAY UNIT

#### Part No. FTL054

The optional crankshaft angle display is a unit that shows the angular position of the crankshaft for mechanical power presses. The crankshaft position is shown both graphically (with red LEDs in a circle) and numerically (with a large, red, three-digit LED). The large display can be easily seen which helps with setup, removal of stuck workpieces, or for assistance during emergency extraction procedures. The Angle Display Card must be purchased in conjunction with this crankshaft angle display unit.

### FEATURES

- Large LED numerical display and circular LED graphic display can be easily seen
- 6" x 6" x 2" enclosure
- Mounts easily
- Supplied with 25' of cable for connection to the control
- Helps satisfy the requirements of Canadian Standard CSA Z142-02, Code for Power Press Operation: Health, Safety, and Guarding Requirements, for indication of crank angle position

### LOAD MONITOR SYSTEM

#### Load Monitor Card

#### Part No. FTL322

The SSC3000 control is designed to accept one or two Load (tonnage) Monitor Cards in the main rack. Each card is capable of monitoring the machine load at four locations on the machine frame or components. Four to eight load cells can be installed on the machine to read up to a maximum of eight zones of tonnage overload—four load cells per Load Monitor Card.

The Load Monitor Card is programmable through the SSC3000 touch screen/display. The minimum and maximum tonnage can be set manually or with a learn key. The learn key will add 10% to or subtract 10% from the current high and low settings. When enabled, a stop signal will be given when an over or under tonnage setting is detected. *The system for load monitoring also requires a load monitor control module and sensors (see next page).*



**Crankshaft Angle Display Mounted on a Mechanical Power Press**

## SSC3000 EXPANDABLE OPTIONS (CONTINUED)

### LOAD MONITOR SYSTEM (CONTINUED)



**Load Monitor Control Module**  
**Part No. RYL102**

The load monitor control module (9" H x 21/4" W x 4" D) detects the underload or overload information that is generated at each load sensor on the machine frame or component—available in a two- or four-cell sensor kit.

In order to use the load monitor system, the machine must be calibrated with calibration cells. This is done after installing the press automation control equipment and sensors. For further details on calibrating the load monitor system, please consult the factory.

The Load Monitor Card must be purchased in conjunction with the load monitor control module and sensor kit.



PART NO.	DESCRIPTION
RYT030	FOUR-CELL SENSOR KIT
RYT031	TWO-CELL SENSOR KIT

### SERVO FEED INTERFACE

A servo feed interface option is available that will communicate with the existing servo feed controller currently attached to the press or a feed that is being purchased. This interface can automate the setting for the feed length and feed rate. This speeds up die changeover because this information is stored once and then sent to the servo feed control when the tooling is changed. The interface consists of a connecting cable, electrical print, and software. Please furnish the manufacturer, model, and serial number of the servo feed to be interfaced.

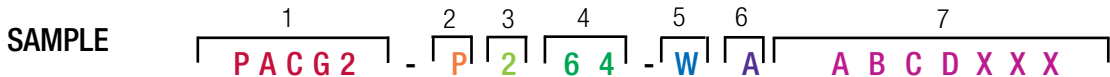


**OBI With Press Automation System and Servo Feed Interface**

# SELECTING AN SSC3000 PRESS AUTOMATION CONTROL

To determine the 18-digit part number for the press automation control required, follow the directions given below and use the information in the **PART NUMBERING SYSTEM CHART** below.

1. The first 5 digits for all press automation controls are PACG2.
2. The 6th digit determines the location of the operator controls.
3. The 7th digit determines the size of the disconnect switch, if provided, in the control enclosure. Zero (0) indicates no disconnect switch provided.
4. The 8th and 9th digits determine the size and type of motor starter(s), if provided, in the control enclosure. Zeros (00) in both positions indicate no motor starter(s) provided.
5. The 10th digit is for the type of light curtain interface provided on the electrical schematics.
6. The 11th digit indicates if a Clutch/Brake Controller Card is required. Zero (0) indicates none is required.
7. The 12th through the 18th digits are for the expandable rack slot options or slot covers, i.e., PLS, Die Protection, Load Monitor, Angle Display Card, and/or slot covers.



The sample shown, PACG2-P264-WAABCDXXX, indicates that the plain-door custom part-revolution control box will contain a C4000 Standard light curtain interface, an IEC 60-A disconnect switch, an IEC 30A reversing main drive motor starter, and an IEC reversing ram adjust motor starter. The control will contain the Clutch/Brake Controller Card, an 8-output PLS Card, an 8-input Die-Protection Card, a 4-input Load Monitor Card, a 4-input Load Monitor Card, an Angle Display Card, and three slot covers.

### SSC3000 PRESS AUTOMATION CONTROL PART NUMBERING SYSTEM CHART

P A C G 2 - X X X X - X X X X X X X X X X

**SYSTEM TYPE PRODUCT CATEGORY**

PACG2 — Press Automation Control

**CONFIGURATION & OPERATOR LOCATION**

- P — All Operators Remote (Plain Door)
- F — All Motor Operators on Door
- M — Main Motor Operators on Door, Ram-Adjust Operators Remote
- C — Console (All Operators Included)
- K — Kit — No Enclosure; Operators Remote
- N — NEMA Components; All Operators Remote (Plain Door)

**DISCONNECT SWITCH SIZE—IEC (PLUS MAXIMUM MAIN MOTOR FLA)**

- 0 — No Disconnect Switch
- 1 — 30A Disconnect — 1- to 20-FLA Main Drive Motor
- 2 — 60-A Disconnect — 21- to 40-FLA Main Drive Motor
- 3 — 100-A Disconnect — 41- to 66-FLA Main Drive Motor
- 4 — 200-A Disconnect — 67- to 133-FLA Main Drive Motor
- 5 — 400-A Disconnect — 134- to 266-FLA Main Drive Motor

**REVERSING/NONREVERSING MAIN MOTOR STARTER WITH OR WITHOUT RAM ADJUST**

- 0 — No Motor Starters
- 1 — Nonreversing Main Motor Starter Without Ram Adjust
- 2 — Reversing Main Motor Starter Without Ram Adjust
- 3 — Nonreversing Main Motor Starter With 12-A Ram Adjust
- 4 — Nonreversing Main Motor Starter With 18-A Ram Adjust
- 5 — Nonreversing Main Motor Starter With 25-A Ram Adjust
- 6 — Reversing Main Motor Starter With 12-A Ram Adjust
- 7 — Reversing Main Motor Starter With 18-A Ram Adjust
- 8 — Reversing Main Motor Starter With 25-A Ram Adjust

**RACK SLOT #2 - #8 OPTIONS**

Begin with 10th digit and proceed to the right by assigning desired option to specific slot.

- A — 8-Output PLS Card (maximum 2 each)
- B — 8-Input Die Protection Card (maximum 3 each)
- C — 4-Input Load Monitor Card\* (maximum 2 each)
- D — Angle Display Card\*\*
- X — Slot Cover(s)

**RACK SLOT #1 CONTROLLER TYPE**

- A — With Clutch/Brake Controller Card
- X — Without Clutch/Brake Controller Card — Slot Cover

**LIGHT CURTAIN OPTIONS\*\***

- B — Banner Light Curtain
- C — C4000 Advanced With LC Operators on Door
- V — C4000 Advanced With LC Operators Remote
- W — C4000 Standard

**MAIN MOTOR STARTER SIZE**

- 0 — No Starter
- IEC
- 1 — 12 A
- 2 — 18 A
- 3 — 25 A
- 4 — 32 A
- 5 — 40 A
- 6 — 50 A
- 7 — 65 A
- 8 — 80 A
- 9 — 95 A
- A — 115 A
- B — 185 A
- C — 265 A

Motor Horsepower Chart—3 Phase				
	208 V	230 V	460 V	575 V
2	2	3	7.5	7.5
5	5	5	10	10
7.5	7.5	10	15	15
10	10	10	20	20
15	15	15	30	30
20	20	20	50	50
25	25	30	60	75
30	30	30	60	75
30	30	40	75	100
50	50	60	125	150
75	75	100	200	200

\* An RYL102 load monitor control module and sensor kit(s) are needed in addition to the load monitor card—see pages 43-44.

\*\* An FTL054 crankshaft angle display unit is needed in addition to the angle display card—see page 43.

## SSC3000 COMPONENT PACKAGES

To complete the SSC3000 control system, component packages are available to use with the SSC3000 control box. These component packages are similar to those listed on pages 34 and 35 for use with the SSC1500 control box; however the prior-action component part number changes within the component packages listed on page 36—see below.

The prior-action station included with the continuous mode of operation component packages is Part No. LLD3000. This replaces the prior-action station Part No. LLD1500 in the component packages listed on page 36.

**The component package part number also changes when ordering an SSC3000 component package.** Change the selected component package's part number suffix **-SSP** listed on pages 34-35 to the suffix **-SSC** when ordering an SSC3000 component package.

## SSC3000 INDIVIDUAL COMPONENTS

### PRIOR-ACTION STATION—Part No. LLD3000\*

This prior-action station has an illuminated push button that must be depressed and released by the operator before depressing the actuating means in order to initiate the continuous mode of operation. This steel enclosure is 3½" x 3¼" x 3¼". The prior-action station is required when using the "walk-away" continuous, continuous-on-demand, automatic single stroke, two-hand-maintained continuous, or foot-maintained continuous mode of operation. These modes of operation are standard features of the SSC3000 control.



Prior-Action Station

### SUPERVISORY CONTROL STATION

Part No. LLD3001

Part No. LLD283\* (required when a USC000 is used—see below)

When multiple operator stations are required, this supervisory control station is furnished separately for each set of palm buttons and/or foot switch operator station. It has its own enclosure and includes an off/on key-operated selector switch and a green on indicator light. The enclosure size is 5¼" x 3" x 3¼".



Supervisory Control Station

### BAR/RUN STATION (NOT INCLUDED IN ANY COMPONENT PACKAGE)

Part No. LLD3002

This remote bar/run station can be used in conjunction with a manual turnover bar when setting dies in the press. The flywheel must have holes in the periphery for insertion of a spring-loaded\*\* turnover bar (or the flywheel can be manually turned when the flywheel cover is removed). The remote station includes a three-position selector switch for bar/off/run, and one push button used for energizing the dual-solenoid air valve to engage the clutch and release the brake. The flywheel must be at rest (static) when engaging the clutch. After the clutch is engaged, the die setup person can manually turn the flywheel with a spring-loaded turnover bar (see page 86). The enclosure size is 5¼" x 3" x 3¼".



Bar/Run Station

### MULTIPLE-OPERATOR JUNCTION BOX

PART NO. USC000\*

When multiple operator stations are required, this junction box is furnished separately for wiring up to four (4) operator stations. This junction box interfaces palm button assemblies/control bars and foot switches, and will not allow the press to run if palm buttons or a foot switch is actuated without its supervisory control station on. A lighted push button with nameplate indicates a fault condition of an operator station. The button is pushed to reset. The enclosure size is 16" x 14" x 6".



Multiple-Operator Junction Box

\* Included in an SSC3000 component package on page 36 or page 37 after changing the suffix **-SSP** to **-SSC** in the component package number.

\*\* For a spring-loaded turnover bar, see page 86.

## CONTROL CONSOLES

All of the previously mentioned part-revolution-clutch controls can be furnished as special control systems engineered to your specifications. Please consult the factory for further details on your requirements. This page illustrate some examples of special controls that can be designed.

A floor-standing console contains the clutch/brake or hydraulic controls and motor controls mounted inside on subpanels. These are typically used on high-speed or large presses. Consoles are used in place of controls mounted to the machine to avoid extreme press shock vibration. Isolating the press controls in the console gives electrical components a longer life. Control consoles are usually furnished in oil-tight enclosures which have a sloped top for operator convenience. Casters are optionally available to provide mobility of the console. The enclosure door has a lockable handle so that unauthorized personnel cannot tamper with the controls.

These consoles may be furnished with IEC or NEMA disconnect switches and magnetic motor starters. The disconnect handle is located on the enclosure door (lockable in the off position). The starter push buttons (and selector, when a reversing starter is furnished) are located on the sloped front. These consoles are available in the configuration shown or any other way that meets your requirements. User-supplied or user-specified components can also be incorporated into these control consoles.

Please furnish exact motor horsepower, voltage, and full-load amps when ordering disconnect switches and motor starters.

## SPECIAL CONTROLS

Have you ever been in a position where you required a unique control, but lacked the time or expertise to design one? If so, we can help you. We have the knowledge and experience to design, manufacture, and install a control panel or an entire control system to meet your specific requirements.

At your request, our safety control specialists can visit your plant to determine exactly what is required or you can mail us your existing prints. A proposal will be submitted to you detailing the exact specifications and costs involved.

Our engineering personnel will design the circuit for the control system. Every control is designed to the applicable OSHA and ANSI standards. The final stage of design results in a complete set of control circuit schematics, connection and layout diagrams.

Next, the control design is sent to our production department. Control panel assembly begins here with the layout and wiring of the control. After the manufacture of the control is complete, it is subject to a rigorous testing procedure which ensures proper operation.

If you require installation of the special control, we have highly skilled installation crews that are available to install the control system or to instruct your own maintenance personnel.

Each special machine control we design can be unique. You have our commitment to quality.



Floor-Standing Control Console



Special Control With Operator Interface, Push Buttons, and Selector Switches



Special Control With Enclosure Door Open Showing SSC1500 Control, Variable Frequency Drive, and Other User-Requested Components

**REMOTE MOTOR CONTROL OPERATOR STATIONS FOR USE WITH SSC1500 PRESS CONTROLS, SSC3000 PRESS CONTROLS, AND SSC1500 PRESS BRAKE CONTROLS**

**Part No. VOS1000**

—For use with *nonreversing* motor starters

This 6¾" x 3½" x 3" station is a motor control green start push button and a red stop push button in a NEMA 12 metal enclosure.



**Part No. VOS1000**

**Part No. LLD3213**

— For use with *reversing ram adjust* motor starters

This 8¾" x 3½" x 3" station has black ram raise and ram lower push buttons, and a two-position ram-adjust off/on selector switch in a NEMA 12 metal enclosure.



**Part No. LLD3213**

**Part No. VOS1100**

—For use with *reversing* motor starters

This 8¾" x 3½" x 3" station is a motor control green start push button, a red stop push button, and a two-position forward/reverse selector switch in a NEMA 12 metal enclosure.



**Part No. VOS1100**

**Part No. LLD3215**

— For use with *reversing main motor starters and reversing ram-adjust* motor starters

This 8¾" x 6¼" x 3¾" station has a two-position ram-adjust off/on selector switch, black ram raise and ram lower push buttons, a two-position forward/reverse selector switch, a motor control green start push button, and a red stop push button in a NEMA 12 metal enclosure.



**Part No. LLD3214**

**Part No. LLD3214**

— For use with *nonreversing* main motor starters and *reversing ram-adjust* motor starters

This 8¾" x 6¼" x 3¾" station has a two-position ram-adjust off/on selector switch, black ram raise and ram lower push buttons, a motor control green start push button, and a red stop push button in a NEMA 12 metal enclosure.



**Part No. LLD3215**



## CONTROL BARS

Control bars of various configurations can be provided to mount either to the machine or on a pedestal-type floor stand. The standard control bars can have various guarded run/inch palm buttons, emergency-stop and top-stop palm buttons, a multiple operator supervisory station selector switch with indicator light, and either of two types of prior-action push buttons. Please refer to the **CONTROL BAR PART NUMBERING SYSTEM CHART** on the next page to obtain the part number of the standard control bar required.

Special control bars can be provided with other required selector switches and indicator lights, depending on the individual requirements. Consult the factory for pricing and delivery when a special control bar is required.



Part No. MCB3111-1



Part No. USC2611-1



Special Control Bar With Additional Selector Switch and Indicator Light in a Larger Enclosure

## FLOOR STANDS FOR CONTROL BARS

Control bars and any palm button assembly can be furnished with either of these floor stands.



Part No. KCL000  
—Floor Stand With Base and Top Plate

This 37" **nonadjustable** heavy-duty floor stand includes a top plate and a 4" x 4" column. The base has four holes for permanent attachment to the floor; bolts are not furnished.



Part No. KCL017  
—Adjustable Floor Stand With Base and Top Plate

The **adjustable** column (28" to 47") on this floor stand can easily be moved up and down for operator comfort. A hand tool is required to make adjustments. The base has four holes for permanent attachment to the floor; bolts are not furnished. Custom heights are available. Please consult the factory.

## SELECTING A CONTROL BAR

To determine the 7- or 8-digit configured part number for a standard control bar, follow directions 1-6 below and use the information in the **CONTROL BAR PART NUMBERING SYSTEM CHART** below.

1. The first 3 digits for all control bars are MCB or USC.
2. The 4th digit determines the size of the bar enclosure.
3. The 5th digit determines the type of run/inch button provided.
4. The 6th digit determines the type of emergency-stop button provided.
5. The 7th digit determines the type of top-stop or return button provided.
6. The 8th digit will indicate the type of modifier provided; e.g., supervisory selector switch, indicator light, and prior-action push button.

CONTROL BAR PART NUMBERING SYSTEM CHART	
<b>X X X - X X X - X</b>	
<p><b>CONTROL BAR</b></p> <p>MCB — Universal Control Bar USC — Control Bar for Use With USC000 Multiple-Operator Junction Box Only</p> <p><b>ENCLOSURE SIZE (4" x 4" x X)</b></p> <p>1 — 18" — Run Buttons on Ends of Enclosure 2 — 24" — Run Buttons on Ends of Enclosure 3 — 30" — All Operators on Front of Enclosure 4 — 36" — All Operators on Front of Enclosure</p> <p><b>RUN BUTTON OPERATOR TYPE</b></p> <p>1 — Rees Black Palm Button With Rockford Systems Guards—Front Only 2 — A-B Articulated Palm Button With A-B Guards—Front Only 3 — N/A 4 — IDEC Green Push Button With IDEC Guard 5 — A-B Zero-Force Touch Buttons With Guards (90-264 VAC) 6 — Banner Opto-Touch Buttons With Guards (20-30 VAC/DC) 7 — Mushroom Push Buttons With Guards (SQ-D) 8 — Rees Chrome Light-Push Button With Rockford Systems Guards—Front Only</p>	<p><b>MODIFIER</b></p> <p>0 — None 1 — Includes Station Off/On Selector Switch and Indicator 2 — Includes Prior-Action Push Button 3 — Includes Station Off/On Selector Switch, Indicator, and Prior Action Push Button 4 — Includes Lighted Prior-Action Push Button (SSC) 5 — Includes Station Off/On Selector Switch, Indicator, and Lighted Prior-Action Push Button</p> <p><b>TOP-STOP OR RETURN TYPE</b></p> <p>0 — None 1 — Rees Yellow Top-Stop Palm Button (1 NO and 1 NC) 2 — A-B Yellow Top-Stop 40 mm Mushroom Palm Button (1 NO and 1 NC) 3 — Rees Yellow Return Palm Button (1 NO and 1 NC) 4 — A-B Yellow Return 40 mm Mushroom Palm Button (1 NO and 1 NC)</p> <p><b>EMERGENCY-STOP TYPE</b></p> <p>1 — Rees Red Palm Button—Latch-Out Type 2 — A-B Red 40 mm Two-Position—Twist-to-Return</p>

### OPERATOR AND EMERGENCY-STOP TYPE BUTTONS FOR CONTROL BARS



Rees Black Palm Button  
With RSI Guard



A-B Articulated Palm  
Button With A-B Guard



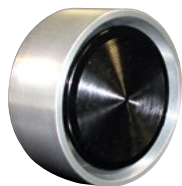
IDEC Button With Guard



A-B Zero-Force Touch  
Button With Guard



Opto-Touch Button  
with Guard



Mushroom Push Button  
With Guard (SQ-D)



Rees Chrome Light-Push  
Button With RSI Guard



Rees Red E-Stop  
Button—Latch-Out



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

All buttons have 1 NO and 1 NC contact arrangement.

## HYDRAULIC POWER PRESS CONTROL SYSTEMS



**Hydraulic Press With a Light Curtain and Two-Hand Control Device as the Point-of-Operation Safeguard— Also Has a Hydraulic Control With Control Reliability**

Each hydraulic power press must be looked at as an individual system. This system consists of, but is not limited to, the machine frame, all mechanical parts, hydraulic system, electrical or electronic systems, pneumatic systems, tooling or dies (present and future), tool or die setup, safeguarding, material handling, size or configuration of workpiece, maintenance requirements, and most importantly, production requirements.

### OSHA REGULATIONS

For hydraulic power presses, the main safety requirements that must be complied with fall under OSHA 29 CFR 1910.212, General Requirements for all Machines. This section of the CFR requires point-of-operation safeguarding.

If auxiliary equipment on the hydraulic power press has mechanical power-transmission apparatuses, then OSHA 29 CFR 1910.219 must be complied with. For lockout/tagout requirements, OSHA 29 CFR 1910.147 should be referenced.

### ANSI STANDARDS

There are several references available on hydraulic press safety; however, most end-users rely on the ANSI (American National Standards Institute) B11.2 standard for best safety practices.

In ANSI B11.2, subclause 6.3 Control System, it states that “All components and subsystems of the control system shall be designed to operate together to provide total system compliance with the requirements of this clause. Control components shall be selected, constructed and connected together in such a way as to withstand expected operational and environmental stresses. The control system shall meet the following design and construction requirements:”

### 6.3.1 PRESS PUMP MOTORS

The control system shall not permit the initiation of slide(s) motion unless at least one pump motor is running. This requirement may not apply to die setting operations—see subclause 9.2.3 in ANSI B11.2.

### 6.3.2 POWER FAILURE

The control system shall be designed so that in the event of power failure, restoration of power will not result in any hazardous slide motion.

### 6.3.3 CONTROL RELIABILITY

Control systems shall be designed and constructed so a single failure or fault within the system:

1. Does not prevent the normal stopping action from being applied to the press, when required;
2. Does not create unintended slide motion;
3. Does prevent initiation of a successive stroke until the failure is corrected.

See Electrical Requirements in this section for other requirements found in ANSI B11.2.

### 6.6.5 HYDRAULIC COMPONENTS AND CIRCUITS

Hydraulic component circuits that control slide(s) motion shall comply with the requirements of 6.3.3.

### CONTROLS

The controls described in this catalog include two-hand control as a point-of-operation safeguarding device. The palm buttons must be depressed concurrently and maintained during the hazardous downstroke of the ram. Release of one or both palm buttons reverses or stops the action of the ram. The controls offered also include a light curtain interface.

### ELECTRICAL REQUIREMENTS

The ANSI B11.2 standard requires a proper main power disconnect switch. A motor starter is also required that drops out when power is lost and will not restart automatically. All AC control circuits and solenoid valves must be powered by 120 V or less (obtained from the transformer), and the control system must be protected against false operation due to an accidental ground.

### UPDATING HYDRAULIC POWER PRESSES

To update the electrical system or to add point-of-operation safeguarding to hydraulic power presses, the electrical and hydraulic schematic diagrams must be reviewed by Rockford Systems' engineering department. Please provide these schematics to our sales personnel or factory-authorized representatives when they visit your plant to conduct a machine survey.

## STANDARD HYDRAULIC POWER PRESS CONTROL

This solid-state control system is designed for use on hydraulic power presses. It is designed and built to comply with OSHA 29 CFR 1910.212 and ANSI B11.2 and B11.19. This control can update or replace existing control systems on hydraulic power presses found in users' plants or can be furnished for new or rebuilt hydraulic power presses.

This control includes control reliability, two-hand control, light curtain interface, and diagnostics (one user-programmable input). It also includes batch and stroke counters with presets, and a hard-wired emergency-stop master control relay.

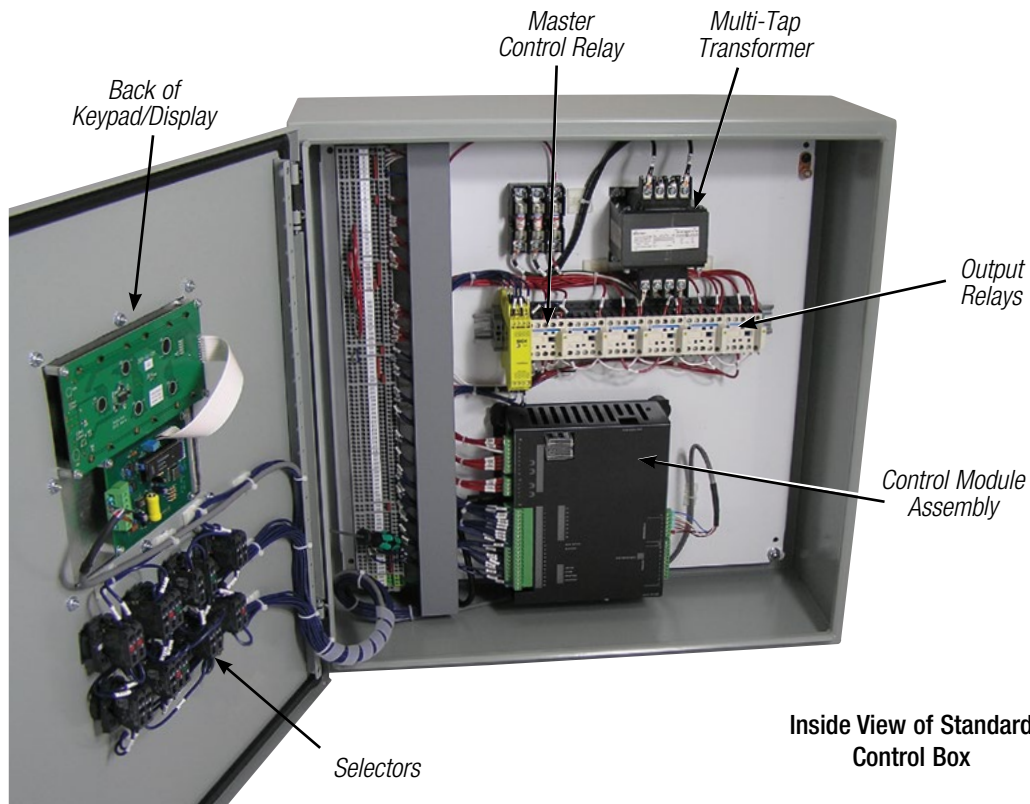
This is an economic, full-featured dual micro-processor-based control system. The system uses redundant inputs from devices such as palm buttons, foot switches, and light curtain(s). The system output to the solenoid valves is provided by two force-guided relays. These output relays are independently controlled and cross-checked by the microprocessors. This allows control-reliable operation of the outputs in the event of a single control component failure in the control. The standard hydraulic power press control has minimum requirements for the press it is to control. These minimum requirements include a directional or one up and one down solenoid valve(s) for the ram, a TOS (top-of-stroke) limit switch, and a BOS (bottom-of-stroke) limit or pressure switch. In most cases, if these already exist, they can be reused. Speed-change valves and limit switches can also be supported with the standard hydraulic control. If other valves exist (additional speed change valves, prefill, regeneration, level, bypass, etc.), please consult the factory for a quote on a special-designed control.

The standard control box is a 20" x 20" x 8" NEMA 12 enclosure with the operator controls and keypad/display mounted in the door, as illustrated above.

A starter or disconnect can be included in a larger enclosure, or a combination starter disconnect can be furnished separately.



Standard Control Box



Inside View of Standard Control Box

## STANDARD HYDRAULIC POWER PRESS CONTROL (CONTINUED)

### OPERATOR INTERFACE KEYPAD/DISPLAY

The operator interface keypad/display is used to enter setup information, monitor machine operation, and display messages on a 4-line x 20-character LCD (liquid crystal display). As standard, this keypad is mounted on the control box door. For operator convenience, it can be installed in a remote operator station. Programming is accessed by a keyed selector switch.

### PROGRAMMING

The hydraulic power press control can be quickly and easily programmed. There is one 24-V DC selectable current-sinking or sourcing programmable diagnostic input provided for the user. A fault message, input logic, and stop type can be assigned to the input from the user input fault message list. When a fault condition is detected, the machine will top stop or emergency stop, and the assigned message will be displayed. This feature helps when troubleshooting common fault conditions.



Keypad/Display

### MODES OF OPERATION

- Off
- Two-hand inch
- Two-hand single stroke
- Foot single stroke
- Foot switch trip or one-hand trip single stroke (used in conjunction with a point-of-operation safeguard)\*
- High, high/low, low speed change
- Two-hand automatic (continuous)
- Automatic single stroke\*

\*Additional components may be required to use this mode of operation.

### FEATURES

- Meets and exceeds OSHA 29 CFR 1910.212 and ANSI B11.2 and B11.19
- Provides two-hand control safeguarding device
- Redundant and cross-checking microprocessors
- Redundant switching style DC power supplies
- Two monitored ram advance (up or down) 24-V force-guided output relays
- External relay monitoring (for use when external relays are used to energize the down valves)
- Blocking valve monitoring
- Press control operates on 85-135 VAC
- Provisions for optional light curtain interface with off/on supervised keyed selector switch
- Easy to read back-lit liquid crystal operator interface display having 4 lines x 20 characters
- One (1) 24-V DC digital user input, programmable, selectable canned message
- One (1) ram speed change (fast-slow) output, standard 120 VAC with a selector switch for high, high/low, low speed (to support machines with a speed change solenoid valve)
- One (1) ram return (up or down) output, standard 120 VAC with a selector switch for pressure, pressure/distance, distance return
- Bottom dwell timer (0-600 seconds)
- Decompression timer (50-250 ms)
- 7-digit stroke counter
- 7-digit batch counter with preset
- Operator interface keypad and display, text in English or Spanish

*For control reliability*

## CUSTOM HYDRAULIC POWER PRESS CONTROL

A custom control box contains the standard control module and components described on pages 52-53 plus the following:

- main power disconnect switch
- main hydraulic pump motor starter

The box will vary in size based on the disconnect switch and motor starter components. The box is furnished with an IEC through-the-door main power fused disconnect switch and an IEC hydraulic pump magnetic motor starter (with push buttons). They are prewired and built into a NEMA 12 enclosure.

Operator controls and the keypad/display are located on the front of the door, or a plain-door control or subpanel can be furnished. A remote operator station or keypad/display kit is required if a plain-door control or subpanel is ordered. See the next page for information on remote operator stations.

To ensure the starter(s) and disconnect are sized properly, please check horsepower for the main hydraulic pump motor on the machine, as well as full-load amps and primary voltage to the machine. After obtaining this information, go to the chart on page 56 to determine the proper custom control box part number. Follow directions 1-7 to determine the correct part number.



### REMOTE OPERATOR-STYLE CONTROL BOXES

Remote operator-style X, Y, and Z hydraulic control boxes include the same features and modes of operation as the standard hydraulic control boxes. **However, they do not have a control transformer.** These control boxes are designed to be located on the front of the machine near the operator.

These controls are for applications where the machine's existing magnetic motor starter, fused disconnect switch, and control transformer meet the safety requirements and can be reused. If the existing control transformer cannot be reused or a new one is required, please contact the factory.

The keypad/display and all operator controls are located on the door (front) of the remote operator-style control box.

### CONTROL MODULE KIT

A control module kit allows the end user to update the hydraulic control of a press with minimum equipment costs. The kit is supplied without the control enclosure, panel, control transformer, control fuse, terminal strips, wire duct, and wiring.

A set of electrical prints is supplied to show typical wiring, and all mounting dimensions are provided in order for a qualified person to install the control module kit. The minimum area required on an existing control panel to install this kit is 18" H x 18" W x 6" D.

This control module kit includes the control module, control relays, shock mounts, fasteners, suppressors, danger labels, and electrical prints. A keypad/display kit is required unless a remote operator station is used (see next page).

If the automatic (continuous) mode of operation is used, a prior-action station

—Part No. LLD6100—is required. See page 57.

### SUBPANEL

A subpanel control can also be furnished. It is the same as the standard control described on pages 52-53 without the enclosure. The minimum area required in an existing control enclosure is 18 1/2" H x 18 1/2" W x 6" D.



## KEYPAD/DISPLAY KIT

### Part No. LLD6011 (for RHPC—Press Controls)

The keypad/display kit can be used with any of the control boxes or the control module kit. This kit includes the keypad/display, an off/program/run selector switch, a light curtain off/on selector switch, a hand/foot selector switch, an inch/single/automatic selector switch, a high/low speed selector switch, a pressure/pressure distance/distance return selector switch, and 25' of cable. Additional push buttons, nameplates, and selector switches for the motor starter, etc., can be furnished depending on the features required. Please consult the factory.



## REMOTE OPERATOR STATIONS

For operator convenience, a remote operator station can be furnished for use with a plain-door standard control box, plain-door custom control box, module kit, or subpanel. The remote operator station contains the keypad/display, program selector switch, and other selector switches as required.

Remote operator stations are available in a standard format or can be customized to meet any requirements. Select from the following remote operator stations.



Part No. LLD6001  
Remote Operator Station for Hydraulic Press

## REMOTE OPERATOR STATIONS FOR HYDRAULIC PRESSES

FEATURES	PART NO. LLD6000	PART NO. LLD6001	PART NO. LLD6002	PART NO. LLD6003	PART NO. LLD6004	PART NO. LLD6005	PART NO. LLD6006	PART NO. LLD6007
KEYPAD/DISPLAY	X	X	X	X	X	X	X	X
OFF/PROGRAM/RUN SELECTOR SWITCH	X	X	X	X	X	X	X	X
INCH/SINGLE/ AUTOMATIC SELECTOR SWITCH	X	X	X	X	X	X	X	X
HAND/FOOT SELECTOR SWITCH	X	X	X	X	X	X	X	X
LIGHT CURTAIN OFF/ON SELECTOR SWITCH	X	X	X	X	X	X	X	X
HIGH/LOW SPEED SELECTOR SWITCH	X	X	X	X	X	X	X	X
PRESSURE/PRESSURE DISTANCE/DISTANCE RETURN SELECTOR SWITCH	X	X	X	X	X	X	X	X
MAIN MOTOR START AND STOP PUSH BUTTONS		X		X		X		X
PRIOR-ACTION BUTTON FOR AUTOMATIC MODES OF OPERATION			X	X			X	X
ADVANCED LIGHT CURTAIN BLANKING SELECTOR SWITCHES					X	X	X	X

## SELECTING AN RHPC HYDRAULIC PRESS CONTROL

To determine the 10-digit configured part number for the hydraulic press control required, follow directions 1-8 below and use the information in the **PART NUMBERING SYSTEM CHART** below.

1. The first 4 digits for all hydraulic press controls are RHPC.
2. The 5th digit determines the size of the disconnect switch, if provided, in the control enclosure. Zero (0) indicates no disconnect switch provided.
3. The 6th digit determines if a nonreversing motor starter is provided. Zero (0) indicates no motor starter provided.
4. The 7th digit determines the size of nonreversing motor starter that is provided in the control enclosure. Zero (0) indicates no motor starter provided.
5. The 8th digit determines the location of the operator controls, or if it is a style X, Y, or Z control without the control transformer.
6. The 9th digit is for the type of light curtain interface provided.
7. The 10th digit (if required) will indicate the type of modifier provided: i.e., motor control operators remote.

**SAMPLE**      1      2      3      4      5      6      7  
RHPC - 2 1 3 - F W 5

The sample shown, RHPC-213-FW5, indicates that the custom control box is for a hydraulic press with a C4000 standard light curtain interface including an IEC 60-A disconnect switch and an IEC 25-A nonreversing motor starter. The keypad/display and all operators will be on the door of the enclosure, except for the motor controls which will be located remote.

### RHPC HYDRAULIC CONTROL PART NUMBERING SYSTEM CHART

RHPC - X X X - X X X

**SYSTEM TYPE PRODUCT CATEGORY**

**RHPC** —Hydraulic Control for Presses

**DISCONNECT SWITCH SIZE—IEC (PLUS MAXIMUM MAIN MOTOR FLA)**

- 0 —No Disconnect Switch
- 1 —30A Disconnect—1- to 20-FLA Main Drive Motor
- 2 —60-A Disconnect—21- to 40-FLA Main Drive Motor
- 3 —100-A Disconnect—41- to 66-FLA Main Drive Motor
- 4 —200-A Disconnect—67- to 133-FLA Main Drive Motor
- 5 —400-A Disconnect—134- to 266-FLA Main Drive Motor

**NONREVERSING MAIN MOTOR STARTER**

- 0 —No Starter
- 1 —Nonreversing Starter

**MAIN MOTOR STARTER SIZE**

IEC	Motor Horsepower Chart—3 Phase			
	208 V	230 V	460 V	575 V
1 —12 A	2	3	7.5	7.5
2 —18 A	5	5	10	10
3 —25 A	5	7.5	15	15
4 —32 A	7.5	10	20	20
5 —40 A	10	10	30	30
6 —50 A	15	15	30	40
7 —65 A	20	20	50	50
8 —80 A	25	30	60	75
9 —95 A	30	30	60	75
A —115 A	30	40	75	100
B —185 A	50	60	125	150
C —265 A	75	100	200	200

**MODIFIER**

- —Blank, No Modifier
- 5 —Motor Operators Remote\*

**LIGHT CURTAIN INTERFACE OPTIONS**

- B —Banner Standard
- C —C4000 Advanced With LC Operators on Door
- V —C4000 Advanced With LC Operators Remote
- W —C4000 Standard

**CONFIGURATION & OPERATOR LOCATION**

- F —Keypad/Display and All Operators on Door of Enclosure
- P —Keypad/Display and All Operators Remote (Plain Door)
- S —Subpanel Only—Without Enclosure, Keypad/Display, and Operators
- K —Kit with Module and Control Relays Only—Without Enclosure, Subpanel, Transformer, Keypad/Display, and Operators
- X —Same as F (above) Without Control Transformer
- Y —Same as F (above) Without Control Transformer but With E-Stop, Return/Inch-up, and Prior Action on the Enclosure
- Z —Same as F (above) Without Control Transformer but With E-Stop, Return/Inch-up, Prior Action, and Two (2) Guarded Run/Inch Buttons on the Enclosure

\*See page 48 for remote motor control operator stations or Safety Shields catalog.

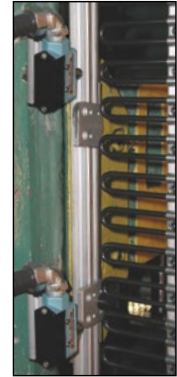


## HYDRAULIC CONTROL SYSTEMS INDIVIDUAL COMPONENTS

### LINEAR CAM AND LIMIT SWITCH ASSEMBLY

Part No. CMT048

The linear cam and limit switch assembly consists of two limit switches and two adjustable cams mounted on an extruded-aluminum bracket. This assembly can provide the linear timing of the top and bottom limits of the machine cycle on a hydraulic machine.



### HIGH/LOW LIMIT SWITCH ASSEMBLY

Part No. CMT049

An additional linear cam and limit switch assembly can be used for a high/low signal during the closing portion of the hydraulic stroke. This assembly consists of one limit switch and one adjustable cam mounted on an extruded-aluminum bracket.

### PALM BUTTON ASSEMBLY

Part No. CTL525

Palm button assembly consists of two black run/inch buttons (with ring guards), a red emergency-stop button and a yellow return/inch-up button. Mounting boxes are furnished with each button. The electrical contact arrangement for all buttons is 1 NO and 1 NC.



Part No. CTL525

### FOOT SWITCH

Part No. CTD011 & CTD088

This foot switch is protected from unintentional operation. A heavy-duty die-cast cover protects the top and both sides, and the front is protected by a hinged flap. The flap must be lifted with the toe before the foot may enter the switch. The electrical contact arrangement is 1 NO and 1 NC.



Foot Switch CTD011



Foot Switch CTD088

### PRIOR-ACTION STATION

Part No. LLD6100

This prior-action station has a push button that must be depressed and released by the operator before depressing the actuating means in order to initiate the automatic mode of operation. This NEMA 12 enclosure size is 3½" x 4½" x 3½".



Prior-Action Station

### SUPERVISORY CONTROL STATION

Part No. LLD6101

Part No. LLD283 (required when a USC000 is used—see below)

When two or more palm button or foot switch operating stations are required on one machine, one supervisory control station is required at each operator station. This remote control station consists of an off/on keyed selector switch and a station on indicator light. The on position allows the operator to use that station, and the off position deactivates only that station. The enclosure size is 5¼" x 3" x 3¼"



Supervisory Control Station

### MULTIPLE-OPERATOR JUNCTION BOX

Part No. USC000

When multiple operator stations are required, this junction box is furnished separately for wiring up to four (4) operator stations. This junction box interfaces palm button assemblies/control bars and foot switches, and will not allow the press to run if palm buttons or a foot switch is actuated without its supervisory control station on. A lighted push button with nameplate indicates a fault condition of an operator station. The button is pushed to reset. The enclosure size is 16" x 14" x 6".



Multiple-Operator Junction Box

## PRESS BRAKE CONTROL SYSTEMS

### INTRODUCTION

Press brakes are one of the most difficult machine tools to safeguard because of their general purpose-type use in industry. General purpose means a press brake can be used to bend from very small parts to very large parts. Production runs on these machines can be one part to thousands of parts. With this type of operation, press brakes must be versatile.

Today, with advanced technology, it is now possible for industry to safeguard press brakes and maintain the same levels of productivity when the employer (user) considers all components in the press brake system. A complete safeguarded system includes, but is not limited to, the type of press brake, the safeguard itself, tooling to be used, size, shape or configuration of workpiece, material handling, production, maintenance, and any anticipated future needs.

### OSHA STANDARDS

Under OSHA, press brakes are cited for noncompliance in accordance with 29 CFR 1910.212— Machine Guarding, which specifically requires point-of-operation safeguarding. All machines fall under this same regulation where it states: “the safeguarding shall be in conformity with any appropriate standard.” Some states may have their own rules and regulations for press brakes.

### ANSI STANDARDS

There are several references available on press brake safety; however, most industries use the ANSI (American National Standards Institute) B11.3 standard. This standard can be purchased by contacting:

#### ANSI

American National Standards Institute, Inc.  
25 West 43rd Street, 4th Floor  
New York, New York 10036  
(212) 642-4900  
[www.ansi.org](http://www.ansi.org)

### TYPES OF PRESS BRAKES

There are two basic categories of press brakes:

#### 1. Part-Revolution

Mechanical-Friction Clutch  
Air Clutch (Single- or Two-Speed)

#### 2. Hydraulic (Down-Acting and Up-Acting)

Each one of these press brake types is discussed on subsequent pages in this section. There are also servo-drive (electric) and hydra-mechanical press brakes that can be safeguarded. Please consult the factory.



### POINT-OF-OPERATION HAZARD

Fortunately, most press brake operations do not require the operators to place their hands or any part of their body into the point-of-operation hazard; however, exposure to point-of-operation injuries still exists. Because of this exposure, the operator(s) must be safeguarded from point-of-operation hazards. Best safety practice is when operators are **never** required to put their hands or any part of their body in the point of operation at any time. Sometimes as the workpiece bends up, a hazard may be created between the part and the front face of the slide. When this happens, be sure the operators do not place their fingers on the top or sides of the material, but support the material from underneath.

### HELPERS

Many times two or more operators are feeding and retrieving workpieces from press brake dies. The employer may describe one person as an operator and one person as a helper; however, a helper is considered an operator when exposed to any point-of-operation hazards. Each operator must be safeguarded and should have his/her own set of operating controls for cycling the machine such as palm buttons or a foot switch.

## METHODS FOR CYCLING AND SETUP

### SEQUENCE OR HIGH/LOW OPERATION

When there is a concern about whip-up action of material, or positioning of a part, the sequence or high/low speed-change mode of operation is used. Sequence is accomplished by stopping the slide on the downstroke (on down-acting machines) just above the workpiece, then completing the downward part of the stroke in a slow, controlled speed. In the high/low mode, the slide does not stop; when selected, it goes into a slower speed for bending the workpiece.

### SINGLE STROKE

In the single-stroke mode, the machine slide will descend through the workpiece and return automatically to stop at the beginning of the cycle. In a high production situation, with certain workpieces, machines are usually single-stroked (cycled) rather than operated in the sequence or high/low mode. The controls offered in this catalog allow the operator to inch on the downstroke in the single-stroke, sequence, and high/low modes, on both mechanical and hydraulic press brakes.

### INCH/SETUP

When the inch mode of operation is provided on press brakes, it must be used for setup only. **Never** operate a press brake in the inch mode for production operations.

### PRESS BRAKES USING POWER PRESS TOOLING

If mechanical or hydraulic press brakes use press tooling (i.e., conventional or unitized dies) for stamping parts, please refer to pages 20-52 for mechanical press control box and component selection, and pages 75 and 76 for air cylinder selection (mechanical-friction-clutch press brakes only), or pages 52-56 for hydraulic press control box selection.

### BASIC SAFETY REQUIREMENTS

When updating press brakes to comply with the indicated safety standards, there are five basic requirements that must always be considered. They are:

1. Safeguarding (Refer to Safeguarding Devices catalog)
2. Controls
3. Disconnects (Refer to Safety Shields catalog)
4. Starters (Refer to Safety Shields catalog)
5. Covers (Refer to [www.rockfordsystems.com](http://www.rockfordsystems.com) for mechanical motion covers)

This introduction and subsequent pages in this catalog will provide information on safety requirements in these areas.

### SAFEGUARDING

Press brake safeguarding can be accomplished by using one of the following safeguarding devices:

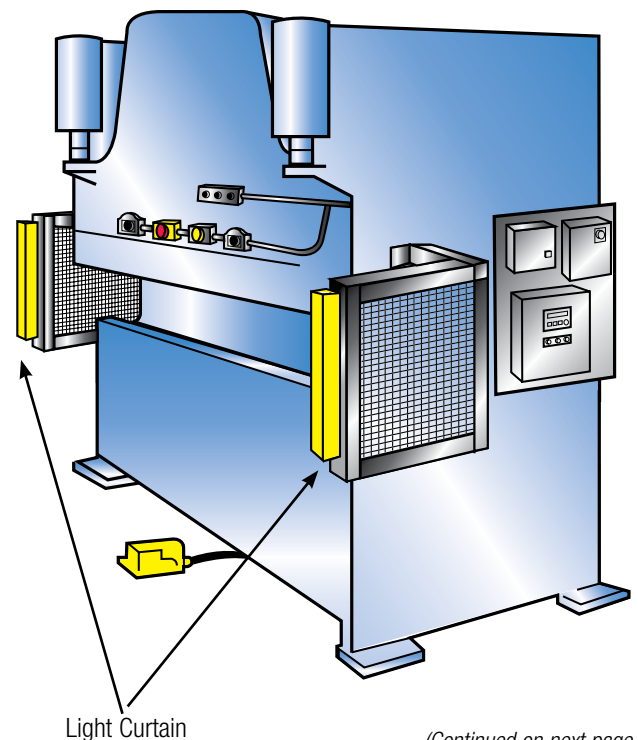
1. Presence-sensing device (Refer to Safeguarding Devices catalog)
2. Two-hand control device (Refer to this catalog)
3. Pullback device (Not offered by Rockford Systems)
4. Restraint device (Refer to Safeguarding Devices catalog)
5. Hostage control device (pp. 61-62)

### PRESENCE-SENSING DEVICES

Of all the recognized point-of-operation safeguarding devices for press brakes, the light curtain is the most versatile for short- to long-run operations and for small to large workpieces. Proper use of this device provides protection for all operators and passersby in production modes of operation. It also minimizes operator resistance to using safety devices.

A muting feature, most commonly used with press brakes, allows the light curtain to be bypassed during the nonhazardous portion of a press brake stroke. This is generally from ¼" or less above the workpiece to the bottom of the stroke and back to the top of the stroke. Blanking of beams or the use of float blanking are also popular options for press brake applications; however, these options must be closely supervised and discouraged whenever possible.

When applying light curtains, they must be mounted at a safe distance—refer to Safeguarding Devices catalog.



(Continued on next page.)

## METHODS FOR CYCLING AND SETUP (CONTINUED)

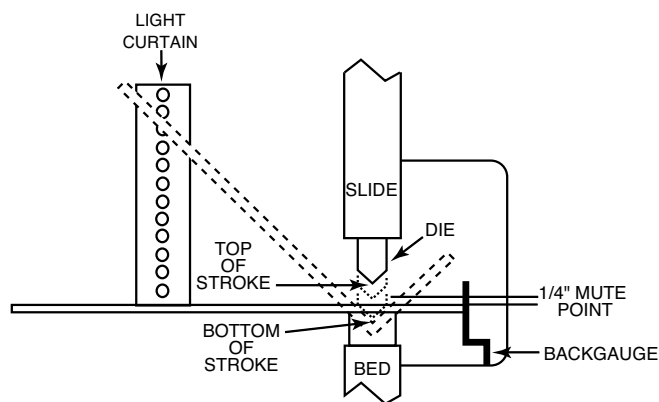
### HOW A LIGHT CURTAIN WORKS AS A SAFEGUARDING DEVICE ON PRESS BRAKES:

- STEP 1** The operator inserts the workpiece into the press brake die and supports it either with his/her hands, on rails, or on a table.
- STEP 2** The press brake is activated by a foot switch or palm buttons.
- STEP 3** If the light curtain is interrupted during the die-closing portion of the cycle, the press brake slide will stop.
- STEP 4** If the light curtain is not interrupted, the press brake will continue its downstroke and will either: 1) make contact with the workpiece and finish the single stroke in normal speed (or in high/low speed if chosen), or 2) stop above the workpiece if in sequence mode. In the sequence mode, the workpiece may be inserted or positioned at this time and then the slide is reactivated to finish the stroke.

Note: The light curtain is muted once the die is a maximum of 1/4" above the workpiece.

When the light curtain is muted, it is automatically turned off or bypassed during the bending operation to permit the workpiece or operator's hand to move through the plane of light without interrupting the cycle.

- STEP 5** The slide returns to the beginning of the cycle.



*This illustration is of a down-acting press brake bending a workpiece with a light curtain used as the safeguard.*

### TWO-HAND CONTROL DEVICES

Two-hand control, as a point-of-operation safe-guarding device for press brakes, is ideal for short-run job-shop operations. Workpieces can be from very small to very large.

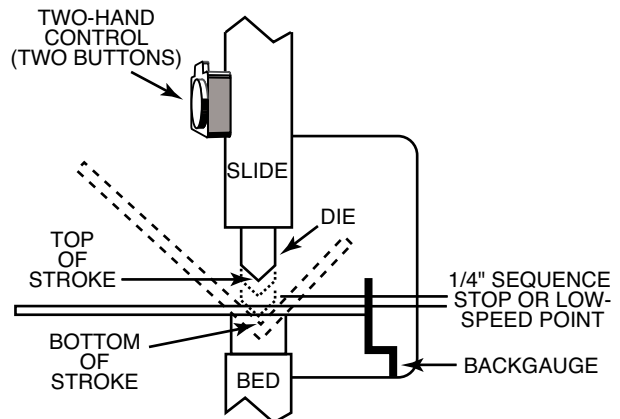
Each operator station is arranged with two guarded run palm button assemblies. These buttons are usually mounted to the slide of the press brake; however, they can also be installed on a floor stand (see page 49) for more flexibility.

Two-hand control provides protection against point-of-operation injury during the die-closing portion of the cycle. Two-hand control is arranged so the operator(s) must hold the palm buttons depressed until the slide reaches a point 1/4" or less above the workpiece. If either palm button is released, the slide stops. Both palm buttons must then be released and reactivated to finish the stroke. Two-hand control is usually arranged to provide this protection in the two-hand single-stroke, sequence, or high/low mode of operation. See information below and on the next page for additional details on how two-hand control and sequence mode of operation work.

### How Two-Hand Control Works:

- STEP 1** By depressing the two run buttons, the operator(s) initiate the press brake cycle.
- STEP 2** The operator(s) must hold the two run buttons until the slide completes its downward travel to the workpiece or until the slide stops 1/4" or less above the workpiece. If the operator(s) remove one hand from the run buttons, the slide will stop. In the single-stroke or high/low mode, the slide will make one complete cycle.
- STEP 3** In the sequence mode, the slide will automatically stop at a preset position 1/4" or less above the workpiece. This preset position is adjustable for different feed-line heights or material thicknesses.
- STEP 4** If the workpiece is not already placed in the die, it may be inserted at this time.
- STEP 5** The palm buttons or the foot switch is now reactivated, causing the slide to continue through the bottom of the cycle and automatically return at high speed to the beginning of the cycle.

*Note: The controls illustrated provide the ability to inch the slide down with the palm buttons or foot switch in the single, sequence, or high/low mode of operation. By inching the slide down in these modes, the operator makes sure the upper die is going to bend the workpiece in the correct position. This also avoids hazardous whip-up action of the workpiece when inching through the workpiece bend.*



*This illustration is of a down-acting press brake bending a workpiece with two-hand control used as the safeguard.*

## METHODS FOR CYCLING AND SETUP (CONTINUED)

### TWO-HAND CONTROL DEVICES (CONTINUED)

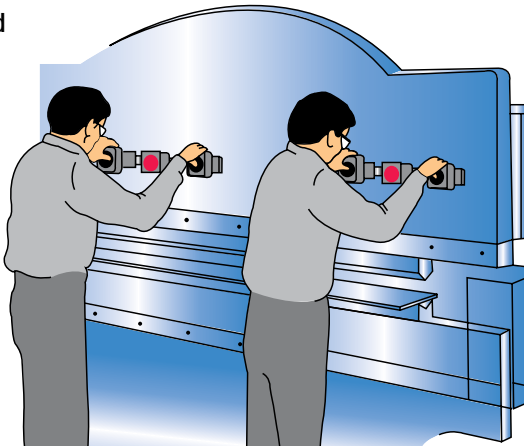
The control packages offered include control reliability to minimize the possibility of an unintended stroke of the slide if there is a single component failure in the control system. The control features antirepeat, preset timing of concurrent operation of palm buttons, and nonresumption of interrupted stroke. The palm buttons must also be mounted at the proper safety distance.

When more than one operator station is required on press brakes, two palm buttons for each station must be used and must be capable of being supervised. The supervised operator stations are arranged so that if all operating stations are bypassed, the press brake will not cycle. If a foot switch is used, one is required for each operator.

When using two-hand control, the operator cannot hold onto the workpiece during the die-closing portion of the stroke. Material tables, rails, magnets on backgauges, etc., can be used to support the workpiece.

If the dies are not the exact length of the material, auxiliary safeguarding is required.

#### Two-Hand Control



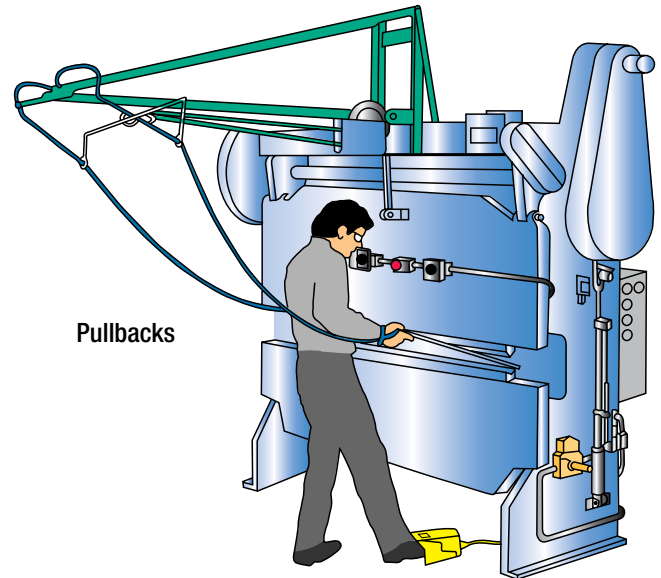
### PULLBACK DEVICE (NOT OFFERED BY ROCKFORD SYSTEMS)

The overhead-pullback device is usually applied on press brakes that perform long-run jobs and when small- to medium-size parts are being produced.

The pullback is a mechanical device operated from the linear motion of the slide or upper die. When adjusted properly, it pulls the operator's hands back should they inadvertently be put into the point-of-operation hazard.

The overhead design allows the operator freedom of movement for loading and unloading workpieces without interference.

Pullbacks are designed for a fixed-length-stroke mechanical press brake; therefore, when applying them to a hydraulic press brake that may have an adjustable stroke, the stroke length will need to remain the same at all times.



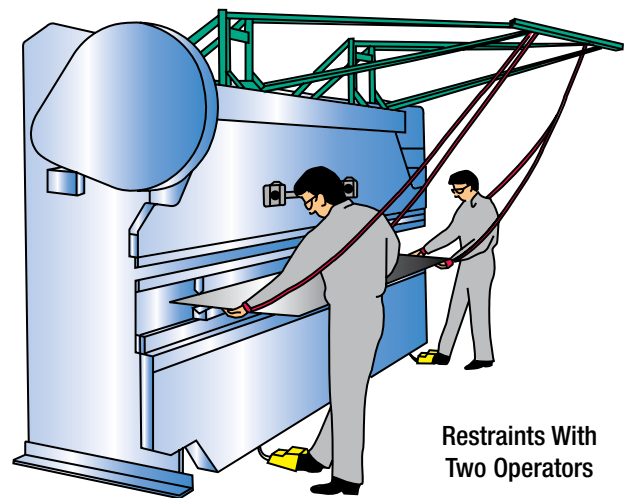
Pullbacks

### RESTRAINT DEVICE

Similar to the overhead pullback, restraints are usually applied on press brakes that perform long-run jobs. The parts being produced are usually medium size with the operator holding onto the workpiece. If small parts are being fed into the die, a hand-feeding tool must be used.

Restraints are adjusted so that an operator cannot reach into the hazardous area at any time.

Both pullbacks and restraints must be properly worn, adjusted, and maintained at all times.



Restraints With Two Operators

### HOSTAGE DEVICE

Hostage control devices are used on machines that perform short-run jobs with very large workpieces. The actuating means (hand or foot) must be protected against unintended operation and arranged so the operator(s) can **never** reach the point-of-operation hazard while the machine is in operation.

## METHODS FOR CYCLING AND SETUP (CONTINUED)

### HOSTAGE DEVICE (CONTINUED)

An example of a hostage control is a foot switch which is permanently mounted to the floor far enough away from the point of operation that the operator(s) cannot reach the point-of-operation hazard when operating the control. Two-hand control or one-hand control can be applied as well.

### SAFE DISTANCE SAFEGUARDING

Safe distance safeguarding is allowable by OSHA and ANSI under certain controlled situations. Please see ANSI B11.3 for compliance guidelines. If safe distance is chosen as the primary safeguard, the control system for both mechanical and hydraulic press brakes must be control reliable. For assistance in determining your control system's reliability, please contact Rockford Systems.

### AUXILIARY SAFEGUARDING

Auxiliary safeguarding is used for additional protection from injuries for all personnel in the machine area. It is used in conjunction with primary safeguarding devices. Auxiliary safeguarding also involves the guarding of other components or hazardous openings on machines.

Auxiliary safeguards include such items as point-of-operation side barriers when light curtains are used, pressure-sensitive floor mats, workpiece tables, or horizontal light curtains. An additional set of light curtains can be used horizontally to prevent an operator or other persons from standing between the vertical plane of light and the point-of-operation hazard. To prevent unauthorized entry on the back side of the press brake, an interlocked cable and danger sign can be used (refer to Safety Shields catalog).

Danger signs, used for warning, can be mounted on the press brake slide in a position that is readily visible to the operator, setup person, or other personnel. Hand tools are another auxiliary safeguard often used when feeding and retrieving small workpieces. Hand tools by themselves are not a point-of-operation safeguarding device.

### CONTROLS

Press brake controls are furnished according to the type of press brake: mechanical friction, air clutch, hydraulic, hydra-mechanical, or electric. The controls and system of the safety-related functions must be control reliable. Please see page 99 for further explanation.

### ELECTRICAL LOCKOUT/TAGOUT REQUIREMENTS

A press brake requires a main power disconnect switch, and a magnetic-type motor starter for the main drive motor and the slide-adjust motor. A lockout valve is required to lock out the air power to the press brake.

### COVERS

Mechanical power-transmission apparatuses of the press brake such as rotating flywheels, gears, sprockets, chains, and shafts must be covered in accordance with OSHA 1910.219, Mechanical Power-Transmission Apparatus and ANSI B15.1. All apparatuses that create a hazard up to 7' above the floor or platform must be guarded (covered).

This is usually done by the user, either by modifying existing guards, by contacting a local sheet-metal fabricator, or refer to our Web site at [www.rockfordsystems.com](http://www.rockfordsystems.com) for mechanical motion covers.

### OTHER SAFETY CONSIDERATIONS

Other areas of press brake safety must be considered in order to comply with the OSHA and ANSI standards. This includes, but is not limited to, the point-of-operation hazard exposure, when the workpiece length is less than the die length. This is a questionable area when using a light curtain or two-hand control (to the 1/4" or less point above the workpiece) as the point-of operation safeguard. In some cases, there is an opening in the die that is larger than 1/4" on both sides of the workpiece. Common practice is to either cut or arrange all dies to be the length of the workpiece or provide barriers on the front of the press brake allowing just enough opening for the workpiece.

Another safety consideration is the proper use of front and back material-position gauges. It is important that this gauging is designed correctly so the workpiece and hand will not inadvertently slip into the hazard area. Special care must be taken with small or narrow workpieces. For example, if the backgauge is not tall enough, the workpiece could slide over it allowing the fingers and hands to be exposed to the point-of-operation hazard.

When blanking the light beam channels of a light curtain, difficulties may arise with the angle at which the workpiece is held from operator to operator. Laying the workpieces on a table or rails, or using magnets to hold workpieces made of ferrous material in position are two ways to eliminate some of the hurdles in safeguarding a press brake.

When holding onto the workpiece, good safety practice is to have the operator's thumbs and fingers positioned alongside or underneath the workpiece—**never on top**.

As with all machinery, the best safety practice is to have a continuing safety program. The operator and all personnel connected with machinery must be safeguarded. The operator and die setter must be fully trained and instructed on all safety procedures and have full knowledge of the safeguarding device being used. The setup and maintenance personnel must also be trained on the proper safe operation of press brakes.

## PRESS BRAKE CONTROL SYSTEMS

A press brake clutch/brake or hydraulic control system consists of:

1. A control box or light curtain interface
- 2a. Individual components

OR

- 2b. Component packages

We offer a variety of control boxes that can be furnished to meet your specific requirements. Solid-state control boxes are available as:

1. Standard clutch/brake or hydraulic control
2. Custom control which includes a fused disconnect switch and magnetic motor starter
3. Special control

### SELECTING A CONTROL SYSTEM

1. To order a complete control system, determine which style control box is required.

A **standard** control box, with operators on the door, includes the clutch/brake or hydraulic control only. It can also be furnished in a plain-door enclosure or as a subpanel. Both plain-door or subpanel options require a remote operator station. Subpanels are furnished without the enclosure and must be installed into an existing enclosure.

A **custom** control box includes a main power disconnect switch and magnetic motor starter in the same enclosure as the clutch/brake or hydraulic control. A reversing slide-adjust motor starter may also be included.

**Special** clutch/brake or hydraulic control boxes can include either a standard or custom control that requires modification for any special requirements. This can be an interface of auxiliary equipment, a light curtain interface for a non-Rockford light curtain, or components specified by the end user, such as NEMA starters and disconnects.

2. After determining the style of control box, determine the location of the operator controls, and the keypad/display. Please remember these should be installed in a convenient location for the operator. These operator controls and keypad/display can be supplied as follows:

1. On the front of the enclosure
2. In a remote operator station
3. In a control bar
4. In a console
5. Loose for installation in an existing box



**Plain-Door Control**  
(Use With Remote Operator Station)

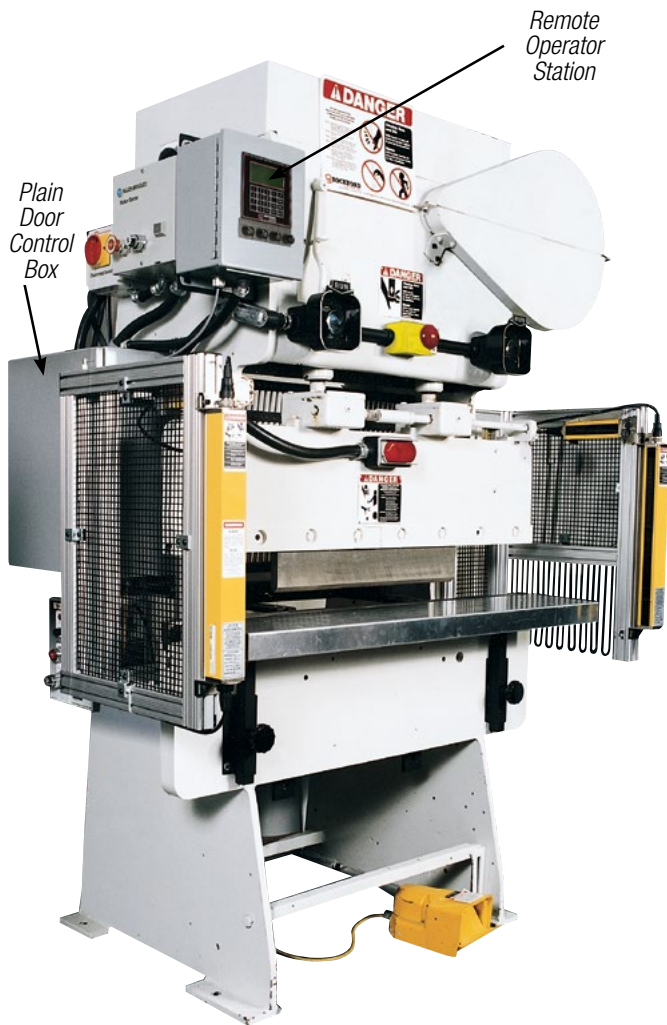


**Remote Operator Station**  
(Use With Plain-Door, Custom, or Special Control)



**Custom or Special Control**  
With Remote Operator Station

## SSC1500 STANDARD PRESS BRAKE CONTROL



**SSC1500 Press Brake Control System Installed  
on a Mechanical-Friction-Clutch Press Brake**

The SSC1500 solid-state control system is designed for use on press brakes. It is designed and built to comply with OSHA, ANSI B11.3 and B11.19 standards with control reliability (see page 99) and brake monitoring. It can be used on both mechanical-friction and single-speed, air-clutch press brakes.

The SSC1500 solid-state control system is designed for use on press brakes. It is designed and built to comply with OSHA, ANSI B11.3 and B11.19 standards with control reliability (see page 99) and brake monitoring. It can be used on both mechanical-friction and single-speed, air-clutch press brakes.

When this control system is furnished for mechanical-friction-clutch press brakes, it is designed to replace the mechanical foot pedal/treadle operation. A foot switch and palm buttons replace the foot pedal/treadle to actuate the press brake. It is also designed for use on single-speed and two-speed air-clutch press brakes.

This control box includes sequence stop and a light curtain interface. Two-hand control or light curtains can be used as the point-of-operation safeguard. Please see pages 59-62 for further details on safeguarding.

The control, in sequence operation, allows the operator to run the slide down at high speed, stopping just above the workpiece. When the workpiece is properly positioned in the die, the clutch is engaged and the brake is released, allowing the slide to finish the cycle or inch through the bottom of the stroke. This slow-speed action, by inching through the bottom of the stroke, avoids the fast whip-up action of the workpiece. After going through the bottom of the stroke, the slide returns normally to the top of the stroke. If necessary, the slide can also be inched down by the foot switch in the single-stroke mode. Air cylinders for engaging and disengaging the clutch and brake on mechanical-friction clutches are detailed on pages 76-77.

On single-speed air-clutch/brake press brakes, the control will either allow the slide to make a single stroke or a sequence stop stroke. On two-speed air-clutch machines, the control allows single stroke, sequence stop stroke, and high/low automatic speed change.

In many applications, a light curtain is used as the safeguard. If this is the case, it is usually mounted vertically in front of the point-of-operation hazard. The control allows the light curtain to be muted from 1/4" or less above the workpiece, through the balance of the stroke.



## SSC1500 STANDARD PRESS BRAKE CONTROL (CONTINUED)

### MODES OF OPERATION

- Off
- Two-hand inch (regular, timed, or top-stop)
- Two-hand single stroke
- Foot single stroke
- Sequence stop (hand/hand, hand/foot, foot/foot)
- High/low automatic speed change (for two-speed only)

### FEATURES

- Meets and exceeds OSHA 1910.212, ANSI B11.3 and B11.19
- Provides two-hand control safeguarding device
- Redundant/cross-checking microprocessors
- Redundant microprocessor logic power supplies
- Redundant solenoid relays
- 4-line x 20-character LCD (liquid crystal display) with 20-key operator interface
- Wide range of input power supply—85- to 135-VAC
- Absolute resolver with sync sensor for timing and motion detection
- Time-based brake monitor with programmable warning and fault set points
- Stop-time measurement test
- Adjustable sequence stop angle
- 6 user-programmable 24-V DC static diagnostic inputs
- 2 user-programmable 24-V DC cyclic die protection inputs
- 7-digit stroke and batch counters with preset, and a 7-digit total counter
- Light curtain interface(s) with off/on selector
- Light curtain mute during the nonhazardous portion of the stroke
- 4 PLS (programmable limit switch) outputs—2 on/off angles, or 1 timed off, or 1 counted output per PLS (or 3 PLS outputs and 1 auxiliary output with 1 contact)
- For two-speed operations: 3 PLS (programmable limit switch) outputs—2 on/off angles, or 1 timed off, or 1 counted output per PLS (or 2 PLS outputs and 1 auxiliary output with 1 contact)
- Information displayed during the machine run cycle: mode of operation, strokes per minute, stop time, stroke counter, batch counter, and angle of crankshaft
- Display of text in English or Spanish

The standard SSC1500 press brake control is housed in a 20" x 20" x 8" NEMA 12 enclosure with the operators and keypad/display mounted on the front of the enclosure.

### KEYPAD/DISPLAY

The keypad/display is used to enter setup information, monitor machine operation, and display messages to the user. The keypad/display has a 4-line x 20-character LCD (liquid crystal display) with 20 keys for entering information and programming. As standard, this keypad/display is mounted in the control box. For operator convenience, it can be furnished in a remote enclosure up to a maximum of 150' from the SSC1500 control module (see page 70).

### PROGRAMMABLE SETTINGS AT THE KEYPAD

The sequence-stop angle setting programs the stopping position on the downstroke for the sequence mode of operation—no manual setting of cams.

On two-speed press brakes, a low single-stroke top-stop angle can be programmed. The high/low automatic speed change is also programmable at the keypad.

### DIAGNOSTICS AND FAULT MESSAGES

There are eight 24-V DC selectable current-sinking or sourcing programmable diagnostic inputs provided for the user. A fault message, input logic, and stop type can be assigned to each input from the list below. When a fault condition is detected, the machine will top stop or emergency stop, and the assigned message will be displayed. This feature helps when troubleshooting common fault conditions.

#### FAULT MESSAGE LIST:

Clutch/Brake Air Fault	Left Side Guard Open
Counterbalance Air Fault	Right Side Guard Open
Dual Solenoid Fault	Feeder Fault
Clutch Valve Fault*	Load Monitor Fault
Brake Valve Fault*	Safety Block Interlock
Lube Fault	Shut Height Fault
High Lube Pressure	Variable Speed Drive Fault
Low Lube Pressure	Die Protection Fault**
Low Lube Level	Short Feed Fault**
Main Motor Overload	Part Ejection Fault**
Ram-Adjust Motor Overload	Stock Buckle Fault**
Lube Motor Overload	End of Stock Fault**
Auxiliary Motor Overload	Pilot Pin Fault**
Guard Interlock Open	Part Input #1**
Front Guard Open	Part Input #2**
Rear Guard Open	Part Input #3**

\*Only used on machines that have a split clutch and brake, and two dual valves have been furnished.

\*\*Messages typically used for die protection.

## SSC1500 CUSTOM PRESS BRAKE CONTROL



### SSC1500 Custom Press Brake Control Box (Operators Located on Door Front)

Custom SSC1500 press brake control boxes are also available to fit your particular requirements. These boxes are furnished with an IEC through-the-door main power fused disconnect switch and an IEC magnetic motor starter (with push buttons). A reversing slide-adjust motor starter may also be included. They are prewired and built into a NEMA 12 enclosure.

Operator controls can be furnished on the front (F) door of the control box or on a plain (P) door with no operators except a disconnect switch. The SSC1500 custom press brake control box can be furnished in many different ways. Please refer to page 70 for the part numbering system.

If a plain door custom control or a subpanel custom control is required, a remote operator station is needed. See ordering information on page 69.

NEMA-style disconnect switches and motor starters, and brand name components specified by our customers are also available.

To ensure the starter(s) and disconnect are sized properly, please check horsepower for the main drive motor and slide adjust motor (if furnished) on the press brake, as well as full-load amps, and primary voltage to the press brake. After obtaining this information, please go to the chart on page 70 to determine the proper custom control box part number. Follow directions 1-6 to obtain the correct part number of the control box.

Example of the part numbering system: The press brake requires a C4000 advanced light curtain interface, a 60-A disconnect switch, a reversing 25-A reversing main motor starter, and a 12-A reversing ram adjust motor starter. All operators will be located on the door of the enclosure except the ram adjust motor control which will be located remote. The part number to order would be PRS263-FC6.

## SSC1500 REMOTE OPERATOR-STYLE CONTROL BOXES FOR PRESS BRAKES

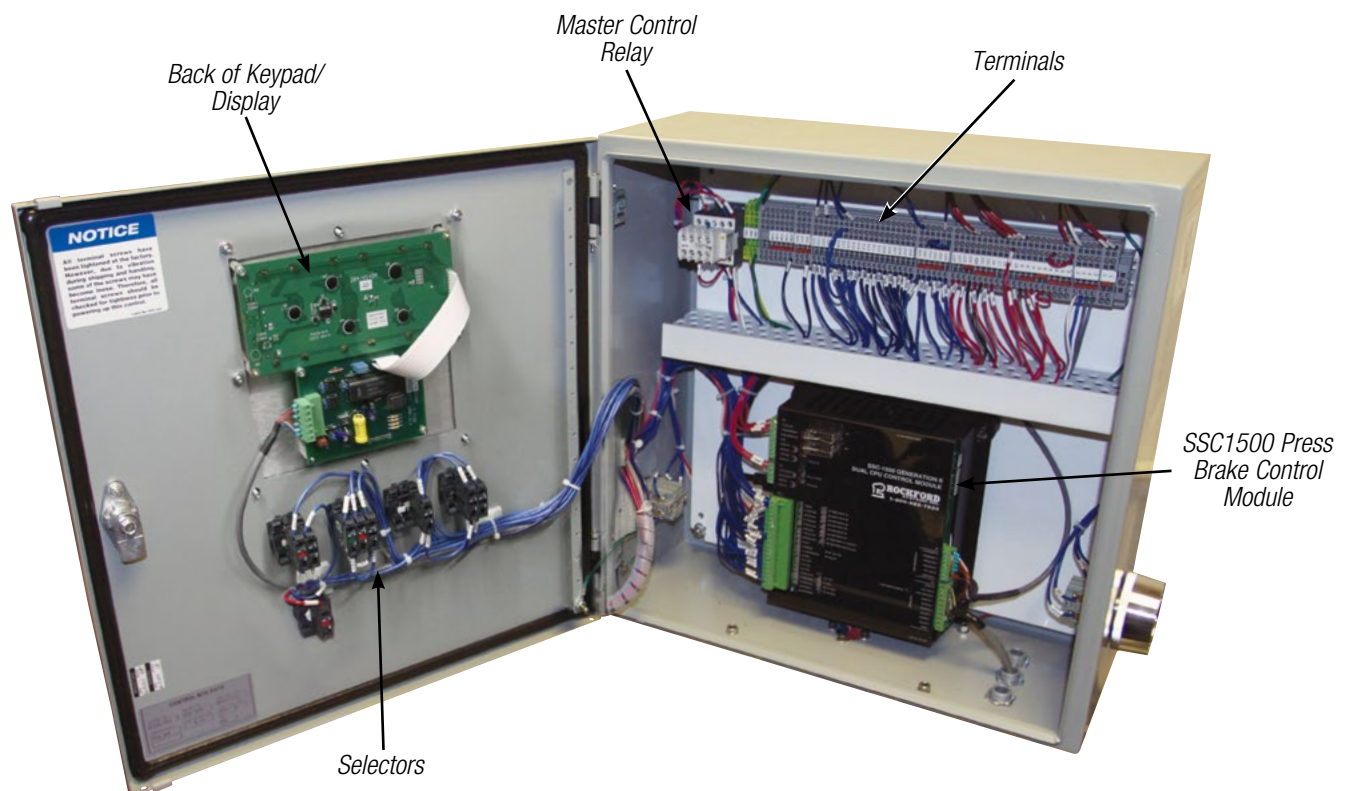


**Style Z Remote Operator Control Box**  
Clutch/Brake Control and Operators In One Box

These remote operator-style clutch/brake control boxes include the same features and modes of operation as the standard SSC1500 control boxes described on pages 64-65. **However, they do not have a control transformer.** These control boxes are designed to be located on the front of the machine near the operator.

These controls are for applications where the machine's existing magnetic motor starter, fused disconnect switch, and control transformer meet the safety requirements and can be reused. If the existing control transformer cannot be reused or a new control transformer is required, please contact the factory.

The three remote operator-style control boxes available have the keypad/display and all operators on the door of the 20" x 20" x 8" NEMA 12 enclosure. Please see the next page for the three styles available.



**Interior of Style Z Remote Operator Control Box**

## SSC1500 REMOTE OPERATOR-STYLE CONTROL BOXES FOR PRESS BRAKES (CONTINUED)



### Style X Includes:

- Keypad/display
- Program/run/off selector switch
- Mode selector switch
- Actuating means selector switch
- Light curtain off/on selector switch
- Internal clutch/brake control module, master control relay, and terminals



### Style Y Includes:

- Keypad/display
- Program/run/off selector switch
- Mode selector switch
- Actuating means selector switch
- Light curtain off/on selector switch
- Internal clutch/brake control module, master control relay, and terminals
- Self-latching emergency-stop button



### Style Z Includes:

- Keypad/display
- Program off/on selector switch
- Mode selector switch
- Actuating means selector switch
- Light curtain off/on selector switch
- Internal clutch/brake control module, master control relay, and terminals
- Self-latching emergency-stop button
- Two guarded run/inch buttons located on the sides of the enclosure

## CONTROL MODULE KIT

Part No. PRS000-KB (for SSC1500 PRS Controls)

Part No. PRT000-KB (for SSC1500 PRT Controls)

A control module kit allows the end user to update the clutch/brake control of a press brake with minimum equipment costs. The kit is supplied without the control enclosure, panel, control transformer, control fuse, terminal strips, wire duct, and wiring.

This control module kit includes the control module, master control relay, shock mounts, fasteners, suppressors, danger labels, and electrical prints. A keypad/display kit is required unless a remote operator station is used (see below).

A set of electrical prints is supplied to show typical wiring and all mounting dimensions are provided in order for a qualified person to install the control module kit. The minimum area required on an existing control panel to install this kit is 18" H x 18" W x 6" D.

## KEYPAD/DISPLAY KIT

Part No. LLD1519G2 (for SSC1500 PRS Controls)

Part No. LLD1545G2 (for SSC1500 PRT Controls)

The keypad/display kit can be used with any of the control boxes or the control module kit. This kit includes the keypad/display, a screen label, a program off/on selector switch, a light curtain off/on selector switch, a hand, hand/foot, foot selector switch, an off/inch/single/sequence stop selector switch, and 25' of cable. Additional push buttons, nameplates, and selector switches for motor starters, etc., can be furnished depending on the features required.

A resolver/pulser assembly and cable, Part No. CMS115, is required with any of the control selections. See page 77 for further details on this component.

## REMOTE OPERATOR STATIONS

For operator convenience, a remote operator station can be furnished for use with a plain-door standard control box, plain-door custom control box, or control module kit. The remote operator station contains the keypad/display, program off/on selector switch, and other selector switches and push buttons as required.

Remote operator stations are available in a standard format or can be customized to meet any requirements. Select from the following remote operator stations or contact the factory with your special requirements.



Remote  
Operator  
Station  
Part No.  
LLD1514G2

FEATURES	REMOTE OPERATOR STATIONS FOR PRS CONTROLS					REMOTE OPERATOR STATIONS FOR PRT CONTROLS				
	LLD1514 G2	LLD1515 G2	LLD1516 G2	LLD1517 G2	LLD1518 G2	LLD1534 G2	LLD1535 G2	LLD1536 G2	LLD1537 G2	LLD1538 G2
KEYPAD/DISPLAY	X	X	X	X	X	X	X	X	X	X
PROGRAM OFF/ON SELECTOR SWITCH	X	X	X	X	X	X	X	X	X	X
LIGHT CURTAIN OFF/ON SELECTOR SWITCH	X	X	X	X	X	X	X	X	X	X
OFF/INCH/SINGLE/SEQUENCE STOP SELECTOR SWITCH	X	X	X	X	X	X	X	X	X	X
HAND, HAND/FOOT, FOOT SELECTOR SWITCH	X	X	X	X	X	X	X	X	X	X
HIGH, HIGH/LOW, LOW SELECTOR SWITCH						X	X	X	X	X
MAIN MOTOR START AND STOP PUSH BUTTONS		X	X	X	X		X	X	X	X
MAIN MOTOR FORWARD/REVERSE SELECTOR SWITCH			X		X			X		X
RAM-ADJUST OFF/ON SELECTOR SWITCH				X	X				X	X
RAM RAISE PUSH BUTTON				X	X				X	X
RAM LOWER PUSH BUTTON				X	X				X	X
LIGHT CURTAIN BLANKING SELECTOR SWITCHES	LLD1524 G2	LLD1525 G2	LLD1526 G2	LLD1527 G2	LLD1528 G2	LLD1539 G2	LLD1540 G2	LLD1541 G2	LLD1542 G2	LLD1543 G2

A  
D  
D

(Use part # at right in place of part # above)

If any of the above remote operator stations are required without the enclosure, please consult the factory.

## SELECTING AN SSC1500 PRESS BRAKE CONTROL

To determine the 8- or 9-digit configured part number for the press brake control required, follow directions 1-6 below and use the information in the **PART NUMBERING SYSTEM CHART** below.

1. The first 3 digits for all SSC1500 press brake controls are PRS or PRT.
2. The 4th digit determines the size of the disconnect switch, if provided, in the control enclosure. Zero (0) indicates no disconnect switch provided.
3. The 5th and 6th digits determine the size and type of motor starter(s), if provided, in the control enclosure. Zeros (00) on both positions indicate no motor starter(s) provided.
4. The 7th digit determines the location of the operator controls, or if it is a style X, Y, or Z control without the control transformer.
5. The 8th digit is for the type of light curtain interface provided.
6. The 9th digit (if required) will indicate the type of modifier provided: i.e., motor control operators remote.

**SAMPLE**      1      2      3      4      5      6  
P R S - 2 6 3 - F C 6

The sample shown, PRS263-FC6, indicates that the custom part-revolution control box with sequence stop mode of operation will contain a C4000 advanced light curtain interface, an IEC 60-A disconnect switch, an IEC 25-A reversing main drive motor starter, and an IEC 12-A reversing ram-adjust motor starter. The keypad/display and all operators will be located on the door of the enclosure, except for the ram-adjust motor controls which will be located remote.

SSC1500 PRESS BRAKE CONTROL PART NUMBERING SYSTEM CHART				
SYSTEM TYPE PRODUCT CATEGORY			MODIFIER	
<div style="border: 1px solid red; padding: 2px;">                     PRS —SSC1500 Press Brake Control                      PRT —SSC1500 Press Brake Control for Two-Speed Air-Clutch Press Brakes                 </div>	<span style="color: red;">↑</span>		<div style="border: 1px solid blue; padding: 2px;">                     -- —Blank, No Modifier                      5 —Main Motor Operators Remote*                      6 —Ram-Adjust Operators Remote*                      7 —Main Motor and Ram-Adjust Operators Remote*                 </div>	
DISCONNECT SWITCH SIZE—IEC (PLUS MAXIMUM MAIN MOTOR FLA)			LIGHT CURTAIN INTERFACE OPTIONS	
<div style="border: 1px solid orange; padding: 2px;">                     0 —No Disconnect Switch                      1 —30A Disconnect—      1- to 20-FLA Main Drive Motor                      2 —60-A Disconnect—      21- to 40-FLA Main Drive Motor                      3 —100-A Disconnect—      41- to 66-FLA Main Drive Motor                      4 —200-A Disconnect—      67- to 133-FLA Main Drive Motor                      5 —400-A Disconnect—      134- to 266-FLA Main Drive Motor                 </div>	<span style="color: orange;">↑</span>		<div style="border: 1px solid blue; padding: 2px;">                     B —Banner Standard                      C —C4000 Advanced With LC Operators on Door                      V —C4000 Advanced With LC Operators Remote                      W —C4000 Standard                 </div>	
REVERSING/NONREVERSING MAIN MOTOR STARTERS WITH OR WITHOUT RAM ADJUST			CONFIGURATION & OPERATOR LOCATION	
<div style="border: 1px solid green; padding: 2px;">                     0 —No Motor Starters                      1 —Nonreversing Main Motor Starter Without Ram Adjust                      2 —Reversing Main Motor Starter Without Ram Adjust                      3 —Nonreversing Main Motor Starter With 12-A Ram Adjust                      4 —Nonreversing Main Motor Starter With 18-A Ram Adjust                      5 —Nonreversing Main Motor Starter With 25-A Ram Adjust                      6 —Reversing Main Motor Starter With 12-A Ram Adjust                      7 —Reversing Main Motor Starter With 18-A Ram Adjust                      8 —Reversing Main Motor Starter With 25-A Ram Adjust                 </div>	<span style="color: green;">↑</span>		<div style="border: 1px solid blue; padding: 2px;">                     F —Keypad/Display and all Operators on Door of Enclosure                      P —Keypad/Display and all Operators Remote (Plain Door)                      S —Subpanel Only—Without Enclosure, Keypad/Display, and Operators                      K —Kit with Module and Control Relays Only—Without Enclosure, Subpanel, Transformer, Keypad/Display, and Operators                      C —Console                      X —Same as F (above) Without Control Transformer                      Y —Same as F (above) Without Control Transformer but with E-Stop                      Z —Same as F (above) Without Control Transformer but With E-Stop and Two (2) Guarded Run/Inch Buttons on the Enclosure                 </div>	
MAIN MOTOR STARTER SIZE				
<div style="border: 1px solid green; padding: 2px;">                     0 —No Starter                      IEC                 </div>	Motor Horsepower Chart—3 Phase			
	208 V	230 V	460 V	575 V
1 —12 A	2	3	7.5	7.5
2 —18 A	5	5	10	10
3 —25 A	5	7.5	15	15
4 —32 A	7.5	10	20	20
5 —40 A	10	10	30	30
6 —50 A	15	15	30	40
7 —65 A	20	20	50	50
8 —80 A	25	30	60	75
9 —95 A	30	30	60	75
A —115 A	30	40	75	100
B —185 A	50	60	125	150
C —265 A	75	100	200	200

\*See page 48 for remote motor control operator stations or Safety Shields catalog.

\*\*Additional light curtain interface options are available upon request—contact Rockford Systems at 1-800-922-7533.

## SSC1500 INDIVIDUAL COMPONENTS

### RESOLVER/PULSER ASSEMBLY

Part No. CMS115\*—40' Cable

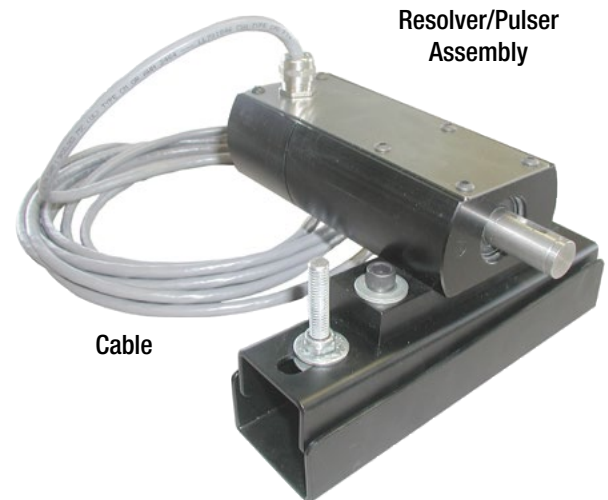
Part No. CMS115-100—100' Cable

An absolute resolver/pulser cycle timing device is required to provide the angular position and velocity/motion information of the machine crankshaft to the control. The resolver is a highly accurate and repeatable device which uses an internally mounted pulser cam and disk to verify the position of the crankshaft.

The resolver/pulser timing device is contained in a rugged, heavy-duty housing with a spring-compression base. The spring base helps isolate the resolver from shock load and vibration that are common occurrences on press brakes. This provides longer life for the components inside the resolver. The spring base also functions as a drive chain tightener.

This resolver allows the setup person to make all cycle timing adjustments with the keypad/display. These adjustments include sequence set point, mute set point, and high/low speed change.

The 3/4" diameter steel drive shaft is mounted in sealed ball bearings. The resolver/pulser is furnished with a 40' cable (or optional 100' cable) that is connected to the drive assembly and wires into the control box. The cable can be cut to length and wired to terminals.



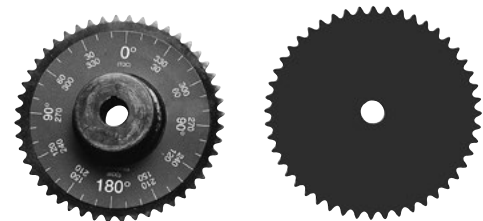
Cable

Resolver/Pulser  
Assembly

### SPROCKET ASSEMBLY

Part No. CML000\*

A sprocket set consists of two 1:1 sprockets. One fits on the 3/4" shaft of the CMS115 resolver/pulser assembly; the other sprocket is for mounting to the end of the press brake crankshaft to rotate the cycle timing device. These 48-tooth sprockets are designed to accept ANSI No. 35 roller chain.

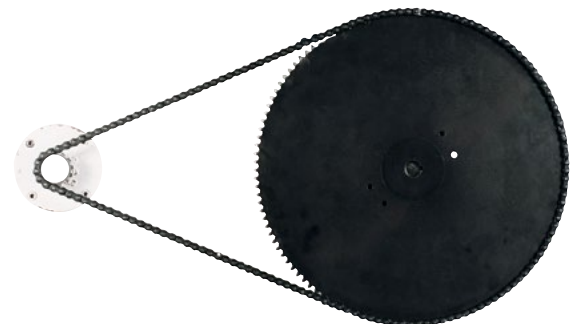


Sprocket Set

### SPECIAL SPROCKETS

Part No. CML100

If your machine does not have access to the crankshaft to provide 1:1 ratio drive for the resolver/pulser assembly, special sprocket sets are available to match the gear drive ratio of the machine. The smaller of the two sprockets is attached to the drive of the machine (usually on the backshaft) and the larger sprocket is attached to the resolver/pulser assembly. Please provide the gear ratio of the press brake when ordering these special sprockets along with the brand name and serial number of the press brake.



Special Sprocket Set

### ROLLER CHAIN

Part No. CMS515\*

ANSI No. 35 roller chain and master link is 10 feet long for driving any of the above sprockets.

*\*Included in component package on page 74.*



Roller Chain

## SSC1500 INDIVIDUAL COMPONENTS (CONTINUED)

### MONITORED DUAL-SOLENOID AIR VALVE

1/2" Port—Part No. RCL652\* for Mechanical-Friction Clutch

This three-way cross flow, series/parallel air valve includes an air pressure electrical output monitor and muffler. Air is put into the clutch and brake when the dual-solenoid air valve is electrically energized. When it is de-energized, the air is dumped through the muffler from the clutch and brake.

This valve consists of two main parts: the piloted monitor assembly and the valve body assembly. The two main valve elements move simultaneously during normal operation. If these elements should fail to move simultaneously, the internal spool shifts, inhibiting further machine operation. The pressure switch will provide a signal to the control system to indicate a fault condition. A reset button on the side of the valve can be used to reset the valve if an accidental valve fault is detected.



Monitored Dual-Solenoid Air Valve

AVERAGE CV (FLOW RATE)		
PART NO.	PORTS 1 TO 2	PORTS 2 TO 3
RCL652	3.0	8.0

### 1/2" FILTER-REGULATOR-LUBRICATOR ASSEMBLY (FRL)

Part No. RCL044\* for Mechanical-Friction Clutch

This assembly is required to meet OSHA and ANSI standards. This FRL assembly filters, regulates, and lubricates the air going through it. This filtered and lubricated air then goes to the dual-solenoid air valve assembly and clutch/brake. The regulator should be adjusted to meet the original equipment manufacturer's requirements. The assembly includes a gauge, coupling, and a steel mounting bracket.



Filter-Regulator-Lubricator Assembly

### AIR PRESSURE SWITCH—Part No. CTD062\*

This air pressure switch monitors low pressure to either the clutch/brake-actuating air cylinder and valve or slide counterbalance systems. Each system requires an air pressure switch. The pressure switch must be set so if the air pressure operating the component is not adequate, or if the air pressure suddenly drops, the press brake becomes inoperable.

This switch is used on applications where the air pressure should not go below a predetermined amount. Each air pressure switch's low level setting is based on each application.

*Note: When press brakes have an air counterbalance system, an air pressure switch and check valve are required. See page 30 for a check valve.*



Air Pressure Switch

### PALM BUTTON ASSEMBLY

To meet OSHA and ANSI safety requirements, the two run/inch buttons must be protected against accidental operation (ring guards) and separated to require the use of both hands to operate them. They must also be mounted at the proper safety distance, if they will be used as a safeguard. The contact arrangement of these buttons is 1 NO and 1 NC.

Part No. CTL507\*

This palm button assembly consists of two black run/inch buttons (with ring guards) and a red emergency-stop button. Mounting boxes are furnished with each button. The red palm button has 1 NO and 1 NC arrangement plus a mechanical latch.

See pages 89-90 for other palm button assembly options. See page 49 for control bars.

*\*Included in a component package on page 74.*



Part No. CTL507



## SSC1500 INDIVIDUAL COMPONENTS (CONTINUED)

### FOOT SWITCH—Part No. CTD011\* & CTD088

This foot switch is protected from unintentional operation. A die-cast cover protects the top and both sides, and the front is protected by a hinged flap. The flap must be lifted with the toe before the foot may enter the switch. The electrical contact arrangement is 1 NO and 1 NC.



Foot Switch CTD011



Foot Switch CTD088

### SUPERVISORY CONTROL STATION

Part No. LLD1501

Part No. LLD283\* (required when a USC000 is used—see below)

When multiple operator stations are required, this supervisory control station is furnished separately for each set of palm buttons and/or foot switch operator station. It has its own enclosure and includes an off/on key-operated selector switch and a green on indicator light. The enclosure size is 3½" x 6¾" x 3".



### MULTIPLE-OPERATOR JUNCTION BOX—Part No. USC000\*

When multiple operator stations are required, this junction box is furnished separately for wiring up to four (4) operator stations. This junction box interfaces palm button assemblies/control bars and foot switches, and will not allow the press brake to run if palm buttons or a foot switch is actuated without its supervisory control station on. A lighted push button with nameplate indicates a fault condition of an operator station. The button is pushed to reset. The enclosure size is 16" x 14" x 6".



Multiple-Operator Junction Box



Crankshaft Angle Display

### CRANKSHAFT ANGLE DISPLAY

Part No. FTL055

The optional crankshaft angle display is a unit that shows the angular position of the crankshaft for mechanical press brakes. The crankshaft position is shown both graphically (with red LEDs in a circle) and numerically (with a large, red, three-digit LED). The large display can be easily seen which helps with setup, removal of stuck workpieces, or for assistance during emergency extractions procedures.

#### FEATURES

- Large LED numerical display and circular LED graphic display can be easily seen
- Mounts easily
- Supplied with 25' of cable for connection to the control
- Helps satisfy the requirements of Canadian Standard CSA Z142-02, Code for Power Press Operation: Health, Safety, and Guarding Requirements, for indication of crank angle position

\*Included in a component package on page 74.

## COMPONENT PACKAGE FOR MECHANICAL-FRICTION-CLUTCH PRESS BRAKES ONLY

To complete the SSC1500 control system for mechanical-friction-clutch press brakes, component packages are available. If component packages for air clutch press brakes are required, please see page 78. Component packages are listed in the chart below. These packages can be furnished with:

- A STANDARD Control (pp. 64-65)
- A REMOTE OPERATOR-STYLE Control (pp. 67-68)
- A CUSTOM Control (p. 66)
- A SPECIAL Control (p. 66)
- A SUBPANEL

To select the proper component package to go with your control box, determine your requirements below:

- A** Modes of operation and actuating means required.
- B** Number of operator stations required.
- C** Type of sprockets required.

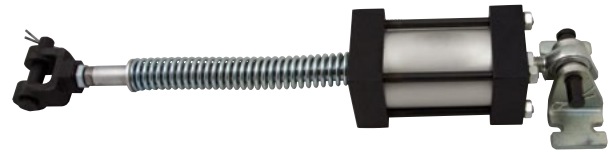
<b>A</b> Modes of operation: Inch, Single, and Sequence Stop (Hand or Foot)				
PRS or PRT Control Box	<b>B</b> ONE OPERATOR STATION		<b>B</b> TWO OPERATOR STATIONS	
<b>A</b>	<b>C</b> STANDARD SPROCKETS	<b>C</b> SPECIAL SPROCKETS	<b>C</b> STANDARD SPROCKETS	<b>C</b> SPECIAL SPROCKETS
<ul style="list-style-type: none"> <li>• Two-Hand Inch Stroke</li> <li>• Two-Hand Single Stroke</li> <li>• Foot Single Stroke</li> <li>• Sequence Stop</li> </ul>	<b>MNK-000-SSP</b> Standard Component Package  CMS115 Resolver/Pulser Timing Device With 40' Cable and Plug CML000 Sprocket Assembly CMS515 10' ANSI No. 35 Roller Chain RCL652 ½" Dual-Solenoid Air Valve RCL044 ½" Filter-Regulator-Lubricator Assembly CTD062 Air Pressure Switch CTL507 Palm Button Assembly CTD011 Foot Switch	<b>MNK-002-SSP</b> Component Package  CML100 Special Sprockets (Replaces CML000)	<b>MNK-001-SSP</b> Component Package  CTL507 Palm Button Assembly CTD011 Foot Switch LLD283 Supervisory Control Station (2) USC000 Multiple Operator Junction Box	<b>MNK-003-SSP</b> Component Package  <b>COMPONENTS REQUIRED IN ADDITION TO THOSE LISTED IN STANDARD PACKAGE AT LEFT</b>  CML100 Special Sprockets (Replaces CML000) CTL507 Palm Button Assembly CTD011 Foot Switch LLD283 Supervisory Control Station (2) USC000 Multiple Operator Junction Box
<b>A</b> Modes of operation: Inch and Single (Hand Only)				
	<b>B</b> ONE OPERATOR STATION		<b>B</b> TWO OPERATOR STATIONS	
MODES OF OPERATION TO BE USED	<b>C</b> STANDARD SPROCKETS	<b>C</b> SPECIAL SPROCKETS	<b>C</b> STANDARD SPROCKETS	<b>C</b> SPECIAL SPROCKETS
PRS or PRT Control Box	<b>MNF-000-SSP</b> Standard Component Package  CMS115 Resolver/Pulser Timing Device With 40' Cable and Plug CML000 Sprocket Assembly CMS515 10' ANSI No. 35 Roller Chain RCL652 ½" Dual-Solenoid Air Valve RCL044 ½" Filter-Regulator-Lubricator Assembly CTD062 Air Pressure Switch CTL507 Palm Button Assembly	<b>MNF-002-SSP</b> Component Package  CML100 Special Sprockets (Replaces CML000)	<b>MNF-001-SSP</b> Component Package  CTL507 Palm Button Assembly LLD283 Supervisory Control Station (2) USC000 Multiple Operator Junction Box	<b>MNF-003-SSP</b> Component Package  <b>COMPONENTS REQUIRED IN ADDITION TO THOSE LISTED IN STANDARD PACKAGE AT LEFT</b>  CML100 Special Sprockets (Replaces CML000) CTL507 Palm Button Assembly LLD283 Supervisory Control Station (2) USC000 Multiple Operator Junction Box

Note: If the press brake has an air counterbalance, an additional CTD062 air pressure switch is required.

Please select an air cylinder from page 75 or 76 to complete this package. For light curtains, mounting brackets and barriers for sides of point of operation, see Safeguarding Devices catalog.

## RCL SERIES AIR CYLINDERS

An air cylinder must be ordered **separately** for mechanical-friction-clutch press brakes that are using the packages described on page 74. It is required to complete the control system. Standard air cylinders are single-acting, pull-type, and spring return. A clevis mounting arrangement is furnished for attaching the cylinder to the machine frame. A rod, yoke, and pin assembly are used for ease in connecting to the existing clutch/brake operating rod. Other types of air cylinders are also available. Before ordering an air cylinder, please check the linkage where the cylinder will be inserted for proper stroke and diameter of air cylinder needed. Please consult the factory for any special requirements, such as push-type cylinders or longer- or shorter-stroke cylinders.



### Part No. RCL004—Air Cylinder

300-lb pull @ 75 PSI, 2 1/2" bore x 2" stroke for press brake sizes up to 8' beds. (Cylinders with longer or shorter strokes, and push cylinders are available upon request.)

### Part No. RCL005—Air Cylinder

500-lb pull @ 75 PSI, 3 1/4" bore x 2" stroke for press brake sizes 10' to 14' beds. (Cylinders with longer or shorter strokes, and push cylinders are available upon request.)

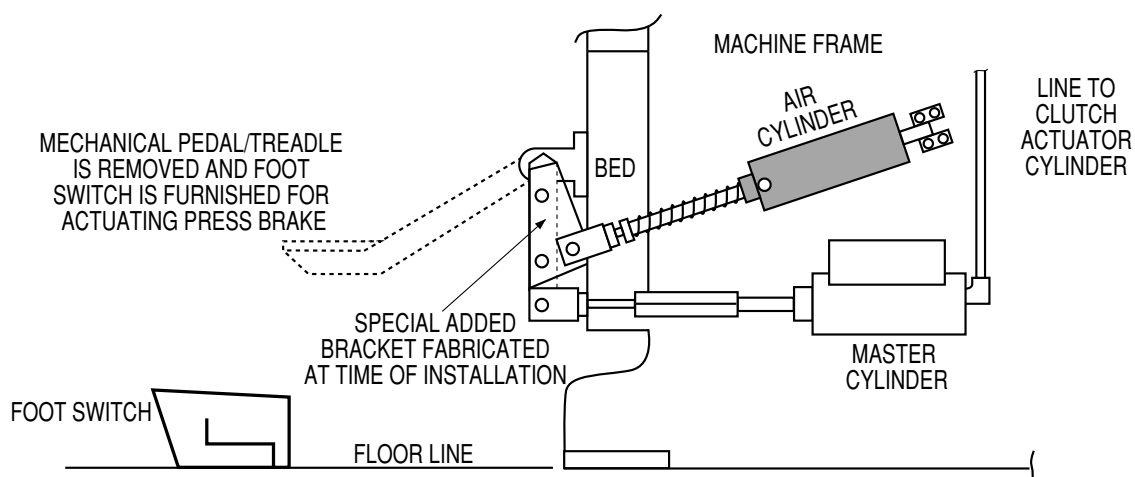
*Note: Please see the next page for special tie-rod-constructed air cylinders (for larger press brakes) or special mounting features.*

## MASTER CYLINDER-OPERATED PRESS BRAKES (OLDER WYSONG PRESS BRAKES)

Press brakes that use a master cylinder-type hydraulic system to operate a mechanical-friction clutch and brake can be retrofitted with the controls illustrated in this catalog. The following illustration shows how the air cylinder that operates the clutch and brake can be applied.

## FOOT SWITCH PACKAGE

For control systems on pages 64-74, the RCL004 air cylinder can be applied as illustrated below.



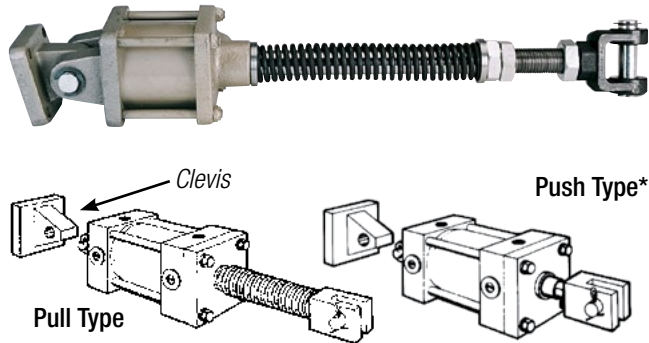
## OTHER AIR CYLINDERS AVAILABLE

The following custom tie-rod-constructed air cylinders can be furnished instead of the standard RCL series cylinders offered on the previous page. These cylinders are furnished when a larger and more durable cylinder is needed to engage and disengage the mechanical-friction clutch and brake of press brakes or when the clevis mount will not fit the machine. Please note that they are offered in tie-rod construction, both pull-type and push-type, single action with spring return. The push type has an internal spring. All cylinders are furnished with yoke and pin on the operating rod to attach to the machine linkage.

When applying an air cylinder to the machine, make sure the alignment (with the machine linkage) is a straight line. Also make sure the cylinder rod, yoke, or any moving parts will not bind after installation. Be sure the rod stroke is not too long—it could cause jackknifing of the cylinder and clutch operating rod. Please consult the factory for any other special cylinder configuration (i.e., longer or shorter stroke) or additional force needed on the return spring.

### TYPE A—CLEVIS MOUNT

This air cylinder is usually mounted in the vertical position on the side of the machine.

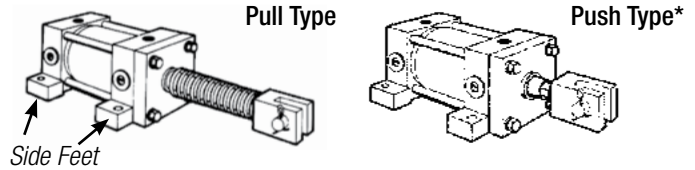


TYPE A – CLEVIS			APPROX. OVERALL LENGTH	RETURN SPRING PRESSURE	AMOUNT OF PULL OR PUSH FORCE AT 75 PSI
PART NO.	BORE	STROKE			
<b>PULL TYPE</b>					
RCK526	2"	2"	23"	60	100
RCK527	2"	3"	25"	40	100
RCK528	2"	4"	27"	20	100
RCK529	3"	2"	26"	120	295
RCK530	3"	3"	28"	80	295
RCK531	3"	4"	30"	40	295
RCK532	4"	2"	30-1/2"	270	460
RCK533	4"	3"	32-1/2"	195	460
RCK534	4"	4"	34-1/2"	120	460
<b>PUSH TYPE</b>					
RCK535	2"	2"	17"	60	135
RCK536	2"	3"	18"	40	135
RCK537	2"	4"	19"	20	135
RCK538	3"	2"	22"	120	330
RCK538	3"	3"	23"	82	330
RCK539	3"	4"	23"	40	330
RCK540	4"	2"	21-1/2"	270	520
RCK541	4"	3"	22-1/2"	195	520
RCK542	4"	4"	23-1/2"	120	520
RCK543					

\*The spring is inside the cylinder on push-type air cylinders.

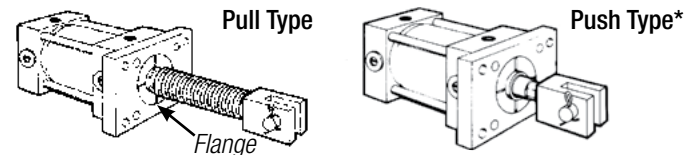
### TYPE B—SIDE-FOOT MOUNT

This air cylinder can be mounted vertically, horizontally, or any angle depending upon application



TYPE B – SIDE FOOT			APPROX. OVERALL LENGTH	RETURN SPRING PRESSURE	AMOUNT OF PULL OR PUSH FORCE AT 75 PSI
PART NO.	BORE	STROKE			
<b>PULL TYPE</b>					
RCK544	2"	2"	21-1/2"	60	100
RCK545	2"	3"	23-1/2"	40	100
RCK546	2"	4"	25-1/2"	20	100
RCK547	3"	2"	20-1/2"	120	295
RCK548	3"	3"	22-1/2"	80	295
RCK549	3"	4"	24-1/2"	40	295
RCK550	4"	2"	28"	270	460
RCK551	4"	3"	30"	195	460
RCK552	4"	4"	32"	120	460
<b>PUSH TYPE</b>					
RCK553	2"	2"	15"	60	135
RCK553	2"	3"	16"	40	135
RCK554	2"	4"	17"	20	135
RCK555	3"	2"	20"	120	330
RCK556	3"	3"	21"	82	330
RCK557	3"	4"	22"	40	330
RCK558	4"	2"	17-1/2"	270	520
RCK559	4"	3"	18-1/2"	195	520
RCK560	4"	4"	19-1/2"	120	520
RCK561	4"	5"	20-1/2"	120	520
RCK590					

### TYPE C—FRONT FLANGE MOUNT



This air cylinder is usually installed in applications where the cylinder rod must go through the frame of the press brake. Rear-flange mount and rod extensions at both ends are also available.

TYPE C – FRONT FLANGE			APPROX. OVERALL LENGTH	RETURN SPRING PRESSURE	AMOUNT OF PULL OR PUSH FORCE AT 75 PSI
PART NO.	BORE	STROKE			
<b>PULL TYPE</b>					
RCK562	2"	2"	21"	60	100
RCK563	2"	3"	23"	40	100
RCK564	2"	4"	25"	20	100
RCK565	3"	2"	23"	120	295
RCK566	3"	3"	25"	80	295
RCK567	3"	4"	27"	40	295
RCK568	4"	2"	28"	270	460
RCK569	4"	3"	30"	195	460
RCK570	4"	4"	32"	120	460
<b>PUSH TYPE</b>					
RCK571	2"	2"	16"	60	135
RCK571	2"	3"	17"	40	135
RCK572	2"	4"	18"	20	135
RCK573	3"	2"	21"	120	330
RCK574	3"	3"	22"	82	330
RCK575	3"	4"	23"	40	330
RCK576	4"	2"	22-1/4"	270	520
RCK577	4"	3"	23-1/4"	195	520
RCK578	4"	4"	24-1/4"	120	520
RCK579					

## SINGLE- AND TWO-SPEED AIR-CLUTCH PRESS BRAKES

### INTRODUCTION

Air-operated clutches and brakes use a friction arrangement that causes engagement and disengagement. When air pressure enters the clutch and brake, through a monitored dual-solenoid air valve, the clutch engages and the brake is released. To stop the motion of the press brake, the opposite takes place.

Some press brakes have one clutch that allows only one speed when cycling the machine while other press brakes have two clutches for two speeds. Two-speed air-clutch press brakes allow the slide to approach the workpiece at a fast speed, disengage (air is dumped from one clutch), then allow the second clutch to engage for a slower speed through the bending operation to the bottom of the stroke. This prevents fast whip-up action of the material. The clutches are again switched for rapid travel back to the top of the stroke.

If these types of machines are newer, they do not always require a completely new clutch/brake control package for control reliability. To verify this, please send the electrical schematics to our engineering department for review. These schematics are also necessary to review for proper interface when a light curtain will be furnished. If a single- or two-speed air-clutch press brake doesn't have control reliability and when brake monitoring is needed, the SSC1500 control can be furnished.

### SELECTING A CONTROL SYSTEM FOR PART-REVOLUTION-AIR-CLUTCH PRESS BRAKES

1. Determine if the press brake is a single- or two-speed press brake (one or two clutches).
2. If the press brake is a single-speed and sequence-stop operation is required, the SSC1500 control on pages 64-74 can be used. Select a component package from page 66. Light curtains, mounting brackets, and lockout valves are not part of the component packages and must be ordered separately. Please see page 33 for an appropriate lockout valve and Safeguarding Devices catalog for light curtain options and mounting brackets.
3. If the press brake has a two-speed air clutch, the standard SSC1500 control on pages 64-74 can be used. Select the component package from page 74. Light curtains mounting brackets (Safeguarding Devices catalog), and lockout valves (page 33) are not part of the component packages and must be ordered separately.

*Notes: See Safety Shields catalog for safeguarding the back side of the press brake.*

## COMPONENT PACKAGES FOR SINGLE- AND TWO-SPEED AIR-CLUTCH PRESS BRAKES

To complete the SSC1500 single- and two-speed air clutch press brake control system, component packages are available. Component packages are listed in the charts below. These packages can be furnished with:

- A STANDARD Control (pp. 64-65)
- A REMOTE OPERATOR-STYLE Control (pp. 67-68)
- A CUSTOM Control (p. 66)
- A CONTROL CONSOLE
- A SPECIAL Control (p. 66)
- A SUBPANEL

To select the proper component package to go with your control box, determine your requirements below:

- A** Modes of operation and initiating means required.
- B** Number of operator stations required.
- C** Type of sprockets required.

<b>A</b> Modes of operation: Inch, Single, and Sequence Stop (Hand or Foot)					
<b>B</b> ONE OPERATOR STATION			<b>B</b> TWO OPERATOR STATIONS		
MODES OF OPERATION TO BE USED	<b>C</b> STANDARD SPROCKETS		<b>C</b> SPECIAL SPROCKETS	<b>C</b> SPECIAL SPROCKETS	<b>C</b> SPECIAL SPROCKETS
PRS or PRT Control Box	TNK-000-SSP Standard Component Package		TNK-004-SSP Component Package	TNK-002-SSP Component Package	TNK-006-SSP Component Package
<ul style="list-style-type: none"> <li>• Two-Hand Inch</li> <li>• Two-Hand Single Stroke</li> <li>• Foot Single Stroke</li> <li>• Sequence Stop</li> </ul>	CMS115 Resolver/Pulser Timing Device With 40' Cable and Plug CML000 Sprocket Assembly CMS515 10' ANSI No. 35 Roller Chain RCL654 ¾" Dual-Solenoid Air Valve RCL045 ¾" Filter-Regulator-Lubricator Assembly CTD062 Air Pressure Switch (For Clutch/Brake) CTL507 Palm Button Assembly CTD011 Foot Switch	<b>COMPONENTS REQUIRED IN ADDITION TO THOSE LISTED IN STANDARD PACKAGE AT LEFT</b>			
		CML100 Special Sprockets (Replaces CML000)	CTL507 Palm Button Assembly CTD011 Foot Switch LLD283 Supervisory Control Station (2) USC000 Multiple Operator Junction Box	CML100 Special Sprockets (Replaces CML000) CTL507 Palm Button Assembly CTD011 Foot Switch LLD283 Supervisory Control Station (2) USC000 Multiple Operator Junction Box	

<b>A</b> Modes of operation: Inch and Single (Hand Only)					
<b>B</b> ONE OPERATOR STATION			<b>B</b> TWO OPERATOR STATIONS		
MODES OF OPERATION TO BE USED	<b>C</b> STANDARD SPROCKETS		<b>C</b> SPECIAL SPROCKETS	<b>C</b> SPECIAL SPROCKETS	<b>C</b> SPECIAL SPROCKETS
PRS or PRT Control Box	TNF-000-SSP Standard Component Package		TNF-004-SSP Component Package	TNF-002-SSP Component Package	TNF-006-SSP Component Package
<ul style="list-style-type: none"> <li>• Two-Hand Inch</li> <li>• Two-Hand Single Stroke</li> </ul>	CMS115 Resolver/Pulser Timing Device With 40' Cable and Plug CML000 Sprocket Assembly CMS515 10' ANSI No. 35 Roller Chain RCL654 ¾" Dual-Solenoid Air Valve RCL045 ¾" Filter-Regulator-Lubricator Assembly CTD062 Air Pressure Switch (For Clutch/Brake) CTL507 Palm Button Assembly	<b>COMPONENTS REQUIRED IN ADDITION TO THOSE LISTED IN STANDARD PACKAGE AT LEFT</b>			
		CML100 Special Sprockets (Replaces CML000)	CTL507 Palm Button Assembly LLD283 Supervisory Control Station (2) USC000 Multiple Operator Junction Box	CML100 Special Sprockets (Replaces CML000) CTL507 Palm Button Assembly LLD283 Supervisory Control Station (2) USC000 Multiple Operator Junction Box	

Note: If the press brake has an air counterbalance, an additional CTD062 air pressure switch is required.

## HYDRAULIC PRESS BRAKE CONTROL SYSTEMS

### INTRODUCTION

Each hydraulic press brake must be looked at as an individual system. This system consists of, but is not limited to, the machine frame, all mechanical parts, hydraulic system, electrical or electronic systems, pneumatic systems, tooling or dies (present and future), tool or die setup, safeguarding, material handling, size or configuration of workpiece, maintenance requirements, and most importantly, production requirements.

In ANSI B11.3, subclause 6.2 Performance of the Safety-Related Functions, it states that “The control system shall meet the requirements of 8.3.”

### 8.3 PERFORMANCE OF THE SAFETY-RELATED FUNCTION(S)

When a component, module, device or system failure occurs, such that it or a subsequent failure of another component, module, device or system would lead to the inability of the safety-related function(s) to respond to a normal stop command or an immediate stop command, the safety-related function shall:

- a) prevent initiation of hazardous machine motion (or situation) until the failure is corrected or until the control system is manually reset; or
- b) initiate an immediate stop command and prevent reinitiation of hazardous machine motion (or situation) until the failure is corrected or until the control system is manually reset; or
- c) prevent re-initiation of hazardous machine motion (or situation) at the next normal stop command until the failure is corrected or until the control system is manually reset.

### 6.14.5 HYDRAULIC COMPONENTS AND CIRCUITS

Hydraulic components and circuits that control ram motion shall comply with the requirements of 6.2 (and 8.3).

### CONTROLS

The controls described in this catalog include two-hand control as a point-of-operation safeguarding device. The palm buttons must be depressed concurrently and maintained during the hazardous downstroke of the ram. Release of one or both palm buttons reverses or stops the action of the ram. The controls offered also include a light curtain interface.

### ELECTRICAL REQUIREMENTS

The ANSI B11.3 standard requires a proper main power disconnect switch. A motor starter is also required that drops out when power is lost and will not restart automatically. All AC control circuits and solenoid valves must be powered by 120 V or less (obtained from the transformer), and the control system must be protected against false operation due to an accidental ground. Refer to subclause 6.1.

### UPDATING HYDRAULIC PRESS BRAKES

To update the electrical system or to add point-of-operation safeguarding to a hydraulic press brake, the electrical and hydraulic schematic diagrams must be reviewed by Rockford Systems’ engineering department. Please provide these schematics to our sales personnel or factory-authorized representatives when they visit your plant to conduct a machine survey.



Hydraulic Press Brake With Remote Operator Station

## STANDARD HYDRAULIC PRESS BRAKE CONTROL

This solid-state control system is designed for use on hydraulic press brakes. It is designed and built to comply with OSHA 29 CFR 1910.212, ANSI B11.3 and B11.19. This control can update or replace existing control systems on hydraulic press brakes found in users' plants or can be furnished for new or rebuilt hydraulic press brakes.

This control includes control reliability, two-hand control, light curtain interface, and diagnostics (two user-programmable inputs). It also includes batch and stroke counters with presets, and a hard-wired emergency-stop master control relay.

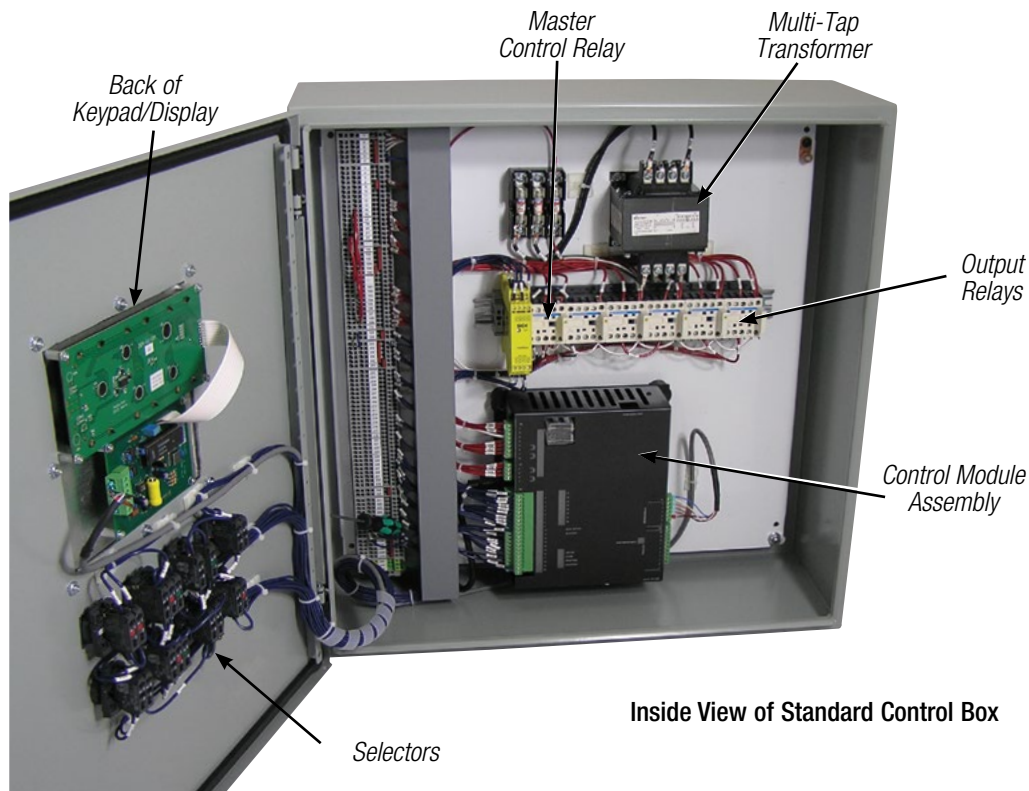
This is an economic, full-featured dual micro-processor-based control system. The system uses redundant inputs from devices such as palm buttons, foot switches, and light curtain(s). The system output to the solenoid valves is provided by two force-guided relays. These output relays are independently controlled and cross-checked by the microprocessors. This allows control-reliable operation of the outputs in the event of a single control component failure in the control. The standard hydraulic press brake control has minimum requirements for the press brake it is to control. These minimum requirements include a directional or one up and one down solenoid valve(s) for the ram, a TOS (top-of-stroke) limit switch, and a BOS (bottom-of-stroke) limit or pressure switch. In most cases, if these already exist, they can be reused. Speed-change valves and limit switches can also be supported with the standard hydraulic control. If other valves exist (additional speed change valves, prefill, regeneration, level, bypass, etc.), please consult the factory for a quote on a special-designed control.

The standard control box is a 20" x 20" x 8" NEMA 12 enclosure with the operator controls and keypad/display mounted in the door, as shown.

A starter or disconnect can be included in a larger enclosure, or a combination starter disconnect can be furnished separately.



Standard Control Box



Inside View of Standard Control Box



## STANDARD HYDRAULIC PRESS BRAKE CONTROL (CONTINUED)

### OPERATOR INTERFACE KEYPAD/DISPLAY

The operator interface keypad/display is used to enter setup information, monitor machine operation, and display messages on a 4-line x 20-character LCD (liquid crystal display). As standard, this keypad is mounted on the control box door. For operator convenience, it can be installed in a remote operator station. Programming is accessed by a keyed selector switch.

### PROGRAMMING

The hydraulic press brake control can be quickly and easily programmed. There are up to two 24-V DC selectable current sinking or sourcing programmable diagnostic inputs provided for the user. A fault message, input logic, and stop type can be assigned to each input from the list shown. When a fault condition is detected, the machine will top stop or emergency stop, and the assigned message will be displayed. This feature helps when troubleshooting common fault conditions.

### MODES OF OPERATION

- Off
- Two-hand inch
- Two-hand single stroke
- Foot single stroke
- Foot switch trip or one-hand trip single stroke (used in conjunction with a point-of-operation safeguard)\*
- High, high/low, low speed change
- Sequence stop (hand/hand, hand/foot, foot/foot)

\*Additional components may be required to use this mode of operation.

### FEATURES

- Meets and exceeds OSHA 29 CFR 1910.212, ANSI B11.3 and B11.19
- Provides two-hand control safeguarding device
- Redundant and cross-checking microprocessors
- Redundant switching style DC power supplies
- Two monitored ram advance (up or down) 24-V force-guided output relays
- External relay monitoring (for use when external relays are used to energize the down valves)
- Blocking valve monitoring
- Press control operates on 85-135 VAC
- Provisions for optional light curtain interface with off/on supervised keyed selector switch
- Easy to read back-lit liquid crystal operator interface display having 4 lines x 20 characters
- Two (2) 24-V DC digital user inputs, programmable, selectable canned messages
- One (1) ram speed change (fast-slow) output, standard 120 VAC with a selector switch for high, high/low, low speed (to support machines with a speed change solenoid valve)
- One (1) ram return (up or down) output, standard 120 VAC with a selector switch for pressure, pressure/distance, distance return
- Bottom dwell timer (0-600 seconds)
- Decompression timer (50-250 ms)
- 7-digit stroke counter
- 7-digit batch counter with preset
- Operator interface keypad and display, text in English or Spanish



Keypad/Display

*For control reliability*

## CUSTOM HYDRAULIC PRESS BRAKE CONTROL

A custom control box contains the standard control module and components described on pages 80-81 plus the following:

- main power disconnect switch
- main hydraulic pump motor starter

The box will vary in size based on the disconnect switch and motor starter components. The box is furnished with an IEC through-the-door main power fused disconnect switch and an IEC hydraulic pump magnetic motor starter (with push buttons). They are prewired and built into a NEMA 12 enclosure.

Operator controls and the keypad/display are located on the front of the door, or a plain-door control or subpanel can be furnished. A remote operator station or keypad/display kit is required if a plain-door control or subpanel is ordered. See page 83 for information on remote operator stations.

To ensure the starter(s) and disconnect are sized properly, please check horsepower for the main drive motor and slide adjust motor (if furnished) on the machine, as well as full-load amps, and primary voltage to the machine. After obtaining this information, go to the chart on page 83 to determine the proper custom control box part number. Follow directions 1-7 to determine the correct part number.



## REMOTE OPERATOR-STYLE CONTROL BOXES

Remote operator-style X, Y, and Z hydraulic control boxes include the same features and modes of operation as the standard hydraulic control boxes. **However, they do not have a control transformer.** These control boxes are designed to be located on the front of the machine near the operator.

These controls are for applications where the machine's existing magnetic motor starter, fused disconnect switch, and **control transformer** meet the safety requirements and can be reused. If the existing control transformer cannot be reused or a new one is required, please contact the factory.

The keypad/display and all operator controls are located on the door (front) of the remote operator-style control box.

## CONTROL MODULE KIT

A control module kit allows the end user to update the hydraulic control of a press brake with minimum equipment costs. The kit is supplied without the control enclosure, panel, control transformer, control fuse, terminal strips, wire duct, and wiring.

A set of electrical prints is supplied to show typical wiring, and all mounting dimensions are provided in order for a qualified person to install the control module kit. The minimum area required on an existing control panel to install this kit is 18" H x 18" W x 6" D.

This control module kit includes the control module, control relays, shock mounts, fasteners, suppressors, danger labels, and electrical prints. A keypad/display kit is required unless a remote operator station is used (see next page).

## SUBPANEL

A subpanel control can also be furnished. It is the same as the standard control described on pages 89-90 without the enclosure. The minimum area required in an existing control enclosure is 18 1/2" H x 18 1/2" W x 6" D.



## KEYPAD/DISPLAY KIT

### Part No. LLD6025

The keypad/display kit can be used with any of the control boxes or the control module kit. This kit includes the keypad/display, an off/program/run selector switch, a light curtain off/on selector switch, a hand/foot selector switch, an inch/single/sequence stop selector switch, a high/low speed selector switch, a pressure/pressure distance/distance return selector switch, and 25' of cable. Additional push buttons, nameplates, and selector switches for the motor starter, etc., can be furnished depending on the features required. Please consult the factory.



## REMOTE OPERATOR STATIONS

For operator convenience, a remote operator station can be furnished for use with a plain-door standard control box, plain-door custom control box, module kit, or subpanel. The remote operator station contains the keypad/display, program selector switch, and other selector switches as required.

Remote operator stations are available in a standard format or can be customized to meet any requirements. Select from the following remote operator stations.



### Part No. LLD6021

Remote Operator Station for Hydraulic Press Brakes

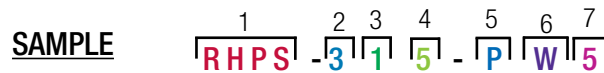
### REMOTE OPERATOR STATIONS FOR HYDRAULIC PRESS BRAKES

FEATURES	PART NO. LLD6020	PART NO. LLD6021	PART NO. LLD6022	PART NO. LLD6023
KEYPAD/DISPLAY	X	X	X	X
OFF/PROGRAM/RUN SELECTOR SWITCH	X	X	X	X
LIGHT CURTAIN OFF/ON SELECTOR SWITCH	X	X	X	X
HIGH/LOW SPEED SELECTOR SWITCH	X	X	X	X
PRESSURE/PRESSURE DISTANCE/DISTANCE RETURN SELECTOR SWITCH	X	X	X	X
INCH/SINGLE/SEQUENCE STOP SELECTOR SWITCH	X	X	X	X
HAND, HAND/FOOT, FOOT SELECTOR SWITCH	X	X	X	X
MAIN MOTOR START AND STOP PUSH BUTTONS		X		X
ADVANCED LIGHT CURTAIN BLANKING SELECTOR SWITCHES			X	X

# SELECTING AN RHPS HYDRAULIC PRESS BRAKE CONTROL

To determine the 10-digit configured part number for the hydraulic press brake control required, follow directions 1-7 below and use the information in the **PART NUMBERING SYSTEM CHART** below.

1. The first 4 digits for all hydraulic press brake controls are RHPS.
2. The 5th digit determines the size of the disconnect switch, if provided, in the control enclosure. Zero (0) indicates no disconnect switch provided.
3. The 6th digit determines if a nonreversing motor starter is provided. Zero (0) indicates no motor starter provided.
4. The 7th digit determines the size of nonreversing motor starter that is provided in the control enclosure. Zero (0) indicates no motor starter provided.
5. The 8th digit determines the location of the operator controls, or if it is a style X, Y, or Z control without the control transformer.
6. The 9th digit is for the type of light curtain interface provided.
7. The 10th digit (if required) will indicate the type of modifier provided: i.e., motor control operators remote.



The sample shown, RHPS-315-PW5, indicates that the custom control box is for a hydraulic press brake that has a plain door box with a C4000 standard light curtain interface including an IEC 100-A disconnect switch and an IEC 40-A nonreversing motor starter. The keypad/display and all operators including the motor controls will be located remote (see page 91).

RHPS HYDRAULIC CONTROL PART NUMBERING SYSTEM CHART																																																																																																																																									
<p><b>SYSTEM TYPE PRODUCT CATEGORY</b></p> <p>RHPS — Hydraulic Control for Press Brakes</p> <p><b>DISCONNECT SWITCH SIZE—IEC (PLUS MAXIMUM MAIN MOTOR FLA)</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr><td>0</td><td>—No Disconnect Switch</td></tr> <tr><td>1</td><td>—30A Disconnect—1- to 20-FLA Main Drive Motor</td></tr> <tr><td>2</td><td>—60-A Disconnect—21- to 40-FLA Main Drive Motor</td></tr> <tr><td>3</td><td>—100-A Disconnect—41- to 66-FLA Main Drive Motor</td></tr> <tr><td>4</td><td>—200-A Disconnect—67- to 133-FLA Main Drive Motor</td></tr> <tr><td>5</td><td>—400-A Disconnect—134- to 266-FLA Main Drive Motor</td></tr> </table> <p><b>NONREVERSING MAIN MOTOR STARTER</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr><td>0</td><td>—No Starter</td></tr> <tr><td>1</td><td>—Nonreversing Starter</td></tr> </table> <p><b>MAIN MOTOR STARTER SIZE</b></p> <p style="text-align: center;">IEC</p> <table style="width: 100%; border-collapse: collapse;"> <tr><td>1</td><td>—12 A</td></tr> <tr><td>2</td><td>—18 A</td></tr> <tr><td>3</td><td>—25 A</td></tr> <tr><td>4</td><td>—32 A</td></tr> <tr><td>5</td><td>—40 A</td></tr> <tr><td>6</td><td>—50 A</td></tr> <tr><td>7</td><td>—65 A</td></tr> <tr><td>8</td><td>—80 A</td></tr> <tr><td>9</td><td>—95 A</td></tr> <tr><td>A</td><td>—115 A</td></tr> <tr><td>B</td><td>—185 A</td></tr> <tr><td>C</td><td>—265 A</td></tr> </table> <table style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <tr><th colspan="5" style="text-align: center;">Motor Horsepower Chart—3 Phase</th></tr> <tr><th></th><th>208 V</th><th>230 V</th><th>460 V</th><th>575 V</th></tr> <tr><td>2</td><td></td><td>3</td><td>7.5</td><td>7.5</td></tr> <tr><td>5</td><td></td><td>5</td><td>10</td><td>10</td></tr> <tr><td>7.5</td><td></td><td>7.5</td><td>15</td><td>15</td></tr> <tr><td>10</td><td></td><td>10</td><td>20</td><td>20</td></tr> <tr><td>15</td><td></td><td>10</td><td>30</td><td>30</td></tr> <tr><td>15</td><td></td><td>15</td><td>40</td><td>40</td></tr> <tr><td>20</td><td></td><td>20</td><td>50</td><td>50</td></tr> <tr><td>25</td><td></td><td>30</td><td>60</td><td>75</td></tr> <tr><td>30</td><td></td><td>30</td><td>60</td><td>75</td></tr> <tr><td>30</td><td></td><td>40</td><td>75</td><td>100</td></tr> <tr><td>50</td><td></td><td>60</td><td>125</td><td>150</td></tr> <tr><td>75</td><td></td><td>100</td><td>200</td><td>200</td></tr> </table>	0	—No Disconnect Switch	1	—30A Disconnect—1- to 20-FLA Main Drive Motor	2	—60-A Disconnect—21- to 40-FLA Main Drive Motor	3	—100-A Disconnect—41- to 66-FLA Main Drive Motor	4	—200-A Disconnect—67- to 133-FLA Main Drive Motor	5	—400-A Disconnect—134- to 266-FLA Main Drive Motor	0	—No Starter	1	—Nonreversing Starter	1	—12 A	2	—18 A	3	—25 A	4	—32 A	5	—40 A	6	—50 A	7	—65 A	8	—80 A	9	—95 A	A	—115 A	B	—185 A	C	—265 A	Motor Horsepower Chart—3 Phase						208 V	230 V	460 V	575 V	2		3	7.5	7.5	5		5	10	10	7.5		7.5	15	15	10		10	20	20	15		10	30	30	15		15	40	40	20		20	50	50	25		30	60	75	30		30	60	75	30		40	75	100	50		60	125	150	75		100	200	200	<p style="text-align: center;"><b>RHPS - X X X - X X X</b></p> <p><b>MODIFIER</b></p> <table style="width: 100%; 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\*See page 48 for remote motor control operator stations or Safety Shields catalog.

## HYDRAULIC CONTROL SYSTEMS INDIVIDUAL COMPONENTS

### LINEAR CAM AND LIMIT SWITCH ASSEMBLY

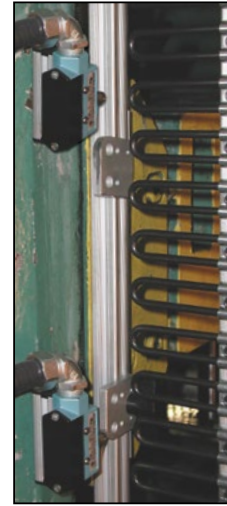
#### Part No. CMT048

The linear cam and limit switch assembly consists of two limit switches and two adjustable cams mounted on an extruded-aluminum bracket. This assembly can provide the linear timing of the top and bottom limits of the machine cycle on a hydraulic machine.

### HIGH/LOW LIMIT SWITCH ASSEMBLY

#### Part No. CMT049

An additional linear cam and limit switch assembly can be used for a high/low signal during the closing portion of the hydraulic stroke. This assembly consists of one limit switch and one adjustable cam mounted on an extruded-aluminum bracket.



### PALM BUTTON ASSEMBLY

#### Part No. CTL525

Palm button assembly consists of two black run/inch buttons (with ring guards), a red emergency-stop button and a yellow return/inch-up button. Mounting boxes are furnished with each button. The electrical contact arrangement for all buttons is 1 NO and 1 NC.



Part No. CTL525

### FOOT SWITCH

#### Part No. CTD011 & CTD088

This foot switch is protected from unintentional operation. A heavy-duty die-cast cover protects the top and both sides, and the front is protected by a hinged flap. The flap must be lifted with the toe before the foot may enter the switch. The electrical contact arrangement is 1 NO and 1 NC.



Foot Switch CTD011



Foot Switch CTD088

### SUPERVISORY CONTROL STATION

#### Part No. LLD6101

#### Part No. LLD283 (required when a USC000 is used—see below)

When two or more palm button or foot switch operating stations are required on one machine, one supervisory control station is required at each operator station. This remote control station consists of an off/on keyed selector switch and a station on indicator light. The on position allows the operator to use that station, and the off position deactivates only that station. The enclosure size is 5¼" x 3" x 3¼"



Supervisory Control Station

### MULTIPLE-OPERATOR JUNCTION BOX

#### Part No. USC000

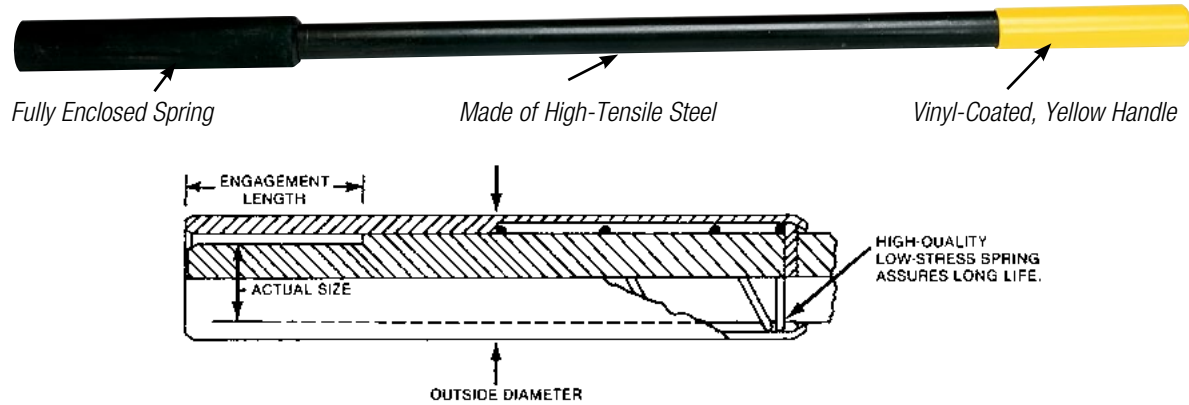
When multiple operator stations are required, this junction box is furnished separately for wiring up to four (4) operator stations. This junction box interfaces palm button assemblies/control bars and foot switches, and will not allow the press to run if palm buttons or a foot switch is actuated without its supervisory control station on. A lighted push button with nameplate indicates a fault condition of an operator station. The button is pushed to reset. The enclosure size is 16" x 14" x 6".



Multiple-Operator Junction Box

## SPRING-LOADED TURNOVER BARS

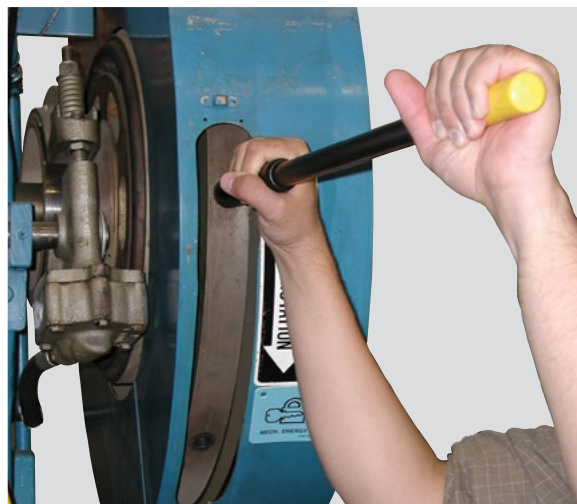
In OSHA 29 CFR 1910.217, it says that “The employer shall provide spring-loaded turnover bars for presses designed to accept such turnover bars.” The turnover bar is most frequently used with mechanical power presses. Turnover bars can also be used on four-slides or any other machine where the bar might be sent into the air if it is inadvertently left in the bar ring hole and the machine is turned on. Each spring-loaded turnover bar is self-ejecting so it can't be left in the bar hole.



### SPRING-LOADED TURNOVER BARS

PART NO.	NORMAL SIZE	ACTUAL SIZE	BAR DIAMETER	OUTSIDE DIAMETER	ENGAGEMENT LENGTH	OVERALL LENGTH	WEIGH IN POUNDS
KMR001	3/8"	.365"	3/4"	1.050"	1.50"	18"	1.8
KMR002	1/2"	.490"	3/4"	1.050"	1.75"	24"	3.5
KMR003	5/8"	.615"	3/4"	1.050"	1.75"	24"	3.5
KMR004	3/4"	.740"	15/16"	1.315"	2.00"	30"	6.7
KMR005	7/8"	.865"	15/16"	1.315"	2.00"	30"	6.7
KMR006	1"	.990"	1-1/4"	1.660"	2.50"	36"	13.7
KMR007	1-1/4"	1.240"	1-1/4"	1.660"	2.50"	36"	14.0

\*Each engaging bar is made .010" under corresponding hole size. End is chamfered for easy entry. Consult the factory for special sizes.



Spring-Loaded Turnover Bar on Flywheel of Mechanical Power Press

## OPTIONAL PALM BUTTON ASSEMBLIES

Other styles of palm buttons are available to meet the OSHA and ANSI safety standards. The following pages include options to our standard palm buttons listed throughout this catalog.

All palm buttons can be furnished:

- as individual palm buttons
- in sets of two with ring guards for two-hand trip or two-hand control
- in control bars, special boxes, or control consoles

Ring guards, covers, or similar devices must protect the palm button from accidental activation. Anti tie-down protection is required for single-stroke, two-hand trip, and two-hand control. It should already be built into the control system where any of these assemblies are applied. The buttons must also be mounted at a proper safety distance according to OSHA 29 CFR 1910.217 for two-hand trip or two-hand control when applying them to mechanical power presses. ANSI also requires that they be at the calculated safety distance on many other machines.

The assemblies, which include the ring guard and mounting plate, provide protection against unintended operation. All emergency-stop buttons are latch-out type buttons.

### LIGHT-PUSH PALM BUTTONS

These light-push palm button assemblies can replace the standard black palm button assemblies (shown throughout this catalog) when a lighter push is required.

The run/inch palm buttons have a single plunger which provides 1 NO and 1 NC contact arrangement. The mushroom head is made of a zinc die cast and has a flat plunger. The palm button cover plate has a solid neoprene gasket which provides an oil-tight seal upon installation.

### ORDERING INFORMATION

**Part No. CTL533**—Two chrome run/inch buttons, ring guards, and red emergency-stop palm button. The red palm button has 1 NO and 1 NC contact arrangement.

**Part No. CTL534**—Two chrome run/inch buttons, ring guards, red emergency-stop palm button, and yellow top-stop palm button. The red and yellow palm button each have 1 NO and 1 NC contact arrangement.

**Part No. CTL538**—Two chrome run/inch buttons, ring guards, red emergency-stop palm button, and yellow return/inch-up palm button. The red and yellow palm button each have 1 NO and 1 NC contact arrangement.



Part No. CTL533



Part No. CTL534



Part No. CTL538

## OPTIONAL PALM BUTTON ASSEMBLIES (CONTINUED)

### ARTICULATED PALM BUTTONS

These palm button assemblies have articulated chrome palm buttons and are offered in 24-V DC low-voltage or 115VAC standard-voltage contacts. The low-voltage buttons are specifically designed for use with solid-state controls only and should not be used with relay-based controls. These ergonomic, heavy-duty palm buttons can be operated at any angle and are easy to push. The buttons are chrome plated and the guards are made of steel. The buttons provide 1 NO and 1 NC contact arrangement.

### STANDARD-VOLTAGE CONTACT RATINGS

Maximum Voltage ..... 600 VAC/DC

Typical Operating Force ..... 3.7 lb (center), 2.7 lb (perim.)

### LOW-VOLTAGE CONTACT RATINGS

Minimum Voltage DC ..... 5 V, 1 mA

Maximum Voltage DC ..... 48 V, 0.1 A

Maximum Voltage AC ..... 240 V, 0.4 A

Typical Operating Force ..... 3.7 lb (center), 2.7 lb (perim.)

### ORDERING INFORMATION

#### STANDARD-VOLTAGE CONTACTS—115VAC

**Part No. CTL547**—Two articulated chrome run/inch buttons with ring guards, mounting boxes, and red emergency-stop palm button.

**Part No. CTL548**—Two articulated chrome run/inch buttons with ring guards, mounting boxes, red emergency-stop palm button, and yellow top-stop palm button.

**Part No. CTL550**—Two articulated chrome run/inch buttons with ring guards, mounting boxes, red emergency-stop palm button, and yellow return/inch-up palm button.

#### LOW-VOLTAGE CONTACTS—24 V DC

**Part No. CTL541**—Two articulated chrome run/inch buttons with ring guards, mounting boxes, and red emergency-stop palm button.

**Part No. CTL542**—Two articulated chrome run/inch buttons with ring guards, mounting boxes, red emergency-stop palm button, and yellow top-stop palm button.

**Part No. CTL544**—Two articulated chrome run/inch buttons with ring guards, mounting boxes, red emergency-stop palm button, and yellow return/inch-up palm button.



Part No. CTL547



Part No. CTL548



Part No. CTL550

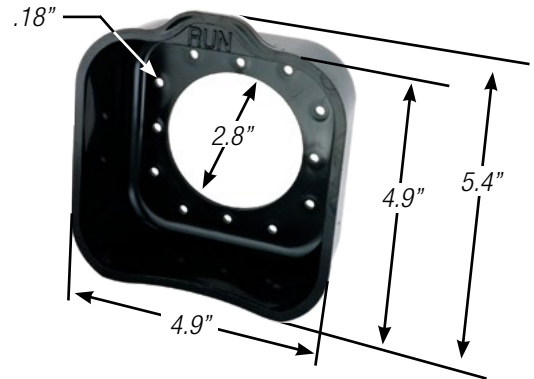


## REPLACEMENT PARTS FOR PALM BUTTON ASSEMBLIES

### Universal Run Button RING Guard Part No. CTK006

This palm button ring guard is the way to protect new and existing run palm buttons from accidental operation. This high-impact PVC plastic palm button ring guard can be used with most palm button brands. The large square ring shape allows the operator to change hand position as well as use other surfaces of the hand to cycle the machine. This ring guard resists deterioration that can occur from cutting oils and other types of lubricants that come in contact with it. This ring guard has a relief for the wrist, and the word run is molded into the top of the ring guard. Four 1¼" screws are furnished with each ring guard.

12 holes for vertical or horizontal mounting



### CHROME PALM BUTTON Part No. CTC737

This heavy-duty, **light-push**, single plunger run/inch palm button provides 1 NO and 1 NC contact arrangement. This 2¼" button is constructed of zinc cast and has a flat plunger. The palm button cover plate has a solid neoprene gasket which provides an oil-tight seal upon installation. This palm button can replace the black palm button described below when a lighter push is required. The force required to operate this button is 2.5 lb.



### ARTICULATED CHROME PALM BUTTON WITH GUARD Part No. CTC746—Standard Voltage Part No. CTC751—Low Voltage

This ergonomic, heavy-duty palm button provides 1 NO and 1 NC contact arrangement. The palm button is chrome plated and the guard is made of steel. The straight-push force required to operate this button is 3.7 lb.



### BLACK PALM BUTTON Part No. CTC726

This standard heavy-duty, single plunger run/inch palm button provides 1 NO and 1 NC contact arrangement. This 2¼" button is mushroom shaped. The palm button cover plate has a solid neoprene gasket which provides an oil-tight seal upon installation. The force required to operate this button is 5 lb.



### YELLOW TOP-STOP PALM BUTTON Part No. CTC727

This heavy-duty, single plunger yellow top-stop palm button provides 1 NO and 1 NC contact arrangement. This 2¼" button has a mushroom-shaped plunger. The palm button cover plate has a solid neoprene gasket which provides an oil-tight seal upon installation. The force required to operate this button is 5 lb.



## REPLACEMENT PARTS FOR PALM BUTTON ASSEMBLIES (CONTINUED)

### YELLOW RETURN/INCH-UP PALM BUTTON

Part No. CTC740

This heavy-duty, single plunger yellow return/inch-up palm button provides 1 NO and 1 NC contact arrangement. This 2¼" button has a mushroom-shaped plunger. The palm button cover plate has a solid neoprene gasket which provides an oil-tight seal upon installation. This button is used to return/inch-up the ram on hydraulically or pneumatically operated machines. The force required to operate this button is 5 lb.



### RED EMERGENCY-STOP PALM BUTTON WITH LOCKOUT

Part No. CTC736

This heavy-duty, single plunger red emergency-stop palm button provides 1 NO and 1 NC contact arrangement. This 2¼" button has a mushroom-shaped plunger with a spring latch that keeps the button latched down when pushed. A release is incorporated. It also has provisions for attaching a padlock to the latch. The palm button cover plate has a solid neoprene gasket which provides an oil-tight seal upon installation. The force required to operate this button is 12.5 lb.



ELECTRICAL RATINGS FOR ALL BUTTONS (EXCEPT ARTICULATED)  
– HEAVY-DUTY ANSI 600/NEMA 300

NORMAL POTENTIAL	NORMAL CURRENT	INRUSH CURRENT
110 TO 120 VAC*	6.0 A	60.0 A
220 TO 240 VAC*	3.0 A	30.0 A
440 TO 480 VAC*	1.5 A	15.0 A
550 TO 600 VAC*	1.2 A	12.0
115 TO 125 V DC**	2.2 A	–
230 TO 250 V DC**	1.1 A	–

\*Power factor of 0.35 or less

\*\*Inductive loads as specified in Section 125 of Industrial Control Devices, Controllers and Assemblies, ANSI/NEMA ICS 2-1988

### MOUNTING BOXES (WITH ¾" NPT THREADED HUBS)

Part No. CTK004

A single-hub mounting box is supplied with all palm button assemblies. It is used when wire terminates at this box. It can also be used when remote mounting electrical cut-off systems or duplex power outlets.

Part No. CTK003

A double-hub mounting box is supplied with all palm button assemblies. It is used when wires are required to go through the box and on to another mounting box.

Single  
Hub



Double  
Hub

## DANGER SIGNS AND LABELS

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

### OPERATOR SAFETY PRECAUTIONS FOR METALFORMING MACHINERY—8 1/2" X 11" X .055" THICK

Part No. KSC000—English

Part No. KSC000S—Spanish

**OPERATOR SAFETY PRECAUTIONS**

Handout for Anyone Operating This Machine

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

**DANGER**

**NEVER**  
Place Your Hands or Any Part of Your Body in This Machine

See Reverse Side for Other Safety Precautions.

**OVER**

Part No. KSC000

KSC000 Front—English

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

- 1 Never operate this machine unless you understand the basic safety instructions. Failure to read your hands or any part of your body in this machine which could result in the loss of fingers, limbs or even death.
- 2 Never use a foot switch to operate this machine unless a point-of-operation guard, shield, or device is provided and properly maintained.
- 3 Never "ride" the foot pedal or foot switch. Never rest your foot on top of the foot pedal or inside the foot switch. Always remove your foot completely from the foot pedal or foot switch after each cycle and any time you are not intending to trip the machine.
- 4 Always use hand tools for loading or resetting material from the point of operation or any other hazardous part of the machine. Never reach through or into a hazardous area of a machine for any reason.
- 5 Never operate this machine unless you have been fully trained and have received and understand all operating instructions. Make sure you know how the machine works and how it is controlled.
- 6 Never operate this machine until you test the machine with its guard or safety device before you start or reset production. Do not begin operating the machine unless you are sure the safeguarding is adjusted properly and working correctly. If you are not sure, notify your supervisor.
- 7 Never operate this machine if it is not working properly or if you notice an unusual noise or vibration. Stop the machine immediately and advise your supervisor.
- 8 Never operate this machine with pullbacks (if furnished) unless they are adjusted properly for you. Have your supervisor demonstrate that when they are disengaged, the pullbacks will pull fingers clear of any pinch points. Always wear your work clothes properly.
- 9 Never operate this machine with pullbacks (if furnished) without reading and understanding the instructions. Instructions must be kept with the pullback device at all times and made available to you. Clean, read, and know these instructions.
- 10 Never operate this machine unless you understand the basic safety instructions. Failure to read your hands or any part of your body in this machine which could result in the loss of fingers, limbs or even death.
- 11 Never operate this machine unless two-hand trip, two-hand control, or pressure-sensitive device (if furnished) is installed correctly and at the proper safety distance. Contact your supervisor if you have any questions regarding the proper safety distance.
- 12 Never operate this machine unless the light curtain (if furnished) is installed into the machine control system properly. Only move during the non-hazardous part of the machine cycle. Barking should be discontinued.
- 13 Never tamper with, alter, remove, or disable any component or safeguard on this machine.
- 14 Always wear safety glasses, hearing protection and any other personal protection equipment needed when operating this machine.
- 15 Never operate this machine with long hair, loose clothing or jewelry. It could become caught in part of the machine or machinery equipment.
- 16 Be sure all persons are clear of the machine before it is cycled, especially when multiple operators or helpers are present. Do not operate machine unless you and every operator and/or helper are protected from injury by a guard or safety device.
- 17 Always stay alert (don't drowsy) and never operate this machine while under the influence of alcohol or any drug, including prescription medications.
- 18 Maintenance and Die Set-Up Personnel: Never work on the machine unless power is off and locked out. Disconnect all air, main energy, electric, gas, hydraulic, etc. and all energy sources. Lock out, tag out, and use a padlock.
- 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, supports, etc.) and auxiliary equipment are free from hazards.

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

**NOTICE TO EMPLOYER:** These operator safety precautions must be given to all operators (including being trained and supervised) of this machine. These precautions should always be hung on the machine readily accessible and visible to the operator. Additional precautions are available upon request.

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

**THESE PRECAUTIONS MUST BE REVIEWED DAILY.**

KSC000 Back—English

**OPERADOR PRECAUCIONES DE SEGURIDAD**

PANFLETO PARA TODOS OPERADORES DE ESTA MAQUINA.

**TODOS OPERADORES DEBEN DE LEER Y COMPRENDER LAS PRECAUCIONES DE SEGURIDAD ANTES DE OPERAR ESTA MAQUINA.**

**PELIGRO**

**NUNCA**  
METE LAS MANOS U OTRA PARTE DEL CUERPO EN ESTA MAQUINA

VEA AL REVES PARA OTRAS PRECAUCIONES DE SEGURIDAD.

**OTRO LADO**

Part No. KSC000S

KSC000S Front—Spanish

**Antes de Manejar esta Máquina Lea y Familiarícese con las Sigüientes Medidas de Seguridad.**

- 1 Nunca maneje la máquina hasta haber comprendido la programación de esta máquina. Consulte con el supervisor las instrucciones de seguridad antes de comenzar a operar la máquina. Nunca maneje la máquina sin un protector en el punto de funcionamiento o dispositivo de seguridad que le protege contra lesiones corporales.
- 2 Nunca maneje la máquina con un controlador a pedal o controlador a pedal. Nunca desactive el pie sobre el punto de operación o dispositivo de seguridad.
- 3 Nunca maneje la máquina a menos que haya recibido capacitación adecuada y comprenda completamente todas las instrucciones de manejo. Este seguro de saber cómo funciona y controla la máquina.
- 4 Nunca se "mover" en el control a pedal o el controlador a pedal. Nunca desactive el pie sobre el punto de operación o dispositivo de seguridad a menos que el supervisor le demuestre cómo hacerlo correctamente. No desactive el protector a menos que el supervisor le demuestre cómo hacerlo correctamente. Si no está seguro, llame a su supervisor.
- 5 Use siempre herramientas manuales para ajustar o retirar material del punto de funcionamiento o cualquier otra pieza peligrosa de la máquina. No alcance ni baje el dedo del punto de funcionamiento bajo ningún circunstancia.
- 6 Nunca maneje la máquina a menos que haya recibido capacitación adecuada y comprenda completamente todas las instrucciones de manejo. Este seguro de saber cómo funciona y controla la máquina.
- 7 Nunca maneje la máquina hasta haberla puesto en marcha con el protector o dispositivo de seguridad antes de iniciar la producción. No ponga a andar la máquina hasta que esté seguro de que el dispositivo de seguridad está ajustado debidamente y funcionando correctamente. Si no está seguro, llame a su supervisor.
- 8 Nunca maneje la máquina si no está funcionando adecuadamente o si usted notara un ruido rítmico o cambio en el rendimiento de la máquina. Apague la máquina inmediatamente y notifique a su supervisor.
- 9 Nunca maneje la máquina con dispositivos de retorno de los tubos salvo que haya sido autorizado adecuadamente como el "hacer el trabajo" que se demuestran como el "hacer el trabajo" no de las partes de equipo. Use siempre las máquinas adecuadamente y bien aseguradas.
- 10 Nunca maneje la máquina con dispositivos de retorno (si los hubiera) sin antes leer y comprender totalmente las instrucciones. Las instrucciones deben estar a su disposición y mantenerse en todo momento fuera al dispositivo de retorno. Observe, siga y siga todas las instrucciones.
- 11 Nunca maneje la máquina a menos que el operador y el supervisor estén presentes y la distancia adecuada de seguridad. No maneje la máquina a menos que haya recibido capacitación adecuada de seguridad.
- 12 Nunca maneje la máquina a menos que la cortina de luz (si la hubiera) se encuentre correctamente instalada. Nunca maneje la máquina si no está correctamente instalada y a una distancia adecuada de seguridad. Consulte con el supervisor si tuviera dudas sobre la distancia adecuada de seguridad.
- 13 Nunca maneje la máquina a menos que la cortina de luz (si la hubiera) se encuentre correctamente instalada. Nunca maneje la máquina si no está correctamente instalada y a una distancia adecuada de seguridad. Consulte con el supervisor si tuviera dudas sobre la distancia adecuada de seguridad.
- 14 Use siempre gafas de seguridad, protectores para oídos o cualquier otro equipo de protección personal que necesite para manejar la máquina.
- 15 Nunca maneje la máquina si trae los cabellos largos, lleva ropa suelta o joyas. Pueden enredarse en las piezas de la máquina o el equipo auxiliar.
- 16 Manténgase de los lados de la máquina antes de ponerla en marcha, especialmente si hay operadores o ayudantes. No maneje la máquina a menos que usted o todos los operadores y/o ayudantes estén protegidos contra lesiones con un protector o dispositivo de seguridad.
- 17 Manténgase siempre alerta (no suelte) después de ajustar la máquina y nunca lo haga bajo la influencia de alcohol, drogas, medicinas o cualquier otro medicamento.
- 18 Al personal de mantenimiento y preparación de herramientas: Nunca trabaje en la máquina a menos que esté etiquetado y etiquetado, o el sistema esté desactivado. Sin bloqueo de seguridad colocado entre los troqueles o matrices a los sistemas de energía (eléctrica, neumática, hidráulica, etc.) se encuentran en uso.
- 19 Este siempre preparado para una situación de emergencia. Debe saber cómo parar y apagar la máquina si fuera necesario.
- 20 Nunca maneje la máquina a menos que todos los componentes de transmisión (rodillos, volantes, engranajes, etc.) y el equipo auxiliar estén libres de peligros.

\*Punto de funcionamiento: "Lugar de la máquina/herramienta donde se coloca el material y se realiza un proceso." (ANSI B11.19)

**AVISO AL EMPLEADOR:** Deberá entregarse copia de estas "Medidas de seguridad para el operador" a todos los operadores (incluyendo al personal de preparación, mantenimiento y supervisión) de la máquina. El presente folleto deberá colocarse en la máquina a disposición y visibilidad del operador. Están disponibles folletos de seguridad adicionales a pedido del interesado.

**IMPORTANTE:** Si debido a limitaciones del idioma o escolaridad el usuario no pudiera leer ni comprender el contenido de las Medidas de seguridad para el operador, dicha información deberá ser traducida, leída e interpretada a la persona, verificándose su comprensión. Comuníquese con la fábrica si necesitara folletos de las Medidas de seguridad en inglés o francés.

**REVISE DIARIAMENTE ESTA MEDIDA DE SEGURIDAD.**

KSC000S Back—Spanish

**GENERAL METALFORMING SIGN**

—5” X 6 “ X .055” THICK



Part No. KSC054—English



Part No. KSC054S—Spanish

**FOOT SWITCH SIGN**

—5” X 6 “ X .055” THICK



Part No. KSC055—English



Part No. KSC055S—Spanish

Also available in French—

Part No. KSC055F (not shown)

**SUGGESTED PROCEDURE FOR MOUNTING THIS SIGN**

THE PURPOSE OF THIS SIGN IS TO ADEQUATELY WARN ALL PERSONNEL OF THE DANGER OF BODILY INJURY OR DEATH.

To accomplish this purpose - ALWAYS mount this sign in the following manner:

- (1) Clearly visible to the operator and other personnel
- (2) At or near eye level
- (3) PERMANENTLY fastened with bolts or rivets

**NEVER OPERATE MACHINE WITHOUT THIS DANGER SIGN VISIBLE TO ALL PERSONNEL.**

Reverse Side of Signs (English)

**General Danger Sign**

—10” x 12” x .055” thick



**PRESS BRAKE DANGER SIGN**

—10” X 12” X .055” THICK



**SUGGESTED PROCEDURE FOR MOUNTING THIS SIGN**

THE PURPOSE OF THIS SIGN IS TO ADEQUATELY WARN ALL PERSONNEL OF THE DANGER OF BODILY INJURY OR DEATH.

To accomplish this purpose - ALWAYS mount this sign in the following manner:

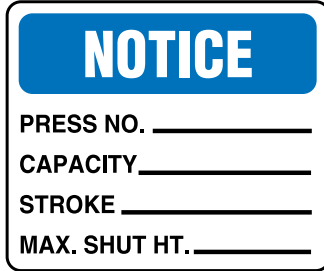
- (1) Clearly visible to the operator and other personnel
- (2) At or near eye level
- (3) PERMANENTLY fastened with bolts or rivets

**NEVER OPERATE MACHINE WITHOUT THIS DANGER SIGN VISIBLE TO ALL PERSONNEL.**

Reverse Side of Above Signs—English

**Notice Sign for Metalforming Machinery**

Part No. KSC033 5" x 6" x .055" thick



**Flywheel Rotation Sign**

Part No. KSC045 1¼" x 5" x .055" thick

Part No. KSC010 2½" x 10" x .055" thick



The labels offered on this page are all furnished with an adhesive back so they will stick to most clean surfaces. All mylar labels are .002" thick. Some labels are offered in various sizes to fit onto a product or into a specific area.

**DANGER—CLOSING RAM AND DIE LABELS**

Part No. KST146 3" x 5" x .002" thick



Part No. KST134 8" x 4¾" x .002" thick

Part No. KST134S 8" x 4¾" x .002" thick—Spanish

Part No. KST145 6¼" x 3½" x .002" thick

Part No. KST145S 6¼" x 3½" x .002" thick—Spanish



Part No. KST135 5" x 5½" x .002" thick

Part No. KST136 2½" x 3" x .002" thick

Part No. KST136S 2½" x 3" x .002" thick—Spanish

Part No. KST137 7¼" x 8" x .002" thick

Part No. KST137S 7¼" x 8" x .002" thick—Spanish

Part No. KST143 5" x 3" x .002" thick

**ROTATING GEARS AND PULLEY LABEL**

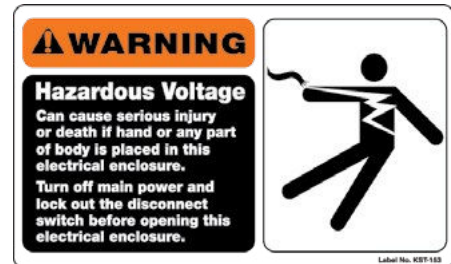
Part No. KST181 3¾" x 2½" x .002" thick



**Hazardous Voltage Label**

Part No. KST152 2½" x 1½" x .002" thick

Part No. KST153 3" x 5" x .002" thick



**Danger—High Voltage Label**

Part No. KST194 2¾" x 5¾" x .003" thick



## SAMPLE PRESS INSPECTION REPORT

Company \_\_\_\_\_

Building \_\_\_\_\_ Department \_\_\_\_\_ Press No. \_\_\_\_\_

Parts Inspected	✓ OK	Defective Condition	Corrective Action	Date Repaired
1. Frame				
2. Motor				
3. Flywheel				
4. Gears (if applicable)				
5. Crankshaft				
6. Clutch				
7. Brake				
8. Ram and Gibs				
9. Connection (Pitman) and Ram Adjusting Screw				
10. Slide Counterbalance (if furnished)				
11. Air System				
12. Electrical System				
13. Foot Switch				
14. Point-of-Operation Safeguarding				
A) Guard				
B) Presence-Sensing (Light Curtain or Radio Frequency)				
C) Pullback (Pullout)				
D) Type A or B Gate (Movable Barrier)				
E) Restraint (Holdout)				
F) Two-Hand Trip or Control				
15. Miscellaneous				
<b>Inspected by:</b>		<b>Date</b>	<input type="checkbox"/> <b>Approved for Use</b>	<input type="checkbox"/> <b>Not Approved</b>

See guide on next page

## GUIDE FOR THE INSPECTION OF MECHANICAL POWER PRESSES

\*Inspect for Code Violations, defects, missing parts, malfunctions, maintenance

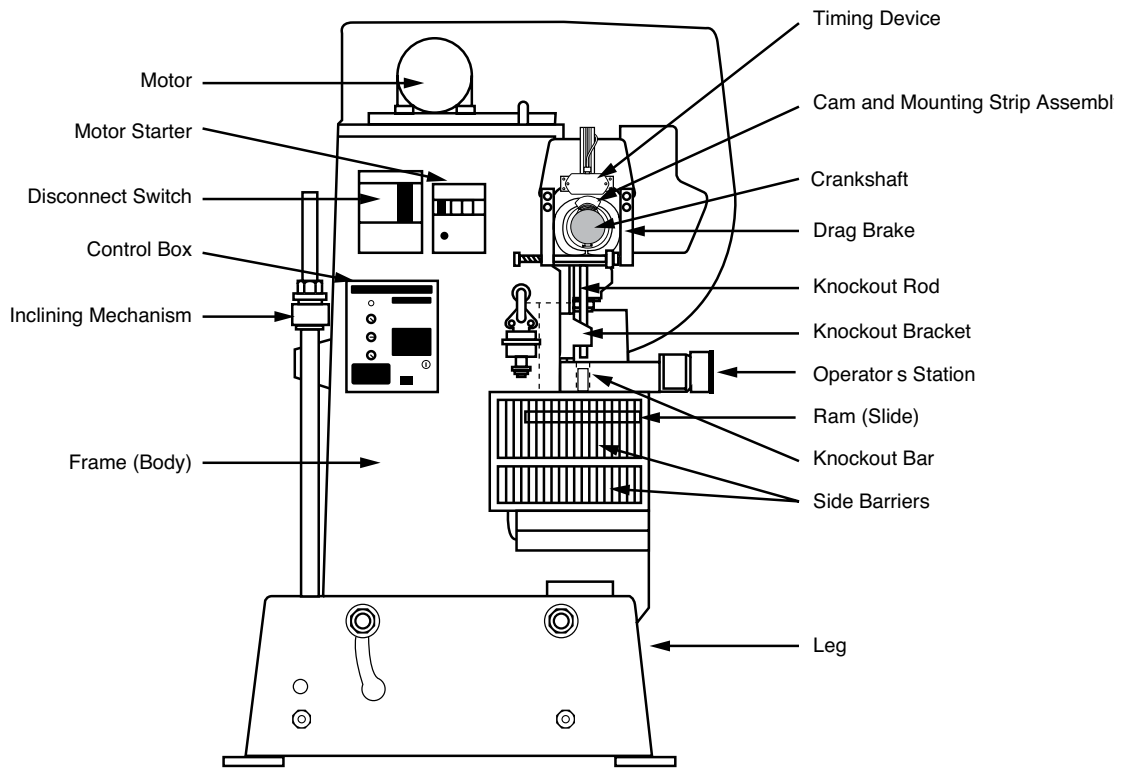
### INSPECTION OF

1. Frame	Cracks? Broken or loose parts? Loose hold down bolts?	12. Electrical system	Solenoids? Motor starter disconnects from voltage fluctuation or power failure? Retripping required? Is any component bypassed?
2. Motor	Clean? Lubrication? Overheating?		Nonslip pad on contact are? Shielded from accidental operation?
3. Flywheel	Rotates in correct direction? Free running? Covered?	13. Foot switch	A) Guard – Barrier that prevents entry of operator's hands or fingers into the point-of-operation area? Adjustment and maintenance? Pinch points remaining in adjacent areas?
4. Gears	Loose? Broken or cracked teeth? Excess noise? Proper lubrication? Covered?	14. Point-of-operation safeguarding	B) Presence-Sensing (light curtain or radio frequency – part-revolution clutch only) – reliable design and proper electrical tie-in to control? Fized at proper safety distance from pinch point? Barrier guards for other hazardous point-of-operation areas?
5. Crankshaft	Cracks? Bent? Proper clearance in bearings?		C) Pullback (Pullout) – enough or too much pull on cables? Is proper adjustment being made for change in operator, die, shift? Records of inspection/maintenance being kept?
6. Clutch	Full-revolution: single-stroke capability, loose or worn parts, including linkage? Weak or broken springs? Compression springs operating on rod, or guided within hole or tube? Properly adjusted?  Part-revolution: air or oil leaks? Proper alignment? Disengagement? Stopping position? Worn clutch lining? Weak or broken springs? Power or air pressure failure or deactivation? Momentary operation of stop control applies brake and releases clutch? Retripping required? Red stop button?  Brake lining worn? Brake properly adjusted? Does it stop slide quickly? Are friction brakes set with compression springs operating on rod, or guided within a hole or tube?		D) Type A or B Gate (B gate for part-revolution clutch only) – point of operation enclosed before press cycle can be initiated? Barrier guards for other hazardous point-of-operation areas?  E) Restraint (Holdout) – adjusted so that operator's fingers cannot reach into dies? Securely anchored? Adjusted for each operator, die, shift?
7. Brake	Face of ram parallel to bolser? Proper gib clearance? Any scoring?		F) Two-hand Trip or Control (two-hand control for part-revolution clutch only) – shielded against unintended operation? Concurrent, antirepeat? Fized in place at proper safety distance from pinch point? Interrupted stroke protection and adequate holding time (for two-hand control only)?
8. Ram and gibs	Proper bearing and ball sear clearances? Screw turns freely?	15. Miscellaneous	Comment on any other items such as: Protection from falling overhead parts. Lighting. Cleanliness. Lubrication. Pressure vessels. Hdraulic-equipment. Auxiliary equipment. General maintenance. Special types of clutches or brakes. Covering of gears, belts, pulleys. Overloading. All auziliary equipment.
9. Connection (pitman) & ram adjusting screw	Spring type: proper adjustment? Broken springs or loose nuts? Pneumatic type: air leakage? Proper air pressure? Loose connection to slide?		
10. Ram counter-balance	Proper air pressure? Valve operation? Pressure gauges? Leaks?		
11. Air system	Can main power switch be locked only in aooof position? Grounding?Condition of wiring? Relays? Rotary limit switches?		

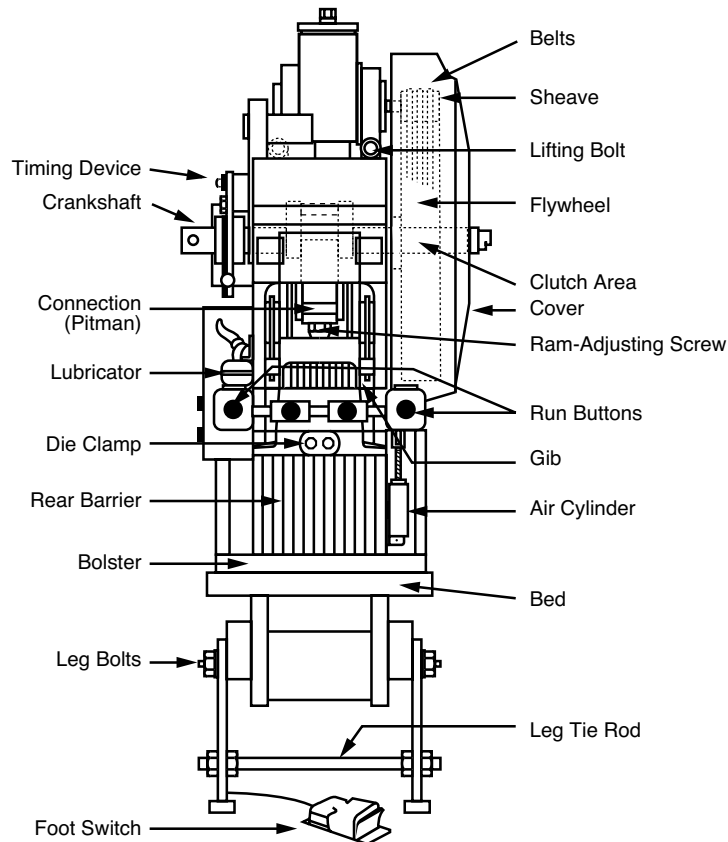
\*Refer to OSHA 29 CFR 1910.212, 1910.217, 1910.219, on pages 106 through 127, ANSI B11.1 & B15.1, and other applicable regulations and standards.

**FULL-REVOLUTION OBI PRESS**

Left-Side View

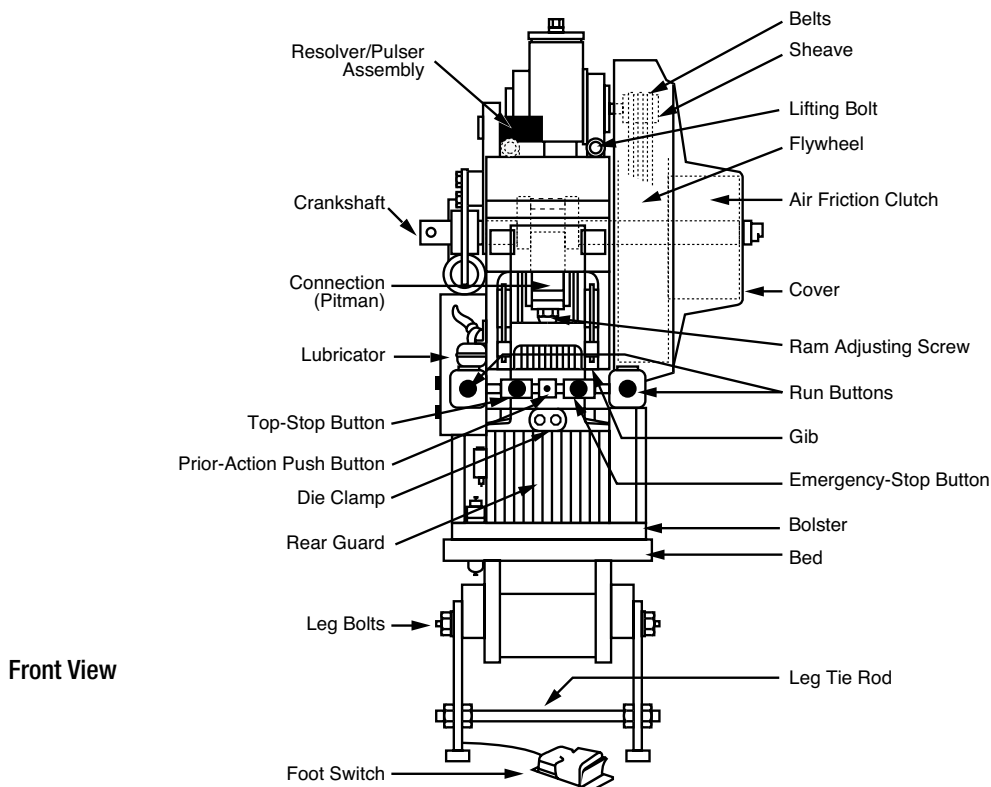
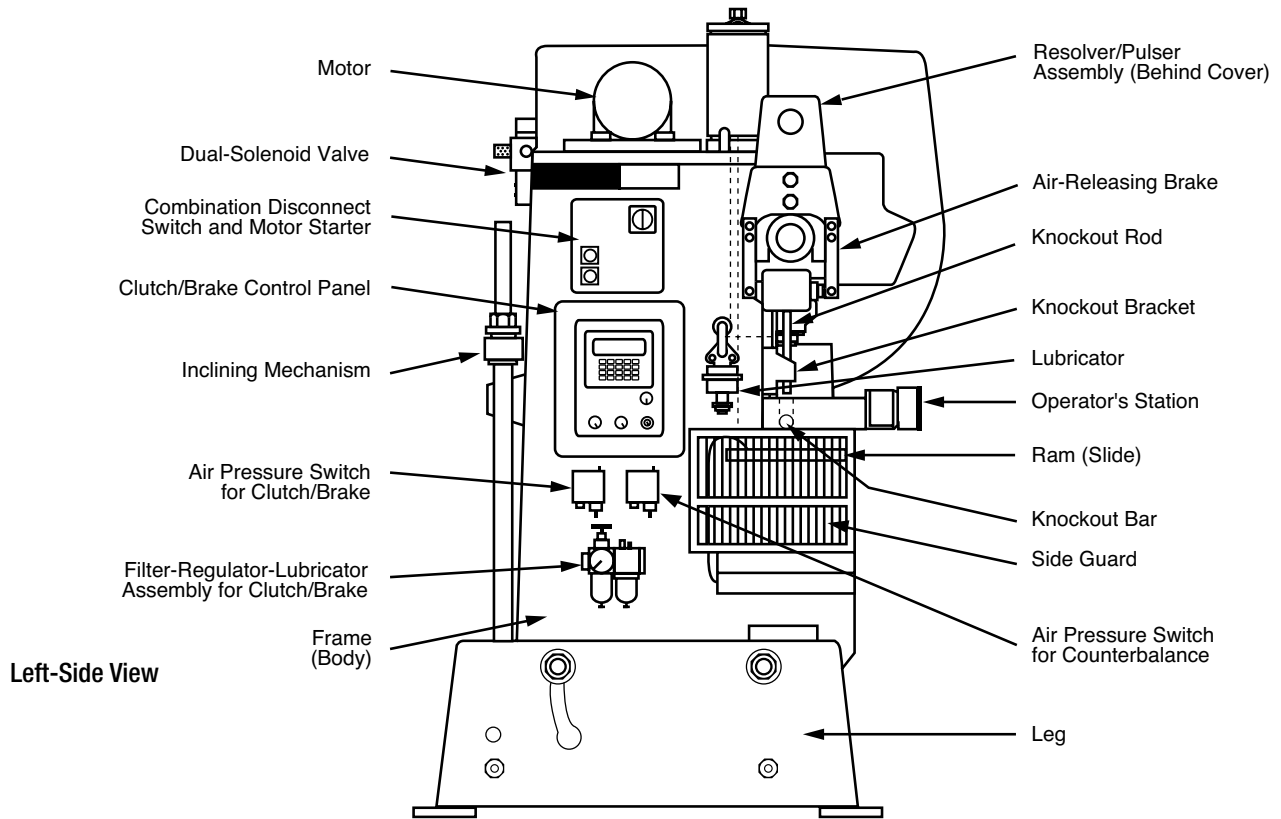


Front View

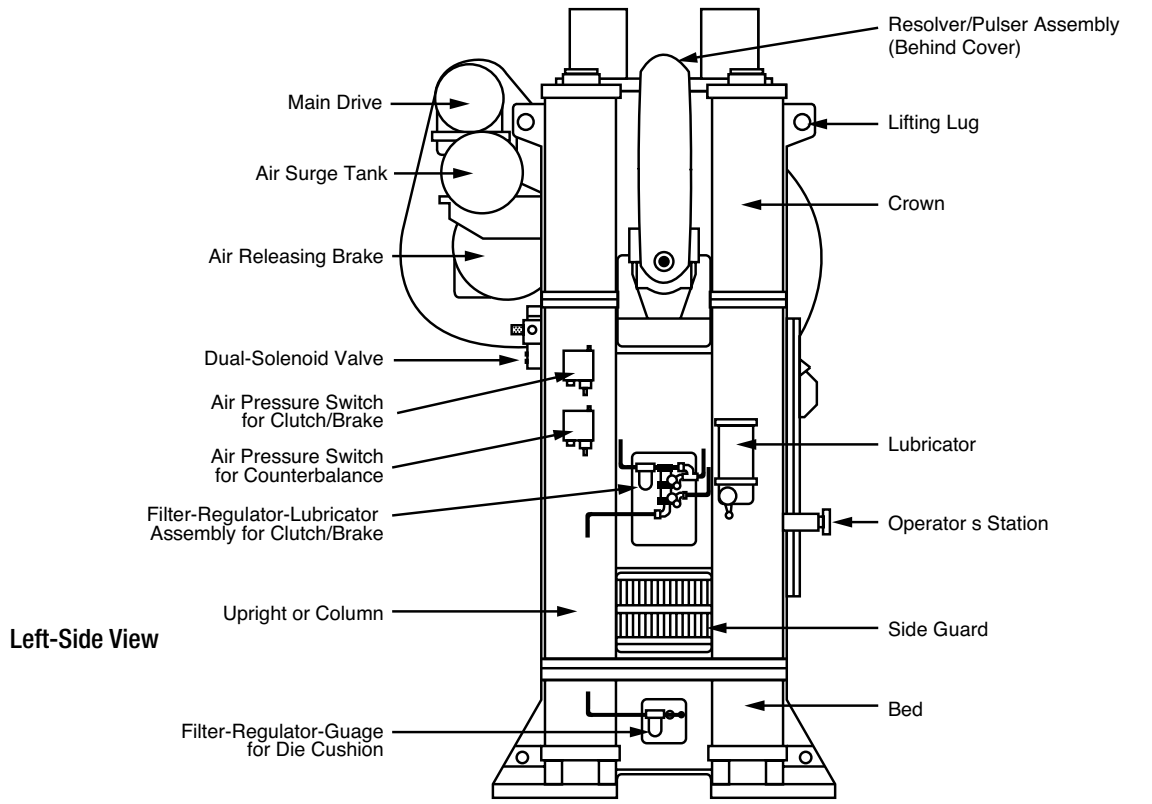




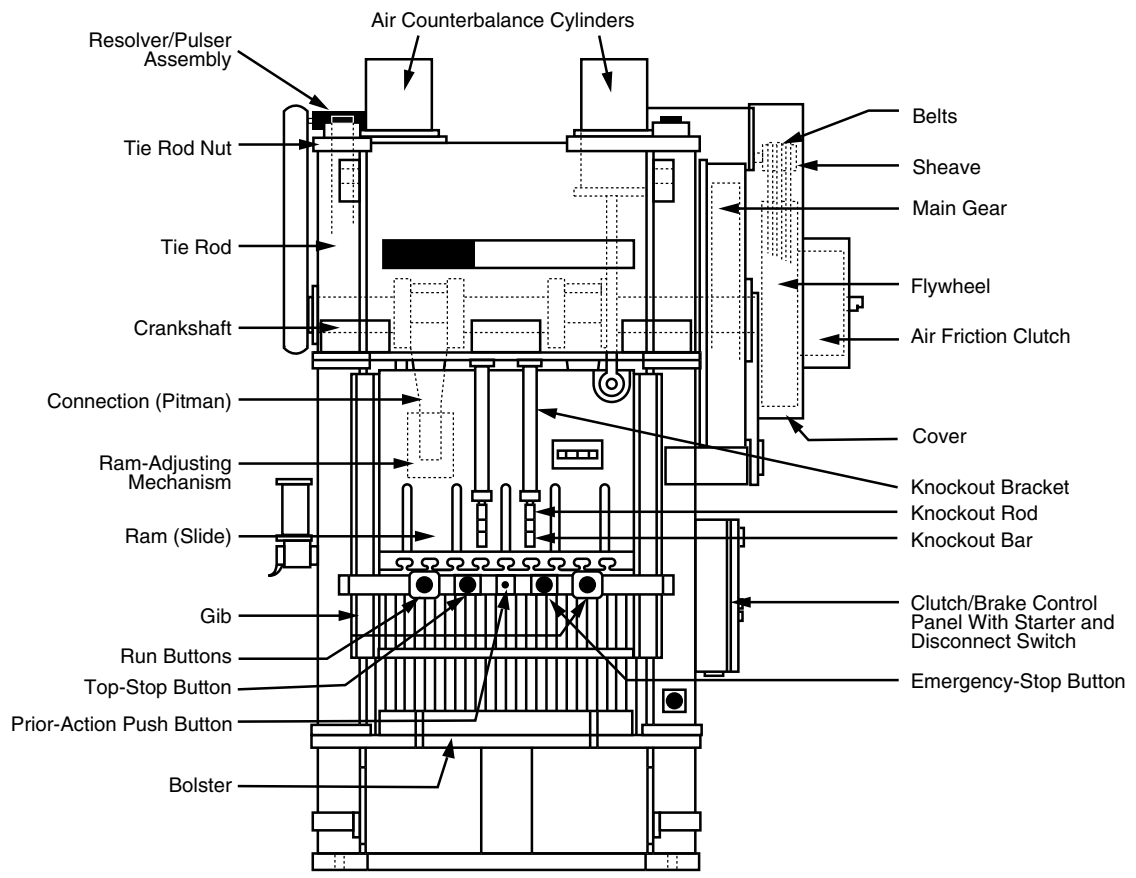
# PART-REVOLUTION OBI PRESS



**PART-REVOLUTION STRAIGHT-SIDE PRESS**



**Left-Side View**



**Front View**

## CONTROL RELIABILITY

Control reliability is a term used in OSHA standard 29 CFR 1910.217 for mechanical power presses and in the ANSI B11 series of standards for safety of machine tools. A new term coming out in the ANSI standards that equates to control reliability is performance of safety-related functions. These terms deal with the part of the system that controls hazardous motion of a machine.

A much older term previously used for control reliability was fail-safe. Fail-safe was often considered the safe state or condition a machine went to when any and all possible component failure combinations occurred, including multiple and simultaneous failures. This is not possible; therefore, the term fail-safe should not be used to describe control reliability of performance of safety-related functions.

Control reliability should be present to ensure that a failure of the control system or device would not result in the loss of the safety-related functions. Control reliability is not just redundancy of components or a system; it must also include monitoring (checking). The components or systems used to provide safety-related functions require proper design and application. These components or systems include electrical, electronic, pneumatic, or hydraulic systems or devices. They frequently consist of monitored multiple, independent, parallel, or series components, subassemblies, or modules. The reliability of the mechanical portions of the machine relied upon for safety must depend on design, maintenance, proper lubrication, and proper use.

The main purpose of control reliability is to make sure the machine will stop when required in the event of a single component failure within the system. In the event of a component failure, machine actuation must be prevented, a stop command must be given, and reactivation of the machine must be prevented until the failure is corrected or the system or device is manually reset.

Two possible ways, among others, for achieving control reliability of the machine control systems or devices are by the use of:

1. Diverse redundancy with monitoring—two or more dissimilar components, subassemblies, or modules are used and the proper operation of each is verified (monitored) by the other(s) to ensure the performance of the safety functions.
2. Homogeneous redundancy with monitoring—two or more identical components, subassemblies, or modules are used and the proper operation of each is verified (monitored) by the other(s) to ensure the performance of the safety functions.

The selection and integration of the components (relays, valves, etc.), subassemblies, and modules that are designed for safety-related functions must be used when building a machine or integrating equipment to an existing machine.

Numerous details about the safety-related functions must be kept in mind to accomplish control reliability of the machine's control system. The main concern is that the machine's hazardous motion stops when a stop command is given.

Rockford Systems offers control reliable systems in this catalog for mechanically, hydraulically, and pneumatically operated machines.

## RISK ASSESSMENT

Every day in industrial plants, machine operators, and setup and maintenance personnel are exposed to potential hazardous situations when running production, changing tools, and repairing machines. They sometimes assume a certain amount of risk around machines, knowingly or unknowingly.

We all take risks in our everyday lives during our normal, daily routines. Obviously, most of us are willing to take these risks to live a normal life. In our litigious society, some people believe the manufacturer of machinery, equipment, and products should be liable for any accidents and personal injuries that occur on machines with the machine's operator(s) assuming no risk. In a perfectly planned and executed environment, this should hold true. However, we know machine safeguards and controls are sometimes bypassed, circumvented, misadjusted, or removed, thus creating additional risks. Machine operators can also make mistakes which can increase risks and cause injury.

For years, several European countries have been conducting risk assessments on industrial machines using the EN-1050 European Normative Standard. Most of these European countries place the safeguarding responsibility on the OEM (original equipment manufacturer). In the United States however, the responsibility for safety is placed upon the user or employer by OSHA. ANSI is trying to distribute this responsibility. They have finalized the B11.TR3:2000 Technical Report entitled Risk Assessment and Risk Reduction—a guideline to estimate, evaluate and reduce risks associated with machine tools. All other ANSI B11 series machine tool safety standards, as revised, will likely refer to this technical report.

To comply with the intent of the ANSI B11.TR3 Technical Report, the OEM, modifier (machine rebuilders, safeguard manufacturer), and the user will be required to work together more closely to determine how to properly protect or safeguard machine operators, and setup and maintenance personnel. They will need to conduct a risk/task hazard analysis and risk assessment of each machine to determine the type of safeguard to apply. A risk assessment will take into consideration several factors including the severity of harm (catastrophic, serious, moderate, or minor), and the probability of occurrence (very likely, likely, unlikely, or remote). A risk cannot be totally eliminated, so the ultimate goal is to lessen the risk until it reaches a tolerable risk level.

## RISK ASSESSMENT (CONTINUED)

As an example, a risk assessment may determine the need for a safeguard across the full length of a press brake's die area to safeguard the point of operation. A light curtain may be chosen as the safeguarding device. If the risk level is significant, the light curtain would need to be mounted properly so an operator could not reach over, under, around, or through it to get into the point of operation. Additional guards or barriers may be required on the sides of the press brake. A simple electrically interlocked cable with a warning sign could be applied to the rear of the press brake. In this example, three point-of-operation risk decisions—front, sides and rear of the press brake—have been made. Different risk decisions would have to be made for additional operators.

In industry, tolerable risk level decisions must be made in order to produce a product. Risk assessments and decisions for the methods of safeguarding used on machines are made every day, and continue to be part of every machine requirement for all production, and setup and maintenance tasks. The ANSI B11.TR 3 serves to provide a voluntary methodology for the risk assessment activity and has been described as “the greatest stride forward in the field of safety in the past 20 years.”

## MACHINE SAFEGUARDING CHOICES

- I. Point-of-operation safeguarding/metal fabricating machines
  - A. Guards
    1. Die enclosure
    2. Fixed
    3. Interlocked
    4. Adjustable
  - B. Devices
    1. Presence-sensing (light curtains or radio frequency)
    2. Two-hand control
    3. Two-hand trip
    4. Pullback
    5. Restraint
    6. Gates
    7. Drop probes
  - C. Other methods
    1. Distance—safe holding (last resort)
    2. Location
    3. Hostage (see ANSI B11.19)
    4. Safe opening (adjustable stroke, sequential operation, adjustable restrictor)
    5. Part-in-place
  - D. Auxiliary safety equipment
    1. Guards or barriers
    2. Mats
    3. Presence-sensing
      - a. Multiple beam with larger MOS
      - c. Radio frequency
    4. Emergency stop (red)
      - a. Push button (multiple)
      - b. Cable
      - c. Trip bar
      - d. Kick plate
    5. Awareness devices
      - a. Barrier
      - b. Visual
      - c. Audible
    6. Hand-feeding tools
- II. Point-of-operation safeguarding of metal turning machines
  - A. Shields (barrier)—protects employees from rotating machine components, chips & coolant
    1. Metal
    2. Plastic
  - B. Guards
  - C. Devices
    1. Presence-sensing
    2. Two-hand control
    3. Gates
  - III. Perimeter safeguarding (for work stations, see point of operation)
    - A. Guards and barriers (latch-out/reset)
    - B. Presence-sensing (latch-out/reset)
      1. Light curtains
    - C. Mats (latch-out/reset)
    - D. Distance—safe holding (last resort)
    - E. Location
  - IV. Supplemental
    - A. Personal protective equipment
    - B. Color-coding
    - C. Warning signs
    - D. Deadman—hold-to-run
    - E. Training (documented)
    - F. Supervision
    - G. Proper lighting
    - H. Inspecting
    - I. Lockout/tagout (disconnects and valves)
    - J. Safety blocks
    - K. Spring-loaded turnover bars
    - L. Covers for mechanical power-transmission apparatuses
  - V. Control of hazardous motion/control reliability
    - A. Electrical or electronic
    - B. Pneumatic
    - C. Hydraulic
  - VI. Motor stop
  - VII. Motor brake (electronic)
  - VIII. Mechanical condition—inspection procedures
    - A. Weekly with tests
    - B. Periodic/regular
  - IX. Safeguarding during machine setup
    - A. Procedure
    - B. Two-hand
    - C. Lockout/tagout
  - X. Safeguarding during minor repair of die or tooling
    - A. Procedure
    - B. Die-safety block interlocked
  - XI. Safeguarding during maintenance of machine
    - A. Procedure
    - B. Lockout/tagout

## SAFETY REQUIREMENTS FOR POWER PRESSES TAKEN FROM OSHA

Any component of the safety system mounted on this press is available from one source:

**ROCKFORD SYSTEMS, LLC**

OSHA's Code of Federal Regulations can be purchased by contacting:

U.S. Government Printing Office  
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OSHA 29 CFR 1910.211, 1910.212, 1910.217, 1910.219, and 1910.147 are included in this catalog for use as a reference when determining safety requirements for bringing machines into compliance with the federal standards.

This information is a comprehensive guide to understanding Federal OSHA (Occupational Safety and Health Administration) and applying its requirements to mechanical power presses and other machines. It is copied verbatim from the Federal Register and contains all pertinent sections of the OSHA standards concerning power presses with which an employer (user) must comply. 29 CFR 1910.212 and 1910.219 can be applied to presses, press brakes and other machines discussed in this catalog as well as lathes, milling machines, etc. Safety standards for these types of machines are available from ANSI (American National Standards Institute). For a copy of the appropriate B11-series standard, see page 3 for the contact information. Be sure to review these standards before updating or installing any equipment on a machine.

If you are unfamiliar with how to properly safeguard the point of operation or how to calculate the safety distance for two-hand control, etc., we offer a series of monthly machine safeguarding seminars to educate the employer/user on the safety requirements. Please see pages 4 through 8 for further details.

Following this section is OSHA standard 29 CFR 1910.147 which contains requirements for the control of hazardous energy (lockout/tagout). This standard covers the servicing and maintenance of machines and equipment where the unexpected energizing or start-up of the machines or equipment, or release of stored energy could cause injury to employees. See page 33 for information on air lockout valves and refer to our Die Safety Blocks catalog for information on die safety blocks.

## OSHA 29 CFR 1910.211—DEFINITIONS

**AS USED IN 29 CFR 1910.217 AND 1910.219 UNLESS THE CONTENT CLEARLY REQUIRES OTHERWISE, THE FOLLOWING POWER PRESS AND MECHANICAL POWER-TRANSMISSION GUARDING TERMS SHALL HAVE THE FOLLOWING MEANING:**

Adjustable barrier guard means a barrier requiring adjustment for each job or die setup.

Antirepeat means the part of the clutch/brake control system designed to limit the press to a single stroke if the tripping means is held operated. Antirepeat requires release of all tripping mechanisms before another stroke can be initiated. Antirepeat is also called single stroke reset or reset circuit.

Authorized person means one to whom the authority and responsibility to perform a specific assignment has been given by the employer.

Automatic feeding means feeding wherein the material or part being processed is placed within or removed from the point of operation by a method or means not requiring action by an operator on each stroke of the press.

Belts include all power transmission belts, such as flat belts, round belts, V-belts, etc., unless otherwise specified.

Belt shifter means a device for mechanically shifting belts from tight to loose pulleys or vice versa, or for shifting belts on cones of speed pulleys.

Belt pole (sometimes called a belt shipper or shipper pole) means a device used in shifting belts on and off fixed pulleys on line or countershaft where there are no loose pulleys.

Bolster plate means the plate attached to the top of the bed of the press having drilled holes or T-slots for attaching the lower die or die shoe.

Brake means the mechanism used on a mechanical power press to stop and/or hold the crankshaft, either directly or through a gear train, when the clutch is disengaged.

Brake Monitor means a sensor designed, constructed, and arranged to monitor the effectiveness of the press braking system.

Clutch means the coupling mechanism used on a mechanical power press to couple the flywheel to the crankshaft, either directly or through a gear train.

Concurrent means acting in conjunction, and is used to describe a situation wherein two or more controls exist in an operated condition at the same time.

Continuous means uninterrupted multiple strokes of the slide without intervening stops (or other clutch control action) at the end of individual strokes.

Control System means sensors, manual input and mode selection elements, interlocking and decision-making circuitry, and output elements to press operating mechanism.

Counterbalance means the mechanism that is used to balance or support the weight of the connecting rods, slide, and slide attachments.

Device means a press control or attachment that:

- (i) Restrains the operator from inadvertently reaching into the point of operation; or
- (ii) Prevents normal press operation if the operator's hands are inadvertently within the point of operation; or
- (iii) Automatically withdraws the operator's hands, if the operator's hands are inadvertently within the point of operation as the dies close.

Die means the tooling used in a press for cutting or forming material. An upper and a lower die make a complete set.

Die builder means any person who builds dies for power presses.

Die enclosure guard means an enclosure attached to the die shoe or stripper, or both, in a fixed position.

Die set means a tool holder held in alignment by guide posts and bushings and consisting of a lower shoe, an upper shoe or punch holder, and guide posts and bushings.

Die setter means an individual who places or removes dies in or from mechanical power presses, and who, as a part of his duties, makes the necessary adjustments to cause the tooling to function properly and safely.

Die setting means the process of placing or removing dies in or from a mechanical power press, and the process of adjusting the dies, other tooling and safeguarding means to cause them to function properly and safely.

Die shoe means a plate or block upon which a die holder is mounted. A die shoe functions primarily as a base for the complete die assembly, and, when used, is bolted or clamped to the bolster plate or the face of slide.

Direct drive means the type driving arrangement wherein no clutch is used; coupling and decoupling of the driving torque is accomplished by energizing and deenergization of a motor. Even though not employing a clutch, direct drives match the operational characteristics of "part revolution clutches" because the driving power may be disengaged during the stroke of the press.

Exposed to contact means that the location of an object is such that a person is likely to come into contact with it and be injured.

Ejector means a mechanism for removing work or material from between the dies.

Face of slide means the bottom surface of the slide to which the punch or upper die is generally attached.

Feeding means the process of placing or removing material within or from the point of operation.

Fixed barrier guard means a die space barrier attached to the press frame.

Flywheels include flywheels, balance wheels, and flywheel pulleys mounted and revolving on crankshaft of engine or other shafting.

Foot control means the foot operated control mechanism designed to be used with a clutch or clutch/brake control system.

Foot pedal means the foot operated lever designed to operate the mechanical linkage that trips a full revolution clutch.

Full-revolution clutch means a type of clutch that, when tripped, cannot be disengaged until the crankshaft has completed a full revolution and the press slide a full stroke.

Gate or movable barrier device means a movable barrier arranged to enclose the point of operation before the press stroke can be started.

Guard means a barrier that prevents entry of the operator's hands or fingers into the point of operation.

Guide post means the pin attached to the upper or lower die shoe, operating within the bushing on the opposing die shoe, to maintain the alignment of the upper and lower dies.

Hand feeding tool means any hand-held tool designed for placing or removing material or parts to be processed within or from the point of operation.

Holdout or restraint device means a mechanism, including attachments for operator's hands, that when anchored and adjusted prevent the operator's hands from entering the point of operation.

Inch means an intermittent motion imparted to the slide (on machines using part revolution clutches) by momentary operation of the “Inch” operating means. Operation of the “Inch” operating means engages the driving clutch so that a small portion of one stroke or indefinite stroking can occur, depending upon the length of time the “Inch” operating means is held operated. “Inch” is a function used by the die setter for setup of dies and tooling, but is not intended for use during production operations by the operator.

Interlocked press barrier guard means a barrier attached to the press frame and interlocked so that the press stroke cannot be started normally unless the guard itself, or its hinged or movable sections, enclose the point of operation.

Jog means an intermittent motion imparted to the slide by momentary operation of the drive motor, after the clutch is engaged with the flywheel at rest.

Knockout means a mechanism for releasing material from either die.

Liftout means the mechanism also known as knockout.

Maintenance runway means any permanent runway or platform used for oiling, maintenance, running adjustment, or repair work, but not for passageway.

Manual feeding means feeding wherein the material or part being processed is handled by the operator on each stroke of the press.

Nip-point belt and pulley guard means a device which encloses the pulley and is provided with rounded or rolled edge slots through which the belt passes.

Operator’s station means the complete complement of controls used by or available to an operator on a given operation for stroking the press.

Part-revolution clutch means a type of clutch that can be disengaged at any point before the crankshaft has completed a full revolution and the press slide a full stroke.

Pinch point means any point other than the point of operation at which it is possible for a part of the body to be caught between the moving parts of a press or auxiliary equipment, or between moving and stationary parts of a press or auxiliary equipment or between the material and moving part or parts of the press or auxiliary equipment.

Point of operation means the area of the press where material is actually positioned and work is being performed during any process such as shearing, punching, forming, or assembling.

Presence-sensing device means a device designed, constructed and arranged to create a sensing field or area and to deactivate the clutch control of the press when an operator’s hand or any other part of his body is within such field or area.

Press means a mechanically powered machine that shears, punches, forms or assembles metal or other material by means of cutting, shaping, or combination dies attached to slides. A press consists of a stationary bed or anvil, and a slide (or slides) having a controlled reciprocating motion toward and away from the bed surface, the slide being guided in a definite path by the frame of the press.

Prime movers include steam, gas, oil, and air engines, motors, steam and hydraulic turbines, and other equipment used as a source of power.

Pullout device means a mechanism attached to the operator’s hands and connected to the upper die or slide of the press, that is designed, when properly adjusted, to withdraw the operator’s hands as the dies close, if the operator’s hands are inadvertently within the point of operation.

Repeat means an unintended or unexpected successive stroke of the press resulting from a malfunction.

Safety block means a prop that, when inserted between the upper and lower dies or between the bolster plate and the face of the slide, prevents the slide from falling of its own deadweight.

Safety system means the integrated total system, including the pertinent elements of the press, the controls, the safeguarding and any required supplemental safeguarding, and their interfaces with the operator, and the environment, designed, constructed and arranged to operate together as a unit, such that a single failure or single operating error will not cause injury to personnel due to point of operation hazards.

Semiautomatic feeding means feeding wherein the material or part being processed is placed within or removed from the point of operation by an auxiliary means controlled by the operator on each stroke of the press.

Sheaves mean grooved pulleys, and shall be so classified unless used as flywheels.

Single stroke means one complete stroke of the slide, usually initiated from a full open (or up) position, followed by closing (or down), and then a return to the full open position.

Single-stroke mechanism means an arrangement used on a full-revolution clutch to limit the travel of the slide to one complete stroke at each engagement of the clutch.

Slide means the main reciprocating press member. A slide is also called a ram, plunger, or platen.

Stop control means an operator control designed to immediately deactivate the clutch control and activate the brake to stop slide motion.

Stripper means a mechanism or die part for removing the parts or material from the punch.

Stroking selector means the part of the clutch/brake control that determines the type of stroking when the operating means is actuated. The stroking selector generally includes positions for Off (Clutch Control), Inch, Single Stroke, and Continuous (when Continuous is furnished).

Sweep device means a single or double arm (rod) attached to the upper die or slide of the press and designed to move the operator’s hands to a safe position as the dies close, if the operator’s hands are inadvertently within the point of operation.

Trip or (tripping) means activation of the clutch to “run” the press.

Turnover bar means a bar used in die setting to manually turn the crankshaft of the press.

Two-hand trip means a clutch actuating means requiring the concurrent use of both hands of the operator to trip the press.

Two-hand control device means a two-hand trip that further requires concurrent pressure from both hands of the operator during a substantial part of the die-closing portion of the stroke of the press.

Unitized tooling means a type of die in which the upper and lower members are incorporated into self-contained units arranged as to hold the die members in alignment.

## OSHA 29 CFR 1910.217—MECHANICAL POWER PRESSES

### EDITED FOR POWER PRESSES

As taken from Title 29 of the Code of Federal Regulations (CFR), Sections 1910.147, 1910.212, 1910.217, and 1910.219.

Many people find the OSHA standards confusing and difficult to read as published in the Code of Federal Regulations. As an aid to the metal stampers and fabricators, we have rearranged and labeled certain paragraphs and sections to help categorize the subject material. Each paragraph has been identified so that the reader can refer to the

regulations and read the paragraph in context as the government wrote it. No words of the text have been changed; however, this information should never be used in place of the actual standards. We can assume no liability for acts taken as a result of reference to it. We offer this guide for use in analyzing problems and finding solutions for bringing full- and part-revolution mechanical power presses into compliance with the federal regulations.

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### WHEN MUST THINGS BE DONE?

#### (A)(4) RECONSTRUCTION AND MODIFICATION

It shall be the responsibility of any person reconstructing, or modifying a mechanical power press to do so in accordance with paragraph (b) of this section.

#### (A)(5) EXCLUDED MACHINES

Press brakes, hydraulic and pneumatic power presses, bulldozers, hot bending and hot metal presses, forging presses and hammers, riveting machines and similar types of fastener applicators are excluded from the requirements of this section.

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### CONSTRUCTION OF PRESS AND ITS CONTROLS —FULL REVOLUTION CLUTCHES

#### (B)(3) MACHINES USING FULL REVOLUTION POSITIVE CLUTCHES

- (i) Machines using full revolution clutches shall incorporate a single stroke mechanism.
- (ii) If the single stroke mechanism is dependent upon spring action, the spring(s) shall be of the compression type, operating on a rod or guided within a hole or tube, and designed to prevent interleaving of the spring coils in event of breakage.

### METHODS OF INITIATING PRESS CYCLE

#### (B)(4) FOOT PEDALS (TREADLE)

- (i) The pedal mechanism shall be protected to prevent unintended operation from falling or moving objects or by accidental stepping onto the pedal.
- (ii) A pad with a nonslip contact area shall be firmly attached to the pedal.
- (iii) The pedal return spring(s) shall be of the compression type, operating on a rod or guided within a hole or tube, and designed to prevent interleaving of spring coils in event of breakage.
- (iv) If pedal counterweights are provided, the path of the travel of the weight shall be enclosed.

#### (B)(5) HAND OPERATED LEVERS

- (i) Hand-lever-operated power presses shall be equipped with a spring latch on the operating lever to prevent premature or accidental tripping.
- (ii) The operating levers on hand-tripped presses having more than one operating station shall be interlocked to prevent the tripping of the press except by the “concurrent” use of all levers.

#### (B)(6) TWO-HAND TRIP

See page 108, paragraph (c)(3)(viii).

- (i) A two-hand trip shall have the individual operator's hand controls protected against unintentional operation and have the individual operator's hand controls arranged by design and construction and/or separation to require the use of both hands to trip the press and use a control arrangement requiring concurrent operation of the individual operator's hand controls.
- (ii) Two-hand trip systems on full revolution clutch machines shall incorporate an antirepeat feature.
- (iii) If two-hand trip systems are used on multiple operator presses, each operator shall have a separate set of controls.



## OSHA 29 CFR 1910.217—MECHANICAL POWER PRESSES (CONTINUED)

### PART REVOLUTION CLUTCHES

#### (AIR AND MECHANICAL-FRICTION CLUTCHES)

#### (B)(7) MACHINES USING PART REVOLUTION CLUTCHES

(i) The clutch shall release and the brake shall be applied when the external clutch engaging means is removed, deactivated or deenergized.

##### Stop control

(ii) A red color stop control shall be provided with the clutch/brake control system. Momentary operation of the stop control shall immediately deactivate the clutch and apply the brake. The stop control shall override any other control, and reactivation of the clutch shall require use of the operating (tripping) means which has been selected.

##### Press stroking selector

(iii) A means of selecting Off, Inch, Single Stroke, and Continuous (when the continuous function is furnished) shall be supplied with the clutch/brake control to select type of operation of the press. Fixing of selection shall be by means capable of supervision by the employer.

##### Inch operation

(iv) The "Inch" operating means shall be designed to prevent exposure of the worker's hands within the point of operation by:

(a) Requiring the concurrent use of both hands to actuate the clutch;  
OR

(b) Being a single control protected against accidental actuation and so located that the worker cannot reach into the point of operation while operating the single control.

##### Single stroke - Two-hand control

See page 107, paragraph (c)(3)(vii)

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

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

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

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

(d) The control systems shall be designed to require release of all operators' hand controls before an interrupted stroke can be resumed. This requirement pertains only to those single stroke, two-hand controls manufactured and installed on or after August 31, 1971. (Refer to (c)(5)(ii) on page 108.)

(vi) Reserved

##### Multiple operating stations

(vii) Controls for more than one operating station shall be designed to be activated and deactivated in complete sets of two operators' hand controls per operating station by means capable of being supervised by the employer. The clutch/brake control system shall be designed and constructed to prevent actuation of the clutch if all operating stations are bypassed.

##### Continuous

(viii) Those clutch/brake control systems which contain both single and continuous functions shall be designed so that completion of continuous circuits may be supervised by the employer. The initiation of continuous run shall require a prior action or decision by the operator in addition to the selection of Continuous on the stroking selector, before actuation of the operating means will result in continuous stroking.

##### Hand/foot selection

(ix) If foot control is provided, the selection method between hand and foot control shall be separate from the stroking selector and shall be designed so that the selection may be supervised by the employer.

##### Foot control

(x) Foot operated tripping controls, if used, shall be protected so as to prevent operation from falling or moving objects, or from unintended operation by accidental stepping onto the foot control.

##### Clutch/brake air valve failure

(xi) The control of air-clutch machines shall be designed to prevent a significant increase in the normal stopping time due to a failure within the operating valve mechanism, and to inhibit further operation if such failure does occur. This requirement shall apply only to those clutch/brake air valve controls manufactured and installed on or after August 31, 1971, but shall not apply to machines intended only for continuous, automatic feeding applications.

(Refer to (c)(5)(iii) on page 108.)

##### Press drive motor interlock

(xii) The clutch/brake control shall incorporate an automatic means to prevent initiation or continued activation of the Single Stroke or continuous functions unless the press drive motor is energized and in the forward direction.

##### Engaging method failure

(xiii) The clutch/brake control shall automatically deactivate in event of failure of the power or pressure supply for the clutch engaging means. Reactivation of the clutch shall require restoration of normal supply and the use of the tripping mechanism(s).

##### Air counterbalance supply

(xiv) The clutch/brake control shall automatically deactivate in event of failure of the counterbalance(s) air supply. Reactivation of the clutch shall require restoration of normal air supply and use of the tripping mechanism(s).

##### Turnover bar operation

(xv) Selection of bar operation shall be by means capable of being supervised by the employer. A separate pushbutton shall be employed to activate the clutch, and the clutch shall be activated only if the drive motor is deenergized.

## OSHA 29 CFR 1910.217—MECHANICAL POWER PRESSES (CONTINUED)

### METHODS OF SAFEGUARDING THE POINT OF OPERATION

#### (C)(1) GENERAL REQUIREMENTS

(i) It shall be the responsibility of the employer to provide and insure the usage of “point-of-operation guards” or properly applied and adjusted point-of-operation devices on every operation performed on a mechanical power press. See Table O-10.

(ii) The requirement of paragraph (c)(1)(i) of this section shall not apply when the point-of-operation opening is one-fourth inch or less. See Table O-10.

#### (C)(2) POINT OF OPERATION GUARDS

(i) Every point of operation guard shall meet the following design, construction, application, and adjustment requirements:

- (a) It shall prevent entry of hands or fingers into the point of operation by reaching through, over, under or around the guard;
- (b) It shall conform to the maximum permissible openings of Table O-10;
- (c) It shall, in itself, create no pinch point between the guard and moving machine parts;
- (d) It shall utilize fasteners not readily removable by operator, so as to minimize the possibility of misuse or removal of essential parts;
- (e) It shall facilitate its inspection, and
- (f) It shall offer maximum visibility of the point of operation consistent with the other requirements.

(ii) A die enclosure guard shall be attached to the die shoe or stripper in a fixed position.

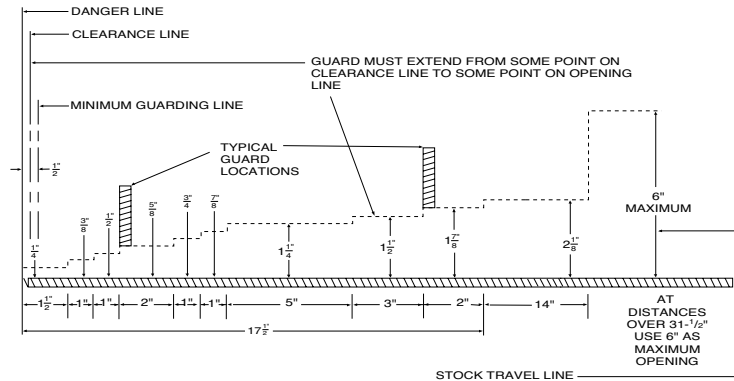
(iii) A fixed barrier guard shall be attached securely to the frame of the press or to the bolster plate.

(iv) An interlocked press barrier guard shall be attached to the press frame or bolster and shall be interlocked with the press clutch control so that the clutch cannot be activated unless the guard itself, or the hinged or movable sections of the guard are in position to conform to the requirements of Table O-10.

(v) The hinged or movable sections of an interlocked press barrier guard shall not be used for manual feeding. The guard shall prevent opening of the interlocked section and reaching into the point of operation prior to die closure or prior to the cessation of slide motion. See paragraph (c)(3)(ii) of this section regarding manual feeding through interlocked press barrier devices.

(vi) The adjustable barrier guard shall be securely attached to the press bed, bolster plate, or die shoe, and shall be adjusted and operated in conformity with Table O-10 and the requirements of this subparagraph. Adjustments shall be made only by authorized personnel whose qualifications include a knowledge of the provisions of Table O-10 and this subparagraph.

(vii) A point of operation enclosure which does not meet the requirements of this subparagraph and Table O-10 shall be used only in conjunction with point-of-operation devices.



Explanation of above diagram:

This diagram shows the accepted safe openings between the bottom edge of a guard and feed table at various distances from the danger line (point of operation).

The clearance line marks the distance required to prevent contact between guard and moving parts.

The minimum guarding line is the distance between the infeed side of the guard and the danger line which is one-half inch from the clearance line.

The various openings are such that for average size hands an operator’s fingers won’t reach the point of operation.

After installation of point-of-operation guards and before a machine is released for operation, a check should be made to verify that the guard will prevent the operator’s hands from reaching the point of operation.

**TABLE O-10**

Distance of opening from point-of-operation hazard (inches)	Maximum width of opening (inches)
1/2 to 1 1/2	1/4
1 1/2 to 2 1/2	3/8
2 1/2 to 3 1/2	1/2
3 1/2 to 5 1/2	5/8
5 1/2 to 6 1/2	3/4
6 1/2 to 7 1/2	7/8
7 1/2 to 12 1/2	1 1/4
12 1/2 to 15 1/2	1 1/2
15 1/2 to 17 1/2	1 3/8
17 1/2 to 31 1/2	2 1/8

This table shows the distances that guards shall be positioned from the danger line in accordance with the required openings.

## OSHA 29 CFR 1910.217—MECHANICAL POWER PRESSES (CONTINUED)

### (C)(3) POINT OF OPERATION DEVICES

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

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

(b) Preventing the operator from inadvertently reaching into the point of operation; or withdrawing his hands if they are inadvertently located in the point of operation as the dies close; or

(c) Preventing the operator from inadvertently reaching into the point of operation at all times; or

(d) [Reserved] (formerly sweep device)

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

(f) Enclosing the point of operation before a press stroke can be initiated, and maintaining this closed condition until the motion of the slide has ceased; or

(g) Enclosing the point of operation before a press stroke can be initiated, so as to prevent an operator from reaching into the point of operation prior to die closure or prior to cessation of slide motion during the downward stroke.

Gate or movable barrier device

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

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

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

Presence sensing

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

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

(b) The devices may not be used as a tripping means to initiate slide motion, except when used in total conformance with paragraph (h) of this section. (Paragraph (h) omitted.)

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

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

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

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

$D_s = \text{minimum safety distance (inches)}$ ;

$63 \text{ inches/second} = \text{hand speed constant}$ ; and

$T_s = \text{stopping time of the press measured at approximately } 90^\circ \text{ position}$

of the crankshaft rotation (seconds).

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

Pull-out (pullback)

(iv) The pull-out device shall protect the operator as specified in paragraph (c)(3)(i)(b) of this section and shall include attachments for each of the operator's hands.

(a) Attachments shall be connected to and operated only by the press slide or upper die.

(b) Attachments shall be adjusted to prevent the operator from reaching into the point of operation or to withdraw the operator's hands from the point of operation before the dies close.

(c) A separate pull-out device shall be provided for each operator if more than one operator is used on the press.

(d) Each pull-out device in use shall be visually inspected and checked for proper adjustment at the start of each operator shift, following a new die setup, and when operators are changed. Necessary maintenance or repair or both shall be performed and completed before the press is operated. Records of inspections and maintenance shall be kept in accordance with paragraph (e) of this section.

Sweep

(v) The sweep device may not be used for point-of-operation safeguarding after December 31, 1976.

Holdout or restraint

(vi) A holdout or a restraint device shall protect the operator as specified in paragraph (c)(3)(i)(c) of this section and shall include attachments for each of the operator's hands. Such attachments shall be securely anchored and adjusted in such a way that the operator is restrained from reaching into the point of operation. A separate set of restraints shall be provided for each operator if more than one operator is required on a press.

Two-hand control (part revolution only)

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

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

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

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

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

$D_s = \text{minimum safety distance (inches)}$ ;

$63 \text{ inches/second} = \text{hand speed constant}$ ; and

$T_s = \text{stopping time of the press measured at approximately } 90^\circ \text{ position of the crankshaft rotation (seconds)}$ .

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

## OSHA 29 CFR 1910.217—MECHANICAL POWER PRESSES (CONTINUED)

### Two-hand trip

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

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

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

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

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

$D_m$  = minimum safety distance (inches);

63 inches/second = hand speed constant; and

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

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

### (C)(4) HAND FEEDING TOOLS

Hand feeding tools are intended for placing and removing materials in and from the press. Hand feeding tools are not a point of operation guard or protection device and shall not be used in lieu of the "guards" or devices required in this section.

### \*(C)(5) ADDED REQUIREMENTS

Additional requirements for safeguarding. Where the operator feeds or removes parts by placing one or both hands in the point of operation, and a two-hand control, presence sensing device or Type B gate or movable barrier (on a part revolution clutch) is used for safeguarding:

(i) The employer shall use a control system and a brake monitor which comply with paragraphs (b)(13) and (14) of this section. This requirement shall be complied with by November 1, 1975;

(ii) The exception in paragraph (b)(7)(v)(d) of this section for two-hand controls manufactured and installed before August 31, 1971 is not applicable under this paragraph (c)(5);

(iii) The control of air clutch machines shall be designed to prevent a significant increase in the normal stopping time due to a failure within the operating valve mechanism, and to inhibit further operation if such failure does occur, where a part revolution clutch is employed. The exception in paragraph (b)(7)(xi) of this section for controls manufactured and installed before August 31, 1971, is not applicable under this paragraph (c)(5).

### (B)(13) CONTROL RELIABILITY\*

When required by paragraph (c)(5) of this section, the control system shall be constructed so that a failure within the system does not prevent the normal stopping action from being applied to the press when required, but does prevent initiation of a successive stroke until the failure is corrected. The failure shall be detectable by a simple test, or indicated by the control system. This requirement does not apply to those elements of the control system which have no effect on the protection against point of operation injuries.

### (B)(14) BRAKE MONITORING\*

When required by paragraph (c)(5) of this section, the brake monitor shall meet the following requirements:

(i) Be so constructed as to automatically prevent the activation of a successive stroke if the stopping time or braking distance deteriorates to a point where the safety distance being utilized does not meet the requirements set forth in paragraph (c)(3)(iii)(e) or (c)(3)(vii)(c) of this section. The brake monitor used with the Type B gate or movable barrier device shall be installed in a manner to detect slide top-stop overrun beyond the normal limit reasonably established by the employer;

(ii) Be installed on a press so that it indicates when the performance of the braking system has deteriorated to the extent described in paragraph (b)(14)(i) of this section; and

(iii) Be constructed and installed in a manner to monitor brake system performance on each stroke.

\*Applies to part revolution only.

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

## OSHA 29 CFR 1910.217—MECHANICAL POWER PRESSES (CONTINUED)

### CONSTRUCTION OF PRESS AND ITS CONTROLS —FOR ALL PRESSES

#### (B)(1) HAZARDS TO PERSONNEL ASSOCIATED WITH BROKEN OR FALLING MACHINE COMPONENTS

Machine components shall be designed, secured or covered to minimize hazards caused by breakage or loosening and falling or release of mechanical energy (i.e., broken springs).

#### (B)(2) BRAKES

Friction brakes provided for stopping or holding a slide movement shall be inherently self-engaging by requiring power or force from an external source to cause disengagement. Brake capacity shall be sufficient to stop the motion of the slide quickly and capable of holding the slide and its attachments at any point in its travel.

#### (B)(8) ELECTRICAL DISCONNECT

(i) A main power disconnect switch capable of being locked only in the Off position shall be provided with every power press control system.

##### Starter

(ii) The motor start button shall be protected against accidental operation.

(iii) All mechanical power press controls shall incorporate a type of drive motor starter that will disconnect the drive motor from the power source in event of control voltage or power source failure, and require operation of the motor start button to restart the motor when voltage conditions are restored to normal.

##### Transformer

(iv) All a.c. control circuits and solenoid valve coils shall be powered by not more than a nominal 120-volt a.c. supply obtained from a transformer with an isolated secondary. Higher voltages that may be necessary for operation of machine or control mechanisms shall be isolated from any control mechanism handled by the operator, but motor starters with integral Start-Stop buttons may utilize line voltage control. All d.c. control circuits shall be powered by not more than a nominal 240-volt d.c. supply isolated from any higher voltage.

##### Ground

(v) All clutch/brake control electrical circuits shall be protected against the possibility of an accidental ground in the control circuit causing false operation of the press.

##### Control circuit

(vi) All clutch/brake control circuits shall incorporate features to minimize the possibility of an unintended stroke in the event of the failure of a control component to function properly, including relays, limit switches, and static output circuits.

#### (B)(9) SLIDE COUNTERBALANCE SYSTEMS

(i) Spring counterbalance systems, when used, shall incorporate means to retain system parts in event of breakage.

(ii) Spring counterbalances, when used, shall have the capability to hold the slide and its attachments at midstroke, without brake applied.

(iii) Air counterbalance cylinders shall incorporate means to retain the piston and rod in case of breakage or loosening.

(iv) Air counterbalance cylinders shall have adequate capability to hold the slide and its attachments at any point in stroke, without brake applied.

(v) Air counterbalance cylinders shall incorporate means to prevent failure of capability (sudden loss of pressure) in event of air supply failure.

#### (B)(10) AIR CONTROLLING EQUIPMENT

Air controlling equipment shall be protected against foreign material and water entering the pneumatic system of the press. A means of air lubrication shall be provided when needed.

#### (B)(11) HYDRAULIC EQUIPMENT

The maximum anticipated working pressures in any hydraulic system on a mechanical power press shall not exceed the safe working pressure rating of any component used in the system.

#### (B)(12) PRESSURE VESSELS

All pressure vessels used in conjunction with power presses shall conform to the American Society of Mechanical Engineers Code for Pressure Vessels, 1968 Edition. (Also see 1910.169 Air Receivers.)

### DESIGN, CONSTRUCTION, SETTING AND FEEDING OF DIES

#### (D)(1) GENERAL REQUIREMENTS

The employer shall: (i) use dies and operating methods designed to control or eliminate hazards to operating personnel, and (ii) furnish and enforce the use of hand tools for freeing and removing stuck work or scrap pieces from the die, so that no employee need reach into the point of operation for such purposes.

#### (D)(2) RESERVED

#### (D)(3) SCRAP HANDLING

The employer shall provide means for handling scrap from roll feed or random length stock operations. Scrap cutters used in conjunction with scrap handling systems shall be safeguarded in accordance with paragraph (c) of this section and with 1910.219.

## OSHA 29 CFR 1910.217—MECHANICAL POWER PRESSES (CONTINUED)

### (D)(4) GUIDE POST HAZARD

The hazard created by a guide post (when it is located in the immediate vicinity of the operator) when separated from its bushing by more than one-fourth inch shall be considered as a point of operation hazard and be protected in accordance with paragraph (c) of this section.

### (D)(5) UNITIZED TOOLING

If unitized tooling is used, the opening between the top of the punch holder and the face of the slide, or striking pad, shall be safeguarded in accordance with the requirements of paragraph (c) of this section.

### (D)(6) TONNAGE, STROKE, AND WEIGHT DESIGNATION

All dies shall be:

- (i) Stamped with the tonnage and stroke requirements; or have these characteristics recorded if these records are readily available to the die setter;
- (ii) Stamped to indicate upper die weight when necessary for air counterbalance pressure adjustment; and
- (iii) Stamped to indicate complete die weight when handling equipment may become overloaded.

### (D)(7) DIE FASTENING

Provision shall be made in both the upper and lower shoes for securely mounting the die to the bolster and slide. Where clamp caps or setscrews are used in conjunction with punch stems, additional means of securing the upper shoe to the slide shall be used.

### (D)(8) DIE HANDLING

Handling equipment attach points shall be provided on all dies requiring mechanical handling.

### (D)(9) DIE SETTING

- (i) The employer shall establish a die setting procedure that will insure compliance with paragraph (c) of this section.
- (ii) The employer shall provide spring loaded turnover bars, for presses designed to accept such turnover bars.
- (iii) The employer shall provide die stops or other means to prevent losing control of the die while setting or removing dies in presses which are inclined.
- (iv) The employer shall provide and enforce the use of safety blocks for use whenever dies are being adjusted or repaired in the press.
- (v) The employer shall provide brushes, swabs, lubricating rolls, and automatic or manual pressure guns so that operators and die setters shall not be required to reach into the point of operation or other hazard areas to lubricate material, punches or dies.

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## INSPECTION, MAINTENANCE, AND MODIFICATION OF PRESSES

### (E)(1) INSPECTION AND MAINTENANCE RECORDS

(i) It shall be the responsibility of the employer to establish and follow a program of periodic and regular inspections of his power presses to insure that all their parts, auxiliary equipment, and safeguards are in a safe operating condition and adjustment. The employer shall maintain a certification record of inspections which includes the date of inspection, the signature of the person who performed the inspection, and the serial number, or other identifier, of the power press that was inspected.

(ii) Each press shall be inspected and tested no less than weekly to determine the condition of the clutch/brake mechanism-antirepeat feature and single stroke mechanism. Necessary maintenance or repair or both shall be performed and completed before the press is operated. These requirements do not apply to those presses which comply with paragraphs (b)(13) and (14) of this section. The employer shall maintain a certification record of inspections, tests and maintenance work which includes the date of the inspection, test or maintenance; the signature

of the person who performed the inspection, test, or maintenance; and the serial number or other identifier of the press that was inspected, tested or maintained.

### (E)(2) MODIFICATION

It shall be the responsibility of any person modifying a power press to furnish instructions with the modification to establish new or changed guidelines for use and care of the power press so modified.

### (E)(3) TRAINING OF MAINTENANCE PERSONNEL

It shall be the responsibility of the employer to insure the original and continuing competence of personnel caring for, inspecting, and maintaining power presses.

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## OPERATION OF POWER PRESSES

### (F)(1) RESERVED

### (F)(2) INSTRUCTION TO OPERATORS

The employer shall train and instruct the operator in the safe method of work before starting work on any operation covered by this section. The employer shall insure by adequate supervision that correct operating procedures are being followed.

### (F)(3) WORK AREA

The employer shall provide clearance between machines so that movement of one operator will not interfere with the work of another. Ample room for cleaning machines, handling material, work pieces, and scrap shall also be provided. All surrounding floors shall be kept in good condition and free from obstructions, grease, oil, and water.

### (F)(4) OVERLOADING

The employer shall operate his presses within the tonnage and attachment weight ratings specified by the manufacturer.

## OSHA 29 CFR 1910.217—MECHANICAL POWER PRESSES (CONTINUED)

### REPORTS OF INJURIES TO EMPLOYEES OPERATING MECHANICAL POWER PRESSES

(g)(1) The employer shall, within 30 days of the occurrence, report to either the Director of the Directorate of Safety Standards Programs, OSHA, U.S. Department of Labor, Washington, D.C. 20210, or the State agency administering plan approved by the Assistant Secretary of Labor for Occupational Safety and Health, all point of operation injuries to operators or other employees. The following information shall be included in the report:

- (i) Employer's name, address and location of the workplace (establishment).
- (ii) Employee's name, injury sustained, and the task being performed (operation, setup, maintenance, or other).
- (iii) Type of clutch used on the press (full revolution, part revolution or direct drive).

(iv) Type of safeguard(s) being used (two-hand control, two-hand trip, pullouts, sweeps or other). If the safeguard is not described in this section, give a complete description.

(v) Cause of the accident (repeat of press, safeguard failure, removing stuck part or scrap, no safeguard provided, no safeguard in use or other).

(vi) Type of feeding (manual with hands in dies or with hands out of dies, semi-automatic, automatic or other).

(vii) Means used to actuate press stroke (foot trip, foot control, hand trip, hand control or other).

(viii) Number of operators required for the operation and the number of operators provided with controls and safeguards.

## OSHA 29 CFR 1910.212—GENERAL REQUIREMENTS FOR ALL MACHINES

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

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

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

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

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

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

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

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

(5) Exposure of blades. When the periphery of the blades of a fan is less than seven (7) feet above the floor or working level, the blades shall be guarded. The guard shall have openings no larger than one-half (1/2) inch.

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

## OSHA 29 CFR 1910.219—MECHANICAL POWER-TRANSMISSION APPARATUS

(a) General requirements. (1) This section covers all types and shapes of power-transmission belts, except the following when operating at two hundred and fifty (250) feet per minute or less: (i) Flat belts one (1) inch or less in width, (ii) flat belts two (2) inches or less in width which are free from metal lacings or fasteners, (iii) round belts one-half ( $\frac{1}{2}$ ) inch or less in diameter; and (iv) single strand V-belts, the width of which is thirteen thirty-seconds ( $1\frac{3}{32}$ ) inch or less.

(2) Vertical and inclined belts (paragraphs (e) (3) and (4) of this section) if not more than two and one-half ( $2\frac{1}{2}$ ) inches wide and running at a speed of less than one thousand (1,000) feet per minute, and if free from metal lacings or fastenings may be guarded with a nip-point belt and pulley guard.

(3) For the textile industry, because of the presence of excessive deposits of lint which constitutes a serious fire hazard, the sides and face sections only of nip-point belt and pulley guards are required, provided the guard shall extend at least six (6) inches beyond the rim of the pulley on the in-running and off-running sides of the belt and at least two (2) inches away from the rim and face of the pulley in all other directions.

(4) This section covers the principal features with which power-transmission safeguards shall comply.

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

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

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

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

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

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

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

(2) Cranks and connecting rods. Cranks and connecting rods, when exposed to contact, shall be guarded in accordance with paragraphs (m) and (n) of this section, or by a guardrail as described in paragraph (o)(5) of this section.

(3) Tail rods or extension piston rods. Tail rods or extension piston rods shall be guarded in accordance with paragraphs (m) and (o) of this section, or by a guardrail on sides and end, with a clearance of not less than fifteen (15) nor more than twenty (20) inches when rod is fully extended.

(c) Shafting—(1) Installation. (i) Each continuous line of shafting shall be secured in position against excessive endwise movement.

(ii) Inclined and vertical shafts, particularly inclined idler shafts, shall be securely held in position against endwise thrust.

(2) Guarding horizontal shafting. (i) All exposed parts of horizontal shafting seven (7) feet or less from floor or working platform, excepting runways used exclusively for oiling, or running adjustments, shall be protected by a stationary casing enclosing shafting completely or by a trough enclosing sides and top or sides and bottom of shafting as location requires.

(ii) Shafting under bench machines shall be enclosed by a stationary casing, or by a trough at sides and top or sides and bottom, as location requires. The sides of the trough shall come within at least six (6) inches of the underside of table, or if shafting is located near floor within six (6) inches of floor. In every case the sides of trough shall extend at least two (2) inches beyond the shafting or protuberance.

(3) Guarding vertical and inclined shafting. Vertical and inclined shafting seven (7) feet or less from floor or working platform, excepting maintenance runways, shall be enclosed with a stationary casing in accordance with requirements of paragraphs (m) and (o) of this section.

**(4) Projecting shaft ends.** (i) Projecting shaft ends shall present a smooth edge and end and shall not project more than one-half the diameter of the shaft unless guarded by nonrotating caps or safety sleeves.

(ii) Unused keyways shall be filled up or covered.

(5) Power-transmission apparatus located in basements. All mechanical power-transmission apparatus located in basements, towers, and rooms used exclusively for power-transmission equipment shall be guarded in accordance with this section, except that the requirements for safeguarding belts, pulleys, and shafting need not be complied with when the following requirements are met:

(i) The basement, tower, or room occupied by transmission equipment is locked against unauthorized entrance.

(ii) The vertical clearance in passageways between the floor and power-transmission beams, ceiling, or any other objects, is not less than five feet six inches (5 ft. 6 in.).

(iii) The intensity of illumination conforms to the requirements of ANSI A11.1-1965 (R-1970).

(iv) [Reserved]

(v) The route followed by the oiler is protected in such manner as to prevent accident.



## OSHA 29 CFR 1910.219—MECHANICAL POWER-TRANSMISSION APPARATUS (CONTINUED)

(d) Pulleys—(1) Guarding. Pulleys, any parts of which are seven (7) feet or less from the floor or working platform, shall be guarded in accordance with the standards specified in paragraphs (m) and (o) of this section. Pulleys serving as balance wheels (e.g., punch presses) on which the point of contact between belt and pulley is more than six feet six inches (6 ft. 6 in.) from the floor or platform may be guarded with a disk covering the spokes.

(2) Location of pulleys. (i) Unless the distance to the nearest fixed pulley, clutch or hanger exceeds the width of the belt used, a guide shall be provided to prevent the belt from leaving the pulley on the side where insufficient clearance exists.

(ii) [Reserved]

(3) Broken pulleys. Pulleys with cracks or pieces broken out of rims shall not be used.

(4) Pulley speeds. Pulleys intended to operate at rim speed in excess of manufacturers normal recommendations shall be specially designed and carefully balanced for the speed at which they are to operate.

(e) Belt, rope, and chain drives—(1) Horizontal belts and ropes. (i) Where both runs of horizontal belts are seven (7) feet or less from the floor level, the guard shall extend to at least fifteen (15) inches above the belt or to a standard height (see Table O-12), except that where both runs of a horizontal belt are 42 inches or less from the floor, the belt shall be fully enclosed in accordance with paragraphs (m) and (o) of this section.

(ii) In power plants or power-development rooms, a guardrail may be used in lieu of the guard required by subdivision (i) of this subparagraph.

(2) Overhead horizontal belts. (i) Overhead horizontal belts, with lower parts seven (7) feet or less from the floor or platform, shall be guarded on sides and bottom in accordance with paragraph (o)(3) of this section.

(ii) Horizontal overhead belts more than seven (7) feet above floor or platform shall be guarded for their entire length under the following conditions:

(a) If located over passageways or work places and traveling 1,800 feet or more per minute.

(b) If center to center distance between pulleys is ten (10) feet or more.

(c) If belt is eight (8) inches or more in width.

(iii) Where the upper and lower runs of horizontal belts are so located that passage of persons between them would be possible, the passage shall be either:

(a) Completely barred by a guardrail or other barrier in accordance with paragraphs (m) and (o) of this section; or

(b) Where passage is regarded as necessary, there shall be a platform over the lower run guarded on either side by a railing completely filled in with wire mesh or other filler, or by a solid barrier. The upper run shall be so guarded as to prevent contact therewith either by the worker or by objects carried by him. In power plants only the lower run of the belt need be guarded.

(iv) Overhead chain and link belt drives are governed by the same rules as overhead horizontal belts and shall be guarded in the same manner as belts.

(3) Vertical and inclined belts. (i) Vertical and inclined belts shall be enclosed by a guard conforming to standards in paragraphs (m) and (o) of this section.

(ii) All guards for inclined belts shall be arranged in such a manner that a minimum clearance of seven (7) feet is maintained between belt and floor at any point outside of guard.

4) Vertical belts. Vertical belts running over a lower pulley more than seven (7) feet above floor or platform shall be guarded at the bottom in the same manner as horizontal overhead belts, if conditions are as stated in paragraphs (e)(2)(ii) (a) and (c) of this section.

(5) Cone-pulley belts. (i) The cone belt and pulley shall be equipped with a belt shifter so constructed as to adequately guard the nip point of the belt and pulley. If the frame of the belt shifter does not adequately guard the nip point of the belt and pulley, the nip point shall be further protected by means of a vertical guard placed in front of the pulley and extending at least to the top of the largest step of the cone.

(ii) If the belt is of the endless type or laced with rawhide laces, and a belt shifter is not desired, the belt will be considered guarded if the nip point of the belt and pulley is protected by a nip point guard located in front of the cone extending at least to the top of the largest step of the cone, and formed to show the contour of the cone in order to give the nip point of the belt and pulley the maximum protection.

(iii) If the cone is located less than 3 feet from the floor or working platform, the cone pulley and belt shall be guarded to a height of 3 feet regardless of whether the belt is endless or laced with rawhide.

(6) Belt tighteners. (i) Suspended counterbalanced tighteners and all parts thereof shall be of substantial construction and securely fastened; the bearings shall be securely capped. Means must be provided to prevent tightener from falling, in case the belt breaks.

(ii) Where suspended counterweights are used and not guarded by location, they shall be so encased as to prevent accident.

(f) Gears, sprockets, and chains—(1) Gears. **Gears shall be guarded in accordance with one of the following methods:**

(i) By a complete enclosure; or

(ii) By a standard guard as described in paragraph (o) of this section, at least seven (7) feet high extending six (6) inches above the mesh point of the gears; or

(iii) By a band guard covering the face of gear and having flanges extended inward beyond the root of the teeth on the exposed side or sides. Where any portion of the train of gears guarded by a band guard is less than six (6) feet from the floor a disk guard or a complete enclosure to the height of six (6) feet shall be required.

(2) Hand-operated gears. Paragraph (f)(1) of this section does not apply to hand-operated gears used only to adjust machine parts and which do not continue to move after hand power is removed. However, the guarding of these gears is highly recommended.

(3) Sprockets and chains. **All sprocket wheels and chains shall be enclosed unless they are more than seven (7) feet above the floor or platform. Where the drive extends over other machine or working areas, protection against falling shall be provided. This subparagraph does not apply to manually operated sprockets.**

## OSHA 29 CFR 1910.219—MECHANICAL POWER-TRANSMISSION APPARATUS (CONTINUED)

(4) Openings for oiling. When frequent oiling must be done, openings with hinged or sliding self-closing covers shall be provided. All points not readily accessible shall have oil feed tubes if lubricant is to be added while machinery is in motion.

(g) Guarding friction drives. The driving point of all friction drives when exposed to contact shall be guarded, all arm or spoke friction drives and all web friction drives with holes in the web shall be entirely enclosed, and all projecting belts on friction drives where exposed to contact shall be guarded.

(h) Keys, setscrews, and other projections. (1) All projecting keys, setscrews, and other projections in revolving parts shall be removed or made flush or guarded by metal cover. This subparagraph does not apply to keys or setscrews within gear or sprocket casings or other enclosures, nor to keys, setscrews, or oilcups in hubs of pulleys less than twenty (20) inches in diameter where they are within the plane of the rim of the pulley.

(2) It is recommended, however, that no projecting setscrews or oilcups be used in any revolving pulley or part of machinery.

(i) Collars and couplings—(1) Collars. All revolving collars, including split collars, shall be cylindrical, and screws or bolts used in collars shall not project beyond the largest periphery of the collar.

(2) Couplings. Shaft couplings shall be so constructed as to present no hazard from bolts, nuts, setscrews, or revolving surfaces. Bolts, nuts, and setscrews will, however, be permitted where they are covered with safety sleeves or where they are used parallel with the shafting and are countersunk or else do not extend beyond the flange of the coupling.

(j) Bearings and facilities for oiling. All drip cups and pans shall be securely fastened.

(k) Guarding of clutches, cutoff couplings, and clutch pulleys—(1) Guards. Clutches, cutoff couplings, or clutch pulleys having projecting parts, where such clutches are located seven (7) feet or less above the floor or working platform, shall be enclosed by a stationary guard constructed in accordance with this section. A “U” type guard is permissible.

(2) Engine rooms. In engine rooms a guardrail, preferably with toeboard, may be used instead of the guard required by paragraph (k) (1) of this section, provided such a room is occupied only by engine room attendants.

(l) Belt shifters, clutches, shippers, poles, perches, and fasteners—(1) Belt shifters. (i) Tight and loose pulleys on all new installations made on or after August 31, 1971, shall be equipped with a permanent belt shifter provided with mechanical means to prevent belt from creeping from loose to tight pulley. It is recommended that old installations be changed to conform to this rule.

(ii) Belt shifter and clutch handles shall be rounded and be located as far as possible from danger of accidental contact, but within easy reach of the operator. Where belt shifters are not directly located over a machine or bench, the handles shall be cut off six feet six inches (6 ft. 6 in.) above floor level.

(2) Belt shippers and shipper poles. The use of belt poles as substitutes for mechanical shifters is not recommended.

(3) Belt perches. Where loose pulleys or idlers are not practicable, belt perches in form of brackets, rollers, etc., shall be used to keep idle belts away from the shafts.

(4) Belt fasteners. Belts which of necessity must be shifted by hand and belts within seven (7) feet of the floor or working platform which are not guarded in accordance with this section shall not be fastened with metal in any case, nor with any other fastening which by construction or wear will constitute an accident hazard.

(m) Standard guards—general requirements—(1) Materials. (i) Standard conditions shall be secured by the use of the following materials: expanded metal, perforated or solid sheet metal, wire mesh on a frame of angle iron or iron pipe securely fastened to floor or to frame of machine.

(ii) All metal should be free from burrs and sharp edges.

(2) Methods of manufacture. (i) Expanded metal, sheet or perforated metal, and wire mesh shall be securely fastened to frame.

(n) [Reserved]

(o) Approved materials—(1) Minimum requirements. The materials and dimensions specified in this paragraph shall apply to all guards, except horizontal overhead belts, rope, cable or chain guards more than seven (7) feet above floor or platform.

(i) [Reserved]

(a) All guards shall be rigidly braced every three (3) feet or fractional part of their height to some fixed part of machinery or building structure. Where guard is exposed to contact with moving equipment additional strength may be necessary.

(2) Wood guards. (i) Wood guards may be used in the woodworking and chemical industries, in industries where the presence of fumes or where manufacturing conditions would cause the rapid deterioration of metal guards; also in construction work and in locations outdoors where extreme cold or extreme heat make metal guards and railings undesirable. In all other industries, wood guards shall not be used.

(3) Guards for horizontal overhead belts. (i) Guards for horizontal overhead belts shall run the entire length of the belt and follow the line of the pulley to the ceiling or be carried to the nearest wall, thus enclosing the belt effectively. Where belts are so located as to make it impracticable to carry the guard to wall or ceiling, construction of guard shall be such as to enclose completely the top and bottom runs of belt and the face of pulleys.

(ii) [Reserved]

(iii) Suitable reinforcement shall be provided for the ceiling rafters or overhead floor beams, where such is necessary, to sustain safely the weight and stress likely to be imposed by the guard. The interior surface of all guards, by which is meant the surface of the guard with which a belt will come in contact, shall be smooth and free from all projections of any character, except where construction demands it; protruding shallow roundhead rivets may be used. Overhead belt guards shall be at least one-quarter wider than belt which they protect, except that this clearance need not in any case exceed six (6) inches on each side. Overhead rope drive and block and roller-chain-drive guards shall be not less than six (6) inches wider than the drive on each side. In overhead silent chain-drive guards where the chain is held from lateral displacement on the sprockets, the side clearances required on drives of twenty (20) inch centers or under shall be not less than one-fourth inch from the nearest moving chain part, and on drives of over twenty (20) inch centers a minimum of one-half inch from the nearest moving chain part.

**OSHA 29 CFR 1910.219—MECHANICAL POWER-TRANSMISSION APPARATUS (CONTINUED)**

(4) Guards for horizontal overhead rope and chain drives. Overhead-rope and chain-drive guard construction shall conform to the rules for overhead-belt guard.

(5) Guardrails and toeboards. (i) Guardrail shall be forty-two (42) inches in height, with midrail between top rail and floor.

(ii) Posts shall be not more than eight (8) feet apart; they are to be permanent and substantial, smooth, and free from protruding nails, bolts, and splinters. If made of pipe, the post shall be one and one-fourth (1¼) inches inside diameter or larger. If made of metal shapes or bars, their section shall be equal in strength to that of one and one-half (1½) by one and one-half (1½) by three-sixteenths (3/16) inch angle iron. If made of wood, the posts shall be two by four (2 x 4) inches or larger. The upper rail shall be two by four (2 x 4) inches or two one by four (1 x 4) strips, one at the top and one at the side of posts. The midrail may be one by four (1 x 4) inches or more. Where panels are fitted with expanded metal or wire mesh as noted in Table O-12 the middle rails may be omitted. Where guard is exposed to contact with moving equipment, additional strength may be necessary.

(iii) Toeboards shall be four (4) inches or more in height, of wood, metal or of metal grill not exceeding one (1) inch mesh.

(p) Care of equipment—(1) General. All power-transmission equipment shall be inspected at intervals not exceeding 60 days and be kept in good working condition at all times.

(2) Shafting. (i) Shafting shall be kept in alignment, free from rust and excess oil or grease.

(ii) Where explosives, explosive dusts, flammable vapors or flammable liquids exist, the hazard of static sparks from shafting shall be carefully considered.

(3) Bearings. Bearings shall be kept in alignment and properly adjusted.

(4) Hangers. Hangers shall be inspected to make certain that all supporting bolts and screws are tight and that supports of hanger boxes are adjusted properly.

(5) Pulleys. (i) Pulleys shall be kept in proper alignment to prevent belts from running off.

(6) Care of belts.

(i) [Reserved]

(ii) Inspection shall be made of belts, lacings, and fasteners and such equipment kept in good repair.

(7) Lubrication. The regular oilers shall wear tight-fitting clothing. Machinery shall be oiled when not in motion, wherever possible.

## OSHA 29 CFR 1910.147—THE CONTROL OF HAZARDOUS ENERGY (LOCKOUT/TAGOUT)

(a) Scope, application and purpose—(1) Scope.

(i) This standard covers the servicing and maintenance of machines and equipment in which the unexpected energizing or start-up of the machines or equipment; or release of stored energy could cause injury to employees. This standard establishes minimum performance requirements for the control of such hazardous energy.

(ii) This standard does not cover the following:

(A) Construction, agriculture and maritime employment;

(B) Installations under the exclusive control of electric utilities for the purpose of power generation, transmission and distribution, including related equipment for communication or metering; and

(C) Exposure to electrical hazards from work on, near, or with conductors or equipment in electric utilization installations, which is covered by Subpart S of this part; and

(D) Oil and gas well drilling and servicing.

(2) Application. (i) This standard applies to the control of energy during servicing and/or maintenance of machines and equipment.

(ii) Normal production operations are not covered by this standard (see Subpart O of this part). Servicing and/or maintenance which takes place during normal production operations is covered by this standard only if:

(A) An employee is required to remove or bypass a guard or other safety device; or

(B) An employee is required to place any part of his or her body into an area on a machine or piece of equipment where work is actually performed upon the material being processed (point of operation) or where an associated danger zone exists during a machine operating cycle.

Note: Exception to paragraph (a)(2)(ii):

Minor tool changes and adjustments, and other minor servicing activities, which take place during normal production operations, are not covered by this standard if they are routine, repetitive, and integral to the use of the equipment for production, provided that the work is performed using alternative measures which provide effective protection (see subpart O of this Part).

(iii) This standard does not apply to the following:

(A) Work on cord and plug connected electric equipment for which exposure to the hazards of unexpected energizing or start-up of the equipment is controlled by the unplugging of the equipment from the energy source and by the plug being under the exclusive control of the employee performing the servicing or maintenance.

(B) Hot tap operations involving transmission and distribution systems for substances such as gas, steam, water or petroleum products when they are performed on pressurized pipelines, provided that the employer demonstrates that (1) continuity of service is essential; (2) shutdown of the system is impractical; and (3) documented procedures are followed, and special equipment is used which will provide proven effective protection for employees.

(3) Purpose. (i) This section requires employers to establish a program and utilize procedures for affixing appropriate lockout devices or tagout devices to energy isolating devices, and to otherwise disable machines or equipment to prevent unexpected energizing, start-up or release of stored energy in order to prevent injury to employees.

(ii) When other standards in this part require the use of lockout or tagout, they shall be used and supplemented by the procedural and training requirements of this section.

(b) Definitions applicable to this section.

**Affected employee.** An employee whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout or tagout; or whose job requires him/her to work in an area in which such servicing or maintenance is being performed.

**Authorized employee.** A person who locks or implements a tagout system procedure on machines or equipment to perform the servicing or maintenance on that machine or equipment. An authorized employee and an affected employee may be the same person when the affected employee's duties also include performing maintenance or service on a machine or equipment which must be locked or a tagout system implemented.

**“Capable of being locked out.”** An energy isolating device will be considered to be capable of being locked out either if it is designed with a hasp or other attachment or integral part to which, or through which, a lock can be affixed, or if it has a locking mechanism built into it. Other energy isolating devices will also be considered to be capable of being locked out, if lockout can be achieved without the need to dismantle, rebuild, or replace the energy isolating device or permanently alter its energy control capability.

**Energized.** Connected to an energy source or containing residual or stored energy.

**Energy isolating device.** A mechanical device that physically prevents the transmission or release of energy, including but not limited to the following: a manually operated electrical circuit breaker; a disconnect switch; a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors and, in addition, no pole can be operated independently; a slide gate; a slip blind; a line valve; a block; and any similar device used to block or isolate energy. The term does not include a push button, selector switch, and other control circuit type devices.

**Energy source.** Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal or other energy.

**Hot tap.** A procedure used in the repair, maintenance and services activities which involves welding on a piece of equipment (pipelines, vessels or tanks) under pressure, in order to install connections or appurtenances. It is commonly used to replace or add sections of pipeline without the interruption of service for air, gas, water, steam, and petrochemical distribution systems.

**Lockout.** The placement of a lockout device on an energy isolating device, in accordance with an established procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

**Lockout device.** A device that utilizes a positive means such as a lock, either key or combination type, to hold an energy isolating device in the safe position and prevent the energizing of a machine or equipment.

## OSHA 29 CFR 1910.147—LOCKOUT/TAGOUT (CONTINUED)

Normal production operations. The utilization of a machine or equipment to perform its intended production function.

Servicing and/or maintenance. Workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment. These activities include lubrication, cleaning or unjamming of machines or equipment and making adjustments or tool changes, where the employee may be exposed to the unexpected energizing or start-up of the equipment or release of hazardous energy.

Setting up. Any work performed to prepare a machine or equipment to perform its normal production operation.

Tagout. The placement of a tagout device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

Tagout device. A prominent warning device, such as a tag and a means of attachment, which can be securely fastened to an energy isolating device in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

(c) General—(1) Energy control program. The employer shall establish a program consisting of an energy control procedure and employee training to ensure that before any employee performs any servicing or maintenance on a machine or equipment where the unexpected energizing, start-up or release of stored energy could occur and cause injury, the machine or equipment shall be isolated, and rendered inoperative, in accordance with paragraph (c)(4) of this section.

(2) Lockout/tagout (i) If an energy isolating device is not capable of being locked out, the employer's energy control program under paragraph (c)(1) of this section shall utilize a tagout system.

(ii) If an energy isolating device is capable of being locked out, the employer's energy control program under paragraph (c)(1) of this section shall utilize lockout, unless the employer can demonstrate that the utilization of a tagout system will provide full employee protection as set forth in paragraph (c)(3) of this section.

(iii) After January 2, 1990, whenever major replacement, repair, renovation or modification of machines or equipment is performed, and whenever new machines or equipment are installed, energy isolating devices for such machines or equipment shall be designed to accept a lockout device.

(3) Full employee protection. (i) When a tagout device is used on an energy isolating device which is capable of being locked out, the tagout device shall be attached at the same location that the lockout device would have been attached, and the employer shall demonstrate that the tagout program will provide a level of safety equivalent to that obtained by using a lockout program.

(ii) In demonstrating that a level of safety is achieved in the tagout program which is equivalent to the level of safety obtained by using a lockout program, the employer shall demonstrate full compliance with all tagout-related provisions of this standard together with such additional elements as are necessary to provide the equivalent safety available from the use of a lockout device. Additional means to be considered as part of the demonstration of full employee protection shall include the implementation of additional safety measures such as the removal of an isolating circuit element, blocking of a controlling switch, opening of an extra disconnecting device, or the removal of a valve handle to reduce the likelihood of inadvertent energizing.

(4) Energy control procedure. (i) Procedures shall be developed, documented and utilized for the control of potentially hazardous energy when employees are engaged in the activities covered by this section.

Note: Exception: The employer need not document the required procedure for a particular machine or equipment, when all of the following elements exist: (1) The machine or equipment has no potential for stored or residual energy or reaccumulation of stored energy after shut down which could endanger employees; (2) the machine or equipment has a single energy source which can be readily identified and isolated; (3) the isolation and locking out of that energy source will completely de-energize and deactivate the machine or equipment; (4) the machine or equipment is isolated from that energy source and locked out during servicing or maintenance; (5) a single lockout device will achieve a locked-out condition; (6) the lockout device is under the exclusive control of the authorized employee performing the servicing or maintenance; (7) the servicing or maintenance does not create hazards for other employees; and (8) the employer, in utilizing this exception, has had no accidents involving the unexpected activation or reenergization of the machine or equipment during servicing or maintenance.

(ii) The procedures shall clearly and specifically outline the scope, purpose, authorization rules, and techniques to be utilized for the control of hazardous energy, and the means to enforce compliance including, but not limited to, the following:

(A) A specific statement of the intended use of the procedure;

(B) Specific procedural steps for shutting down, isolating, blocking and securing machines or equipment to control hazardous energy;

(C) Specific procedural steps for the placement, removal and transfer of lockout devices or tagout devices and the responsibility for them; and

(D) Specific requirements for testing a machine or equipment to determine and verify the effectiveness of lockout devices, tagout devices, and other energy control measures.

(5) Protective materials and hardware. (i) Locks, tags, chains, wedges, key blocks, adapter pins, self-locking fasteners, or other hardware shall be provided by the employer for isolating, securing or blocking of machines or equipment from energy sources.

(ii) Lockout devices and tagout devices shall be singularly identified; shall be the only device(s) used for controlling energy; shall not be used for other purposes; and shall meet the following requirements:

(A) Durable. (1) Lockout and tagout devices shall be capable of withstanding the environment to which they are exposed for the maximum period of time that exposure is expected.

(2) Tagout devices shall be constructed and printed so that exposure to weather conditions or wet and damp locations will not cause the tag to deteriorate or the message on the tag to become illegible.

(3) Tags shall not deteriorate when used in corrosive environments such as areas where acid and alkali chemicals are handled and stored.

(B) Standardized. Lockout and tagout devices shall be standardized within the facility in at least one of the following criteria: Color; shape; or size; and additionally, in the case of tagout devices, print and format shall be standardized.

(C) Substantial—(1) Lockout devices. Lockout devices shall be substantial enough to prevent removal without the use of excessive force or unusual techniques, such as with the use of bolt cutters or other metal cutting tools.

## OSHA 29 CFR 1910.147—LOCKOUT/TAGOUT (CONTINUED)

(2) Tagout devices. Tagout devices, including and their means of attachment, shall be substantial enough to prevent inadvertent or accidental removal. Tagout device attachment means shall be of a non-reusable type, attachable by hand, self-locking, and non-releasable with a minimum unlocking strength of no less than 50 pounds and having the general design and basic characteristics of being at least equivalent to a one-piece, all-environment-tolerant nylon cable tie.

(D) Identifiable. Lockout devices and tagout devices shall indicate the identity of the employee applying the device(s).

(iii) Tagout devices shall warn against hazardous conditions if the machine or equipment is energized and shall include a legend such as the following: Do Not Start, Do Not Open, Do Not Close, Do Not Energize, Do Not Operate.

(6) Periodic inspection. (i) The employer shall conduct a periodic inspection of the energy control procedure at least annually to ensure that the procedure and the requirements of this standard are being followed.

(A) The periodic inspection shall be performed by an authorized employee other than the one(s) utilizing the energy control procedure being inspected.

(B) The periodic inspection shall be designed to correct any deviations or inadequacies observed.

(C) Where lockout is used for energy control, the periodic inspection shall include a review, between the inspector and each authorized employee, of that employee's responsibilities under the energy control procedure being inspected.

(D) Where tagout is used for energy control, the periodic inspection shall include a review, between the inspector and each authorized and affected employee, of that employee's responsibilities under the energy control procedure being inspected, and the elements set forth in paragraph (c)(7)(ii) of this section.

(ii) The employer shall certify that the periodic inspections have been performed. The certification shall identify the machine or equipment on which the energy control procedure was being utilized, the date of the inspection, the employees included in the inspection, and the person performing the inspection.

(7) Training and communication. (i) The employer shall provide training to ensure that the purpose and function of the energy control program are understood by employees and that the knowledge and skills required for the safe application, usage, and removal of energy controls are required by employees. The training shall include the following:

(A) Each authorized employee shall receive training in the recognition of applicable hazardous energy sources, the type and magnitude of the energy available in the workplace, and the methods and means necessary for energy isolation and control.

(B) Each affected employee shall be instructed in the purpose and use of the energy control procedure.

(C) All other employees whose work operations are or may be in an area where energy control procedures may be utilized, shall be instructed about the procedure, and about the prohibition relating to attempts to restart or reenergize machines or equipment which are locked out or tagged out.

(ii) When tagout systems are used, employees shall also be trained in the following limitations of tags:

(A) Tags are essentially warning devices affixed to energy isolating devices, and do not provide the physical restraint on those devices that is provided by a lock.

(B) When a tag is attached to an energy isolating means, it is not to be removed without authorization of the authorized person responsible for it, and it is never to be bypassed, ignored or otherwise defeated.

(C) Tags must be legible and understandable by all authorized employees, affected employees, and all other employees whose work operations are or may be in the area, in order to be effective.

(D) Tags and their means of attachment must be made of materials which will withstand the environmental conditions encountered in the workplace.

(E) Tags may evoke a false sense of security, and their meaning needs to be understood as part of the overall energy control program.

(F) Tags must be securely attached to energy isolating devices so that they cannot be inadvertently or accidentally detached during use.

(iii) Employee retraining.

(A) Retraining shall be provided for all authorized and affected employees whenever there is a change in their job assignments, a change in machines, equipment or processes that present a new hazard, or when there is a change in the energy control procedures.

(B) Additional retraining shall also be conducted whenever a periodic inspection under paragraph (c)(6) of this section reveals, or whenever the employer has reason to believe, that there are deviations from or inadequacies in the employee's knowledge or use of the energy control procedures.

(C) The retraining shall reestablish employee proficiency and introduce new or revised control methods and procedures, as necessary.

(iv) The employer shall certify that employee training has been accomplished and is being kept up to date. The certification shall contain each employee's name and dates of training.

(8) Energy isolation. Implementation of lockout or the tagout system shall be performed only by authorized employees.

(9) Notification of employees. Affected employees shall be notified by the employer or authorized employee of the application and removal of lockout devices or tagout devices. Notification shall be given before the controls are applied, and after they are removed from the machine or equipment.

(d) Application of control. The established procedure for the application of energy control (implementation of lockout or tagout system procedures) shall cover the following elements and actions and shall be done in the following sequence:

(1) Preparation for shutdown. Before an authorized or affected employee turns off a machine or equipment, the authorized employee shall have knowledge of the type and magnitude of the energy, the hazards of the energy to be controlled, and the method or means to control the energy.

(2) Machine or equipment shutdown. The machine or equipment shall be turned off or shut down using the procedures required by this standard. An orderly shutdown must be utilized to avoid any additional or increased hazard(s) to employees as a result of equipment deenergization.

## OSHA 29 CFR 1910.147—LOCKOUT/TAGOUT (CONTINUED)

(3) Machine or equipment isolation. All energy isolating devices that are needed to control the energy to the machine or equipment shall be physically located and operated in such a manner as to isolate the machine or equipment from the energy source(s).

(4) Lockout or tagout device application. (i) Lockout or tagout devices shall be affixed to each energy isolating device by authorized employees.

(ii) Lockout devices, where used, shall be affixed in a manner that will hold the energy isolating devices in a “safe” or “off” position.

(iii) Tagout devices, where used, shall be affixed in such a manner as will clearly indicate that the operation or movement of energy isolating devices from the “safe” or “off” position is prohibited.

(A) Where tagout devices are used with energy isolating devices designed with the capability of being locked, the tag attachment shall be fastened at the same point at which the lock would have been attached.

(B) Where a tag cannot be affixed directly to the energy isolating device, the tag shall be located as close as safely possible to the device, in a position that will be immediately obvious to anyone attempting to operate the device.

(5) Stored energy. (i) Following the application of lockout or tagout devices to energy isolating devices, all potentially hazardous stored or residual energy shall be relieved, disconnected, restrained, and otherwise rendered safe.

(ii) If there is a possibility of reaccumulation of stored energy to a hazardous level, verification of isolation shall be continued until the servicing or maintenance is completed, or until the possibility of such accumulation no longer exists.

(6) Verification of isolation. Prior to starting work on machines or equipment that have been locked out or tagged out, the authorized employee shall verify that isolation and deenergization of the machines or equipment have been accomplished.

(e) Release from lockout or tagout. Before lockout or tagout devices are removed and energy is restored to the machine or equipment, procedures shall be followed and actions taken by the authorized employee(s) to ensure the following:

(1) The machine or equipment. The work area shall be inspected to ensure that nonessential items have been removed and to ensure that machine or equipment components are operationally intact.

(2) Employees. (i) The work area shall be checked to ensure that all employees have been safely positioned or removed.

(ii) Before lockout or tagout devices are removed and before machines or equipment are energized, affected employees shall be notified that the lockout or tagout devices have been removed.

(3) Lockout or tagout devices removal. Each lockout or tagout device shall be removed from each energy isolating device by the employee who applied the device. Exception to paragraph (e)(3): when the authorized employee who applied the lockout or tagout device is not available to remove it, that device may be removed under the direction of the employer, provided that specific procedures and training for such removal have been developed, documented and incorporated into the employer’s energy control program. The employer shall demonstrate that the specific procedure provides equivalent safety to the removal of the device by the authorized employee who applied it. The specific procedure shall include at least the following elements:

(i) Verification by the employer that the authorized employee who applied the device is not at the facility;

(ii) Making all reasonable efforts to contact the authorized employee to inform him/her that his/her lockout or tagout device has been removed; and

(iii) Ensuring that the authorized employee has this knowledge before he/she resumes work at that facility.

(f) Additional requirements (1) Testing or positioning of machines, equipment or components thereof. In situations in which lockout or tagout devices must be temporarily removed from the energy isolating device and the machine or equipment energized to test or position the machine, equipment or component thereof, the following sequence of actions shall be followed.

(i) Clear the machine or equipment of tools and materials in accordance with paragraph (e)(1) of this section;

(ii) Remove employees from the machine or equipment area in accordance with paragraph (e)(2) of this section;

(iii) Remove the lockout or tagout devices as specified in paragraph (e)(3) of this section;

(iv) Energize and proceed with testing or positioning;

(v) De-energize all systems and reapply energy control measures in accordance with paragraph (d) of this section to continue the servicing and/or maintenance.

(2) Outside personnel (contractors, etc.). (i) Whenever outside servicing personnel are to be engaged in activities covered by the scope and application of this standard, the on-site employer and the outside employer shall inform each other of their respective lockout or tagout procedures.

(ii) The on-site employer shall ensure that his/her personnel understand and comply with restrictions and prohibitions of the outside employer’s energy control procedures.

(3) Group lockout or tagout. (i) When servicing and/or maintenance is performed by a crew, craft, department or other group, they shall utilize a procedure which affords the employees a level of protection equivalent to that provided by the implementation of a personal lockout or tagout device.

(ii) Group lockout or tagout devices shall be used in accordance with the procedures required by paragraph (c)(4) of this section including, but not necessarily limited to, the following specific requirements:

(A) Primary responsibility is vested in an authorized employee for a set number of employees working under the protection of a group lockout or tagout device (such as an operations lock);

(B) Provision for the authorized employee to ascertain the exposure status of individual group members with regard to the lockout or tagout of the machine or equipment; and

(C) When more than one crew, craft, department, etc., is involved, assignment of overall job-associated lockout or tagout control responsibility to an authorized employee designated to coordinate affected work forces and ensure continuity of protection; and

## OSHA 29 CFR 1910.147—LOCKOUT/TAGOUT (CONTINUED)

(D) Each authorized employee shall affix a personal lockout or tagout device to the group lockout device, group lockbox, or comparable mechanism when he or she begins work, and shall remove those devices when he or she stops working on the machine or equipment being serviced or maintained.

(4) Shift or personnel changes. Specific procedures shall be utilized during shift or personnel changes to ensure the continuity of lockout or tagout protection, including provision for the orderly transfer of lockout or tagout devices between offgoing and oncoming employees, to minimize exposure to hazards from the unexpected energizing, start-up of the machine or equipment, or release of stored energy.

*Note: The following Appendix to §1910.147 serves as a nonmandatory guideline to assist employers and employees in complying with the requirements of this section, as well as to provide other helpful information. Nothing in the Appendix adds to or detracts from any of the requirements of this section.*

### APPENDIX A—TYPICAL MINIMAL LOCKOUT OR TAGOUT SYSTEM PROCEDURES

#### GENERAL

Lockout is the preferred method of isolating machines or equipment from energy sources. To assist employers in developing a procedure which meets the requirements of the standard, however, the following simple procedure is provided for use in both lockout or tagout programs. This procedure may be used when there are limited number or types of machines or equipment or there is a single power source. For more complex systems, a more comprehensive procedure will need to be developed, documented, and utilized.

#### LOCKOUT (OR TAGOUT) PROCEDURE FOR (NAME OF COMPANY).

##### PURPOSE

This procedure establishes the minimum requirements for the lockout or tagout of energy isolating devices. It shall be used to ensure that the machine or equipment is isolated from all potentially hazardous energy, and locked out or tagged out before employees perform any servicing or maintenance activities where the unexpected energizing, start-up or release of stored energy could cause injury (Type(s) and Magnitude(s) of Energy and Hazards).

##### RESPONSIBILITY

Appropriate employees shall be instructed in the safety significance of the lockout (or tagout) procedure (Name(s)/Job Title(s) of employees authorized to lockout or tagout). Each new or transferred affected employee and other employees whose work operations are or may be in the area shall be instructed in the purpose and use of the lockout or tagout procedure (Name(s)/Job Title(s) of affected employees and how to notify).

##### PREPARATION FOR LOCKOUT OR TAGOUT

Make a survey to locate and identify all isolating devices to be certain which switch(es), valve(s) or other energy isolating devices apply to the equipment to be locked or tagged out. More than one energy source (electrical, mechanical or others) may be involved. (Type(s) and Location(s) of energy isolating means.)

#### SEQUENCE OF LOCKOUT OR TAGOUT SYSTEM PROCEDURE

(1) Notify all affected employees that a lockout or tagout system is going to be utilized and the reason therefor. The authorized employee shall know the type and magnitude of energy that the machine or equipment utilizes and shall understand the hazards thereof.

(2) If the machine or equipment is operating, shut it down by the normal stopping procedure (depress stop button, open toggle switch, etc.).

(3) Operate the switch, valve, or other energy isolating device(s) so that the equipment is isolated from its energy source(s). Stored energy (such as that in springs, elevated machine members, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure, etc.) must be dissipated or restrained by methods such as repositioning, blocking, bleeding down, etc. (Type(s) of Stored Energy-methods to dissipate or restrain.)

(4) Lockout and/or tagout the energy isolating devices with assigned individual lock(s) and tag(s) (Method(s) Selected; i.e., locks tags, additional safety measures).

(5) After ensuring that no personnel are exposed, and as a check on having disconnected the energy sources, operate the push button or other normal operating controls to make certain the equipment will not operate (Type(s) of Equipment checked to ensure disconnections).

CAUTION: Return operating control(s) to “neutral” or “off” position after the test.

(6) The equipment is now locked out or tagged out.

#### RESTORING MACHINES OR EQUIPMENT TO NORMAL PRODUCTION OPERATIONS

(1) After the servicing and/or maintenance is complete and equipment is ready for normal production operations, check the area around the machines or equipment to ensure that no one is exposed.

(2) After all tools have been removed from the machine or equipment, guards have been reinstalled and employees are in the clear, remove all lockout or tagout devices. Operate the energy isolating devices to restore energy to the machine or equipment.

#### PROCEDURE INVOLVING MORE THAN ONE PERSON

In the preceding steps, if more than one individual is required to lockout or tagout equipment, each shall place his/her own personal lockout device or tagout device on the energy isolating device(s). When an energy isolating device cannot accept multiple locks or tags, a multiple lockout or tagout device (hasp) may be used. If lockout is used, a single lock may be

used to lockout the machine or equipment with the key being placed in a lockout box or cabinet which allows the use of multiple locks to secure it. Each employee will then use his/her own lock to secure the box or cabinet. As each person no longer needs to maintain his or her lockout protection, that person will remove his/her lock from the box or cabinet. (Name(s)/Job Title(s) of employees authorized for group lockout or tagout.)



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## **OSHA 29 CFR 1910.147—LOCKOUT/TAGOUT (CONTINUED)**

### **BASIC RULES FOR USING LOCKOUT OR TAGOUT SYSTEM PROCEDURE**

All equipment shall be locked out or tagged out to protect against accidental or inadvertent operation when such operation could cause injury to personnel. Do not attempt to operate any switch, valve, or other energy isolating device where it is locked or tagged out.

### **LOCKOUT (OR TAGOUT) PROCEDURE**

Entry No. (Description)

1. Name of Company
2. Type(s) and Magnitude(s) of energy and hazards
3. Name(s)/Job Title(s) of employees authorized to lockout or tagout
4. Name(s)/Job Title(s) of affected employees and how to notify
5. Type(s) and Location of energy isolating means
6. Type(s) of Stored Energy-methods to dissipate or restrain
7. Method(s) Selected i.e., locks, tags, additional safety measures, etc.
8. Type(s) of Equipment checked to ensure disconnections
9. Name(s)/Job Title(s) of employees authorized for group lockout or tagout

## STD 1-7.3 LOCKOUT/TAGOUT

OSHA Instruction STD 1-7.3 (issued September 11, 1990)— Inspection Procedures and Interpretive Guidance is for 29 CFR 1910.147, The Control of Hazardous Energy (commonly referred to as OSHA's Lockout/Tagout Standard).

The purpose of STD 1-7.3 is to establish policies and provide clarification to ensure uniform enforcement of the Lockout/Tagout Standard. STD 1-7.3 also provides for the acceptance of "alternative procedures" in the servicing and maintenance of sophisticated and complex equipment such as that found in the petroleum and chemical industries.

The following is an outline of highlights from STD 1-7.3. This outline is intended to single out some of the new information which was not included in 29 CFR 1910.147. Reference must be made to the entire STD 1-7.3 to ensure complete compliance.

### UNDER LETTER I. INTERPRETIVE GUIDANCE

1. Scope (f)(1) provides an explanation of cord and plug connected equipment by defining when the (unplugged) plug is under the exclusive control of the employee performing the servicing and/or maintenance. Listed are the following three options:

- 1) plug is physically in the possession of the employee
- 2) in arm's reach and in line of sight of the employee
- 3) if the employee has affixed a lockout/tagout device on the plug

Scope (f)(2) requires that the company lockout/tagout procedures specify the acceptable procedure for handling cord and plug connected equipment. 2. Procedures (c) states that "similar machines and/or equipment (such as those using the same type and magnitude of energy and the same or similar types of controls) can be covered with a single written procedure."

3. Lockout versus Tagout (a) states that "OSHA has determined that lockout is a surer means of ensuring deenergization of equipment than tagout, and that it is the preferred method." (over tagout)

4. Employees and Training (b) states that "employees who exclusively perform functions related to normal production operations, and who perform servicing and/or maintenance under the protection of normal machine safeguarding, need only be trained as "affected" (rather than "authorized") employees even if tagout procedures are used." (See I.1.d. and I.1.e. of this instruction.)

5. Periodic Inspection by the Employer (a)(3) states that "energy control procedures used less frequently than once a year need be inspected only when used."

6. Equipment Testing or Positioning (no changes from 1910.147)

7. Group Lockout/Tagout states that "group lockout/tagout procedures shall be tailored to the specific industrial operation and may be unique in the manner that employee protection from the release of hazardous energy is achieved. Irrespective of the situation, the requirements of this generic standard specify that each employee performing maintenance or servicing activities shall be in control of hazardous energy during his/her period of exposure."

(a) Group operations normally require that a lockout/tagout program be implemented which ensures that each authorized employee is protected from the unexpected release of hazardous energy by his/her personal lockout/tagout device(s). No employee may affix the personal lockout/tagout device of another employee. Various group lockout/tagout procedures discussed in Appendix C provide for

each authorized employee's use of his/her personal lockout/tagout device(s).

(b) One of the most difficult problems addressed by the standard involves the servicing and maintenance of complex equipment. Such equipment is frequently used in the petrochemical and chemical industries. Acceptable group lockout/tagout procedures for complex equipment are discussed further in Appendix C.

The following is the explanation for potentially hazardous stored energy or residual energy which might reaccumulate:

8. Compliance with Group Lockout/Tagout (e)(2) "Monitoring may be accomplished, for example, by observation or with the aid of a monitoring device which will sound an alarm if a hazardous energy level is being approached."

(h) In regards to group lockout/tagout operations, "... a master tag is a personal tagout device if each employee personally signs on and signs off on it and if the tag clearly identifies each authorized employee who is being protected by it."

### SUBPART J. CLASSIFICATION OF VIOLATIONS

1. A deficiency in the employer's energy control program and/or procedure that could contribute to a potential exposure capable of producing serious physical harm or death shall be cited as a serious violation.

2. The failure to train "authorized," "affected," and "other" employees as required for their respective classifications should normally be cited as a serious violation.

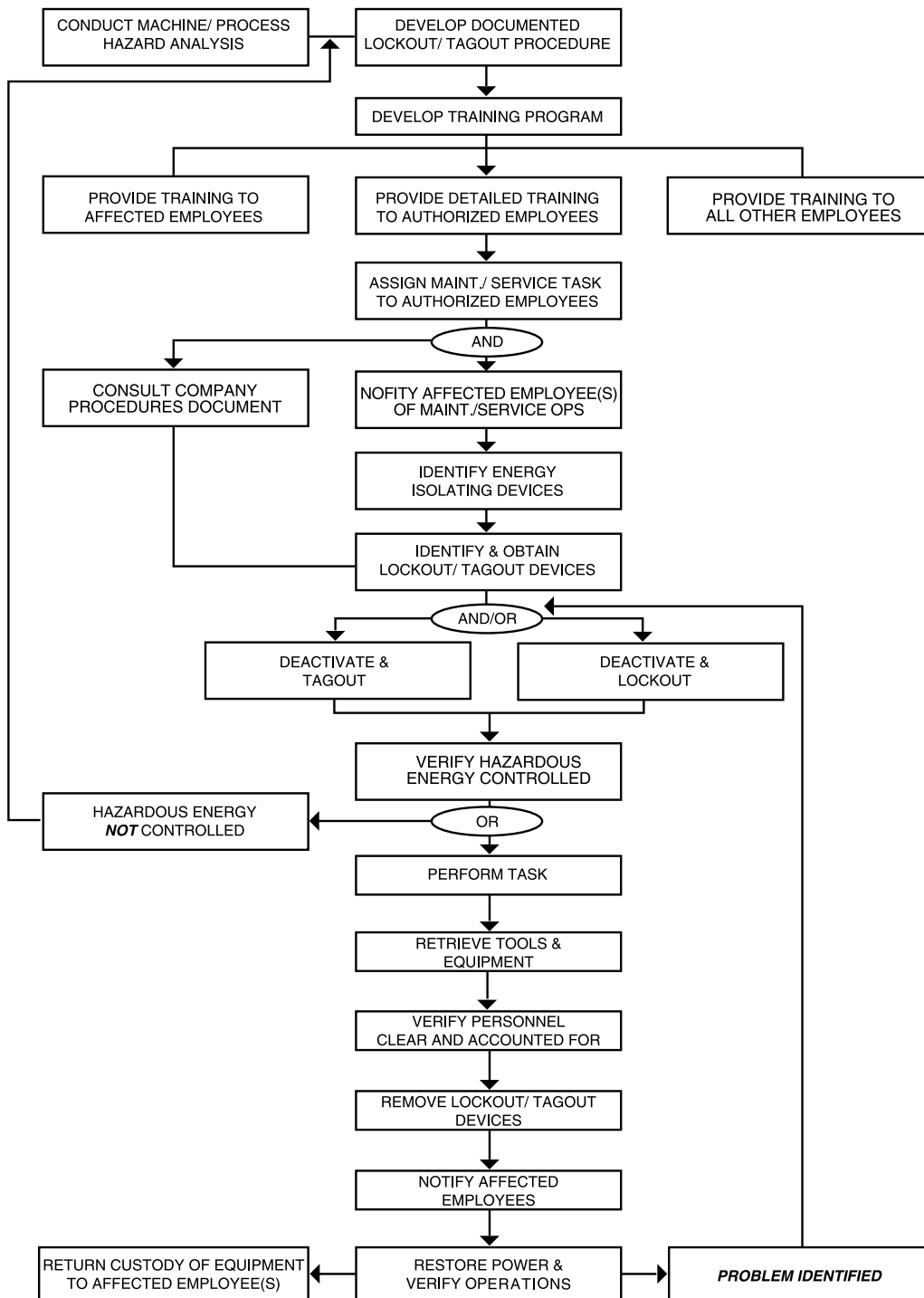
3. Paperwork deficiencies in lockout/tagout programs where effective lockout/tagout work procedures are in place shall be cited as other-than-serious.

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### APPENDIX B

This flow diagram does not constitute the exclusive or definitive means of complying with the standard in any particular situation and is presented solely as an aid.

EXAMPLE—FUNCTIONAL FLOW DIAGRAM FOR IMPLEMENTATION OF LOCKOUT / TAGOUT REQUIREMENTS



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### APPENDIX C

#### A. NORMAL PRODUCTION OPERATIONS

1. Safeguarding of servicing/maintenance workers can be ensured by:
  - a. Effective machine safeguarding in compliance with Subpart O [machine guarding requirements—see (A) (2)].
  - b. Compliance with 29 CFR 1910.147 (Lockout/Tagout) in situations where the normal production operation safeguards are rendered ineffective or do not protect the servicing/maintenance worker.
2. Routine and repetitive activities are not covered by this standard if alternative measures provide effective protection from the hazards associated with unexpected energizing. Compliance with the machine guarding requirements of Subpart O is an example of such alternative measures.
3. Examples of routine maintenance/servicing which can often be done under the protection of “production-mode safeguarding” are: lubricating, draining sumps, servicing of filters, and inspection for leaks and/or mechanical malfunction.  

Examples that are not considered to be normal routine maintenance functions and would therefore trigger the need for lockout/tagout are: replacement of machine or process equipment components such as valves, gauges, linkages, support structure, etc.
4. It is explained that some of the safeguarding alternatives presented in ANSI B11.19 can be used to provide protection while clearing minor jams and performing other minor servicing functions. The two safeguarding alternatives mentioned are interlocked barrier guards and presence sensing devices.

#### B. GROUP LOCKOUT/TAGOUT

Example procedures are given to illustrate the implementation of a group lockout/tagout procedure involving many energy isolating devices and/or many servicing/maintenance personnel. Several examples are given involving authorized employees who affix personal lockout/tagout devices in a group lockout/tagout setting.

##### 1. Definitions.

The following new definitions for group lockout/tagout are given:

- a. **Primary Authorized Employee** is the authorized employee who exercises overall responsibility for adherence to the company lockout/tagout procedure.
- b. **Principle Authorized Employee** is an authorized employee who oversees or leads a group of servicing/maintenance workers (e.g. plumbers, carpenters, electricians, metal workers, mechanics).
- c. **Job-Lock** is a device used to ensure the continuity of energy isolation during a multi-shift operation. It is placed upon a lock-box. A key to the job-lock is controlled by each assigned primary authorized employee from each shift.
- d. **Job-Tag with Tab** is a special tag for tagout of energy isolating devices during group lockout/tagout procedures. The tab of the tag is removed for insertion into the lock-box. The company procedure would require that the tagout job-tag cannot be removed until the tab is rejoined to it.

- e. **Master Lockbox** is the lockbox into which all keys and tabs from the lockout or tagout devices securing the machine or equipment are inserted and which would be secured by a “job-lock” during multi-shift operations.
- f. **Satellite Lockbox** is a secondary lockbox or lockboxes to which each authorized employee affixes his/her personal lock or tag.
- g. **Master Tag** is a document used as an administrative control and accountability device. This device is normally controlled by the operations department personnel and is a personal tagout device if each employee personally signs on and signs off on it, and if the tag clearly identifies each authorized employee who is being protected by it.
- h. **Work Permit** is a control document which authorizes specific tasks and procedures to be accomplished.

##### 2. Organization.

A sample “basic organizational structure” is outlined to explain the relationship between and responsibilities of the primary authorized employee, principal authorized employee, authorized employees, and equipment operators.

##### 3. Examples of Procedures for Group Lockout/Tagout.

Examples are presented for the various methods of lockout/tagout using lockbox procedures.

- a. Four procedures (Type A, Type B, Type C, Type D) address circumstances ranging from a small group of servicing/maintenance employees during a one-shift operation to a comprehensive operation involving many workers over a longer period. They are:
  - (1) **Type A.** Each authorized employee places his/ her personal lock or tag upon each energy isolating device and removes it upon departure from that assignment. Each authorized employee verifies or observes the deenergization of the equipment.
  - (2) **Type B.** Under a lockbox procedure, a lock or job-tag with tab is placed upon each energy isolation device after deenergization. The key(s) and removed tab(s) are then placed into a lockbox. Each authorized employee assigned to the job then affixes his/her personal lock or tag to the lockbox. As a member of a group, each assigned authorized employee verifies that all hazardous energy has been rendered safe. The lockout/tagout devices cannot be removed or the energy isolating device turned on until the appropriate key or tab is matched to its lock or tag.
  - (3) **Type C.** After each energy isolating device is locked/tagged out and the keys/tabs placed into a master lockbox, each servicing/maintenance group “principal” authorized employee places his/her personal lock or tag upon the master lockbox. Then each principal authorized employee inserts his/her key into a satellite lockbox to which each authorized employee in that specific group affixes his/ her personal lock or tag. As a member of a group, each assigned authorized employee verifies that all hazardous energy has been rendered safe. Only after the servicing/maintenance functions of the specific sub-group have been concluded and the personal locks or tags of the respective employees have been removed from the satellite lockbox can the principal authorized employee remove his/her lock from the master lockbox.

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(4) Type D. During operations to be conducted over more than one shift (or even many days or weeks), a system such as described here might be used. Single locks/tags are affixed upon a lockbox by each authorized employee as described at Type B or Type C above. The master lockbox is first secured with a job-lock before subsequent locks by the principal authorized employees are put in place on the master lockbox. The job-lock may have multiple keys if they are in the sole possession of the various primary authorized employees (one on each shift). As a member of a group, each assigned authorized employee verifies that all hazardous energy has been rendered safe. In this manner, the security provisions of the energy control system are maintained across shift changes while permitting reenergization of the equipment at any appropriate time or shift.

b. Normal group lockout/tagout procedures require the affixing of individual lockout/tagout devices by each authorized employee to a group lockout device, as discussed in paragraph B.3.a. of this appendix. However, in the servicing and maintenance of sophisticated and complex equipment, such as process equipment in petroleum refining, petroleum production, and chemical production, there may be a need for adaptation and modification of normal group lockout/tagout procedures in order to ensure the safety of the employees performing the servicing and maintenance. To provide greater worker safety through implementation of a more feasible system, and to accommodate the special constraints of the standard's requirement for ensuring employees a level of protection equivalent to that provided by the use of a personal lockout or tagout device, an alternative procedure may be implemented if the company documentation justifies it. Lockout/tagout, blanking, blocking, etc., is often supplemented in these situations by the use of work permits and a system of continuous worker accountability. In evaluating whether the equipment being serviced or maintained is so complex as to necessitate a departure from the normal group lockout/tagout procedures (discussed in paragraph B.3.a.), to the use of an alternative procedure, the following factors (often occurring simultaneously) are some of those which must be evaluated: physical size and extent of the equipment being serviced/maintained; the relative inaccessibility of the energy isolating devices; the number of employees performing the servicing/maintenance; the number of energy isolating devices to be locked/tagged out; and the interdependence and interrelationship of the components in the system or between different systems.

(1) "Once the equipment is shut down and the hazardous energy has been controlled, maintenance/servicing personnel, together with operations personnel, must verify that the isolation of the equipment is effective . . ."

(2) (Fifteen) specific issues related to the control of hazardous energy in complex process equipment are described . . . in a typical situation which could be found at any facility."

c. "It should be noted that the purpose of the lockout/tagout standard is to reduce the likelihood of worker injuries and fatalities during servicing/maintenance operations . . ."

### OTHER SERVICES OFFERED BY ROCKFORD SYSTEMS

#### OSHA 29 CFR 1910.147—LOCKOUT/TAGOUT REQUIREMENTS

According to OSHA 29 CFR 1910.147, The control of hazardous energy (lockout/tagout), all employers must develop a complete hazardous control program by January 2, 1990. To assist employers in accomplishing this, Rockford Systems covers this subject in our machine safeguarding seminar. Students are instructed on lockout/tagout procedures and taught the OSHA regulations for lockout/tagout.

This subject is taught through the use of classroom discussions, visual aids and handouts, including OSHA 29 CFR 1910.147, STD 1-7.3—Inspection Procedures and Interpretive Guidance for 29 CFR 1910.147—The Control of Hazardous Energy.



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