

HYDRAULIC PRESS/ PRESS BRAKE CONTROL SYSTEMS



"The Machine Safeguarding People"
ROCKFORD
SYSTEMS, INC.
www.rockfordsystems.com

4620 Hydraulic Road
Rockford, Illinois 61109-2695
Toll-Free 1-800-922-7533
Phone 815-874-7891 • Fax 815-874-6144
sales@rockfordsystems.com





HYDRAULIC SYSTEMS

Each hydraulic press or 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.

OSHA REGULATIONS

For hydraulic presses and press brakes, 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 or press brake 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 and press brake safety; however, most end-users rely on the ANSI (American National Standards Institute) B11.2 and ANSI B11.3 standards 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.

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 B11.2 and B11.3 standards require 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 PRESSES AND PRESS BRAKES

To update the electrical system or to add point-of-operation safeguarding to a hydraulic press or 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.

STANDARD HYDRAULIC CONTROL BOX



Standard Control Box



Standard Control Box—Inside View

This solid-state control system is designed for use on hydraulic power presses/press brakes. It is designed and built to comply with OSHA 29 CFR 1910.212 and ANSI B11.2, B11.3, and B11.19. This control can update or replace existing control systems on hydraulic presses/press brakes found in user's plants or can be furnished for new or rebuilt hydraulic presses/press brakes.

This control includes control reliability, two-hand control, light curtain interface, and diagnostics (four 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

hydraulic press/press brake control has minimum requirements to properly interface to an existing machine. These minimum requirements include a directional or one up and one down valve 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.

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.

Keypad/
Display



PROGRAMMING

The hydraulic control can be quickly and easily programmed. There are up to four 24-V DC PNP or NPN 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
- Two-hand automatic (continuous)—press
- Automatic single stroke*—press
- Sequence stop (hand/hand, hand/foot, foot/foot)—press brake

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

FEATURES

- Meets and exceeds OSHA 29 CFR 1910.212 and ANSI B11.2, 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) 120-V force-guided output relays
- Blocking valve monitoring
- Press control operates on 85-135 V AC
- 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
- Four (4) 24-V DC digital user inputs, programmable, selectable canned messages
- One (1) ram speed change (fast-slow) output, standard 120 V AC 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 V AC 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 CONTROL BOX

A custom control box contains the standard control module and components described on page 3 plus the following:

- main power disconnect switch
- main drive 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 6 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 7 to determine the proper custom control box part number. Follow directions 1-8 to determine the correct part number.



Remote Operator Station

Custom Plain Door Control Box

REMOTE OPERATOR-STYLE CONTROL BOXES

Remote operator-style X, Y, and Z hydraulic control boxes include the same features and modes of operation as the standard hydraulic control boxes. **However, they do not have a control transformer.** These control boxes are designed in a smaller enclosure so they can be conveniently 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 8" 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 (on a hydraulic press), a prior-action station—Part No. LLD-6100—is required. See page 8.



SUBPANEL

A subpanel control can also be furnished. It is the same as the standard control described on pages 3-4 without the enclosure. The minimum area required in an existing control enclosure is 22½" H x 22½" D x 8" W.

KEYPAD/DISPLAY KIT

Part No. LLD-6011 (for RHPC—Press Controls)

Part No. LLD-6025 (for RHPS—Press Brake 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, 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. LLD-6001
Remote Operator Station for
Hydraulic Press

REMOTE OPERATOR STATIONS FOR HYDRAULIC PRESSES

FEATURES	LLD-XXXX PART NO.							
	6000	6001	6002	6003	6004	6005	6006	6007
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/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

REMOTE OPERATOR STATIONS FOR HYDRAULIC PRESS BRAKES

FEATURES	LLD-XXXX PART NO.			
	6020	6021	6022	6023
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/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 RHP HYDRAULIC CONTROL

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

1. The first 3 digits for all RHP hydraulic controls are RHP.
2. The 4th digit determines the type of features the control offers.
3. The 5th digit determines the size of the disconnect switch, if provided, in the control enclosure. Zero (0) indicates no disconnect switch provided.
4. The 6th digit determines if a nonreversing motor starter is provided. Zeros (00) in both positions indicate no motor starter provided.
5. The 7th digit determines the size of nonreversing motor starter that is provided in the control enclosure. Zero (0) indicates no motor starter provided.
6. 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.
7. The 9th digit is for the type of light curtain interface provided.
8. 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	8			
R	H	P	-	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 Sick 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.

RHP HYDRAULIC CONTROL PART NUMBERING SYSTEM CHART																																																																							
<p style="text-align: center; color: red; margin: 0;">RHP X -X X X - X X X</p> <p style="margin: 0;">SYSTEM TYPE PRODUCT CATEGORY ↑</p> <p style="margin: 0;">RHP—Hydraulic Control</p> <p style="margin: 0; color: orange;">CONTROL FEATURES</p> <p style="margin: 0;">C—Control for Presses S—Control for Press Brakes</p> <p style="margin: 0; color: blue;">DISCONNECT SWITCH SIZE—IEC (PLUS MAXIMUM MAIN MOTOR FLA)</p> <p style="margin: 0;">0—No Disconnect Switch 1—30-A Disconnect— 1- to 17-FLA Main Drive Motor 2—60-A Disconnect— 18- to 34-FLA Main Drive Motor 3—100-A Disconnect— 35- to 57-FLA Main Drive Motor 4—200-A Disconnect— 58- to 114-FLA Main Drive Motor 5—400-A Disconnect— 115- to 228-FLA Main Drive Motor</p> <p style="margin: 0; color: green;">NONREVERSING MAIN MOTOR STARTER</p> <p style="margin: 0;">0—No Starter 1—Nonreversing Starter</p> <p style="margin: 0; color: green;">MAIN MOTOR STARTER SIZE</p> <table style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <tr> <td style="width: 15%;"></td> <td colspan="4" style="text-align: center;">Motor Horsepower Chart—3 Phase</td> </tr> <tr> <td style="width: 15%;"></td> <td style="text-align: center;">208 V</td> <td style="text-align: center;">230 V</td> <td style="text-align: center;">460 V</td> <td style="text-align: center;">575 V</td> </tr> <tr> <td style="width: 15%;">1—12 A</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> <td style="text-align: center;">5</td> <td style="text-align: center;">7.5</td> </tr> <tr> <td>2—18 A</td> <td style="text-align: center;">3</td> <td style="text-align: center;">3</td> <td style="text-align: center;">10</td> <td style="text-align: center;">10</td> </tr> <tr> <td>3—25 A</td> <td style="text-align: center;">5</td> <td style="text-align: center;">5</td> <td style="text-align: center;">15</td> <td style="text-align: center;">15</td> </tr> <tr> <td>4—32 A</td> <td style="text-align: center;">7.5</td> <td style="text-align: center;">10</td> <td style="text-align: center;">20</td> <td style="text-align: center;">20</td> </tr> <tr> <td>5—40 A</td> <td style="text-align: center;">10</td> <td style="text-align: center;">10</td> <td style="text-align: center;">25</td> <td style="text-align: center;">30</td> </tr> <tr> <td>6—50 A</td> <td style="text-align: center;">10</td> <td style="text-align: center;">15</td> <td style="text-align: center;">30</td> <td style="text-align: center;">40</td> </tr> <tr> <td>7—65 A</td> <td style="text-align: center;">15</td> <td style="text-align: center;">20</td> <td style="text-align: center;">40</td> <td style="text-align: center;">50</td> </tr> <tr> <td>8—80 A</td> <td style="text-align: center;">20</td> <td style="text-align: center;">25</td> <td style="text-align: center;">50</td> <td style="text-align: center;">60</td> </tr> <tr> <td>9—95 A</td> <td style="text-align: center;">25</td> <td style="text-align: center;">30</td> <td style="text-align: center;">60</td> <td style="text-align: center;">75</td> </tr> <tr> <td>A—115 A</td> <td style="text-align: center;">30</td> <td style="text-align: center;">40</td> <td style="text-align: center;">75</td> <td style="text-align: center;">100</td> </tr> <tr> <td>B—185 A</td> <td style="text-align: center;">50</td> <td style="text-align: center;">60</td> <td style="text-align: center;">125</td> <td style="text-align: center;">150</td> </tr> <tr> <td>C—265 A</td> <td style="text-align: center;">75</td> <td style="text-align: center;">75</td> <td style="text-align: center;">200</td> <td style="text-align: center;">200</td> </tr> </table>		Motor Horsepower Chart—3 Phase					208 V	230 V	460 V	575 V	1—12 A	2	3	5	7.5	2—18 A	3	3	10	10	3—25 A	5	5	15	15	4—32 A	7.5	10	20	20	5—40 A	10	10	25	30	6—50 A	10	15	30	40	7—65 A	15	20	40	50	8—80 A	20	25	50	60	9—95 A	25	30	60	75	A—115 A	30	40	75	100	B—185 A	50	60	125	150	C—265 A	75	75	200	200	<p style="margin: 0;">MODIFIER</p> <p style="margin: 0;">-- —Blank, No Modifier 5 —Motor Operators Remote</p> <p style="margin: 0; color: blue;">LIGHT CURTAIN INTERFACE OPTIONS</p> <p style="margin: 0;">C —Sick C4000 Advanced With LC Operators on Door V —Sick C4000 Advanced With LC Operators Remote W —Sick C4000 Standard</p> <p style="margin: 0; color: blue;">CONFIGURATION & OPERATOR LOCATION</p> <p style="margin: 0;">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, Prior Action, and Two (2) Guarded Run/Inch Buttons on the Enclosure</p>
	Motor Horsepower Chart—3 Phase																																																																						
	208 V	230 V	460 V	575 V																																																																			
1—12 A	2	3	5	7.5																																																																			
2—18 A	3	3	10	10																																																																			
3—25 A	5	5	15	15																																																																			
4—32 A	7.5	10	20	20																																																																			
5—40 A	10	10	25	30																																																																			
6—50 A	10	15	30	40																																																																			
7—65 A	15	20	40	50																																																																			
8—80 A	20	25	50	60																																																																			
9—95 A	25	30	60	75																																																																			
A—115 A	30	40	75	100																																																																			
B—185 A	50	60	125	150																																																																			
C—265 A	75	75	200	200																																																																			

HYDRAULIC CONTROL SYSTEMS INDIVIDUAL COMPONENTS

LINEAR CAM AND LIMIT SWITCH ASSEMBLY

Part No. CMT-048

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. CMT-049

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. CTL-525

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. CTL-525

FOOT SWITCH

Part No. CTD-011

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

PRIOR-ACTION STATION (HYDRAULIC PRESS ONLY)

Part No. LLD-6100

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. LLD-6101

Part No. LLD-283 (required when a USC-000 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. USC-000

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