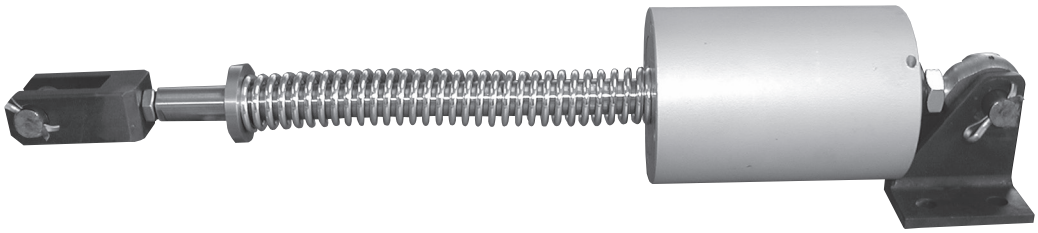
ROCKFORD
SYSTEMS, LLC

INSTALLATION MANUAL FOR
Air Cylinders



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

5795 Logistics Parkway • Rockford, Illinois 61109 • Toll-Free 1-800-922-7533 • Phone 815-874-7891
Fax 815-874-6144 • Web Site www.rockfordsystems.com • E-Mail customerservice@rockfordsystems.com
Manual No. KSL096

Safety Precautions

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Safety References

OSH ACT AND OSHA STANDARDS

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

1. General Duty Clause from the Occupational Safety and Health Act of 1970 (Public Law 91-596, 91st Congress, S. 2193, December 29, 1970):

DUTIES

SEC. 5. (a) Each employer—

(1) shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees;

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

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

2. OSHA standards that an employer (user) must comply with include:

29 CFR PART 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS

Subpart J—General Environmental Controls

1910.147 The Control of Hazardous Energy (Lockout Tagout)

Subpart O—Machinery and Machine Guarding

1910.212 General Requirements for All Machines
1910.217 Mechanical Power Presses
1910.219 Mechanical Power-Transmission Apparatus

Subpart S—Electrical

General

1910.301 Introduction

Design Safety Standards for Electrical Systems

1910.302 Electric Utilization Systems
1910.303 General Requirements
1910.304 Wiring Design and Protection
1910.305 Wiring Methods, Components, and Equipment for General use

Safety-Related Work Practices

1910.331 Scope
1910.332 Training
1910.333 Selection and Use of Work Practices
1910.334 Use of Equipment
1910.335 Safeguards for Personnel Protection

Note: This list of standards is only a partial listing. Visit www.osha.gov for a complete listing of OSHA standards.

The OSH Act and OSHA standards can be obtained on the OSHA Web site (www.osha.gov) or by contacting:

Superintendent of Documents
U.S. Government Printing Office
P.O. Box 371954
Pittsburgh, PA 15250-7954
Phone: (202) 512-1800
Fax: (202) 512-2250
www.gpo.gov

ANSI SAFETY STANDARDS FOR MACHINE TOOLS

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

B11.1 Mechanical Power Presses
B11.2 Hydraulic Power Presses
B11.3 Power Press Brakes
B11.4 Shears
B11.5 Iron Workers
B11.6 Manual Turning Machines (Lathes)
B11.7 Cold Headers and Cold Formers
B11.8 Drilling, Milling, and Boring Machines
B11.9 Grinding Machines
B11.10 Metal Sawing Machines
B11.11 Gear and Spline Cutting Machines
B11.12 Roll Forming and Roll Bending Machines
B11.13 Automatic Screw/Bar and Chucking Machines
B11.14 Coil Slitting Machines/Systems
B11.15 Pipe, Tube, and Shape Bending Machines
B11.16 Metal/Powder Compacting Presses
B11.17 Horizontal Hydraulic Extrusion Presses
B11.18 Coil Processing Systems
B11.19 Performance Criteria for Safeguarding
B11.20 Manufacturing Systems/Cells
B11.21 Lasers
B11.22 Turning Centers and CNC Turning Machines
B11.23 Machining Centers and CNC Milling, Drilling, and Boring Machines
B11.24 Transfer Machines
B11.TR1 Ergonomic Guidelines
B11.TR2 Mist Control Considerations
B11.TR3 Risk Assessment and Risk Reduction
B11.TR4 Selection of Programmable Electronic Systems (PES/PLC)

(Continued on next page.)

ANSI SAFETY STANDARDS FOR MACHINE TOOLS (CONTINUED)

The ANSI safety standards on page 3 can be purchased by contacting:

AMT—The Association for Manufacturing Technology
7901 Westpark Drive
McLean, Virginia 22102
Phone: (703) 893-2900
Toll-Free: 1-800-524-0475
Fax: (703) 893-1151
E-Mail: AMT@amtonline.org
www.amtonline.org

NFPA ELECTRICAL SAFETY STANDARDS

The most complete electrical safety standards are published by NFPA (National Fire Protection Association). The following is a list of relevant electrical safety standards:

NFPA 70 National Electrical Code

NFPA 70B Recommended Practice for Electrical Equipment Maintenance

NFPA 70E Standard for Electrical Safety in the Workplace

NFPA 79 Electrical Standard for Industrial Machinery NFPA electrical safety standards can be purchased by contacting:

NFPA (National Fire Protection Association)
1 Batterymarch Park
Quincy, MA 02269-9101
Phone: (617) 770-3000
Fax: (617) 770-0700
www.nfpa.org

NATIONAL SAFETY COUNCIL SAFETY MANUALS

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

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

These manuals and can be obtained by contacting:

National Safety Council
1121 Spring Lake Drive
Itasca, IL 60143-3201
1-800-621-7619, Ext. 2199
Fax: (630) 285-0797
www.nsc.org

OTHER SAFETY SOURCES

NIOSH (National Institute of Occupational Safety and Health)
4676 Columbia Parkway
Cincinnati, OH 45226
Toll-Free: 1-800-35-NIOSH (1-800-356-4674)
Phone: (513) 533-8328
Fax: (513) 533-8573
www.cdc.gov/niosh

NEMA (National Electrical Manufacturers Association)
1300 North 17th Street, Suite 1847
Rosslyn, VA 22209
Phone: (703) 841-3200
Fax: (703) 841-5900
www.nema.org

RIA (Robotic Industries Association)
900 Victors Way, Suite 140
P.O. Box 3724
Ann Arbor, MI 48106
Phone: (734) 994-6088
Fax: (734) 994-3338
www.roboticsonline.com

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

Warranty

9. Limited Warranties.

9.1. (i) Subject to Section 8.1(ii) below, Rockford Systems makes to Customer the following sole and exclusive warranties with respect to Goods:

(a) with respect to Goods that are manufactured based on Customer specifications, at the time of shipment by Rockford Systems, the Goods sold under the Agreement that are manufactured by Rockford Systems pursuant to such specifications conform to such specifications set forth in the applicable Order Documentation; and

(b) at the time of shipment by Rockford Systems, the Goods sold under the Agreement that are manufactured by Rockford Systems are free from defects in material and workmanship.

(c) Rockford Systems's warranty is for a period of 1 year, and begins from date of shipment from Rockford Systems to the original purchaser.

This warranty does not include accessories, parts or equipment sold hereunder that are manufactured by someone other than Rockford Systems.

(ii) Every claim by Customer against Rockford Systems for breach of warranty with respect to the Goods shall be deemed waived by Customer unless written notice thereof is received by Rockford Systems within fifteen (15) days after discovery.

9.2. If Rockford Systems breaches either of the warranties set forth in Section 8.1(i) above, and written notice thereof is received by Rockford Systems from Customer within the applicable time period specified in Section 8.1(ii) above, Customer's sole and exclusive remedy and Rockford Systems's only obligation shall be, as Rockford Systems in its sole and exclusive judgment shall determine, the replacement of the nonconforming Goods, or an adjustment to the purchase price for the nonconforming Goods or the repair of the nonconforming Goods. All transportation charges related to replacement or repair of Goods shipped to Rockford Systems's plant or facility (or other place at Rockford Systems's direction) shall be prepaid by Customer. Rockford Systems shall be responsible for reasonable transportation charges back to Customer for Goods that have been replaced or repaired by Rockford Systems. Any replacement Goods or repaired Goods shall be subject to these Terms and Conditions.

9.3. THE EXPRESS WARRANTIES SET FORTH HEREIN ARE THE ONLY WARRANTIES APPLICABLE TO THE SALE OF GOODS BY ROCKFORD SYSTEMS TO CUSTOMER PURSUANT TO THE AGREEMENT, AND THEY EXCLUDE ALL OTHER EXPRESS, ORAL OR WRITTEN WARRANTIES, AS WELL AS ANY WARRANTIES IMPLIED BY LAW WITH RESPECT TO THE GOODS, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PURPOSE, NOTWITHSTANDING ANY DISCLOSURE TO ROCKFORD SYSTEMS OF THE INTENDED USE OF THE GOODS.

9.4. Rockford Systems's warranties under Section 8.1(i) are void if repairs or modifications of the Goods are made by anyone other than Rockford Systems. Without limitation of the foregoing, Rockford Systems assumes no responsibility for and shall have no obligations to Customer because defects in any materials furnished by, or any faulty workmanship provided by, any party other than Rockford Systems.

9.5. Rockford Systems reserves the right to improve its products through changes in design or material without being obligated to incorporate such changes into products of prior manufacture. Customer cannot rely on any such changes as proof of insufficiency or inadequacy of prior designs of the Goods or material contained in the Goods.

9.6. If Customer grants to an end user of the Goods (or any other customer of Customer) any warranty that is greater in scope or time than the warranty and claims period stated herein, Rockford Systems shall not be liable beyond the scope of the limited warranty, the claim period, the damages and the remedies provided for under this Section.

9.7. Solely to the extent transferable, Rockford Systems assigns and transfers to Customer the original manufacturer's warranty on Goods sold hereunder that are not manufactured by Rockford Systems.

RCL Series Air Cylinders

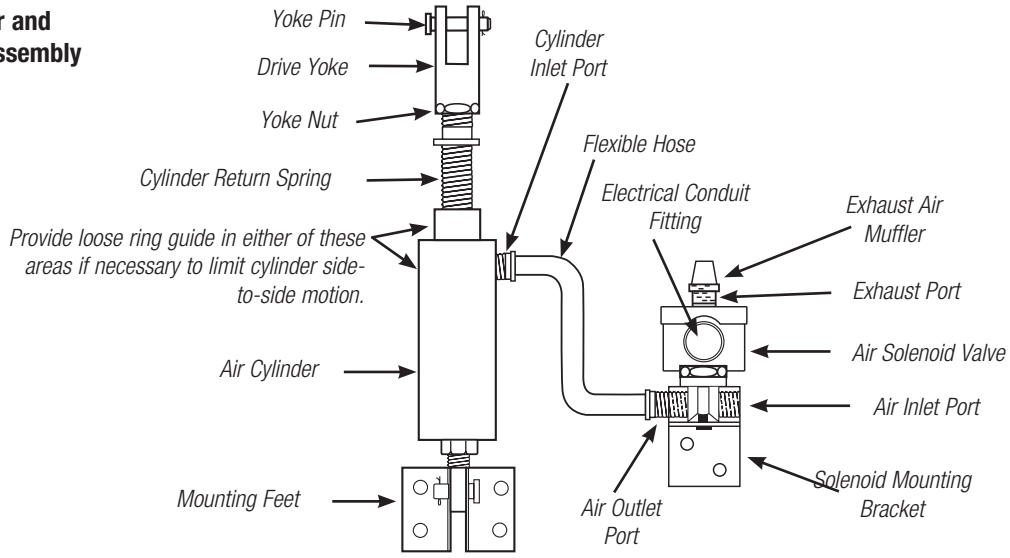
Please read this entire manual before installing any cylinder.

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

The assembly consists of the cylinder, two mounting feet, a mounting pin, drive yoke, drive pin, and a yoke lock nut. This assembly is illustrated in Figure 2.1. Locate this assembly on the machine so that the feet can be mounted to a convenient surface. The yoke should be attached to the machine linkage, and the air inlet should be oriented toward the air solenoid valve location.

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

Figure 2.1
Air Cylinder and Solenoid Assembly



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

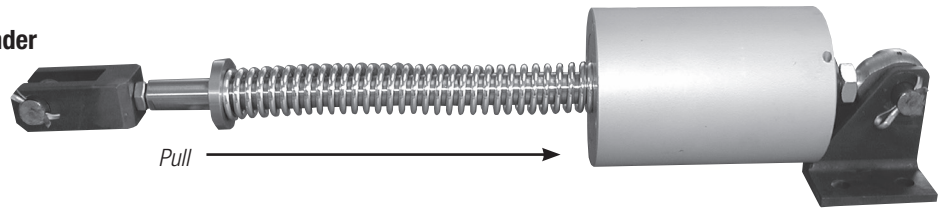
Note: Threaded air joints do not generally require sealant; however, Teflon tape may be used to prevent leakage.

The clutch operating rod must now be linked to the air cylinder by some convenient means. One easy method is to establish an approximate cylinder location, then cut the existing operating rod to a length that will allow the forming of a loop at the end. Heat this end and form a loop suitable to receive the yoke pin. Next, assemble the yoke and operating rod and establish the final mounting feet location. Final adjustments may be made using the threaded portion of this piston rod, yoke, and lock nut. Tighten the lock nut securely after final adjustment.

(Continued on next page.)

The existing clutch mechanism must contain adequate returning means for the operating rod. The return spring on the air cylinder is intended to return the piston rod of the cylinder. The air cylinder return spring is not intended to be applied as the only returning means.

Photo 2.1
Standard Air Cylinder



Standard Pull Type

Part No.	RCL001	RCL002	RCL003	RCL004	RCL005
PRESS SIZE (Tons)	¼ to 7	8 to 35	36 to 70	71 to 125	126 to 200
Size (Bore x Stroke)	1⅛" X 1"	1½" X 1"	2" x 2"	2½" x 2"	3" x 2"
PULL FORCE (@ 75 PSI)	50 lb	100 lb	200 lb	300 lb	500 lb
Repair Kit* Part No.		RCF098	RCF099		RCF100

*Repair kits consist of new piston seals and new cap seals.

Standard Push Type

Part No.	RCL022	RCL023	RCL024	RCL025
PRESS SIZE (Tons)	8 to 35	36 to 70	71 to 125	126 to 200
Size (Bore x Stroke)	1½" X 1"	2" x 2"	2½" x 2"	3" x 2"
PULL FORCE (@ 75 PSI)	100 lb	200 lb	300 lb	500 lb

Other Air Cylinders

In most cases, the tie-rod-constructed air cylinders on the next page can be furnished in place of the standard RCL-series cylinders explained previously. These cylinders are furnished when the standard cylinder is not large enough or if a more durable cylinder is needed to engage and disengage the mechanical-friction clutch and brake of press brakes or when the standard clevis mount offered (Type A) 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.

Photo 2.2
Clevis-Mount Tie-Rod Cylinder

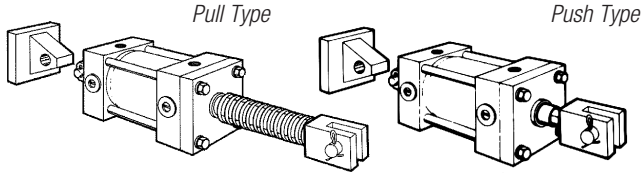
When applying an air cylinder to the machine, make sure the alignment (with the machine linkage) is a straight line. Also make sure that the cylinder rod, yoke, or any moving parts will not bind after installation. Be sure the rod stroke is not too long because it could cause jackknifing of the cylinder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

(Continued on next page.)

TYPE A

CLEVIS MOUNT

The clevis-mount air cylinder is usually mounted in the vertical position on the side of the machine.



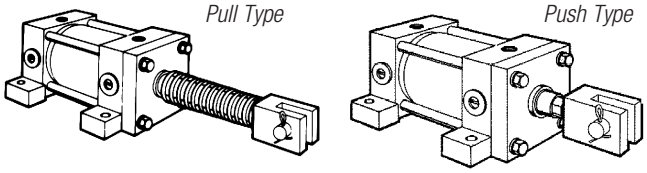
TYPE A—Clevis Mount

Part No.	Bore	Stroke	Approx. Overall Length	Return Spring Pressure	Amount of Pull or Push Force at 75 PSI
PULL TYPE					
RCK526	2"	2"	23"	60	100
RCK527	2"	3"	25"	40	100
RCK528	2"	4"	27"	20	100
RCK529	3"	2"	26"	120	295
RCK530	3"	3"	28"	80	295
RCK531	3"	4"	30"	40	295
RCK532	4"	2"	30½"	270	460
RCK533	4"	3"	32½"	195	460
RCK534	4"	4"	34½"	120	460
PUSH TYPE					
RCK535	2"	2"	17"	60	135
RCK536	2"	3"	18"	40	135
RCK537	2"	4"	19"	20	135
RCK538	3"	2"	22"	120	330
RCK539	3"	3"	23"	82	330
RCK540	3"	4"	24"	40	330
RCK541	4"	2"	21½"	270	520
RCK542	4"	3"	22½"	195	520
RCK543	4"	4"	23½"	120	520

TYPE B

SIDE-FOOT MOUNT

The side-foot-mount air cylinder can be mounted vertically, horizontally, or any angle depending upon application. Side-foot-mount air cylinders are usually mounted in the vertical position on the side of the machine.



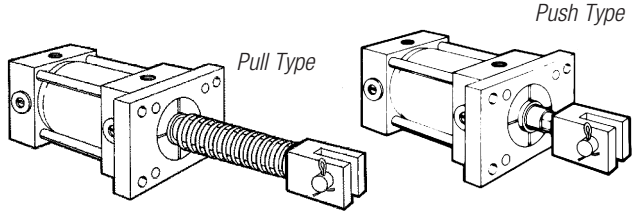
TYPE B—Side-Foot Mount

Part No.	Bore	Stroke	Approx. Overall Length	Return Spring Pressure	Amount of Pull or Push Force at 75 PSI
PULL TYPE					
RCK544	2"	2"	21½"	60	100
RCK545	2"	3"	23½"	40	100
RCK546	2"	4"	25½"	20	100
RCK547	3"	2"	20½"	120	295
RCK548	3"	3"	22½"	80	295
RCK549	3"	4"	24½"	40	295
RCK550	4"	2"	28"	270	460
RCK551	4"	3"	30"	195	460
RCK552	4"	4"	32"	120	460
PUSH TYPE					
RCK553	2"	2"	15"	60	135
RCK554	2"	3"	16"	40	135
RCK555	2"	4"	17"	20	135
RCK556	3"	2"	20"	120	330
RCK557	3"	3"	21"	82	330
RCK558	3"	4"	22"	40	330
RCK559	4"	2"	17½"	270	520
RCK560	4"	3"	18½"	195	520
RCK561	4"	4"	19½"	120	520
RCK590	4"	5"	20½"	120	520

TYPE C

FRONT-FLANGE MOUNT

The front-flange-mount air cylinder is usually installed in situations where the cylinder rod needs to go through the frame of the press brake. Rear-flange mount and rod extensions at both ends are available. Front-flange-mount cylinders are usually mounted through the frame.



TYPE C—Front-Flange Mount

Part No.	Bore	Stroke	Approx. Overall Length	Return Spring Pressure	Amount of Pull or Push Force at 75 PSI
PULL TYPE					
RCK562	2"	2"	21"	60	100
RCK563	2"	3"	23"	40	100
RCK564	2"	4"	25"	20	100
RCK565	3"	2"	23"	120	295
RCK566	3"	3"	25"	80	295
RCK567	3"	4"	27"	40	295
RCK568	4"	2"	28"	270	460
RCK569	4"	3"	30"	195	460
RCK570	4"	4"	32"	120	460
PUSH TYPE					
RCK571	2"	2"	16"	60	135
RCK572	2"	3"	17"	40	135
RCK573	2"	4"	18"	20	135
RCK574	3"	2"	21"	120	330
RCK575	3"	3"	22"	80	330
RCK576	3"	4"	23"	40	330
RCK577	4"	2"	22¼"	270	520
RCK578	4"	3"	23¼"	195	520
RCK579	4"	4"	24¼"	120	520

(...)

Double-Acting Air Cylinders (Part Nos. RCK508 and RCK514)

These double-acting air cylinders are inserted in the clutch operating linkage. This linkage is usually located in the vertical position on the left side of a press brake. All existing compression spring return must remain on the linkage.

DOUBLE-ACTING AIR CYLINDER SPECIFICATIONS

Cylinder Part No.	Bore	Stroke	A		B		Body		Clevis			Approx. Lb Pull (@ 75 PSI)
			Min	Max	Min	Max	C	D	E	F	G	
RCK508	3"	3"	16.5"	19.5"	15.5"	18.5"	9.5"	3.25".50"	1"	1"	500	
RCK514	4"	3"	16.5"	19.5"	15.5"	18.5"	9.75"	4.25".50"	1"	1"	800	

Figure 2.2

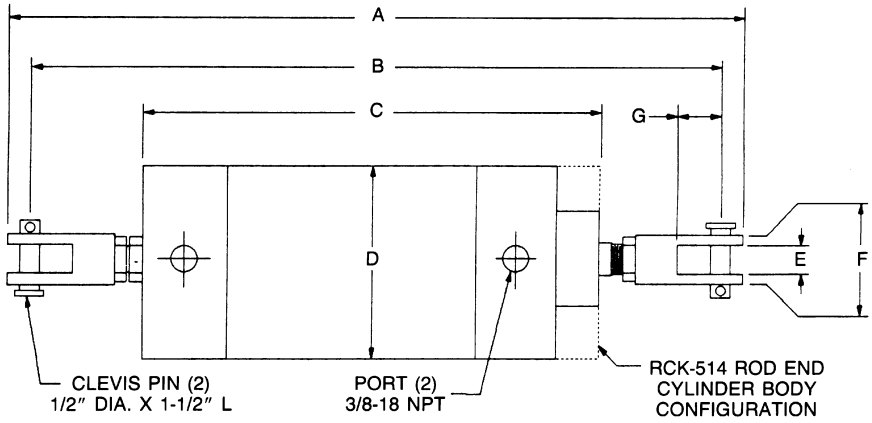
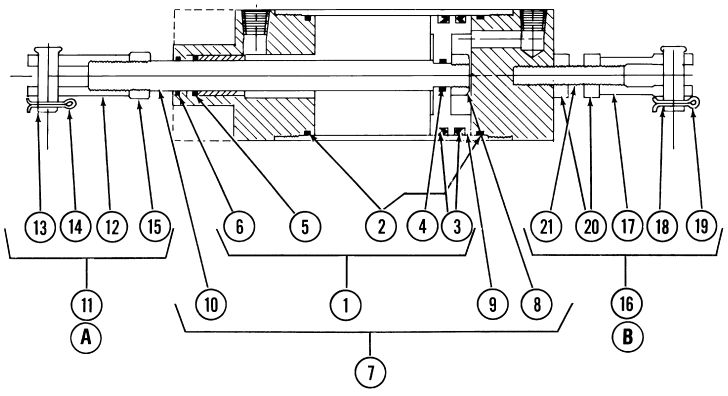


Figure 2.3



REPLACEMENT KITS

ITEM NO.	DESCRIPTION	RCK508	RCK514
1	**Seal Kit:**		
2	Tube Seal (2)		
3	Piston Seal (2)	RCF004	RCF005
4	Static Piston Seal		
5	Rod Seal		
6	Rod Wiper		
7	**Rod/Piston Kit:**		
8	Flex Lock Nut		
9	Piston	RCF154	RCF155
1	Seal Kit		
10	Rod		
11	**Mtg. Hardware Kit A:**		
12	Rod Clevis		
13	Clevis Pin		
14	Cotter Pin	RCF114	RCF115
15	Jam Nut		
16	**Mtg. Hardware Kit B:**		
17	Rod Clevis		
18	Clevis Pin		
19	Cotter Pin		
20	Jam Nut (2)	RCF116	RCF117
21	Threaded Rod		