

HH Series with Hydraulic Rod Lock 1.50" to 8.00" Bore



Operating Principal

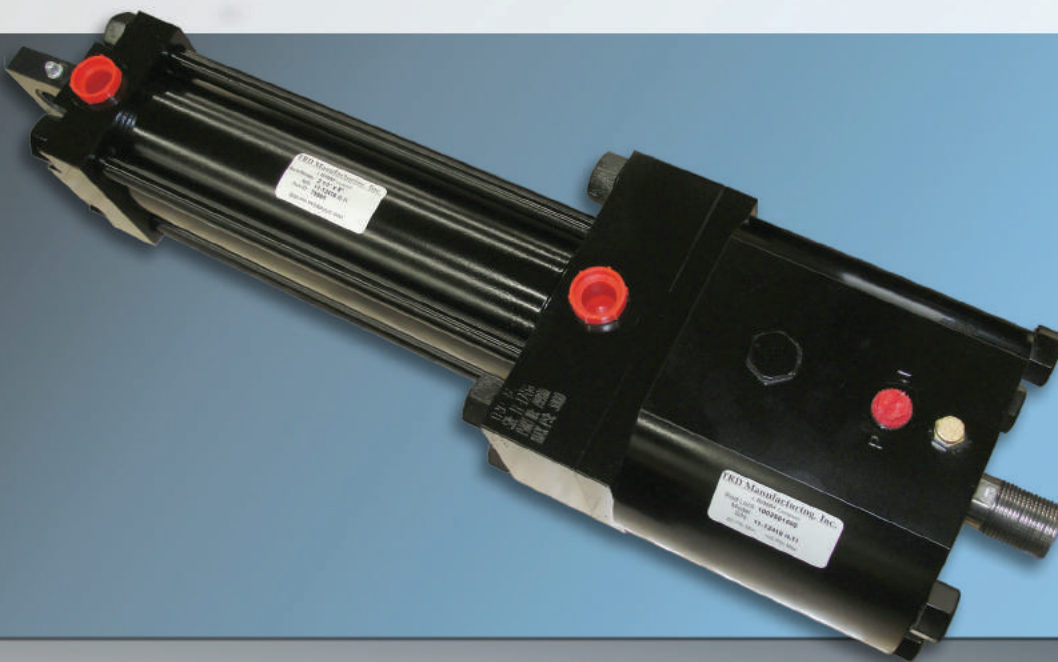
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**95% OF OUR CYLINDERS SHIP IN 2-3 DAYS!
ONE DAY RUSH SERVICE AVAILABLE ON ALL CATALOGED CYLINDER MODELS!**

SERIES 'HH' WITH HYDRAULIC ROD LOCK

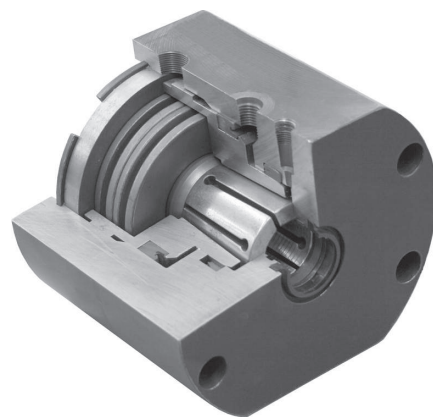
The TRD difference...

TRD's floating rod bushing design and 'RL' Series Rod Lock = OPTIMIZED RESULTS and SUPERIOR PERFORMANCE.

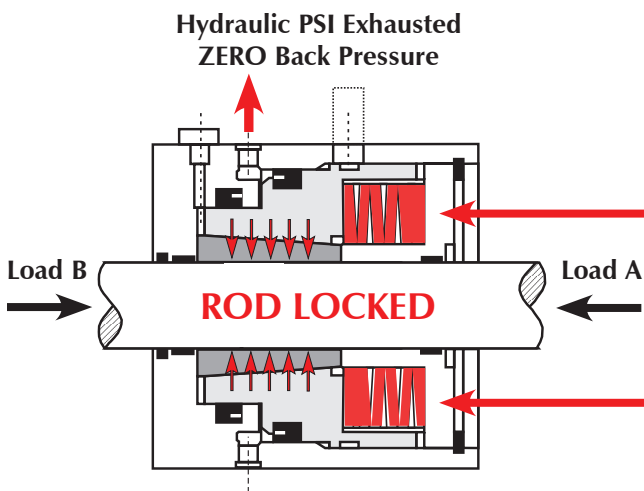
For rod locks to achieve the rated holding force and maximize cycle life, good alignment must be maintained between the locking mechanism and cylinder rod. Superior performance and trouble-free operation are assured with TRD's floating rod bushing design and accurate rod lock alignment.

Rod locks are used to hold linear cylinder loads stationary in any mounting orientation during power off condition. Units will lock in both directions to rated holding force. They are not designed to withstand rotational loads or to brake the load in dynamic applications. TRD offers each rod lock model in three different holding forces, depending on available release pressure.

Refer to page 42 for minimum release pressure and corresponding holding force.

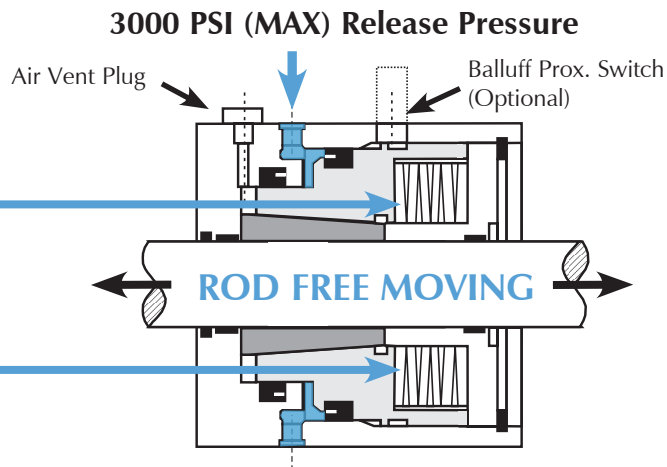


OPERATING PRINCIPAL



CLAMPING (LOCKED) CONDITION:

When hydraulic pressure is exhausted from rod lock, extreme spring force is applied to the piston/outer lock housing. This utilizes an ultra-fine tapered wedge, transferring the spring force directly to the rod. Clamping action does not move or disturb the rod, maintaining rod position during actuation.



UN-CLAMPED CONDITION:

When hydraulic pressure is applied to rod lock, the hydraulic pressure overcomes the spring force, moving piston outer locking housing. This movement provides clearance between the rod lock and piston rod, which allows free rod movement.

OPERATING PRESSURE

Cylinder	Refer to Cylinder Mount Rating
Rod Lock (Low PSI)	750 to 3000 PSI HYD.
Rod Lock (Med PSI)	1000 to 3000 PSI HYD.
Rod Lock (High PSI)	1500 to 3000 PSI HYD.

AXIAL MOVEMENT (CLAMPED)*

Load Direction A	.000"
Load Direction B	.012" Max

*Represents clearance within the rod lock unit, .000" movement due to actuation.

OPERATING TEMPERATURE

Standard Seals	-20°F to 200°F (-29°C to 93°C)
Fluorocarbon Seals	0°F to 400°F (-18°C to 204°C)

ROD MATERIAL REQUIREMENTS

Diameter	+.000" to -.002" Nominal Diameter
Hardened Shaft	.0005" Minimum hard chrome
Finish	6 to 10 micro-inch

CLAMP SPECIFICATIONS

Response Time	100 ms (clamp); 100 ms (un-clamp)
Average Life	1,000,000 Clamp Cycles

HOW TO ORDER: SERIES 'HH' WITH ROD LOCK

HH - - 250 x 10 - H2C6 - 100 - KK1 - P15 = N375 - S S S S -

NFPA MOUNT (TO MOUNT CYLINDER)	
ME6	CAP RECTANGULAR MOUNTING HOLES (1.50" to 8.00" Bore)*
MF2	CAP RECTANGULAR FLANGE (1.50" to 8.00" Bore)*
MF6	SQUARE FLANGE, CAP END (1.50" to 8.00" Bore)*
MP1	FIXED CAP PIVOT CLEVIS (1.50" to 8.00" Bore)*
MS4	BOTTOM TAPPED HOLES (1.50" to 8.00" Bore)
MT2	CAP TRUNNION (1.50" to 8.00" Bore)
MT4	INTERMEDIATE (CENTER) TRUNNION (1.50" to 8.00" Bore)*
MX2	EXTENDED TIE RODS - CAP (1.50" to 8.00" Bore)

* HEAD END SPACER THICKNESS CAN VARY AND WILL ADD LENGTH TO CYLINDER

OPTIONS	
RLH	ROD LOCK READY CYLINDER NO ROD LOCK INSTALLED
RLH-MODEL NUMBER	CYLINDER WITH INSTALLED ROD LOCK EXAMPLE: RLH-100250750

Rod Lock Model Numbers

RLH- 100 250 750

ROD SIZE	BORE	RELEASE PSI	OPTIONS	
062	150	750	P	Proximity Switch Ready
100	150	1000	V	Fluorocarbon Seals
	200	1500		
	250			
137	200		X	Special (Specify)
	250			
	325			
175	250			
	325			
	400			
200	325			
	500			
	600			
250	600			
300	600			
300	700			
350	800			
400	800			

Replacement rod locks can be ordered using the same methodology.

Examples:

RLH-1374001500

RLH-100250750P

See page 7 for additional cylinder how-to-order information.

Consult factory for additional mounts.

TECHNICAL DATA: ROD LOCKS

ROD DIA.	BORE	MODEL NUMBER	① MIN RELEASE PSI	② MAX HOLDING FORCE	VOLUME OF OIL		WEIGHT (LBS)
					CM ³	IN ³	
0.625	1.50	RLH-625150750	750	1,100	6	0.4	11.5
		RLH-6251501000	1000	1,800			
		RLH-6251501500	1500	2,250			
1.000	1.50	RLH-100150750	750	1,200	6	0.4	10.5
		RLH-1001501000	1000	2,000			
		RLH-1001501500	1500	2,300			
1.000	2.00	RLH-100200750	750	2,900	16	1.0	20.8
		RLH-1002001000	1000	5,200			
		RLH-1002001500	1500	5,600			
1.000	2.50	RLH-100250750	750	2,900	16	1.0	31.0
		RLH-1002501000	1000	5,200			
		RLH-1002501500	1500	6,000			
1.375	2.00	RLH-137200750	750	2,700	10	0.6	20.0
		RLH-1372001000	1000	2,700			
		RLH-1372001500	1500	5,200			
1.375	2.50	RLH-137250750	750	2,700	16	1.0	30.2
		RLH-1372501000	1000	5,200			
		RLH-1372501500	1500	6,000			
1.375	3.25	RLH-137325750	750	8,200	30	1.8	66.0
		RLH-1373251000	1000	11,500			
		RLH-1373251500	1500	16,000			
1.750	2.50	RLH-175250750	750	3,500	16	1.0	29.5
		RLH-1752501200	1200	5,200			
		RLH-1752502000	2000	7,500			
1.750	3.25	RLH-175325750	750	8,200	30	1.8	65.1
		RLH-1753251000	1000	11,500			
		RLH-1753251500	1500	16,000			

ROD DIA.	BORE	MODEL NUMBER	① MIN RELEASE PSI	② MAX HOLDING FORCE	VOLUME OF OIL		WEIGHT (LBS)
					CM ³	IN ³	
1.750	4.00	RLH-175400750	750	8,200	39	2.4	75.5
		RLH-1754001000	1000	12,000			
		RLH-1754001500	1500	17,000			
2.000	3.25	RLH-200325750	750	8,200	39	2.4	64.0
		RLH-2003251000	1000	11,500			
		RLH-2003251500	1500	16,000			
2.000	5.00	RLH-200500750	750	8,200	39	2.4	114.0
		RLH-2005001000	1000	12,000			
		RLH-2005001500	1500	17,000			
2.500	6.00	RLH-250600750	750	30,000	129	7.9	270.0
		RLH-2506001000	1000	36,000			
		RLH-2506001500	1500	50,000			
3.000	6.00	RLH-300600750	750	17,000	129	7.9	260.0
		RLH-3006001000	1000	22,500			
3.000	7.00	RLH-300700750	750	30,000	144	8.8	380.0
		RLH-3007001000	1000	36,000			
		RLH-3007001500	1500	50,000			
3.500	8.00	RLH-350800750	750	40,000	181	11.0	550.0
		RLH-3508001000	1000	55,000			
		RLH-3508001500	1500	80,000			
4.000	8.00	RLH-400800750	750	40,000	230	14.0	530.0
		RLH-4008001000	1000	55,000			
		RLH-4008001500	1500	80,000			

① Maximum hydraulic release pressure: 3000 PSI.

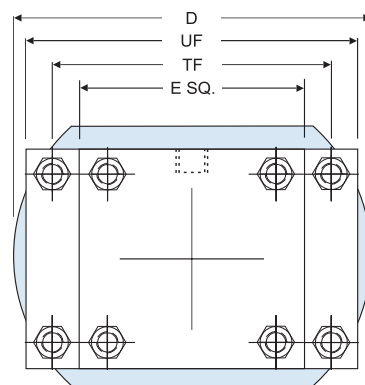
② Holding forces are based on dry or mineral-oil lubricated shafts.

SERIES 'HH' WITH ROD LOCK: BASIC CYLINDER (No Mount)

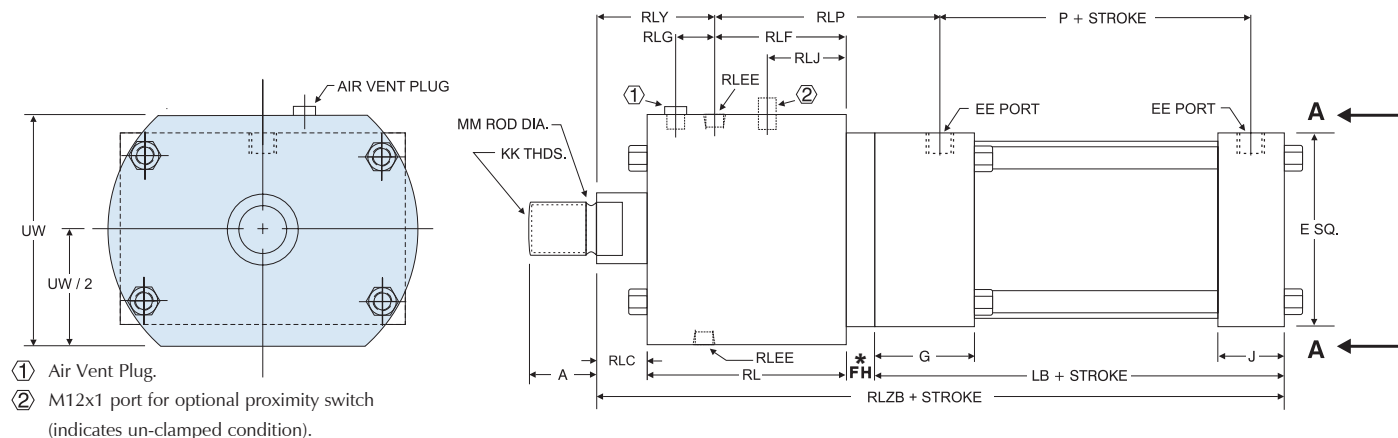
To be able to handle the high holding forces, the rod lock cylinder uses a full rectangle cylinder head and full rectangle bushing retainer plate to attach the rod lock unit to the cylinder.

Customers need to specify an additional NFPA mount to use the cylinder in any application.

Refer to pages 8 through 26 for basic cylinder dimensions not shown.



VIEW AA



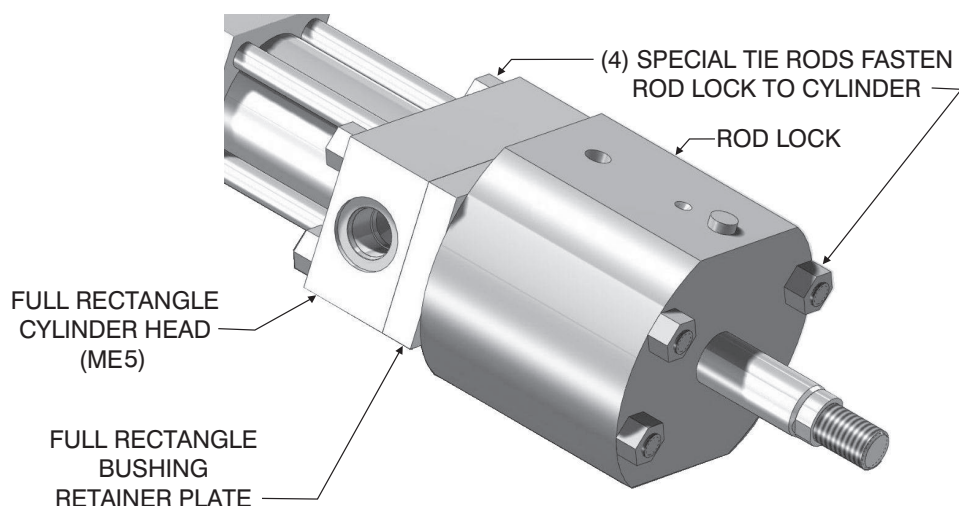
ROD DIA. (MM)	BORE	D	E	FH*	TF	UF	UW	RL	RLC	RLEE	RLF	RLG	RLJ	RLP	RLY	ADD TO STROKE	
																RLZB	
0.625	1.50	4.370	2.500	0.375	3.438	4.250	3.250	3.547	0.375	SAE 4	2.125	0.750	0.790	3.500	1.740	8.930	
1.000	1.50	4.370	2.500	0.375	3.438	4.250	3.500	3.453	0.500	SAE 4	1.875	0.870	0.790	3.250	2.010	8.947	
1.000	2.00	5.375	3.000	0.625	4.125	5.125	4.500	4.375	0.500	SAE 4	2.900	0.850	1.000	4.531	1.910	10.120	
1.000	2.50	5.984	3.500	0.625	4.625	5.625	5.000	5.125	0.500	SAE 4	3.480	1.000	1.500	5.031	2.160	11.000	
1.375	2.00	5.370	3.000	0.625	4.125	5.125	4.500	4.650	0.625	SAE 4	3.000	1.000	1.500	4.625	2.210	10.531	
1.375	2.50	5.984	3.500	0.625	4.625	5.625	5.000	5.125	0.625	SAE 4	3.500	0.900	1.500	5.031	2.280	11.120	
1.375	3.25	7.750	4.500	0.750	5.875	7.125	6.500	6.500	0.625	SAE 4	4.500	1.100	2.600	6.375	2.625	13.375	
1.750	2.50	5.984	3.500	0.625	4.625	5.625	5.000	5.900	0.750	SAE 4	3.900	0.960	2.438	5.531	2.700	12.040	
1.750	3.25	7.750	4.500	0.750	5.875	7.125	6.500	6.500	0.750	SAE 4	4.672	0.930	2.600	6.547	2.580	13.500	
1.750	4.00	8.375	5.000	0.875	6.375	7.625	7.000	6.500	0.750	SAE 4	4.375	1.230	2.200	6.313	2.810	13.875	
2.000	3.25	7.750	4.500	0.750	5.875	7.125	6.500	6.500	0.875	SAE 4	4.438	1.160	2.600	6.313	2.938	13.625	
2.000	5.00	11.250	6.500	0.875	8.188	9.750	7.000	6.500	0.875	SAE 4	4.375	1.230	2.200	6.375	3.000	14.500	
2.500	6.00	12.750	7.500	1.000	9.438	11.250	10.000	9.000	1.000	SAE 8	6.625	1.125	3.000	8.750	3.375	18.375	
3.000	6.00	12.750	7.500	1.000	9.438	11.250	10.000	9.000	1.000	SAE 8	4.875	1.100	3.110	7.000	5.125	18.375	
3.000	7.00	14.750	8.500	1.000	10.625	12.625	13.000	10.000	1.000	SAE 8	7.325	1.375	4.730	9.825	3.675	20.500	
3.500	8.00	16.140	9.500	1.000	11.813	14.000	14.000	11.500	1.000	SAE 10	8.938	1.320	5.350	11.625	3.563	23.000	
4.000	8.00	16.140	9.500	1.000	11.813	14.000	14.000	11.500	1.000	SAE 10	8.875	1.370	5.350	11.563	3.625	23.000	

*May vary per mount, consult factory for details.

SERIES 'HH' WITH ROD LOCK: BASIC CYLINDER (No Mount)

General Construction

TRD 'HH' Series hydraulic cylinders are designed to be stand alone units so they can be fully serviced without the rod lock installed. Hydraulic rod locks are aligned and bolted to the cylinders using (4) special tie rods and hex nuts. This design allows for both the cylinder and the rod lock to maintain full serviceability once in use.

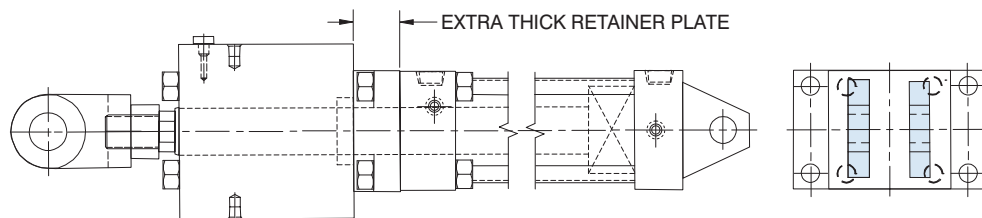
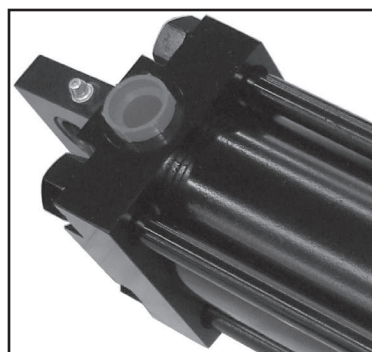


CYLINDER DESIGN AND AVAILABLE MOUNTS

A full rectangle cylinder head mount is used exclusively to attach the rod lock to the cylinder. An additional mount must be specified to be able to use the cylinder.

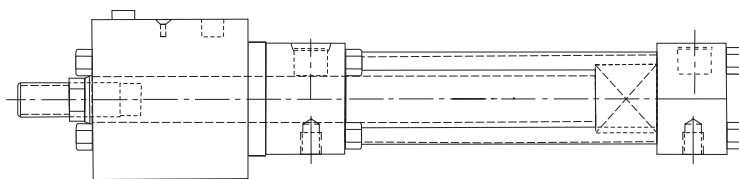
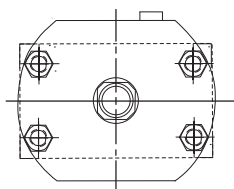
The cylinder design can vary depending on the bore size, tie rod hex nut location and desired mount. **Note: some designs will increase cylinder overall length.**

SB mount with special recessed hex nuts at cap



MP1 mount with special, extra thick bushing retainer plate and recessed tie rod hex nuts at head.

MS4 mount with standard hex nuts at cap.



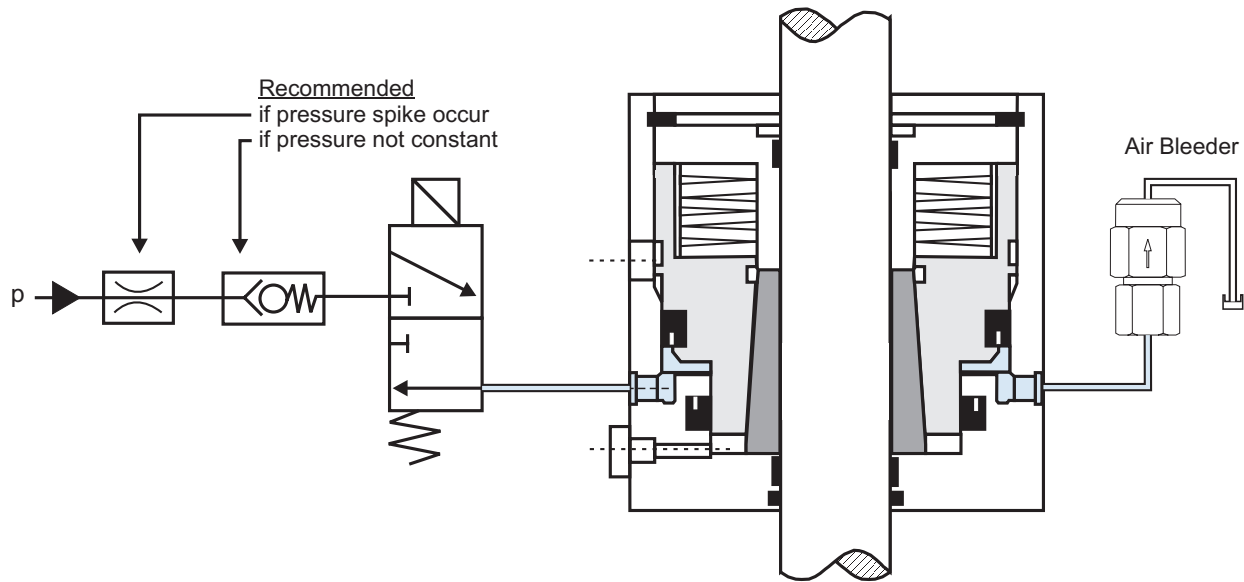
Contact your local distributor with the basic cylinder bore, stroke and desired NFPA mount information and TRD will configure a cylinder with rod lock to meet your specifications!

ROD LOCK HYDRAULIC CIRCUIT AND AUTOMATIC AIR BLEED VALVE

In most applications, the sample circuit in Figure 1 is used to actuate the rod lock. To release (un-clamp) the rod lock, the three-way valve is energized, supplying pressure to the rod lock. In power failure modes, E-Stop, loss of hydraulic pressure, etc., pressure is removed from the rod lock; spring energized rod lock clamps the rod holding it in place.

Avoid designs where the piston rod is moved while rod lock is actuated (clamped condition); piston rod and rod lock damage may occur. Do not exceed the maximum holding force of the rod lock unit.

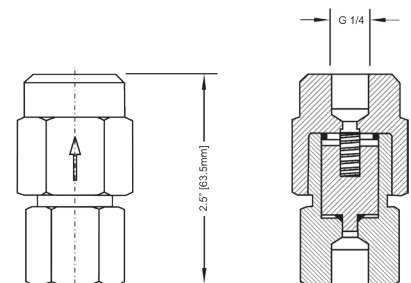
Figure 1



AUTOMATIC AIR BLEED VALVE ABV-1

All rod lock units have a very short activation stroke and quick (100ms) response. It is highly recommended that all air be removed from the rod lock unit. Trapped air at high pressure and frequent cycling can cause ignition of the air-oil mixture, causing mini explosions (dieseling) to occur, which will lead to seal failure.

To avoid trapped air, an automatic air bleed valve (or similar component) should be installed between the rod lock and the oil reservoir. Locate the ABV-1 as near as possible to the rod lock, in the port with the highest elevation (see Figures 2 and 3).



Part Number: ABV-1
(Order separately)

ABV-1 OPERATION

The automatic air bleed valve (ABV-1) opens slightly each time pressure is removed from the rod lock, allowing air to escape back to the oil reservoir.

For proper operation, back pressure exceeding 30 PSI (2 bar) should be avoided between the ABV-1 and oil reservoir.

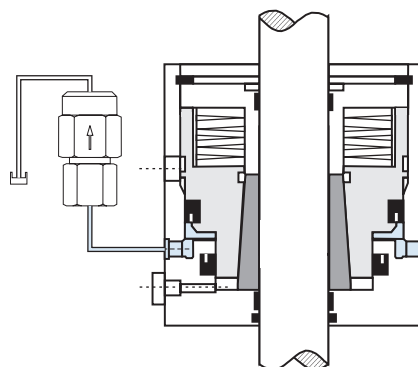


Figure 2: Vertical Mount

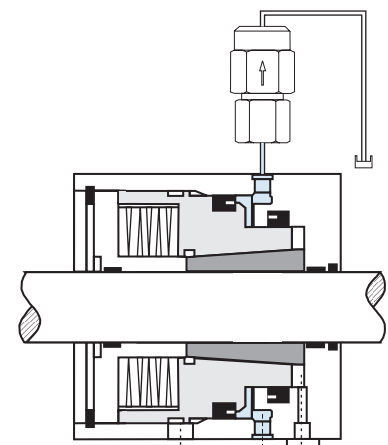


Figure 3: Horizontal Mount

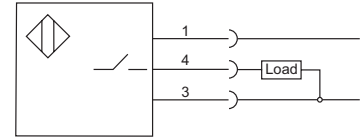
ROD LOCK SENSORS (For Un-Clamped Condition)

An inductive proximity switch (with M12 x 1 thread) can be used to sense the rod lock un-clamped (free moving rod) condition.
(BALLUFF Model: BES 516325S4)



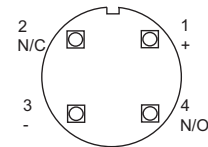
ELECTRICAL DATA	
SA Operational distance with steel	1.6 mm
Maximum switching frequency	800 Hz
Operating voltage	10 - 30 V DC
Supply voltage ripple	≤ 15% (Peak to Peak)
Load current capacity	≤ 200 mA
Protection against polarity reversal	yes
Short circuit protected	yes
Function display	LED
Output resistance	2.2 K + Diode + LED
Ambient temperature range	-25°C to 70°C (-13°F to 158°F)
Temperature of switch point	≤ 4 mm / °C
Parallel cap to load permitted	1 mF at 24 V DC
Residual voltage (un-clamped)	≤ 0.8 V
Voltage drop (clamped)	≤ 2.5 V
Voltage rise on switching	
Switching hysteresis	≤ 15% Sensing distance
Repeatability	≤ 5% Sensing distance
Current Consumption	≤ 25 mA clamped / ≤ 12 mA un-clamped

SCHEMATIC



Wiring Connections:
PNP Normally Open

View of Male Connector Pins



PROXIMITY SENSOR INSTALLATION INSTRUCTIONS

- 1) Apply hydraulic pressure to rod lock (un-clamped condition).
- 2) Assemble the proximity sensor jam nut and lock tooth washer to the proximity sensor. Thread the proximity sensor (by hand) into the M12 x 1 rod lock threaded port until it contacts the internal steel piston.
- 3) Back the proximity sensor out one full turn. While holding the proximity sensor's position, tighten the jam nut to 15 ft-lbs (do not over torque).
- 4) With electrical power off, connect the proximity sensor electric wiring per the diagram included with the sensor. When the electrical power is on, the proximity sensor LED should be "on" to indicate an un-clamped condition. Slight adjustments may be necessary to set proximity sensor for proper operation.
- 5) Remove the hydraulic pressure to the rod lock, the proximity sensor LED should go "off" to indicate the clamped conditions.

ROD LOCK INSTALLATION INSTRUCTIONS

- 1) Using a flexible hydraulic rated hose, apply hydraulic pressure to the rod lock unit (refer to model number for specific rod lock hydraulic release pressure).
- 2) With the rod lock counter-bored end facing the cylinder rod end, align rod lock to rod. Using care not to damage rod lock seals or bearings, slide the rod lock onto the piston rod until it contacts the cylinder mounting surface. Rod lock should fully contact the cylinder.
- 3) Remove the hydraulic pressure to the rod lock. Torque cylinder tie rod nuts a little at a time, in a clockwise rotation, finishing with the proper cylinder tie rod torque (refer to torque charts on page 150).
- 4) Cycle the rod lock unit on and off several times. With pressure applied, the cylinder rod should move freely by hand.
- 5) If the cylinder rod does not move freely, remove the rod lock and repeat installation instructions. If the piston rod still drags, check the squareness of the rod lock to the cylinder and make adjustments as needed.

WARNING! DO NOT DISASSEMBLE ROD LOCK — UNIT CONTAINS HIGH SPRING FORCE THAT COULD CAUSE PERSONAL INJURY. Return to TRD for service.