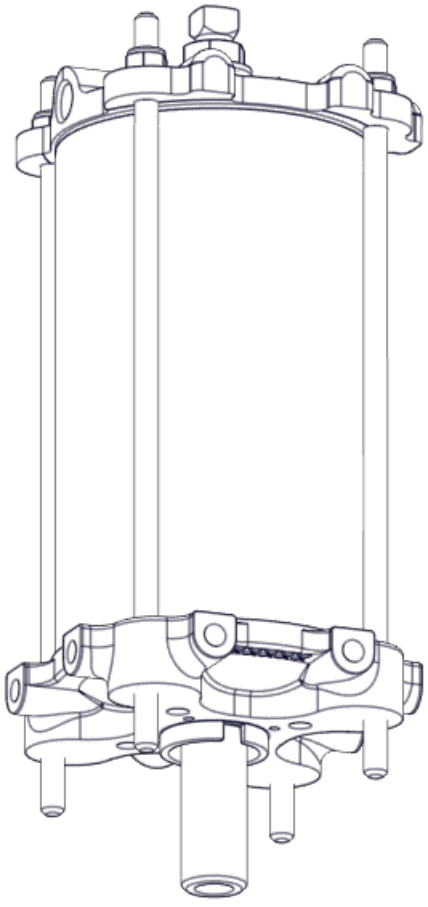
DeZURIK
REPAIR KIT
CYLINDER ACTUATOR FOR KNIFE GATE VALVES



Instruction D11045
February 2016

DeZURIK | APCO | HILTON | WILLAMETTE

Instructions

These instructions are intended for personnel who are responsible for the installation, operation and maintenance of cylinder actuators.

Safety Messages

All safety messages in the instructions are flagged with the word Caution, Warning or Danger. These messages must be followed exactly to avoid equipment damage, personal injury or death.

Safety label(s) on the product indicate hazards that can cause equipment damage, personal injury or death. If a safety label becomes difficult to see, or if a label has been removed, please contact DeZURIK for replacement.

WARNING!
Personnel involved in the installation or maintenance of valves should be constantly alert to potential emission of process material and take appropriate safety precautions. Always wear suitable protection when dealing with hazardous process materials. Handle valves which have been removed from service with the assumption of process material within the valve.

Parts

Order parts from your DeZURIK sales representative, or directly from DeZURIK. When ordering parts, please include the 7-digit part number and 4-digit revision number (example: **9999999R000**) located on the data plate attached to the valve assembly. Also include the part name, the assembly drawing number, the balloon number and the quantity stated on the assembly drawing.

DeZURIK Service

DeZURIK service personnel are available to install, maintain and repair all DeZURIK products. DeZURIK also offers customized training programs and consultation services. For more information, contact your local DeZURIK sales representative or visit our website at www.dezurik.com.

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Description

The cylinder used with DeZURIK gate valves is a pneumatic double-acting cylinder that has a recommended supply pressure between 60 and 100 psi. Cylinder pressure not to exceed 100 psi, cylinder can operate at less than 60 psi when valve thrust requirements allow. Use proper cylinder sizing to determine operating pressure.

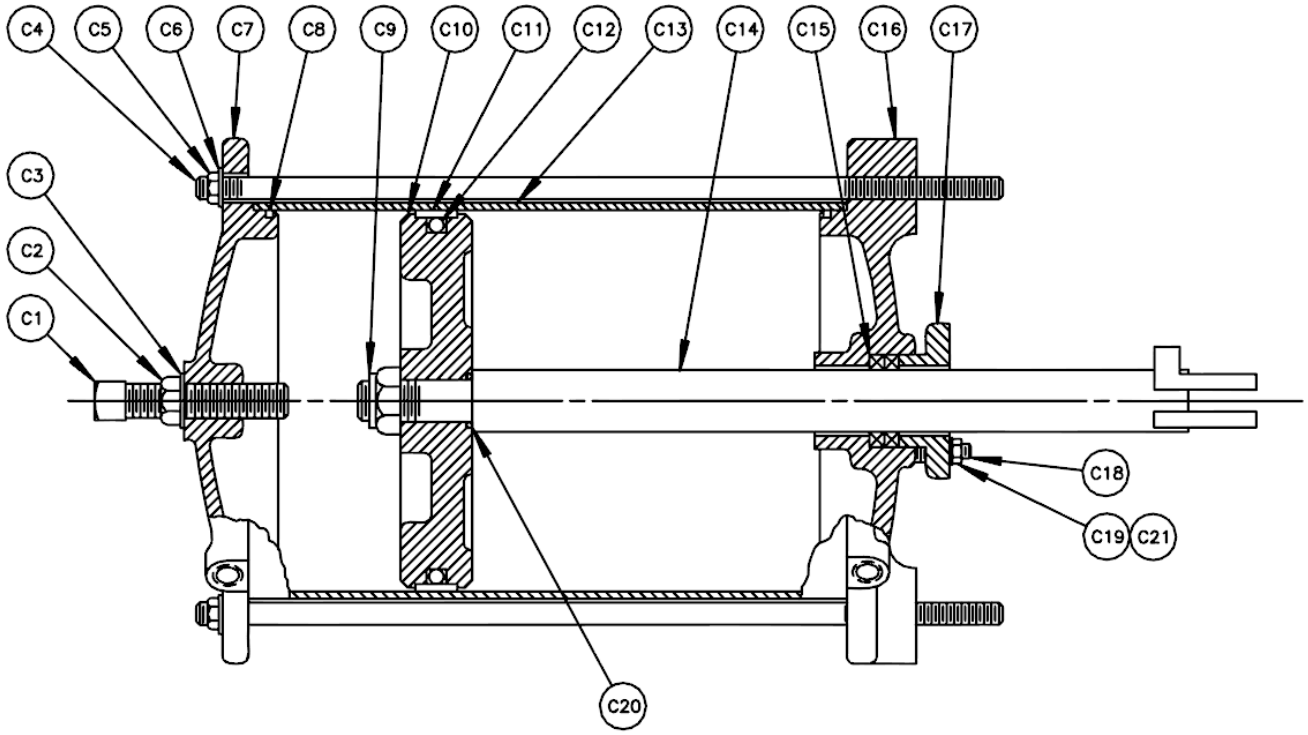
WARNING!
This cylinder is a pressure vessel. Pressure in the cylinders can cause personal injury or equipment damage. Release pressure from both ends of the cylinder before servicing.

Cylinder Types

Over time, DeZURIK cylinders have evolved to fit with a wide range of products. There are four types of cylinder actuators which are described on the following pages: Type A Packing Gland type; Type B Cylinder Actuator for UNV and PGV Ported Gate Valves; Type C General type; Type D General type with cartridge. Refer to Figures 1A thru D to identify the type of pneumatic cylinder that is being serviced.

This instruction includes procedures for replacing parts of the four DeZURIK Cylinder types. Note that not all parts included in the kit will be used to repair all cylinder types.

Cylinder Types continued



NO.	PART NAME	QTY.
C1	SET SCREW	1
C2	JAM NUT	1
* C3	THREAD SEAL (CYLINDER CAP)	—
C4	TIE ROD (4” & 6” CYLINDER)	4
C4	TIE ROD (8” CYLINDER)	6
C4	TIE ROD (10” & 12” CYLINDER)	8
C5	NUT (4” & 6” CYLINDER)	4
C5	NUT (8” CYLINDER	6
C5	NUT (10” & 12” CYLINDER)	8
C6	LOCK WASHER (4” & 6” CYLINDER)	4
C6	LOCK WASHER (8” CYLINDER)	6
C6	LOCK WASHER (10” & 12” CYLINDER)	8
C7	CYLINDER CAP	1
* C8	O-RING (CYLINDER TUBE)	2

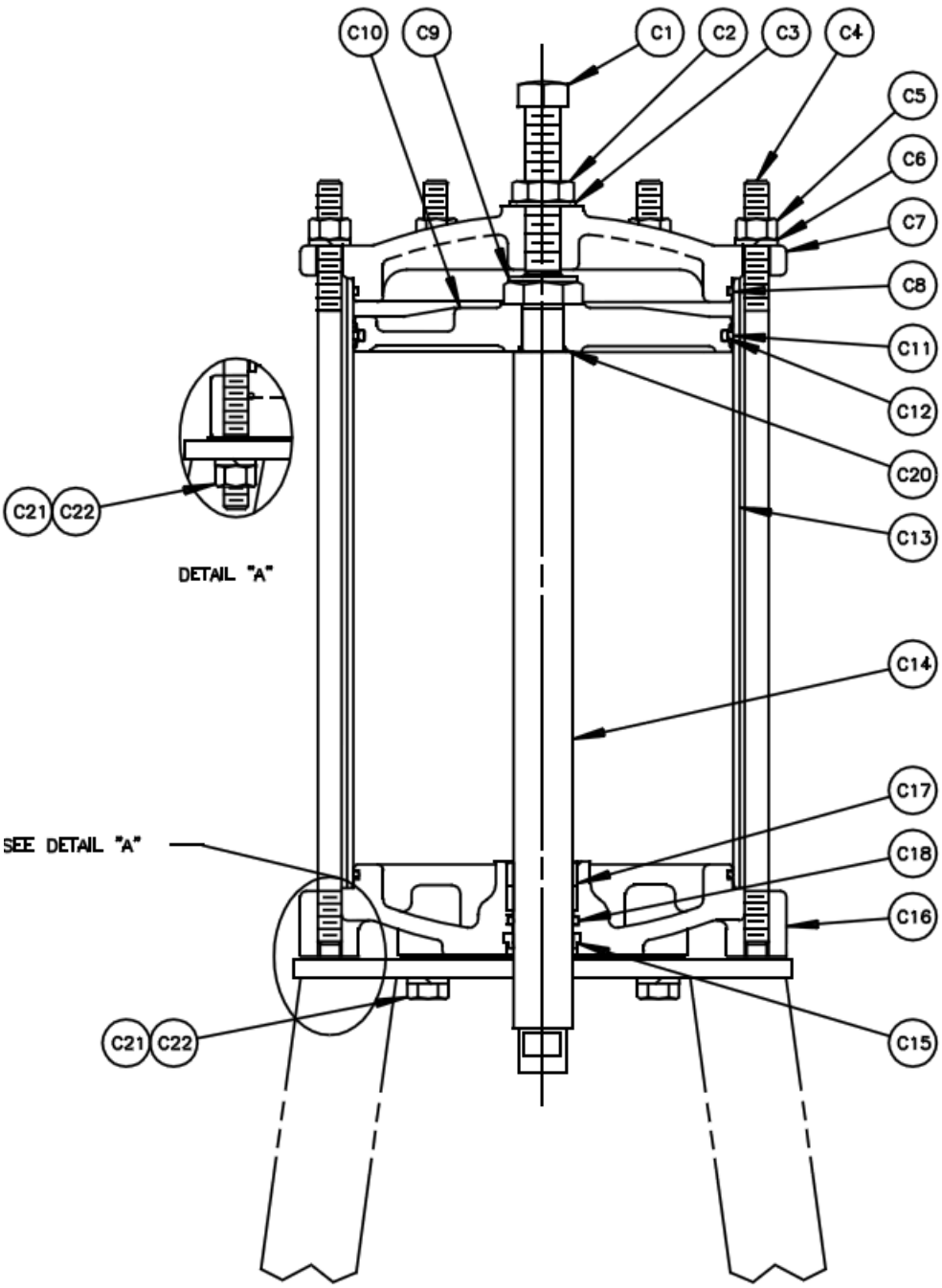
NO.	PART NAME	QTY.
C9	LOCK NUT	1
C10	PISTON	1
* C11	PISTON SEAL	1
* C12	O-RING (PISTON)	1
C13	CYLINDER TUBE	1
C14	PISTON ROD	1
* C15	PACKING	—
C16	CYLINDER HEAD	1
C17	GLAND	1
C18	STUD	2
C19	JAM NUT	2
* C20	O-RING (PISTON ROD)	1
C21	WASHER	2

* Items marked by an asterisk are included in your repair kit.

Figure 1A: Type A Packing Gland Type

The Packing Gland Type Cylinder actuator is easily identified by the gland (C17).

Cylinder Types continued

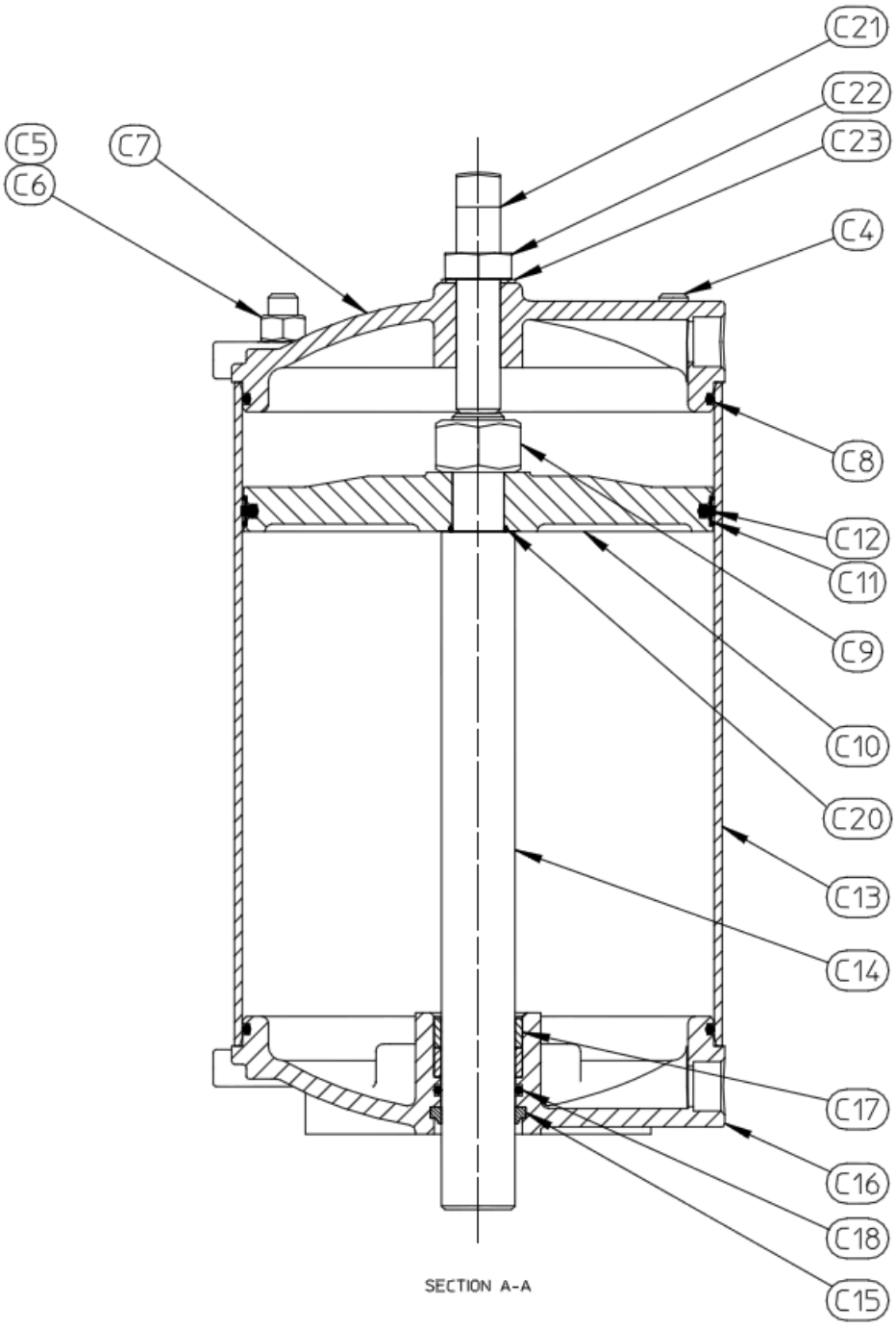


*Items marked with an asterisk are included in your repair kit

NO.	PART NAME	QTY.
C1	SET SCREW	1
C2	JAM NUT	1
*C3	THREAD SEAL	1
C4	TIE ROD (6” CYLINDER)	4
C4	TIE ROD (10”, 12” & 14” CYLINDERS)	8
C5	NUT (6” CYLINDER)	4
C5	NUT (8” CYLINDER)	6
C5	NUT (10”, 12” & 14” CYLINDER)	8
C6	LOCKWASHER (6” CYLINDER)	4
C6	LOCKWASHER (8” CYLINDER)	6
C6	LOCKWASHER (10”, 12” & 14” CYLINDER)	8
C7	CYLINDER CAP	1
*C8	O-RING (CYLINDER TUBE)	2
C9	LOCK NUT	1
C10	PISTON	1
*C11	PISTON SEAL	1
*C12	O-RING (PISTON)	1
C13	CYLINDER TUBE	1
C14	CYLINDER ROD	1
*C15	WIPER	1
C16	CYLINDER HEAD	1
C17	BEARING (6”, 12” & 14” CYLINDERS)	1
C17	BEARING (8” & 10” CYLINDER)	2
*C18	ROD SEAL	1
*C20	O-RING (PISTON ROD)	1
C21	NUT (6” CYLINDER)	4
C21	SCREW (8”-14” CLYNIDERS)	4
C22	LOCKWASHER	4

Figure 1B: Type B Cylinder Actuator For UNV and PGV Ported Valves
Identified by the stepped piston rod end.

Cylinder Types continued

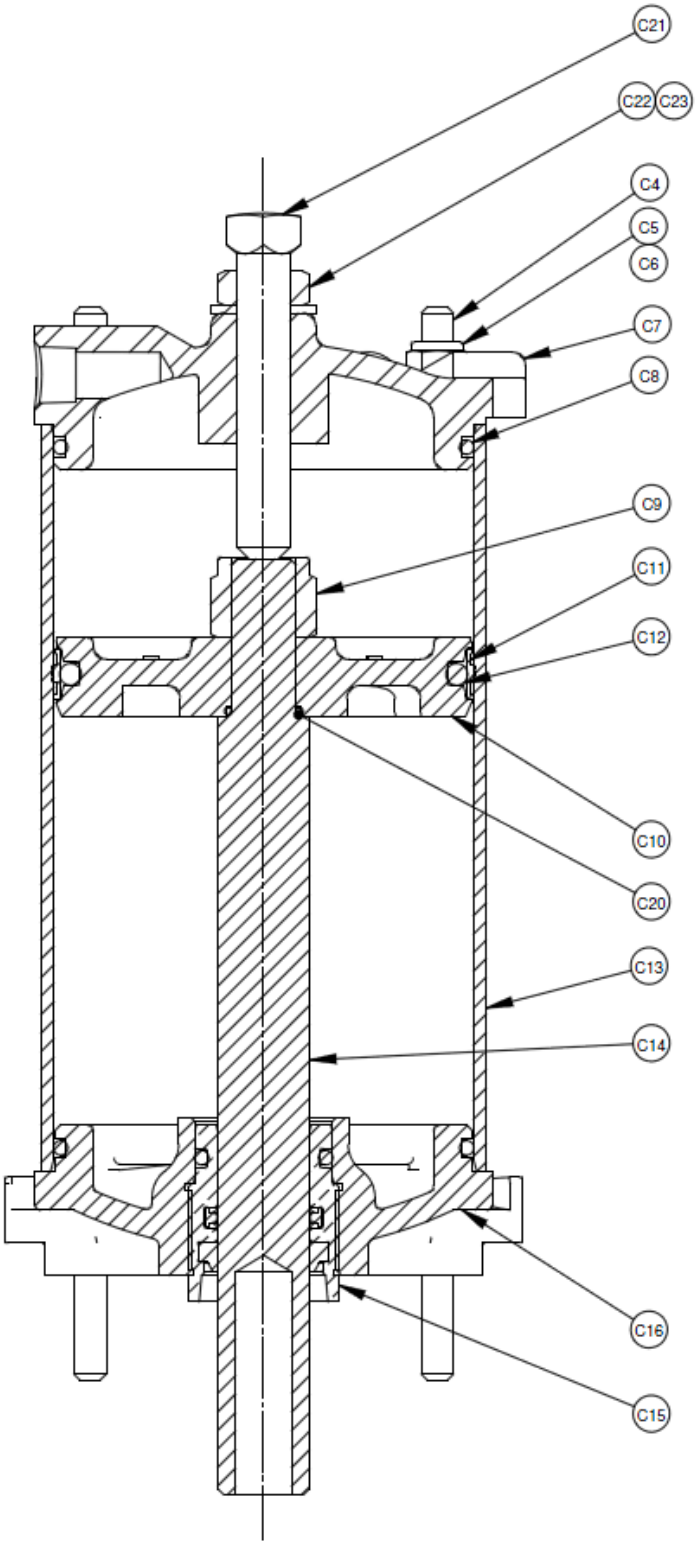


NO.	PART NAME	QTY.
C4	TIE ROD	4
C5	NUT	4
C6	LOCKWASHER	4
C7	CYLINDER CAP	1
*C8	O-RING (CYLINDER TUBE)	2
C9	LOCK NUT	1
C10	PISTON	1
*C11	PISTON SEAL (NOT USED IN LOW TEMP CYLINDER)	1
*C12	O-RING (PISTON)	1
C13	CYLINDER TUBE	1
C14	PISTON ROD	1
*C15	WIPER	1
C16	CYLINDER HEAD	1
C17	BEARING (4”, 6”, 12” & 14” CYLINDERS)	1
C17	BEARING (8” & 10” CYLIN-DER)	2
*C18	O-RING (CLYNIDER HEAD)	1
*C20	O-RING (PISTON ROD)	1
C21	ADJUSTING SCREW	1
C22	JAM NUT	1
*C23	THREAD SEAL	1

*Items marked with an asterisk are included in your repair kit

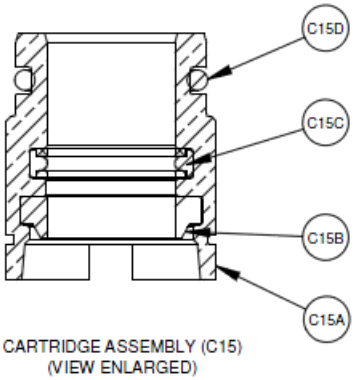
Figure 1C: Type C General Type
Identified by the female thread in the end of the piston rod (C14)

Cylinder Types continued



NO.	PART NAME	QTY.
C4	TIE ROD	4
C5	NUT	4
C6	LOCKWASHER	4
C7	CYLINDER CAP	1
*C8	O-RING (CYLINDER TUBE)	2
C9	LOCK NUT	1
C10	PISTON	1
*C11	PISTON SEAL (NOT USED IN LOW TEMP CYLINDER)	1
*C12	O-RING (PISTON)	1
C13	CYLINDER TUBE	1
C14	PISTON ROD	1
C15	CARTRIDGE ASSEMBLY	1
C15A	CARTRIDGE	1
*C15B	WIPER	1
*C15C	ROD SEAL	1
*C15D	O-RING	1
C16	CYLINDER HEAD	1
*C20	O-RING (PISTON ROD)	1
C21	ADJUSTING SCREW	1
C22	JAM NUT	1
*C23	THREAD SEAL	1

*Items marked with an asterisk are included in your repair kit



CARTRIDGE ASSEMBLY (C15)
(VIEW ENLARGED)

Figure 1D: Type D General Type with Cartridge
Identified by the replaceable rod seal and wiper in the removable cartridge.

Lubrication

The cylinder only requires lubrication when reassembling a unit that has been disassembled. When reassembling, lubricate the piston seal (C11), o-ring (C12), piston (C10) grooves and cylinder wall (C13) with Dow Corning No. 44 lubricant, or for cylinders that are for -40°C to -50°C (-40°F to –58°F) environments, lubricate with Dow Corning No. 55 lubricant.

Adjustments

Aligning the Cylinder - See applicable Figure 1A, 1B, 1C or 1D for component identification

To work properly, the piston rod (C14) and gate must be aligned. The mounting holes in the cylinder and yoke are designed to allow for adjustment. Visually check the alignment with the valve in the open and close positions, and adjust as needed.

1. Align the piston rod (C14) and the gate with each other.
2. Check the piston rod (C14) and gate alignment in the valve open and closed positions.
3. Adjust the cylinder position if needed.
   Note: Oversized mounting holes in the cylinder and yoke allow for adjustment.

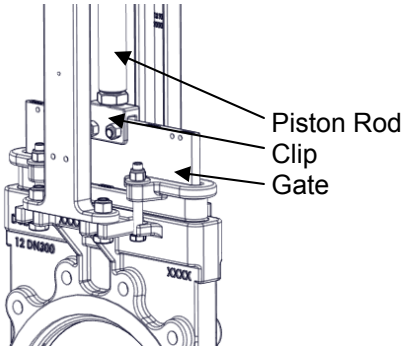


Figure 2: Connection to Valve

Cylinder Support

The unit may be mounted in any position around the pipeline, however it is best to mount the valve with the cylinder in a vertical position. If the valve is installed with the cylinder in a position other than vertical, the customer must provide additional support on size 10 inch and larger valves. This support can be mounted using the tapped holes in the cylinder head (C16), but do not mount the supports on the cylinder tube (C13). See the installation drawing for dimension location of cylinder support.

Cylinder Stroke Adjustment (if applicable)

The adjusting set screw (C1 in Fig. 1A and 1B or C21 in Fig. 1C and 1D) in the cylinder acts as the cylinder stroke adjustment. Adjust this set screw so that the actuator does not pull the gate off the seat ring when the valve is fully opened.

To adjust the closed position:

1. Close the valve.
2. For Type C and D cylinders (Fig. 1C and 1D), turn the clip into the piston rod (C14) until the cylinder has a minimum of 1/16” stroke remaining and tighten jam nut.
3. Open the valve and adjust the adjusting screw (C1 in Fig. 1A and 1B or C21 in Fig. 1C and 1D) until the gate is clear of the flow port but fully on the seat ring. Tighten jam nut (C2 in Fig. 1A and 1B or C22 in Fig. 1C and 1D).

Piston Rod Packing Adjustment (Fig. 1A)

Type A cylinders which have packing (C15) around the piston rod (C14); may need periodic adjustment to stop packing leakage. Tighten the gland nuts (C19) uniformly only until the leak stops.

IMPORTANT: Once the leak has stopped, do not continue tightening the gland nuts. Over-tightening the gland nuts will result in premature packing failure.

Cartridge Rebuild For Type D Cylinders (Fig. 1D)

To repair a cylinder actuator with the rod seal and wiper damaged by outside contaminants on the piston rod (C14) during the retracting stroke.

WARNING!
This cylinder is a pressure-containing vessel! Removing any parts while under pressure could cause personal injury or equipment damage. Release the pressure from both ends of the cylinder before attempting disassembly or repair.

See Figure 3. The rod seal (C15C) and wiper (C15B) are installed in the cartridge, along with an o-ring (C15D).

Disassembling the Cartridge For Type D Cylinders (Fig. 1D)

1. Shut off the air supply
2. Remove the cylinder cartridge (C15) by unscrewing it from the head (C16) with a spanner wrench.
3. Once cartridge is threaded free from the head, slide cartridge all the way down the piston rod and off.
4. Remove the wiper (C15B), rod seal (C15C) and o-ring (C15D) from the cartridge (C15A) (Fig. 3).

Reassembling the Cartridge For Type D Cylinders

1. Clean the cartridge (C15A on Fig. 3) grooves and lubricate with Dow Corning Number 44 lubricant, or Dow Corning Number 55 in cylinders for –40°C to –50°C service.
2. Insert the rod seal (C15C) into its groove, making sure it lies flat in the groove. Insert the PTFE backing rings as shown in Figure 3. NOTE: The backing rings are cut with a bevel; make sure the beveled ends of the rings ends meet but do not overlap.
3. Insert wiper (C15B) into its groove.
4. Place o-ring (C15D) into its outer groove.
5. Carefully slide assembled cartridge, in proper orientation, onto piston rod (C14) and screw cartridge into the cylinder head (C16). Refer to Fig. 1D.
6. Mount cylinder onto valve and perform cylinder stroke adjustment as needed.

Cartridge Assembly Replacement For Type D Cylinders

WARNING!
This cylinder is a pressure-containing vessel! Removing any parts while under pressure could cause personal injury or equipment damage. Release the pressure from both ends of the cylinder before attempting disassembly or repair.

To replace the cylinder cartridge assembly shut off the air supply (Fig. 1D).

1. Remove the cylinder cartridge (C15) by unscrewing it from the head (C16) with a spanner wrench.
2. Once cartridge is threaded free from the head, slide cartridge all the way down the piston rod and off.
3. Replace it with a new cylinder cartridge (C15).

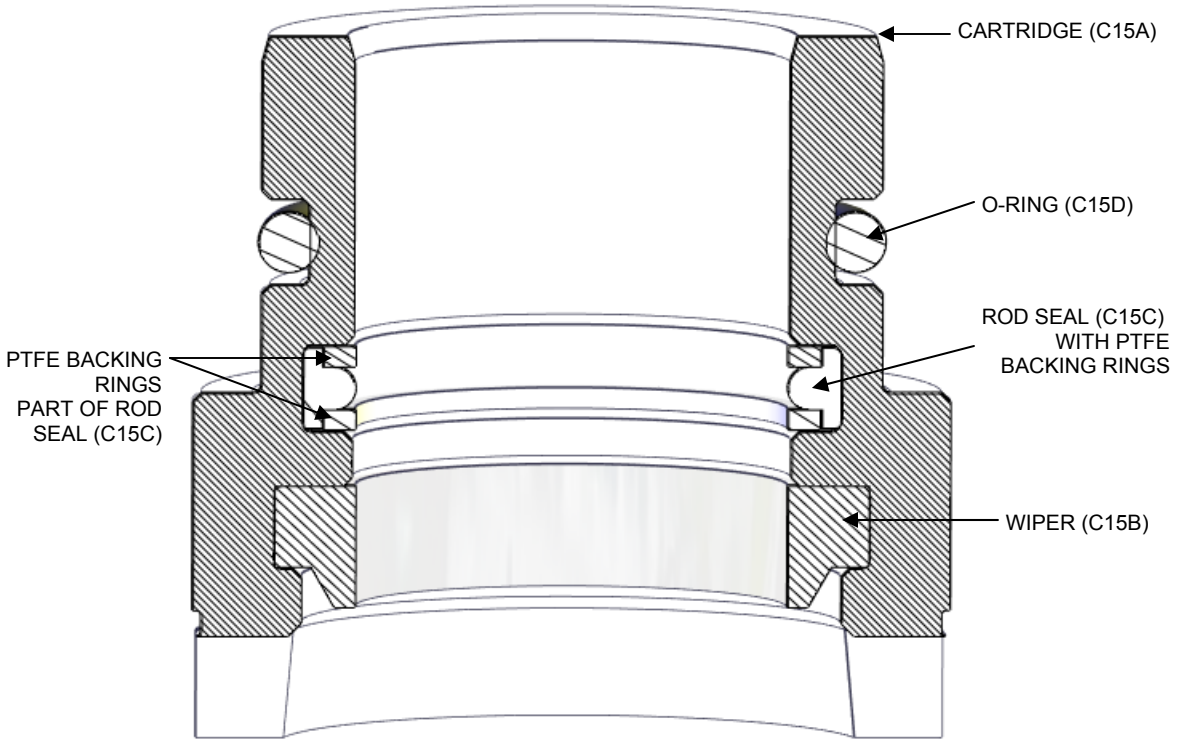


Figure 3: Cartridge Assembly (C15)

Disassembling the Cylinder

WARNING!
This cylinder is a pressure-containing vessel! Removing any parts while under pressure could cause personal injury or equipment damage. Release the pressure from both ends of the cylinder before attempting disassembly or repair.

1. Shut off the air/fluid supply to the cylinder and relieve pipeline and cylinder pressure.
2. Disconnect the air supply lines.

   Note: When flexible tubing is used, only one swivel connector is used on each piece of tubing. The swivel connector is located on the end of the tubing attached to the cylinder port.
3. Remove the nuts (C5) and washers (C6) from the tie-rods (C4).
4. Remove the cylinder cap (C7) and remove the o-ring seal (C8) from the cylinder cap (C7).

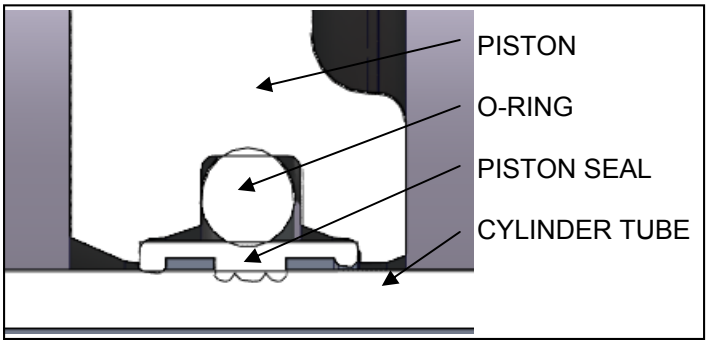


Figure 4—Piston Seal Detail

5. Remove the cylinder tube (C13), piston seal (C11) and o-ring (C12). Clean the parts and the grooves in the piston (C10). See Figure 4.

   Note: Rotating the cylinder tube (C13) while pulling makes it easier to get it off the piston (C10).
6. Remove the piston rod (C14) assembly and remove the o-ring (C8) from the cylinder head (C16).

   Note: Cylinders for - 40°C to - 50°C (-40°F to –58°F) service applications do not have a piston seal (C11). These cylinders have a larger o-ring (C12) in the piston (C10).
7. a. **For type A cylinders**, remove jam nut (C19), washer (C21) and gland (C17). Then pull out packing (C15) from the cylinder head (C16).

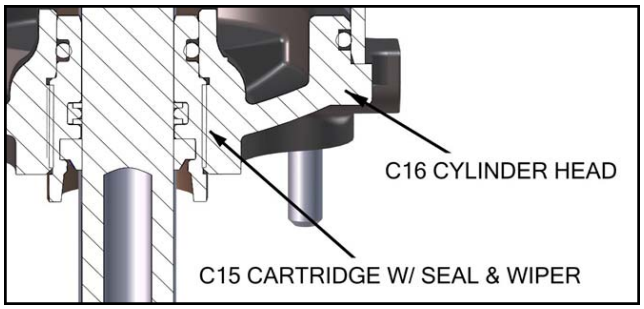


Figure 5—Rod Seal Detail

   b. **For type B cylinders**, remove the wiper (C15) and rod seal (C18) from the cylinder head (C16). Generally, bearing(s) (C17) would not be expected to be removed and replaced unless noticeably damaged.

   c. **For type C cylinders**, remove the wiper (C15) and rod seal (C18) from the cylinder head (C16). Generally, bearing(s) (C17) would not be expected to be removed and replaced unless noticeably damaged.

   d. **For type D cylinders**, remove cylinder seal cartridge assembly (C15). Use a spanner wrench to unscrew the cartridge assembly (C15) out of the cylinder head (C16). See Fig 5 and pages 9 and 10 for cylinder rebuild or replacement.
8. Clean all parts thoroughly. Replace damaged parts.

Reassembling the Cylinder

1. Clean bore of cylinder head (C16) and lubricate with Dow Corning Number 44 lubricant, or Dow Corning Number 55 on cylinders used in - 40°C to - 50°C (-40°F to –58°F) service.
2. Lubricate the o-ring (C8) and place it on the cylinder head (C16).
3. **For type B and C cylinders:**
   - install the piston rod seal (C18) in the cylinder head (C16).
   - insert the seal ring into the groove, making sure the sealing ring lies flat in the groove.
   - then insert the PTFE backing rings as shown in Figure 6. The backing rings are cut with a bevel. Make sure the beveled ends of the rings ends meet but do not overlap.
   - lubricate the wiper (C15) and place it in the cylinder head (C16).
4. **For type D cylinders**, clean and thread in the cylinder cartridge assembly (C15) into the cylinder head (C16).
5. Carefully install the piston rod (C14).

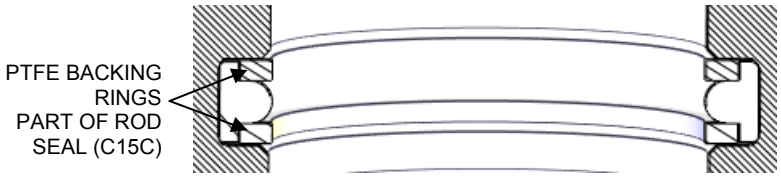


Figure 6— Cartridge Assembly

6. Lubricate the piston seal (C11), o-ring (C12) and cylinder groove with Dow Corning Number 44 lubricant and place the o-ring (C12) and seal (C11) on the piston (C10). For cylinders for - 40°C to -50°C (-40°F to –58°F) service applications, a piston seal (C11) is not used and Dow Corning No. 55 lubricant should be applied.

Table A: Tie-rod Nut Torques

Cylinder Size	Torque	
	Lbs. Ft.	Nm
C4	12	16
C6-C8	16	22
C10-C14	20	27

7. Carefully slide the cylinder tube (C13) over the piston (C10). The piston seal (C11) must be well lubricated. Start the cylinder tube (C13) at a 45° angle and rotate it into position onto the piston (C10). See Figure 7.
8. Lubricate the o-ring (C8) and place it on the cylinder cap (C7).
9. Place the cylinder cap (C7) on the cylinder tube (C13) and place the washers (C6) and nuts (C5) on the tie-rods (C4). Tighten the nuts (C5) to the torque listed in Table A.
10. **For Type A cylinders**, insert packing layers (C15) around the piston rod (C14) and then install the gland (C17), washers (C21) and nuts (C19). Tighten the gland nuts (C19) uniformly only until any leak stops. Once leak has stopped, do not continue tightening the gland nuts. Over-tightening the gland nuts will result in premature packing failure.

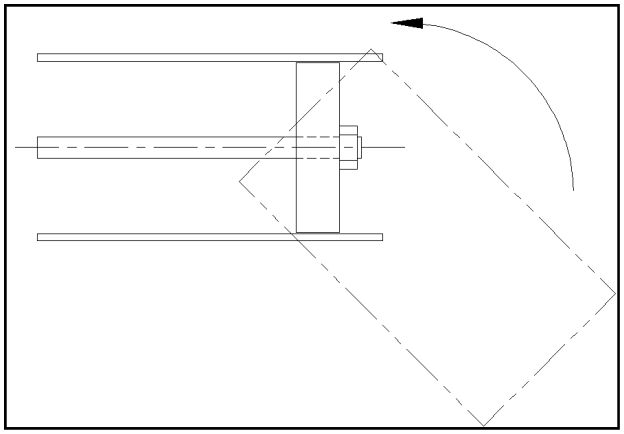


Figure 7—Assembling Cylinder

Troubleshooting

External Leakage	Cartridge leak	Worn or damaged piston rod or cartridge	Replace piston rod if surface is rough
			Replace piston rod and rebuild or replace cartridge if worn
	Cylinder tube seal leak	Loose tie rods	Tighten tie rod nuts to recommended torque as per bore size. See table A
		Excessive pressure	Reduce pressure to determine max. pressure rated limits
		Damaged O-rings	Replace o-rings and retorque tie rods. See table A
Internal Leakage	Piston seal leakage	Piston seal wear	Replace seal o-ring as required
		Cylinder drifts	Pressurize one side of the cylinder piston and disconnect air/fluid line at opposite port. If no leakage, find cause of cylinder drift in other component parts in the circuit
Cylinder Fails to Move the Load	Pressure is too low.	Check pressure at cylinder, make sure it is to circuit requirements	
	Piston seal leakage	Cycle cylinder by operating the valve, watch air/fluid flow at valve exhaust ports at end of cylinder stroke.	Replace piston seals if flow is excessive
	Cylinder is undersized for the load	Replace cylinder with one of a larger bore size	
	Piston rod broken	Contact DeZURIK	
Erratic or Chatter Operation	Load misalignment, excessive friction at cartridge or piston	Correct alignment of cylinder to load	
	Load requirements are to closely sized to cylinder	Install larger cylinder	
	Static and kinetic friction	Install speed control valves to provide back pressure for controlling stroke	

Guarantee

Products, auxiliaries and parts thereof of DeZURIK, Inc. manufacture are warranted to the original purchaser for a period of twenty -four (24) months from date of shipment from factory, against defective workmanship and material, but only if properly installed, operated and serviced in accordance with DeZURIK, Inc. recommendations. Repair or replacement, at our option, for items of DeZURIK, Inc. manufacture will be made free of charge, (FOB) our facility with removal, transportation and installation at your cost, if proved to be defective within such time, and this is your sole remedy with respect to such products. Equipment or parts manufactured by others but furnished by DeZURIK, Inc. will be repaired or replaced, but only to the extent provided in and honored by the original manufacturers warranty to DeZURIK, Inc., in each case subject to the limitations contained therein. No claim for transportation, labor or special or consequential damages or any other loss, cost or damage shall be allowed. You shall be solely responsible for determining suitability for use and in no event shall DeZURIK, Inc. be liable in this respect. DeZURIK, Inc. does not guarantee resistance to corrosion, erosion, abrasion or other sources of failure, nor does DeZURIK, Inc. guarantee a minimum length of service. Your failure to give written notice to us of any alleged defect under this warranty within twenty (20) days of its discovery, or attempts by someone other than DeZURIK, Inc. or its authorized representatives to remedy the alleged defects therein, or failure to return product or parts for repair or replacement as herein provided, or failure to install and operate said products and parts according to instructions furnished by DeZURIK, Inc., or misuse, modification, abuse or alteration of such product, accident, fire, flood or other Act of God, or failure to pay entire contract price when due shall be a waiver by you of all rights under this warranty.

The foregoing guarantee shall be null and void if, after shipment from our factory, the item is modified in any way or a component of another manufacturer, such as but not limited to, an actuator is attached to the item by anyone other than DeZURIK, Inc. Factory Service personnel. All orders accepted shall be deemed accepted subject to this limited warranty, which shall be exclusive of any other or previous Warranty, and this shall be the only effective guarantee or warranty binding on DeZURIK, Inc., despite anything to the contrary contained in the purchase order or represented by any agent or employee of DeZURIK, Inc., in writing or otherwise, notwithstanding, including but not limited to implied warranties.

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Sales and Service

For information about our worldwide locations, approvals, certifications and local representative:

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