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Type MR105 Direct-Operated Pressure Reducing Regulators

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WARNING

Failure to follow these instructions or to properly install and maintain this equipment could result in an explosion, fire and/or chemical contamination causing property damage and personal injury or death.

Fisher™ regulators must be installed, operated and maintained in accordance with federal, state and local codes, rules and regulations and Emerson Process Management Regulator Technologies, Inc. (Emerson) instructions.

If the regulator vents gas or a leak develops in the system, service to the unit may be required. Failure to correct trouble could result in a hazardous condition.

Installation, operation and maintenance procedures performed by unqualified personnel may result in improper

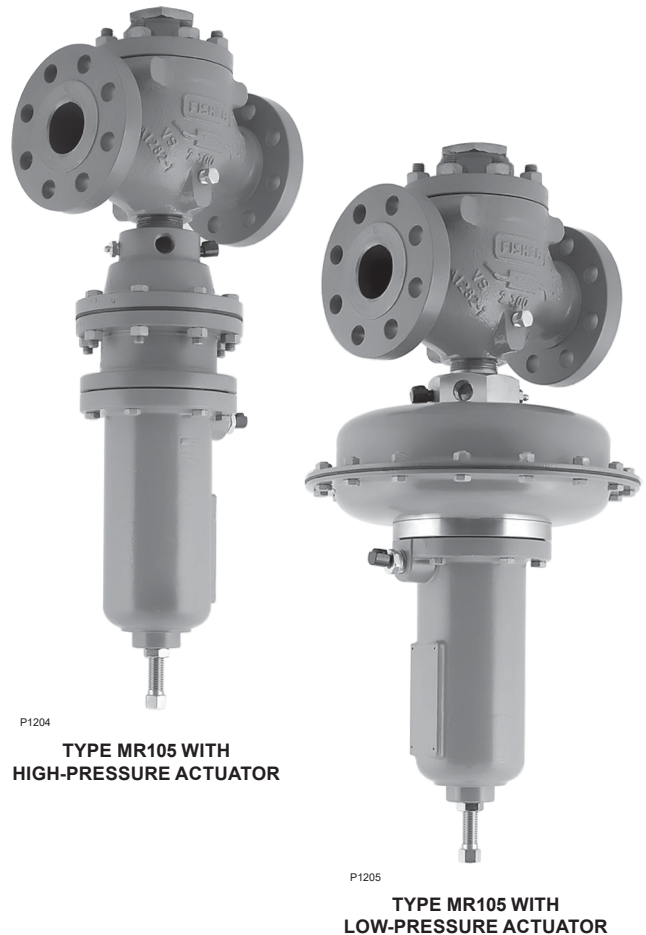


Figure 1. Type MR105 Direct-Operated Pressure Reducing Regulators

adjustment and unsafe operation. Either condition may result in equipment damage or personal injury. Call a qualified personnel when installing, operating and maintaining the Type MR105 regulator.

Type MR105

Specifications

The Specifications section on this page provides the ratings and other specifications for the Type MR105. The following information is stamped on the nameplate fastened on the regulator at the factory: type; body size; maximum inlet, outlet and differential pressure; maximum pressure above setpoint; maximum casing pressure; maximum temperature; spring range; cage type; and trim and diaphragm material.

Body Sizes and End Connection Styles

See Table 1

Shutoff Classification Per ANSI/FCI 70-3-2004

Class VI (Soft Seat)

Maximum Inlet, Outlet and Emergency Casing Pressures⁽¹⁾

See Table 3

Outlet Pressure Ranges⁽¹⁾

5 to 300 psig / 0.34 to 20.7 bar; see Table 2

Maximum Setpoint⁽¹⁾

Low-Pressure Actuator: 43 psig / 3.0 bar

High-Pressure Actuator:

Nitrile (NBR) and Ethylene Propylene (EPDM)

Diaphragm: 300 psig / 20.7 bar

Fluorocarbon (FKM) Diaphragm: 150 psig / 10.3 bar

Maximum Pressure Over Setpoint to Avoid Internal Parts Damage⁽¹⁾

Low-Pressure Actuator: 20 psig / 1.4 bar

High-Pressure Actuator: 120 psig / 8.3 bar

Maximum Differential Pressures⁽¹⁾

See Table 4

Temperature Capabilities⁽¹⁾⁽⁴⁾

Nitrile (NBR): -20 to 180°F / -29 to 82°C

Fluorocarbon (FKM)⁽²⁾: 20 to 250°F / -7 to 121°C

EPDM⁽³⁾: -20 to 225°F /

-29 to 107°C

Flow and Sizing Coefficients

See Table 5

Pressure Registration

External

Downstream Control Line Connection Size

1/2 NPT

Spring Case Vent

Type Y602-12

Pressure-Loaded Spring Case Vent⁽⁵⁾

1/2 NPT

Approximate Weights

For Type MR105 with Low-Pressure Actuator

NPS 1 / DN 25 : 86 lbs / 39 kg

NPS 2 / DN 50: 116 lbs / 53 kg

NPS 3 / DN 80: 165 lbs / 75 kg

NPS 4 / DN 100: 174 lbs / 79 kg

For Type MR105 with High-Pressure Actuator

NPS 1 / DN 25: 76 lbs / 34 kg

NPS 2 / DN 50: 105 lbs / 48 kg

NPS 3 / DN 80: 155 lbs / 70 kg

NPS 4 / DN 100: 164 lbs / 74 kg

Options

- Visual Travel Indicator
- Drain Valve
- Pressure-Loaded Actuator⁽⁵⁾
- NACE Construction
- Bleed Valve (for High-Pressure Actuator Only)
- EPDM Elastomer Trim Parts

1. The pressure/temperature limits in this Instruction Manual and any applicable standard or code limitation should not be exceeded.

2. Fluorocarbon (FKM) is limited to 200°F / 93°C in hot water.

3. EPDM is limited to 20 to 250°F / -7 to 121°C when used with Low Pressure Actuator.

4. Special low temperature constructions for process temperatures between -76 to 104°F / -60 to 40°C are available by request. The low temperature construction passed Emerson laboratory testing for lockup and external leakage down to -76°F / -60°C.

5. Consult the local Sales Office for this option.



WARNING

To avoid possible personal injury, equipment damage or leakage due to escaping fluid do not stand on or apply an external load to the actuator or any part of the regulator while working around the regulator.

Note

To avoid cavitation, it is recommended that the customer follow the capacity sizing guidelines found in Bulletin 71.1:MR105.

Introduction

Scope of the Manual

This instruction manual provides installation, adjustment, maintenance and parts ordering information for Type MR105 direct-operated pressure reducing regulators.

Description

The Type MR105 direct-operated pressure reducing regulators are high capacity multi-purpose regulators. They are designed to handle pressures up to 400 psig / 27.6 bar and temperatures up to 250°F / 121°C. Large

Table 1. Body Size and End Connection Style

BODY MATERIAL	END CONNECTION STYLE	
	Body Size	
	NPS 1 and 2 / DN 25 and 50	NPS 3 and 4 / DN 80 and 100
Cast Iron	NPT, CL125 FF or CL250 RF	CL125 FF or CL250 RF
WCC Steel ⁽¹⁾⁽²⁾	NPT, CL150 RF, CL300 RF, CL600 RF or PN 16/25/40 RF	CL150 RF, CL300 RF, CL600 RF or PN 16 RF
CF8M Stainless Steel ⁽¹⁾⁽²⁾	NPT, CL150 RF, CL300 RF, CL600 RF or PN 16/25/40 RF	CL150 RF, CL300 RF, CL600 RF or PN 16 RF
CF3M Stainless Steel ⁽¹⁾⁽²⁾	NPT, CL150 RF, CL300 RF, CL600 RF or PN 16/25/40 RF	CL150 RF, CL300 RF, CL600 RF or PN 16 RF

1. Optional NACE construction available.
2. Constructions meet API 614 requirements.

Table 2. Outlet Pressure Range

NPS 1 AND 2 / DN 25 AND 50 BODY SIZE										
Actuator Type	Spring Range		Spring Part Number	Spring Color Code	Spring Wire Diameter		Spring Free Length		Maximum Pressure Over Setpoint to Avoid Internal Parts Damage	
	psig	bar			In.	mm	In.	mm	psig	bar
	Low Pressure	5 to 12			0.34 to 0.83	GE42909X012	White	0.437	11.1	9.70
10 to 24		0.69 to 1.6	GE42910X012	Silver	0.500	12.7				
14 to 32		0.96 to 2.2	GE42911X012	Orange	0.562	14.3				
18 to 43		1.2 to 3.0	GE43002X012	Red	0.625	15.9				
High Pressure	25 to 60 ⁽¹⁾	1.7 to 4.1 ⁽¹⁾	GE42907X012	Green	0.375	9.52	9.70	246	120	8.3
	43 to 100	3.0 to 6.9	GE42909X012	White	0.437	11.1				
	75 to 175 ⁽²⁾	5.2 to 12.1 ⁽²⁾	GE42910X012	Silver	0.500	12.7				
	110 to 300 ⁽²⁾	7.6 to 20.7 ⁽²⁾	GE42911X012	Orange	0.562	14.3				
NPS 3 AND 4 / DN 80 AND 100 BODY SIZE										
Actuator Type	Spring Range		Spring Part Number	Spring Color Code	Spring Wire Diameter		Spring Free Length		Maximum Pressure Over Setpoint to Avoid Internal Parts Damage	
	psig	bar			In.	mm	In.	mm	psig	bar
	Low Pressure	5 to 8			0.34 to 0.55	GE42909X012	White	0.437	11.1	9.70
8 to 20		0.55 to 1.4	GE42910X012	Silver	0.500	12.7				
12 to 30		0.83 to 2.1	GE42911X012	Orange	0.562	14.3				
18 to 39		1.2 to 2.7	GE43002X012	Red	0.625	15.9				
High Pressure	39 to 72	2.7 to 5.0	GE42909X012	White	0.437	11.1	9.70	246	120	8.3
	71 to 175 ⁽²⁾	4.9 to 12.1 ⁽²⁾	GE42910X012	Silver	0.500	12.7				
	110 to 250 ⁽²⁾	7.6 to 17.2 ⁽²⁾	GE42911X012	Orange	0.562	14.3				

1. NPS 2 / DN 50 body size spring range is limited to 45 psig / 3.1 bar.
2. Maximum setpoint is limited to 150 psig / 10.3 bar for constructions with Fluorocarbon (FKM) diaphragm.

multi-purpose regulators provide fast, simple, reliable and economical pressure control for a number of applications and are suitable for different flow media such as liquid, air and gas. In addition, the drain valve option allows you to drain the system without expensive spool pieces saving you time and space. Also, the bleed valve option allows you to purge the air trapped underneath the diaphragm when the high-pressure regulator is installed in the upright position. Typical applications include lube oil, cooling water and natural gas district stations.

are opened. Operating personnel must protect themselves from exposure to system fluids or equivalent.

Principle of Operation

The Type MR105 is a direct-operated pressure reducing regulator. Downstream pressure is registered externally through a 1/2 NPT control line tapped in the bonnet (for low-pressure actuator, see Figure 2) or in the lower diaphragm casing (for high-pressure actuator, see Figure 3). When downstream demand decreases, the pressure under the actuator diaphragm increases. This pressure overcomes the regulator setting (which is set by the regulator control spring). Through the action of the actuator stem and valve spring, the valve plug moves closer to the seat ring and reduces the flow. When demand downstream increases, pressure under the actuator diaphragm decreases. Spring force pushes the actuator stem downward, the valve plug moves away from the seat ring and the flow increases downstream as the regulator opens in response to the



WARNING

Escaping process fluid from an open bleed valve may result in regulator damage, personal injury and property damage. To avoid such injury and damage, make certain the bleed valve (if used) is properly closed after venting air or equivalent.

Always open bleed valves slowly. These valves contain no packing, so some fluid weepage will occur when the valves

Type MR105

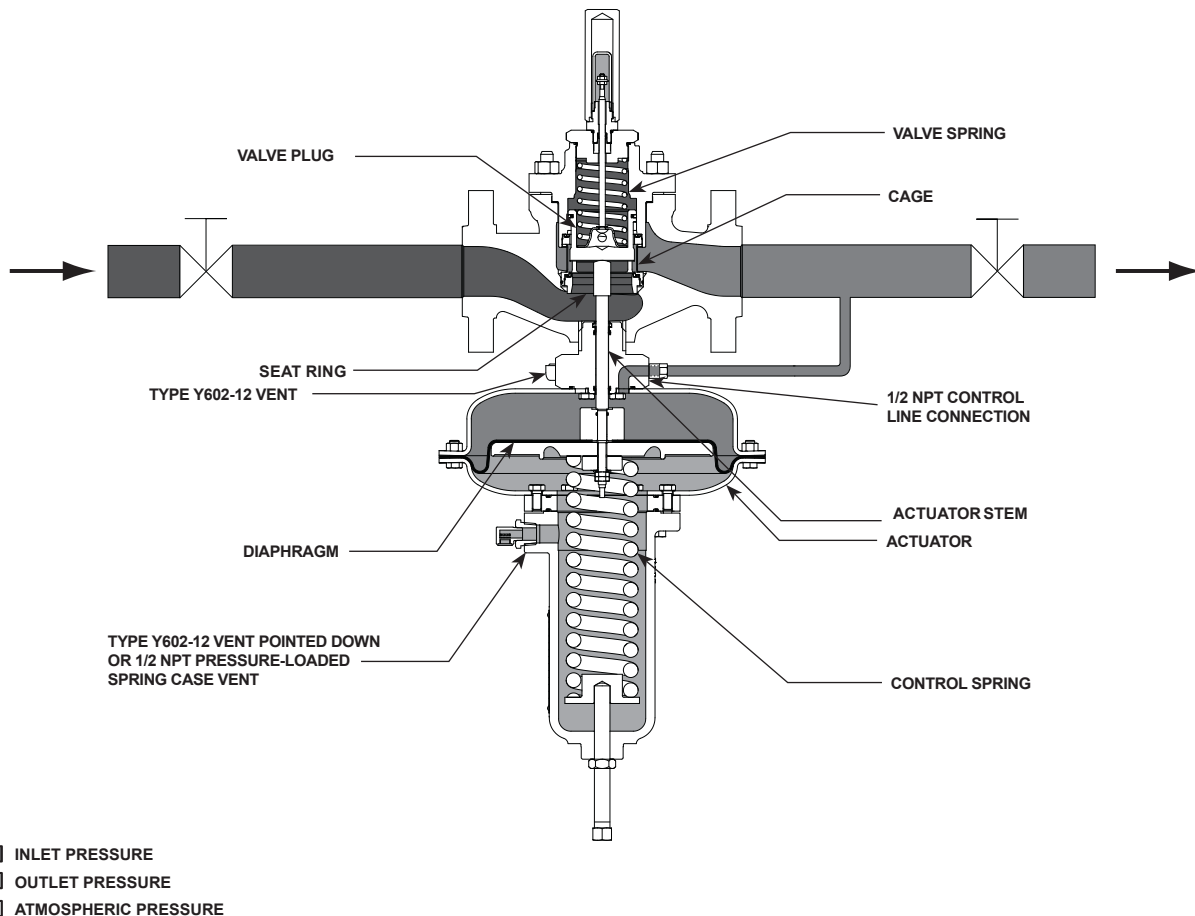


Figure 2. Type MR105 with Low-Pressure Actuator Operational Schematic

decreased pressure underneath the diaphragm. The downward motion of the plug allows flow through the cage into the downstream system.

Increased downstream pressure permits the regulator to close. The combination of valve spring force and valve plug unbalance provides positive valve plug shutoff against the port and upper seals.

Installation

WARNING

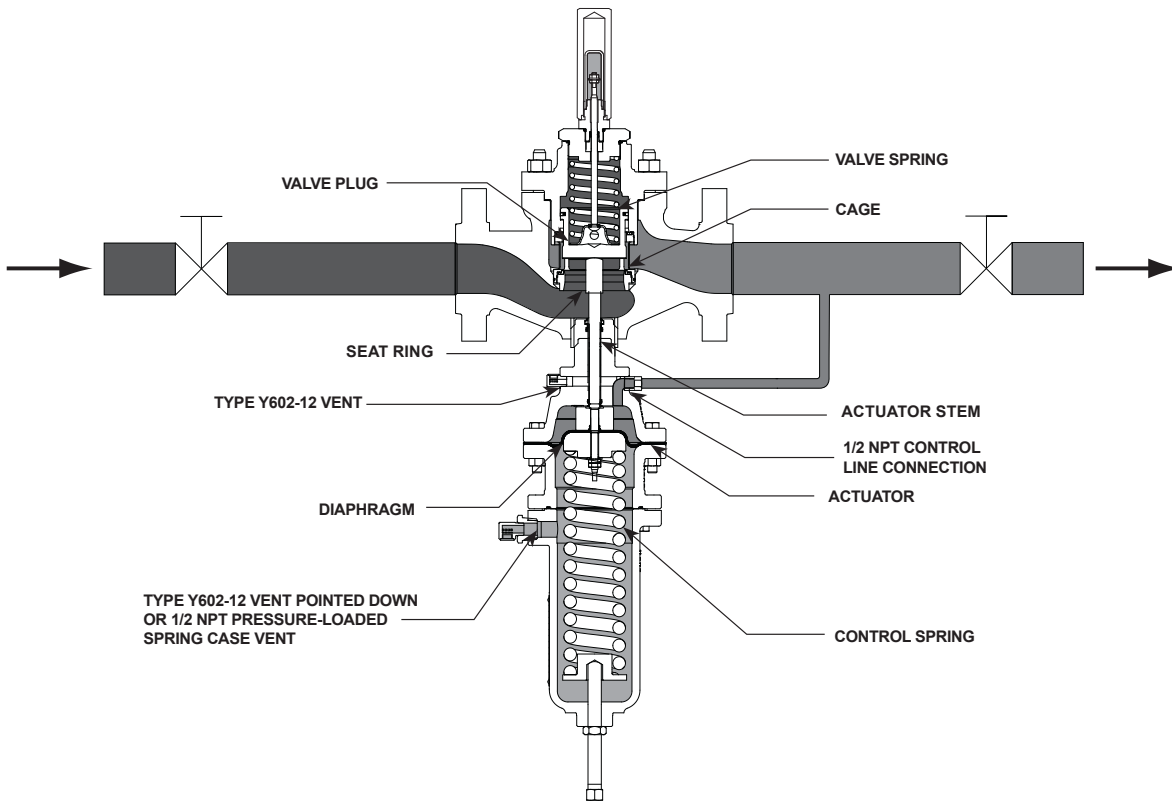
Personal injury or system damage may result if this regulator is installed, without appropriate overpressure protection, where service conditions could exceed the limits given in the Specifications section and/or regulator nameplate. Refer to Overpressure Protection section for recommendations

on how to prevent service conditions from exceeding those limits.

Additionally, physical damage to the regulator may result in personal injury or property damage due to escaping of accumulated gas. To avoid such injury and damage, install the regulator in a safe location.

All vents should be kept open to permit free flow of gas to the atmosphere. Protect openings against entrance of rain, snow, insects or any other foreign material that may plug the vent or vent line. On outdoor installations, point the spring case vent downward to allow condensate to drain.

Under enclosed conditions or indoors, escaping gas may accumulate and be an explosion hazard. In these cases, the vent should be piped away from the regulator to the outdoors.



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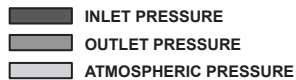


Figure 3. Type MR105 with High-Pressure Actuator Operational Schematic

Table 3. Maximum Inlet, Outlet and Emergency Casing Pressure⁽¹⁾

BODY MATERIAL	END CONNECTION	MAXIMUM INLET PRESSURE		MAXIMUM OUTLET PRESSURE				MAXIMUM EMERGENCY CASING PRESSURE			
				Low-Pressure Actuator		High-Pressure Actuator ⁽²⁾		Low-Pressure Actuator		High-Pressure Actuator ⁽²⁾	
		psig	bar	psig	bar	psig	bar	psig	bar	psig	bar
Cast Iron	NPT	340	23.4	70	4.8	340	23.4	70	4.8	340	23.4
	CL125 FF	175	12.1			175	12.1			175	12.1
	CL250 RF	400	27.6			400	27.6			400	27.6
WCC steel	NPT	400	27.6	70	4.8	400	27.6	70	4.8	400	27.6
	CL150 RF	245	16.9			245	16.9			245	16.9
	CL300 RF	400	27.6			400	27.6			400	27.6
	CL600 RF					400	27.6			400	27.6
	PN 16 RF	245	16.9			245	16.9			245	16.9
	PN 16/25/40 RF	400	27.6			400	27.6			400	27.6
CF8M Stainless steel	NPT	400	27.6	70	4.8	400	27.6	70	4.8	400	27.6
	CL150 RF	225	15.5			225	15.5			225	15.5
	CL300 RF	400	27.6			400	27.6			400	27.6
	CL600 RF					400	27.6			400	27.6
	PN 16 RF	225	15.5			225	15.5			225	15.5
	PN 16/25/40 RF	400	27.6			400	27.6			400	27.6
CF3M Stainless steel	NPT	400	27.6	70	4.8	400	27.6	70	4.8	400	27.6
	CL150 RF	185	12.7			185	12.7			185	12.7
	CL300 RF	400	27.6			400	27.6			400	27.6
	CL600 RF					400	27.6			400	27.6
	PN 16 RF	185	12.7			185	12.7			185	12.7
	PN 16/25/40 RF	400	27.6			400	27.6			400	27.6

1. Based on a maximum temperature of 250°F / 121°C.

2. Maximum outlet and emergency casing pressures for constructions with Fluorocarbon (FKM) diaphragm are limited to 230 psig / 15.8 bar or the body rating limit, whichever is lower.

Type MR105

Note

To avoid premature wear of internal parts, it is recommended that the actuator be oriented up or down in liquid service as shown in Figures 2 and 3.

General Installation Instructions

Vertical installation with the actuator installed directly above or below the main valve is recommended but for optimal performance the actuator should be installed below the main valve. The use of a bleed valve is recommended for liquid installations that require the high pressure actuator to be mounted above the main valve. The unit will operate in horizontal installations with the actuator on the side, however, this could result in premature wear of parts. Make sure that flow will be in the same direction as that indicated by the body arrow. Orientation of the two vents should always be down. Vents may be rotated after regulator installation so that the vent screens are down.

Before installing the regulator:

- Check for damage which might have occurred during shipment.
- Check for and remove any dirt or foreign material which may have accumulated in the regulator body.
- Blow out any debris, dirt or copper sulfate in the tubing and the pipeline.
- Apply pipe compound to the external threads of the pipe before installing the regulator.
- Make sure gas flow through the regulator is in the same direction as the arrow on the body. "Inlet" and "Outlet" connections are clearly marked.

Note

A linear cage is recommended for applications where low flow stability is a concern but it will limit the overall capacity of the regulator.

Note

For proper regulator control and operation, make certain the flow arrow on the body matches the flow direction.

Note

Contact appropriate Emerson representative prior to removing or modifying restrictor (if used) in sense

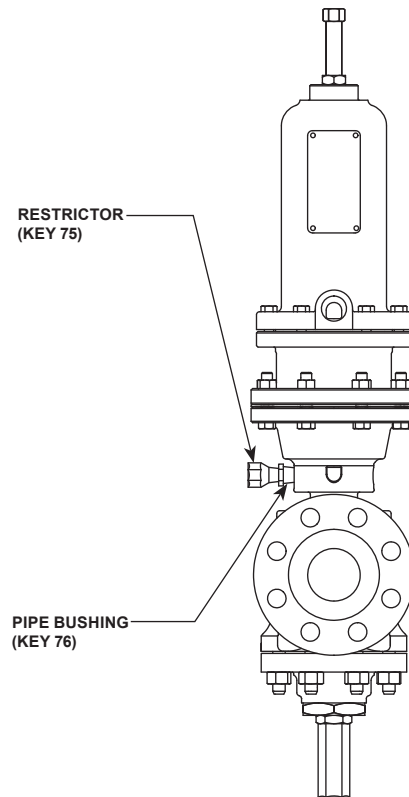


Figure 4. Type MR105 with High-Pressure Actuator and Restrictor Option

line. Improper adjustment to restrictor can lead to instability in pressure reducing regulator.

Note

Restrictor is intended for use on liquid applications with high-pressure actuator. Refer to Figure 4.

CAUTION

This regulator can be installed in a pit, which is prone to flooding. The vents of the spring case and lower diaphragm casing (High-Pressure Actuator) or bonnet (Low-Pressure Actuator) should be above the expected flood level or vent lines should be installed to terminate above the water level so that they are exposed to atmospheric pressure.

Table 4. Maximum Differential Pressure

ACTUATOR TYPE	BODY SIZE		MAXIMUM DIFFERENTIAL PRESSURE			
			Gas Service (Linear Cage)		Liquid Service (Quick Opening Cage)	
	NPS	DN	psid	bar d	psid	bar d
Low Pressure	1	25	400 or maximum inlet pressure, whichever is lower	27.6 or maximum inlet pressure, whichever is lower	200	13.6
	2	50			200	13.6
	3	80			225	15.5
	4	100			225	15.5
High Pressure	1	25	400 or maximum inlet pressure, whichever is lower	27.6 or maximum inlet pressure, whichever is lower	250	17.2
	2	50			200	13.6
	3	80			225	15.5
	4	100			250	17.2

Table 5. Wide-Open Flow and IEC Sizing Coefficient

LINEAR CAGE								
Body Size		Wide-Open Flow Coefficient		IEC Sizing Coefficient				
		Line Size Equals Body Size		C ₁	K _m	F _L	X _T	F _d
NPS	DN	C _g	C _v					
1	25	463	13.7	34.0	0.81	0.90	0.73	0.36
2	50	761	22.5	33.8	0.75	0.87	0.72	0.24
3	80	997	30.5	32.7	0.78	0.88	0.68	0.22
4	100	934	27.5	34.0	0.77	0.88	0.75	0.18
QUICK OPENING CAGE								
Body Size		Wide-Open Flow Coefficient		IEC Sizing Coefficient				
		Line Size Equals Body Size		C ₁	K _m	F _L	X _T	F _d
NPS	DN	C _g	C _v					
1	25	597	17.5	34.1	0.81	0.90	0.73	0.43
2	50	1740	48.2	36.1	0.81	0.90	0.82	0.34
3	80	3540	103.1	34.4	0.76	0.87	0.75	0.32
4	100	4300	135.9	31.6	0.72	0.85	0.65	0.30
REDUCED PORT QUICK OPENING CAGE								
Body Size		Wide-Open Flow Coefficient		IEC Sizing Coefficient				
		Line Size Equals Body Size		C ₁	K _m	F _L	X _T	F _d
NPS	DN	C _g	C _v					
2	50	1570	43.8	35.9	0.81	0.90	0.72	0.36

Installation Location

- The installed regulator should be adequately protected from vehicular traffic and damage from other external sources.
- Install the regulator with the vent pointed vertically down, see Figures 2 and 3.** If the vent cannot be installed in a vertically down position, the regulator must be installed under a separate protective cover. Installing the regulator with the vent down allows condensation to drain, minimizes the entry of water or other debris through the vent and minimizes vent blockage from freezing precipitation.
- Do not install the Type MR105 in a location where there can be excessive water accumulation or ice formation,** such as directly beneath a downspout, gutter or roof line of a building. Even a protective hood may not provide adequate protection in these instances.

- Install the regulator so that any gas discharge through the vent or vent assembly is over 3 ft / 0.9 m away from any building opening.
- Periodically check all vent openings to be sure that they are not plugged.



CAUTION

To protect against precipitation, make certain that the vents are oriented such that the opening does not allow precipitation to enter vents.

Regulators Subjected to Heavy Snow Conditions

Some installations, such as in areas with heavy snowfall, may require a hood or enclosure to protect the regulator from snow load and vent freeze over.



WARNING

Personal injury, equipment damage or leakage due to escaping fluid may result if the bonnet (key 61, Low-Pressure Actuator) or lower diaphragm casing (key 62, High-Pressure Actuator) is backed off or loosened when installing control line.

Downstream Control Line Installation

The Type MR105 regulator requires a downstream control line for proper pressure control. A 1/2 NPT control line connection is located on the bonnet (for low-pressure actuator, see Figure 2) or on the lower diaphragm casing (for high-pressure actuator, see Figure 3). For high-pressure actuator with Quick Opening Cage (liquid service), pipe bushing (key 76) and restrictor (key 75) should be installed in the 1/2 NPT control line connection (see Figure 4).

Connect the downstream control line tubing to the bonnet or lower casing and run the tubing approximately 20 in. / 0.5 m downstream. For best results, the outer diameter of the control line tubing should be 3/8 in. / 9.5 mm or larger.

Vent Line Installation

Type MR105 regulators have a 1/2 NPT vent opening on the spring case. When installed inside a building or if it is necessary to vent escaping gas away from the regulator, install a remote vent line in the spring case tapping. Vent piping should be as short and direct as possible with a minimum number of bends and elbows. The remote vent line should be at least 1/2 in./13 mm outer diameter tubing or 1/2 NPT pipe.

Remove the Type Y602-12 vent and the pipe bushing (key 76, Figure 6) and attach the vent line at this location. The other end of the vent line should be located outside with a screened vent (Type Y602-12 vent connector). The Type Y602-12 vent connector should be pointed down and protected as described in the Installation Location section.

Overpressure Protection



WARNING

Personal injury, equipment damage or leakage due to escaping accumulated

gas or bursting of pressure-containing parts may result if this regulator is:

- Overpressured;
- Used with incompatible process fluid;
- Installed where service conditions could exceed the limits given in the Specifications section and on the appropriate nameplate; or
- Where conditions exceed any ratings of adjacent piping or piping connections.

To avoid such injury or damage, provide pressure-relieving or pressure-limiting devices to prevent service conditions from exceeding those limits.

Type MR105 regulators have an outlet pressure rating lower than the inlet pressure rating. The recommended pressure limitations are stamped on the regulator nameplate. Some type of overpressure protection is needed if the actual inlet pressure can exceed the maximum operating outlet pressure rating. Overpressuring any portion of the regulators beyond the limits in the Specifications section may cause leakage, damage to regulator parts or personal injury due to bursting of pressure-containing parts.

Provide an external overpressure protection if inlet pressure will be high enough to damage downstream equipment. Common methods of external overpressure protection include relief valves, monitoring regulators, shut-off devices and series regulation.

If the regulator is exposed to an overpressure condition, it should be inspected for any damage that may have occurred. Regulator operation below the limits specified in the Specifications section and regulator nameplate does not preclude the possibility of damage from external sources or from debris in the pipeline.

Startup



WARNING

To avoid possible personal injury, equipment damage or leakage due to escaping fluid, make certain the regulator is installed as instructed in the Installation section.

Pressure gauges must always be used to monitor downstream pressure during Startup.

1. Check that proper installation is completed and downstream equipment has been properly adjusted.
2. Make sure all block and vent valves are closed.
3. Slowly open the valves in the following order:
 - a. Loading supply and control line valve(s), if used
 - b. Inlet shut-off valve
 - c. Outlet shut-off valve
4. If the regulator has the bleed valve option, slowly open valve to allow air to escape from lower casing. Once fluid starts to bleed out, close valve.

CAUTION

The regulator is factory-set as specified on the order or at the midpoint of the spring range. The allowable spring range is stamped on the nameplate. If a pressure setting other than the one specified is desired, be sure to change the pressure setting by following the Adjustment procedure.

5. If resetting setpoint, then set the regulator to the desired outlet pressure according to the Adjustment procedure.

Adjustment

Key numbers are referenced in Figure 6.

WARNING

Personal injury, equipment damage or leakage due to escaping fluid may result if adjusting screw (key 73) and jam nut (key 72) are not installed properly. Also, main spring (key 68) may go solid resulting in the regulator not locking up if jam nut is not installed and adjusting screw is adjusted completely down.

The factory setting of the regulator can be varied within the pressure range stamped on the nameplate. To change the outlet pressure, loosen the jam nut (key 72) using a hand wrench (not an impact gun), turn the adjusting screw (key 73) clockwise to increase outlet pressure setting or counterclockwise

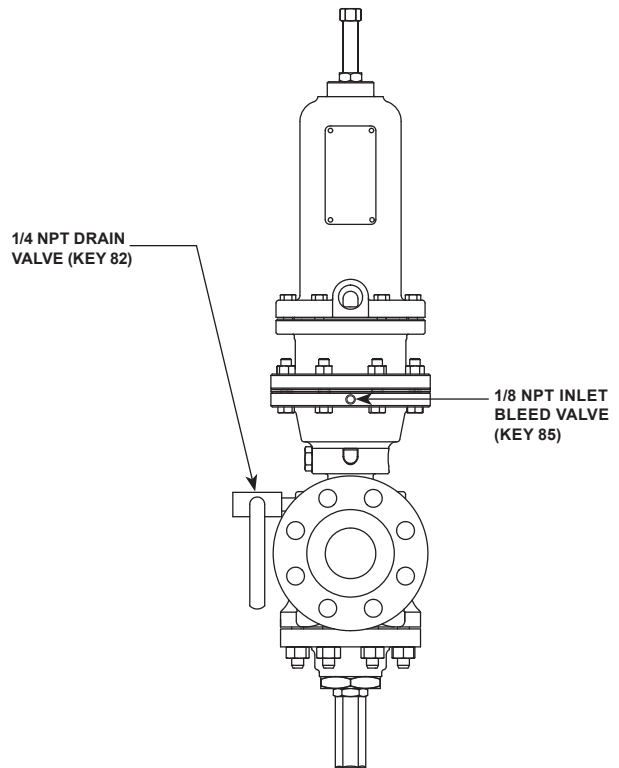


Figure 5. Type MR105 with High Pressure Actuator, Drain Valve and Bleed Valve Option

to decrease it. Monitor the outlet pressure with a test gauge during the adjustment. Tighten the jam nut to maintain the desired setting.

All regulator springs can be backed off to provide zero outlet. Recommended outlet pressure ranges available and color codes of the control springs are shown in the Specifications section and in Table 2.

Shutdown

WARNING

Personal injury, equipment damage or leakage due to escaping fluid may result if needle valves are used to isolate the pressure reducing regulator. It is strongly recommended that block valves be used to properly isolate the regulator from system.

Escaping process fluid from an open drain valve (see Figure 5) may result in regulator damage, personal injury and property damage. To avoid such injury

and damage, make certain the drain valve (if used) is properly closed after bleeding process fluid.

1. Isolate the regulator from the system in steps 2 and 3.
2. Close the upstream shut-off valve to the regulator inlet.
3. Close the downstream shut-off valve to the regulator outlet.



WARNING

To avoid personal injury or damage of internal parts from a pressure-loaded actuator, carefully vent the regulator spring case pressure prior to outlet pressure.

4. If the actuator is pressure loaded, vent the loading pressure slowly to release pressure in the spring case.

Note

To avoid internal damage due to reverse pressurization of main valve components, make certain pressure reducing regulator outlet pressure is bled prior to inlet pressure.

5. Slowly open the downstream vent valve to vent downstream pressure.
6. Leave the downstream vent valve open to vent inlet pressure and to release all remaining pressure in the regulator.
7. If the regulator has the drain valve option, slowly open valve to drain fluid inside valve body. Make sure to close valve after fluid has been drained.

Maintenance



WARNING

Personal injury, equipment damage or leakage due to escaping fluid may result if seals are not properly lubricated or maintained. Due to normal part wear or damage that may occur from external sources, this regulator should be inspected and maintained periodically. The frequency of inspection, maintenance and replacement of parts depend upon the severity of service

conditions or the requirements of local, state and federal regulations.

Regulators that have been disassembled for repair must be tested for proper operation before being returned to service. Only parts manufactured by Emerson should be used for repairing Fisher™ regulators. Restart gas utilization equipment according to normal start-up procedures.

Note

To protect against reduced performance, make certain vents are not plugged when conducting routine maintenance.

Annual Maintenance

The stem O-rings on the Type MR105 actuator can be lubricated during regularly scheduled maintenance, using the grease fitting (key 44). Stem O-rings can be checked for damage during normal operation. If line pressure leakage or unexpected grease extrusion from the actuator vent (key 26) is observed the stem O-ring needs to be replaced.

Change Nameplate

Be certain that the nameplates are updated to accurately indicate any field changes in equipment, materials, service conditions or pressure settings.

Disassembly



WARNING

To avoid personal injury resulting from sudden release of pressure, isolate the regulator from all pressure and cautiously release trapped pressure from the regulator before attempting disassembly.

Failure to properly follow maintenance installation procedures when replacing parts could result in regulator damage, personal injury and property damage from escaping process fluid or regulators separation during testing or after reinstallation in the pipe line.

Instructions are given below for the disassembly of Type MR105 pressure reducing regulators. Suitable lubricants are indicated on the assembly drawings.

Table 6. Type MR105 Product Assembly Torque

PART NAME AND KEY NUMBER	TORQUE							
	NPS 1 / DN 25 Body Size		NPS 2 / DN 50 Body Size		NPS 3 / DN 80 Body Size		NPS 4 / DN 100 Body Size	
	FT-LB	N•m	FT-LB	N•m	FT-LB	N•m	FT-LB	N•m
Body Flange Studs and Nuts (keys 3 and 29)	75 to 95	102 to 129	50 to 65	68 to 88	100 to 130	136 to 176	160 to 210	217 to 285
Lower Indicator Fitting (key 5)	90 to 130	122 to 176	90 to 130	122 to 176	90 to 130	122 to 176	90 to 130	122 to 176
Indicator Plug (key 27)	90 to 130	122 to 176	90 to 130	122 to 176	90 to 130	122 to 176	90 to 130	122 to 176
Indicator Fitting (key 35)	60 to 90	81 to 122	60 to 90	81 to 122	60 to 90	81 to 122	60 to 90	81 to 122
Actuator Stem Jam Nuts (key 48)	12 to 14	16 to 19	12 to 14	16 to 19	12 to 14	16 to 19	12 to 14	16 to 19
Low Pressure: Actuator Flange Cap Screws and Nuts (keys 57 and 58)	27 to 29	37 to 39	27 to 29	37 to 39	27 to 29	37 to 39	27 to 29	37 to 39
High Pressure: Actuator Flange Studs and Nuts (keys 57 and 58)	45 to 55	61 to 75	45 to 55	61 to 75	45 to 55	61 to 75	45 to 55	61 to 75
Bonnet and Spring Case Spacer Cap Screws (key 65)	10 to 12	14 to 16	10 to 12	14 to 16	10 to 12	14 to 16	10 to 12	14 to 16
Spring Case Cap Screws (key 67)	25 to 28	34 to 38	25 to 28	34 to 38	25 to 28	34 to 38	25 to 28	34 to 38

Note: All studs, screws and nuts shall be lubricated. All final torque values shall be verified with a calibrated torque wrench.

Table 7. Type MR105 Trim Weight

BODY SIZE		TRIM WEIGHT WITH TRAVEL INDICATOR		TRIM WEIGHT WITHOUT TRAVEL INDICATOR	
NPS	DN	LB	kg	LB	kg
1	25	9	4.1	8	3.6
2	50	15	6.8	14	6.4
3	80	30	14	28	13
4	100	49	22	48	22

Apply the lubricants as the regulator is being reassembled. All O-rings, gaskets and seals should be lubricated with a good grade of general-purpose lubricant and installed gently rather than forced into position. Refer to Table 6 for torque specifications. Refer to Figure 6 while servicing Type MR105 regulators.

Replacing Travel Indicator Assembly

If the trim parts are replaced, the travel indicator should also be replaced. The Quick Change Travel Indicator Kit includes a travel indicator assembly, including all necessary elastomers for the travel indicator. The elastomer repair kit does not contain the elastomeric components for the travel indicator assembly.

1. Remove the travel indicator assembly by removing the lower indicator fitting (key 5) from the body flange (key 2).
2. Coat the threads of the lower indicator fitting (key 5) with a good grade of general-purpose lubricant.
3. Install the travel indicator assembly; torque the lower indicator fitting (key 5) to 90 to 130 ft-lbs / 122 to 176 N•m.

4. Check indicator zeroing by unscrewing the indicator protector (key 19) and seeing if the flange of the flanged nut (key 22) lines up evenly with the closed mark on the indicator scale (key 18). If not, remove the indicator scale and separate the flanged nut and hex nut (key 8). Hold the indicator scale against the indicator fitting (key 35) with the scale base resting against the smallest shoulder of the fitting and turn the flanged nut until its flange is aligned with the closed scale marking. Then lock both nuts against each other and install the indicator scale and protector.

Replacing Trim Parts

Perform this procedure when inspecting, cleaning or replacing individual trim package parts.

CAUTION

All disassembly, trim change and reassembly steps in this section may be performed with the regulator in the main line. The trim for NPS 3 and 4 / DN 80 and 100 is heavy (see Table 7) and may be awkward to remove or reinstall in some valve/pipeline orientations. Follow your company policy for lifting and handling heavy parts.

Note

Access to the valve spring (key 9) and travel indicator parts in step 1 can be gained without removing the body flange (key 2).

Type MR105

1. Remove the lower indicator fitting (key 5) and attached parts. Proceed to step 5 if only maintenance on the indicator fitting or attached parts is performed.
2. Loosen the hex nuts (key 29) and stud bolts (key 3) and remove the body flange (key 2) from the valve body (key 1).
3. Use the valve body (key 1) as a holding fixture if desired. Flip the body flange (key 2) over and anchor it on the valve body.
4. To gain access to the port seal (key 12), upper seal (key 15) or valve plug (key 16) part, unscrew the seat ring (key 13) from the cage (key 11) and the cage from the body flange (key 2). To remove the piston ring (key 14) and/or plug O-ring (key 20), remove the valve plug (key 16) from the body flange, insert a screwdriver into the pre-cut fold over area of the piston ring and unfold the piston ring. Proceed to step 6 if no further maintenance is necessary.
5. To replace the body flange (key 2) or gain access to the valve spring (key 9), indicator stem (key 10), stem O-ring (key 7), spring seat (key 28) or E-ring (key 23), remove the indicator protector (key 19) and indicator scale (key 18). Since some compression is left in the spring, carefully remove the flanged nut (key 22) and hex nut (key 8). A screwdriver may be inserted through the O-ring retainer (key 6) to remove the stem O-ring without removing the retainer. If necessary, unclip the E-ring from the indicator stem.
6. Replace and lubricate parts such as the gasket (key 4) and cage O-ring (key 17) as necessary. If the port and upper seals (keys 12 and 15) were removed, install them in their retaining slots with the grooved sides facing out. Also lubricate any other surfaces as necessary for ease of installation. No further main valve maintenance is necessary if just the lower indicator fitting (key 5) and attached parts were removed.
7. Install the plug O-ring (key 20) and piston ring (key 14) onto the valve plug (key 16). Insert the valve plug into the body flange (key 2), install the cage (key 11) plus upper seal (key 15) and cage O-ring (key 17) into the body flange and then install the seat ring (key 13) plus port seal (key 12) into the cage. Apply a thin coating of lubricant to seals for protection during assembly. Use the valve body as a holding fixture during this step and insert a wrench handle (or similar tool) into the seat ring slots for leverage when tightening the seat ring and cage.
8. Remove the upside-down body flange (key 2) if it was anchored on the body (key 1). Coat the cage seating surfaces of the valve body web and the body flange seating surfaces of the valve body neck with a good grade of general-purpose lubricant.



WARNING

Personal injury, equipment damage or leakage due to escaping fluid may result if regulator bolts are not tightened to proper load. Always tighten bolts in an alternating pattern.

9. Install the body flange (key 2) on the body (key 1) and secure it evenly using the stud bolts (key 3) and nuts (key 29). Tighten to the torque value specified in Table 6.
10. Make sure that the lower indicator fitting and stem O-rings (keys 21 and 7) and O-ring retainer (key 6) are installed in the lower indicator fitting (key 5). Install the spring seat (key 28) and attach it with the E-ring (key 23) to the slotted end of the indicator stem (key 10). Install the valve spring (key 9).
11. Being careful not to cut the stem O-ring (key 7) with the stem threads, install the lower indicator fitting (key 5) down over the indicator stem (key 10) until resting on the valve spring (key 9). Install the hex nut (key 8) and then the flanged nut (key 22) on the indicator stem, pushing on the fitting if necessary to provide sufficient stem thread exposure. To maintain clearance for indicator part installation, compress the spring seat (key 28) by turning the hex nut (key 8) down on the stem until the threads bottom.
12. Install the lower indicator fitting (key 5) with attached parts into the body flange (key 2). Back off the hex nut (key 8) until the valve spring (key 9) completely closes the valve plug (key 16) against the port and upper seals (keys 12 and 15), as indicated by stem threads showing between the hex nut (key 8) and indicator fitting (key 35). Hold the indicator scale (key 18) against the indicator fitting with the scale base resting against the smallest shoulder of the indicator fitting and turn the flanged nut (key 22) until its flange is aligned with the closed scale marking. Then lock both nuts against each other and install the indicator scale and protector (keys 18 and 19).

Actuator Maintenance

Perform this procedure if it is desired to inspect or replace the diaphragm or other internal parts or if it is desired to change the outlet pressure range of the regulator by changing the control spring.



WARNING

To avoid possible personal injury from spring or pressure-loaded actuator, make certain the adjusting screw is completely backed off or the spring case pressure is vented prior to disassembly. Otherwise, the spring load or loading pressure could forcefully eject the spring case.

Replacing Main Spring

1. Loosen the jam nut (key 72). If pressure-loaded actuator is used, remove also the sealing washer (key 71). Using a hand wrench (not an impact gun), unscrew the adjusting screw (key 73) and remove it from the spring case (key 70).
2. Loosen and remove the cap screws (key 67) and lift off the spring case (key 70) from the spring case spacer (key 66 for Low-Pressure Actuator), upper casing welding assembly (key 87 for Low-Pressure Pressure-Loaded Actuator) or upper diaphragm casing (key 63 for High-Pressure Actuator).
3. Remove the upper spring seat (key 69) and control spring (key 68). Replace the control spring if desired.
4. For pressure-loaded actuator, replace the upper casing welding assembly top O-ring (Low-Pressure Actuator) or upper diaphragm casing O-ring (High-Pressure Actuator) (key 64) if necessary. Install the new O-ring in the groove on the top surface of the upper casing welding assembly (key 87) for Low-Pressure Actuator or upper diaphragm casing (key 63) for High-Pressure Actuator. If spring (key 68) and spring case spacer/upper diaphragm casing O-ring (key 64) replacement has been completed and no further maintenance in the actuator and its internal parts is necessary, proceed to step 23 for Low-Pressure Actuator or step 20 for High-Pressure Actuator.

For Low-Pressure Actuator Diaphragm Replacement

5. Remove the cap screws (key 57) and hex nuts (key 58) connecting the casings (key 63 or 87 and key 62) and diaphragm (key 56). Lift off the upper diaphragm casing (key 63) or upper casing welding assembly (key 87).
6. Unscrew the jam nuts (key 48) and remove them from the actuator stem (key 40).
7. Remove the Belleville spring washer (key 49), lower spring guide (key 52) and diaphragm plate (key 55) from the actuator stem (key 40).
8. Lift off the diaphragm (key 56) from the actuator stem (key 40) and inspect it for damage. Replace if necessary. If no further maintenance or inspection is required, proceed to step 18 to reassemble the actuator.

Note

Exercise care to ensure that the actuator stem (key 40) enters and exits the lower diaphragm head bore without pinching, cutting or damaging in any way the lower diaphragm head O-ring (key 51).

9. Carefully remove the lower diaphragm head (key 53) from the actuator stem (key 40) so that the actuator stem threads do not damage the O-ring inside the lower diaphragm head. Replace the lower diaphragm head O-ring (key 51) if necessary.
10. Remove the cap screws (key 65) connecting the lower diaphragm casing (key 62) and internal stiffener plate (key 84) to the bonnet (key 61). Lift the stiffener plate and lower casing off of the bonnet.
11. If it is desired to replace the bonnet and stem O-rings (keys 60 and 47) and bearings (key 46), disconnect the control line attached to bonnet (key 61). Unscrew the bonnet from the valve body (key 1). Remove stem (key 40) from the bonnet by pulling on the end of the stem without threads.
12. Remove the wiper (key 45, detail Z) on the threaded (orifice side) end of the bonnet (key 61) to reach the bearing (key 46) and stem O-ring (key 47). Install the new stem O-ring and bearing and put back the wiper.
13. Turn the bonnet (key 61) over and install another stem O-ring (key 47) and bearing (key 46, detail X) in the top side of the bonnet. Inspect the bonnet O-ring (key 60) installed in the groove located on the top surface of the bonnet (key 61) for any damage and replace if necessary.
14. Lubricate the bore on both ends of the bonnet (key 61). Install the bonnet over the actuator stem (key 40) and thread into the valve body (key 1). Tighten the bonnet into the body until the connecting pipe holes in the bonnet are located 90° from the valve body ends for correct tubing

alignment. Do not loosen the bonnet thread to align the pipe holes. Always tighten the bonnet to make alignment for the control line.

Note

Position the bonnet (key 61) such that the vent (key 26) is facing valve body (key 1) inlet, the lube fitting (key 44) is facing body outlet end and the 1/2 NPT control line connection (key 30) is located 90° from the valve body ends.

Note

Exercise care to ensure that the actuator stem (key 40) enters and exits the bonnet bore without pinching, cutting or damaging the valve stem O-rings (key 47).

15. Lubricate the cap screws (key 65) and use it to position and secure the lower diaphragm casing (key 62) and internal stiffener plate (key 84) to the bonnet (key 61). Tighten the cap screws to a torque of 10 to 12 ft-lbs / 14 to 16 N•m.
16. The serrated side of the lower diaphragm head (key 53) should be facing up toward the threaded end of the actuator stem (key 40). Carefully install the lower diaphragm head over the actuator stem.

Note

Exercise care to ensure that the actuator stem (key 40) enters and exits the lower diaphragm head bore without pinching, cutting or damaging in any way the lower diaphragm head O-ring (key 51).

17. Place the diaphragm (key 56) over the actuator stem (key 40) and on top of the lower diaphragm head (key 53). The convolutions of the diaphragm should be pointing up.
18. Place the following over the actuator stem (key 40) and on top of the diaphragm (key 56), in the following order: diaphragm plate (key 55), lower spring guide (key 52) and Belleville spring washer (key 49). The raised inner diameter of the Belleville spring washer should be pointing toward the threaded end of the actuator stem.
19. Lubricate the threads of the actuator stem (key 40) and thread the two jam nuts (key 48) onto it. Using wrench flats, hold the stem and torque the jam nuts individually. Tighten to a torque of 12 to 14 ft-lbs / 16 to 19 N•m.

Note

For pressure-loaded actuator option skip steps 20 and 21 and proceed to step 22 with upper casing welding assembly (key 87).

20. Install the upper diaphragm casing (key 63) or spring case spacer (key 66) assembly while aligning the bolt circle holes in the upper diaphragm casing, diaphragm (key 56) and lower diaphragm casing (key 62).

Note

Exercise care to ensure that the diaphragm (key 56) is not pinched, twisted or wrinkled while compressing between the upper and lower diaphragm casings (keys 62 and 63).

21. Lubricate the cap screws (key 57) and nuts (key 58) and carefully insert through holes in the outer flange of the diaphragm casings (keys 62 and 63) and diaphragm (key 56). Tighten the cap screws to the hex nuts to a final torque value of 27 to 29 ft-lbs / 37 to 39 N•m.
22. Place the control spring (key 68) inside the hole in the upper diaphragm casing (key 63) or upper casing welding assembly (key 87) and over the lower spring guide (key 52). The spring should be sitting on top of the diaphragm plate (key 55).
23. Lubricate the bore on the top of the upper spring seat (key 69) where the adjusting screw (key 73) will make contact. Place the upper spring seat on top of the control spring (key 68).
24. Install the spring case (key 70) over the control spring (key 68) and upper spring seat (key 69) and on top of the spring case spacer (key 66) or upper casing welding assembly (key 87). Align the holes in the spring case with the holes in the spring case spacer or upper casing welding assembly while ensuring the vent assembly (key 26) is aligned with valve body inlet.
25. Lubricate cap screws (key 67) and use them to secure the spring case (key 70) to the spring case spacer (key 66) or upper casing welding assembly (key 87). Tighten the cap screws to a final torque of 25 to 28 ft-lbs / 34 to 38 N•m.

**WARNING**

Personal injury, equipment damage or leakage due to escaping fluid may result if adjusting screw (key 73) and jam nut (key 72) are not installed properly. Also, main spring (key 68) may go solid resulting in the regulator not locking up if jam nut is not installed and adjusting screw is adjusted completely down.

26. Lubricate the adjusting screw (key 73) and thread on the jam nut (key 72). If pressure-loaded actuator is used, install the sealing washer (key 71). Lubricate the adjusting screw and place it into the spring case (key 70). Thread the adjusting screw using a hand wrench (not an impact gun) until it touches the upper spring seat (key 69). Set the regulator to the desired outlet pressure according to the procedure in Adjustment section.

For High-Pressure Actuator Diaphragm Replacement

5. Remove the cap screws (key 57) and hex nuts (key 58) connecting the diaphragm casings (keys 62 and 63) and diaphragm (key 56). Lift off the upper diaphragm casing (key 63).
6. Unscrew the jam nuts (key 48, detail V) and remove them from the actuator stem (key 40).
7. Remove the Belleville spring washer (key 49) and lower spring seat (key 54) from the actuator stem (key 40).
8. Lift off the diaphragm (key 56) from the actuator stem (key 40) and inspect it for damage. Replace if necessary. If no further maintenance or inspection is required, proceed to step 15.

Note

Exercise care to ensure that the actuator stem (key 40) enters and exits the lower diaphragm head bore without pinching, cutting or damaging in any way the lower diaphragm head O-ring (key 51).

9. Carefully remove the lower diaphragm head (key 53) from the actuator stem (key 40). Replace the lower diaphragm head O-ring (key 51) if necessary.
10. If it is desired to replace the stem O-rings (key 47, detail X and Z) and bearings (key 46), disconnect the control line tubing. Remove the lower diaphragm casing (key 62) by unthreading it from the valve body (key 1). Remove stem (key 40) from the lower casing by pulling on the end of the stem without threads.

11. Remove the wiper ring (key 45, detail Z) on the threaded end of the lower diaphragm casing (key 62) to reach the bearing (key 46) and stem O-ring (key 47). Install the new stem O-ring and bearing and put back the wiper.
12. Turn the lower diaphragm casing (key 62) over and install another stem O-ring (key 47) and bearing (key 46) in the top side of the lower casing.
13. Lubricate the bore on both ends of the lower diaphragm casing (key 62). Install the lower casing over the actuator stem (key 40) and thread into the valve body (key 1). Tighten the lower casing into the body until the connecting pipe holes in the casing are located 90° from the valve body ends for correct tubing alignment. Do not loosen the bonnet thread to align the pipe holes. Always tighten the lower casing to make alignment for the control line.

Note

Position the lower diaphragm casing (key 62) such that the vent (key 26) is facing valve body (key 1) inlet, the lube fitting (key 44) is facing body outlet end and the 1/2 NPT control line connection (key 30) is located 90° from the valve body ends.

Note

Exercise care to ensure that the actuator stem (key 40) enters and exits the casing bore without pinching, cutting or damaging the actuator stem O-rings (key 47).

14. The serrated side of the lower diaphragm head (key 53) should be facing up toward the threaded end of the actuator stem (key 40). Carefully install the lower diaphragm head over the actuator stem.

Note

Exercise care to ensure that the actuator stem (key 40) enters and exits the lower diaphragm head bore without pinching, cutting or damaging in any way the lower diaphragm head O-ring (key 51).

15. Lubricate the convoluted side of the diaphragm (key 56) and place over the actuator stem (key 40) and on top of the lower diaphragm head (key 53). The convolutions of the diaphragm should be pointing up.

16. Place the lower spring seat (key 54) and Belleville spring washer (key 49) over the actuator stem (key 40) and on top of the diaphragm (key 56). The raised inner diameter of the spring washer should be pointing toward the threaded end of the actuator stem.
17. Lubricate the threads of the actuator stem (key 40) and thread the two jam nuts (key 48) onto it. Using wrench flats, hold the stem and torque the two jam nuts individually. Tighten to a torque of 12 to 14 ft-lbs / 16 to 19 N•m.
18. Install the upper diaphragm casing (key 63) while aligning the bolt circle holes in the upper diaphragm casing, diaphragm (key 56) and lower diaphragm casing (key 62).

Note

Exercise care to ensure that the diaphragm (key 56) is not pinched, twisted or wrinkled while compressing between the upper and lower diaphragm casings (keys 62 and 63).

19. Lubricate the cap screws (key 57) and nuts (key 58) and carefully insert through holes in the outer flange of the diaphragm casings (keys 62 and 63) and diaphragm (key 56). Tighten the cap screws to the hex nuts to a final torque value of 45 to 55 ft-lbs / 61 to 75 N•m.
20. Place the control spring (key 68) inside the hole in the upper diaphragm casing (key 63) and over the lower spring seat (key 54). The spring should be sitting on top of the lower spring seat.
21. Lubricate the bore on the top of the upper spring seat (key 69) where the adjusting screw (key 73) will make contact. Place the upper spring seat on top of the control spring (key 68).
22. Install the spring case (key 70) over the control spring (key 68) and upper spring seat (key 69) and on top of the upper diaphragm casing (key 63). Align the holes in the spring case with the holes in the upper casing while ensuring the vent assembly (key 26) is aligned with valve body inlet.
23. Lubricate cap screws (key 67) and use them to secure the spring case (key 70) to the upper diaphragm casing (key 63). Tighten the cap screws to a final torque of 25 to 28 ft-lbs / 34 to 38 N•m.



WARNING

Personal injury, equipment damage or leakage due to escaping fluid may result if adjusting screw (key 73) and jam nut (key 72) are not installed properly. Also, spring (key 68) may go solid resulting in regulator not locking up if jam nut is not installed and adjusting screw is adjusted completely down.

24. Lubricate the adjusting screw (key 73) and thread on the jam nut (key 72). If pressure-loaded actuator is used, install the sealing washer (key 71). Lubricate the adjusting screw and place it into the spring case (key 70). Thread the adjusting screw using a hand wrench (not an impact gun) until it touches the upper spring seat (key 69). Set the regulator to the desired outlet pressure according to the procedure in Adjustment section.

Regulator Reassembly

As indicated by the square callouts in Figure 6, it is recommended that a good quality pipe thread sealant be applied to pressure connections and fittings and a good quality lubricant be applied to O-rings. Also apply an anti-seize compound to the adjusting screw threads and other areas as needed.

After repair, the regulator should be tested for proper operation before being put back into service.

Parts Ordering

When corresponding with your local Sales Office about this regulator, always reference the equipment serial number or FS number found on the nameplate.

When ordering replacement parts, reference the key number of each needed part as found in the following parts list. Separate kits containing all recommended spare parts are available.

Parts List

Note

In this parts list, parts marked NACE are intended for corrosion-resistant service as detailed in the NACE International Standard MR0175-2003 and MR0103.

Type MR105

Key 1, Type MR105 Valve Bodies

MATERIAL	END CONNECTION	PART NUMBER			
		NPS 1 / DN 25	NPS 2 / DN 50	NPS 3 / DN 80	NPS 4 / DN 100
Cast Iron	NPT	34B7611X012	38A8845X012	-----	-----
	CL125 FF	34B8630X012	38A8847X012	38A8851X012	38A8865X012
	CL250 RF	37B5950X012	38A8846X012	38A8850X012	38A8854X012
WCC Steel	NPT	37B5946X012	38A8848X012	-----	-----
	CL150 RF	37B5947X012	38A8853X012	38A8872X012	38A8867X012
	CL300 RF	37B5948X012	38A8849X012	38A8871X012	38A8869X012
	CL600 RF	37B5949X012	38A8844X012	38A8852X012	38A8866X012
	PN 16/25/40 RF	GE05956X012	GE05960X012	-----	-----
	PN 16 RF	-----	-----	GE05965X012	GE05969X012
CF8M Stainless Steel (NACE)	NPT	37B5946X032	38A8848X032	-----	-----
	CL150 RF	37B5947X032	38A8853X072	38A8872X052	38A8867X042
	CL300 RF	37B5948X032	38A8849X032	38A8871X052	38A8869X032
	CL600 RF	37B5949X032	38A8844X032	38A8852X042	38A8866X032
	PN 16/25/40 RF	GE05956X022	GE05960X022	-----	-----
	PN 16 RF	-----	-----	GE05965X022	GE05969X022
CF3M Stainless Steel (NACE)	CL150 RF	37B5947X102	38A8853X082	-----	-----
	CL300 RF	37B5948X102	38A8849X122	38A8871X122	-----
WCC Steel (NACE)	NPT	37B5946X022	38A8848X022	-----	-----
	CL150 RF	37B5947X022	38A8853X052	38A8872X062	38A8867X032
	CL300 RF	37B5948X022	38A8849X022	38A8871X042	38A8869X022
	CL600 RF	37B5949X022	38A8844X022	38A8852X032	38A8866X022

Key	Description	Part Number	Key	Description	Part Number
13	Seat Ring		16*	Valve Plug	
	416 Stainless Steel			416 Stainless Steel	
	NPS 1 / DN 25	24A6781X012		NPS 1 / DN 25	14A6780X012
	NPS 2 / DN 50	24A5670X012		NPS 2 / DN 50	24A6772X012
	NPS 3 / DN 80	24A5655X012		NPS 3 / DN 80	24A9421X012
	NPS 4 / DN 100	24A5640X012		NPS 4 / DN 100	24A8182X012
	316 Stainless Steel (NACE)			S20910 Stainless Steel (NACE)	
	NPS 1 / DN 25	24A6781X022		NPS 1 / DN 25	14A6780X132
	NPS 2 / DN 50	24A5670X022		316 Stainless Steel (NACE)	
	NPS 3 / DN 80	24A5655X022		NPS 2 / DN 50	24A6772X032
	NPS 4 / DN 100	24A5640X022		NPS 3 / DN 80	24A9421X022
	316L Stainless Steel (NACE)			NPS 4 / DN 100	24A8182X022
NPS 1 / DN 25	24A6781X052	316L Stainless Steel (NACE)			
NPS 2 / DN 50	24A5670X042	NPS 2 / DN 50	24A6772X072		
NPS 3 / DN 80	24A5655X042	NPS 3 / DN 80	24A9421X052		
NPS 4 / DN 100	24A5640X042	NPS 4 / DN 100	24A8182X052		
14*	Piston Ring		17*	Cage O-ring (NACE)	
	PTFE (NACE)			Nitrile (NBR)	
	NPS 1 / DN 25	14A6786X012		NPS 1 / DN 25	10A7777X012
	NPS 2 / DN 50	14A5675X012		NPS 2 / DN 50	10A7779X012
	NPS 3 / DN 80	14A5660X012		NPS 3 / DN 80	14A5688X012
NPS 4 / DN 100	14A5645X012	NPS 4 / DN 100	10A3481X012		
15*	Upper Seal (NACE)		Fluorocarbon (FKM)		
	Nitrile (NBR)		NPS 1 / DN 25	10A7778X012	
	NPS 1 / DN 25	14A6789X012	NPS 2 / DN 50	10A7779X022	
	NPS 2 / DN 50	24A5674X012	NPS 3 / DN 80	14A5688X022	
	NPS 3 / DN 80	24A5659X012	NPS 4 / DN 100	10A3483X012	
	NPS 4 / DN 100	24A5644X012	EPDM		
	Fluorocarbon (FKM)		NPS 1 / DN 25	10A7777X022	
	NPS 1 / DN 25	14A8187X012	NPS 2 / DN 50	10A7779X052	
	NPS 2 / DN 50	25A7413X012	NPS 3 / DN 80	14A5688X082	
	NPS 3 / DN 80	25A7376X012	NPS 4 / DN 100	10A3481X052	
	NPS 4 / DN 100	25A7468X012	18	Travel Indicator Scale, Plastic	
	EPDM		NPS 1 / DN 25	14A6759X012	
	NPS 1 / DN 25	14A6789X022	NPS 2 / DN 50	14A5678X012	
NPS 2 / DN 50	24A5674X062	NPS 3 and 4 / DN 80 and 100	14A5662X012		
NPS 3 / DN 80	24A5659X062	19	Travel Indicator Protector, Zinc-Plated Steel		
NPS 4 / DN 100	24A5644X052		14A6769X012		

*Recommended spare part.

Type MR105

Key	Description	Part Number	Key	Description	Part Number
20*	Valve Plug O-ring (NACE) Nitrile (NBR)		40	Actuator Stem	
	NPS 1 / DN 25	14A6981X012		S17400 Stainless Steel	
	NPS 2 / DN 50	14A5686X012		NPS 1 / DN 25	GE39146X012
	NPS 3 / DN 80	1V326906562		NPS 2 / DN 50	GE39147X012
	NPS 4 / DN 100	14A5688X012		NPS 3 / DN 80	GE39148X012
	Fluorocarbon (FKM)			NPS 4 / DN 100	GE39149X012
	NPS 1 / DN 25	14A8188X012		S20910 Stainless Steel (NACE)	
	NPS 2 / DN 50	14A5686X022		NPS 1 / DN 25	GE39146X022
	NPS 3 / DN 80	1V3269X0042		NPS 2 / DN 50	GE39147X022
	NPS 4 / DN 100	14A5688X022		NPS 3 / DN 80	GE39148X022
	EPDM			NPS 4 / DN 100	GE39149X022
	NPS 1 / DN 25	14A6981X032	43	Nameplate	-----
	NPS 2 / DN 50	14A5686X052	44	Lube Fitting, Steel (NACE)	1L847828992
	NPS 3 / DN 80	1V3269X0062	45	Wiper Ring (NACE)	15A6002XN12
	NPS 4 / DN 100	14A5688X082	46*	Bearing (NACE) (2 required)	
21*	Lower Indicator Fitting O-ring (NACE) Nitrile (NBR)			Nylon (PA)	17A7112X012
	NPS 1 / DN 25	10A8931X012		Nyliner	17A7112X022
	NPS 2, 3 and 4 / DN 50, 80 and 100	10A3800X012	47*	Valve Stem O-ring (NACE) (2 required)	
	Fluorocarbon (FKM)			Nitrile (NBR)	1C782206992
	NPS 1 / DN 25	10A0811X012		Fluorocarbon (FKM)	1K756106382
	NPS 2, 3 and 4 / DN 50, 80 and 100	1R727606382		EPDM	1C7822X0052
	EPDM		48*	Jam Nut (2 required), Zinc-Plated Steel (NACE)	1A946324122
	NPS 1 / DN 25	10A8931X022	49*	Bellefonte Spring Washer (NACE)	GG04933X012
	NPS 2, 3 and 4 / DN 50, 80 and 100	10A3800X042	51*	Lower Diaphragm Head O-ring (NACE)	
22	Flange Nut, Steel	14A5693X012		Nitrile (NBR)	1P420706992
23	E-ring, Stainless Steel	14A8181X012		Fluorocarbon (FKM)	1L949306382
24	Drive Screw, Stainless Steel (NACE) (6 required)	1A368228982		EPDM	1P4207X0032
25	Flow Arrow	-----	52	Lower Spring Guide, Zinc-Plated Steel (NACE) ⁽¹⁾ (Low-Pressure Actuator only)	GE39171X012
26	Vent Assembly (NACE) (2 required/ 1 required for Pressure-Loaded Actuator)	Type Y602-12	53	Lower Diaphragm Head 17-4 Stainless Steel (NACE)	
27	Plug (Type MR105 Without Travel Indicator Only) Steel			Low-Pressure Actuator	GE39137X012
	NPS 1 / DN 25	14A6983X012		High-Pressure Actuator	GG02195X012
	NPS 2, 3 and 4 / DN 50, 80 and 100	14A9684X012	54	Lower Spring Seat, Zinc-Plated Steel (NACE) ⁽¹⁾ (High-Pressure Actuator only)	GE39174X012
	Stainless Steel (NACE)		55	Diaphragm Plate, Cast Iron (NACE) ⁽¹⁾ (Low-Pressure Actuator only)	GG02994X012
	NPS 1 / DN 25	14A6983X022	56*	Diaphragm (NACE)	
	NPS 2, 3 and 4 / DN 50, 80 and 100	14A9684X032		Low-Pressure Actuator	
28	Spring Seat, Zinc-Plated Steel			Nitrile (NBR)/Nylon (PA)	GG02995X012
	NPS 1 / DN 25	14A6982X012		Fluorocarbon (FKM)/Nylon (PA)	GG02995X022
	NPS 2, 3 and 4 / DN 50, 80 and 100	15A2206X012		EPDM	GG02995X052
29	Hex Nut Steel			High-Pressure Actuator	
	NPS 1 / DN 25 (4 required)	1C3306X0832		Nitrile (NBR)/Nylon (PA)	GE39329X012
	NPS 2 / DN 50 (8 required)	1A3772X0892		Fluorocarbon (FKM)/Nomex®	GE39329X022
	NPS 3 / DN 80 (8 required)	1A3760X0832		EPDM	GE39329X052
	NPS 4 / DN 100 (8 required)	1A3520X0922	57	Cap Screw	
	Stainless Steel (NACE)			Low-Pressure Actuator (16 required)	
	NPS 1 / DN 25 (4 required)	1C330635252		Steel	1E7603X0062
	NPS 2 / DN 50 (8 required)	1A377235252		Stainless Steel (NACE)	1E7603X0072
	NPS 3 / DN 80 (8 required)	1A376035252		High-Pressure Actuator (8 required)	
	NPS 4 / DN 100 (8 required)	1A352035252		Steel	T10990X0012
30	Pipe Plug, 1/2 NPT Steel			Stainless Steel (NACE)	1A219235222
	Stainless Steel (NACE)		58	Hex Nut	
33	NACE Tag (not shown)	-----		Low-Pressure Actuator	
34	Seal Wire, Stainless Steel (NACE) (not shown)	1U7581X0022		Steel (16 required)	1A3465X0092
35	Indicator Fitting, Stainless Steel	T21104T0012		Stainless Steel (16 required) (NACE)	1A3465X0102
36*	Back O-ring, PTFE (2 required)	1K786806992		High-Pressure Actuator	
37*	Indicator Fitting O-ring			Steel (8 required)	1E9445X0502
	Nitrile (NBR)	18B3438X012		Stainless Steel (16 required) (NACE)	1A337435252
	Fluorocarbon (FKM)	1N430306382	60*	O-ring (NACE) (Low-Pressure Actuator only)	
	EPDM	1N4303X0012		Nitrile (NBR)	1F358106992
38	Pipe Plug, 1/4 NPT (not used with Drain Valve option)			Fluorocarbon (FKM)	1F3581X0022
	Steel	1A767524662	61	Bonnet (Low-Pressure Actuator only)	
	Stainless Steel (NACE)	1A767535072		Steel	33B0301X012
				316 Stainless Steel (NACE)	33B0301X072

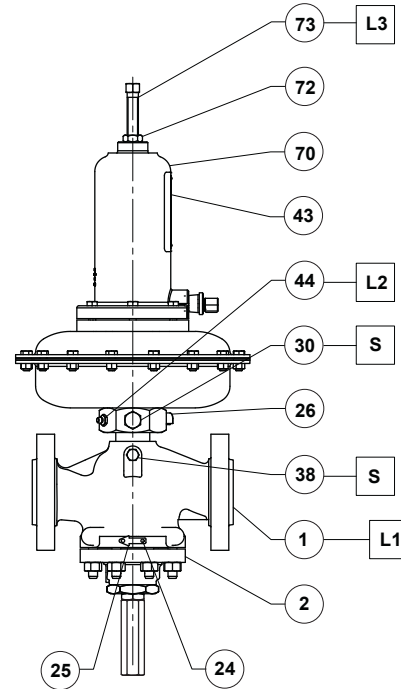
*Recommended spare part.

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1. Meets chemical and physical requirements of NACE MR0175-2003 and MR0103 for non-pressure loaded applications only. It is assumed that this part is not "exposed" to the sour gas.

Type MR105

Key	Description	Part Number
62	Lower Diaphragm Casing Low-Pressure Actuator Steel 316 Stainless Steel (NACE) High-Pressure Actuator Steel CF3M/CF8M Stainless Steel (NACE) High-Pressure Actuator with 1/8 NPT Tap for Bleed Valve (optional) Steel CF3M/CF8M Stainless Steel (NACE)	24A5680X012 24A5680X072 GG00833X012 GG00833X022 ERSA01471A0 ERSA01471A1
63	Upper Diaphragm Casing Low-Pressure Actuator Steel 316 Stainless Steel (NACE) High-Pressure Actuator Steel CF3M/CF8M Stainless Steel (NACE)	GG02988X012 GG02988X022 GG00884X012 GG00884X022
64*	Upper Diaphragm Casing O-ring (For Low and High-Pressure Actuator) Nitrile (NBR) Fluorocarbon (FKM)	1P233206992 1P2332X0012
65	Cap Screw (10 required) (Low-Pressure Actuator only) Steel Stainless Steel (NACE)	1A368424052 1A3684X0102
66	Spring Case Spacer (Low-Pressure Actuator only) Steel 316 Stainless Steel (NACE)	GG00877X012 GG00877X022
67	Cap Screw (6 required) Steel Stainless Steel (NACE)	1C4038X0062 1C4038X0032
68	Control Spring, Steel Alloy (NACE) ⁽¹⁾ (Refer to Table 2 for the Spring Ranges) White Silver Orange Red Green (for NPS 1 and 2 / DN 25 and 50 body sizes only)	GE42909X012 GE42910X012 GE42911X012 GE43002X012 GE42907X012
69	Upper Spring Seat, Zinc-Plated Steel (NACE) ⁽¹⁾	GG02175X012
70	Spring Case WCC Steel CF3M/CF8M Stainless Steel (NACE)	GG00917X012 GG00917X022
71	Seal Washer (For Pressure-Loaded Actuator only) Steel/Nitrile (NBR) Steel/Fluorocarbon (FKM) ⁽²⁾	11A9681X012 11A9681X022
72	Jam Nut (NACE) Steel Stainless Steel	1A319224122 1A3192K0012
73	Adjusting Screw (NACE) Steel Stainless Steel	GG03609X012 GG03609X022
75	Restrictor (see Figure 4) (For Liquid Service High-Pressure Actuator only) Steel Stainless Steel (NACE)	17B5175X022 17B5175X012
76	Pipe Bushing (1 required), For All Actuators Steel Stainless Steel (NACE)	1C379026232 1C3790X0012



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APPLY LUBRICANT OR SEALANT⁽¹⁾:
L1 = MULTI-PURPOSE POLYTETRAFLUOROETHYLENE (PTFE) LUBRICANT
L2 = MULTI-PURPOSE NLGI⁽²⁾ GRADE 1 GREASE
L3 = ANTI-SEIZE COMPOUND
S = MULTI-PURPOSE PTFE THREAD SEALANT

NOTE: KEY 38 IS NOT USED WITH 1/4 NPT DRAIN VALVE OPTION.

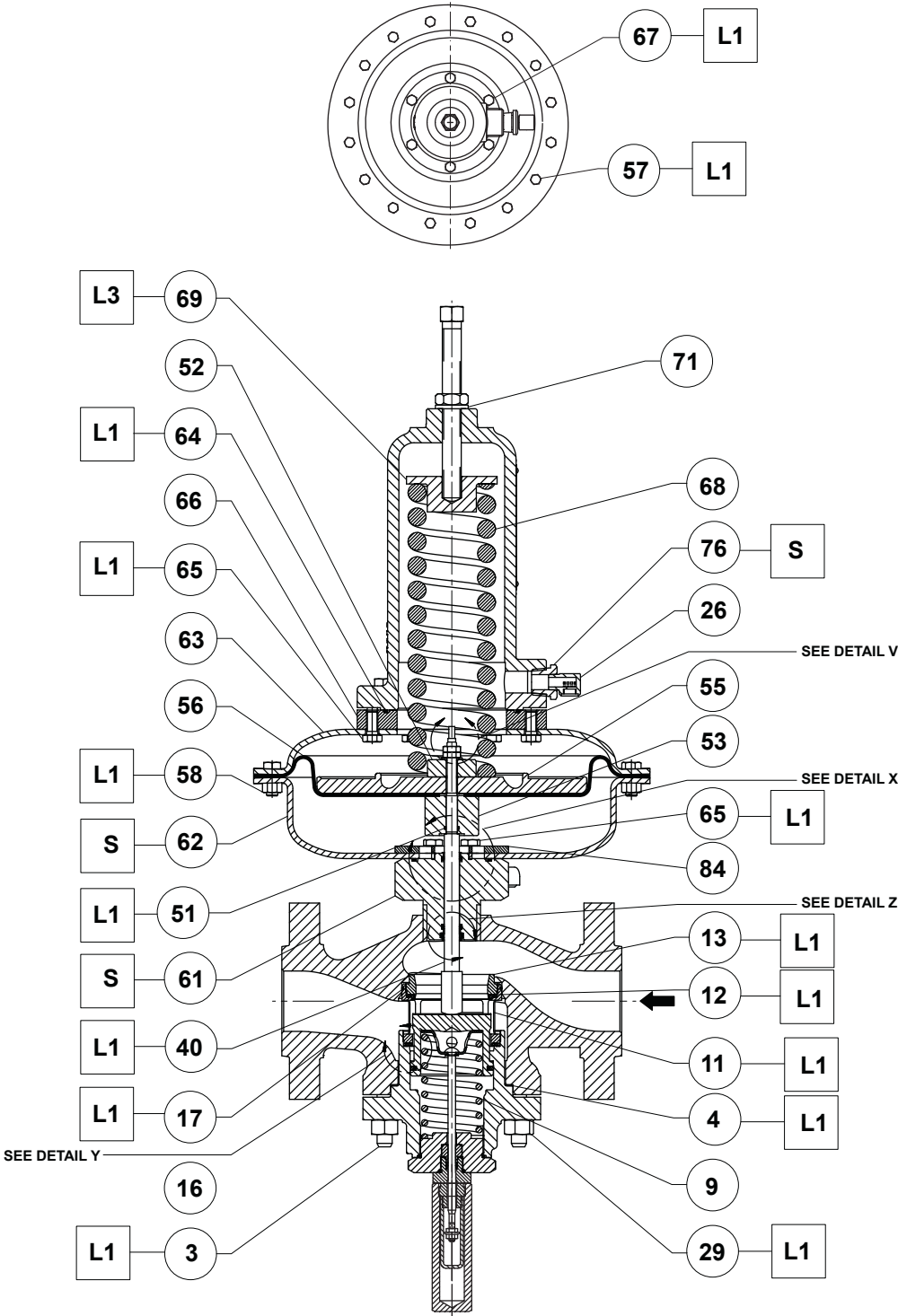
- Lubricants and sealants must be selected such that they meet the temperature requirements.
- National Lubricating Grease Institute.

Figure 6. Type MR105 Direct-Operated Pressure Reducing Regulator Assemblies

Key	Description	Part Number
76	Pipe Bushing (2 required), For Liquid Service on High-Pressure Actuators Steel Stainless Steel (NACE)	1C379026232 1C3790X0012
81	Pipe Nipple, Stainless Steel (NACE) (not shown)	1C488238982
82	Drain Valve, Stainless Steel (NACE) (see Figure 5), 1/4 NPT	13B2392X082
84	Internal Stiffener Plate (Low-Pressure Actuator only) Steel Stainless Steel (NACE)	ERSA00169A0 ERSA00169A1
85	Bleed Valve, Stainless Steel (NACE) (see Figure 5), 1/8 NPT	15A6011XDG2
87	Upper Casing Welding Assembly (Low-Pressure Actuator only) (not shown) Steel Stainless Steel	ERSA02584A0 ERSA02584A1

*Recommended spare part.

- Meets chemical and physical requirements of NACE MR0175-2003 and MR0103 for non-pressure loaded applications only. It is assumed that this part is not "exposed" to the sour gas.
- Consult the local Sales Office for availability.



TYPE MR105 WITH LOW-PRESSURE ACTUATOR ASSEMBLY

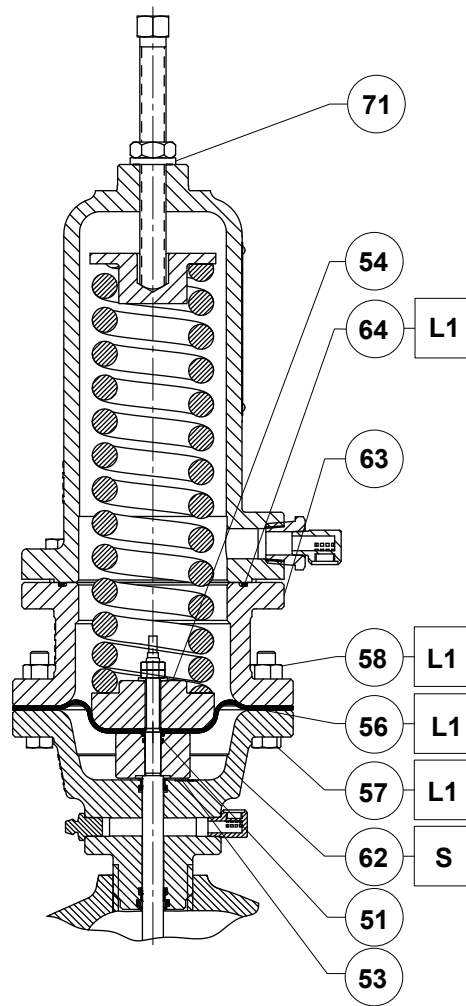
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APPLY LUBRICANT OR SEALANT⁽¹⁾:
 L1 = MULTI-PURPOSE PTFE LUBRICANT
 L3 = ANTI-SEIZE COMPOUND
 S = MULTI-PURPOSE PTFE THREAD SEALANT
 NOTE: KEYS 64 AND 71 ARE USED ONLY FOR PRESSURE-LOADED ACTUATORS.

1. Lubricants and sealants must be selected such that they meet the temperature requirements.

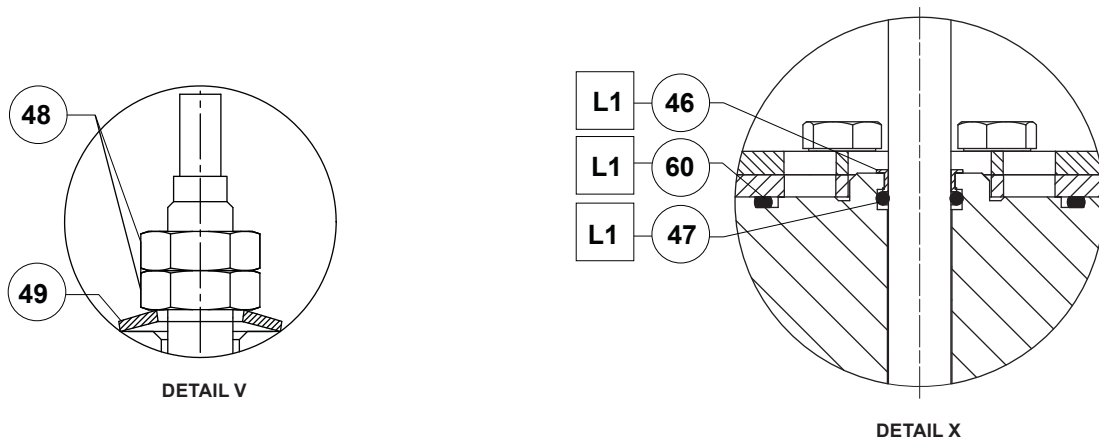
Figure 6. Type MR105 Direct-Operated Pressure Reducing Regulator Assemblies (continued)

Type MR105



NOTE: KEYS 64 AND 71 ARE USED ONLY FOR PRESSURE-LOADED ACTUATORS.

TYPE MR105 WITH HIGH-PRESSURE ACTUATOR ASSEMBLY

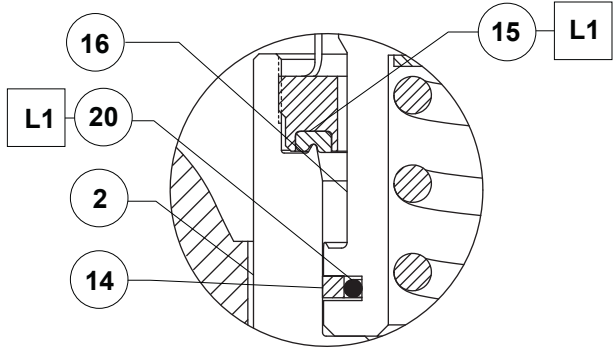


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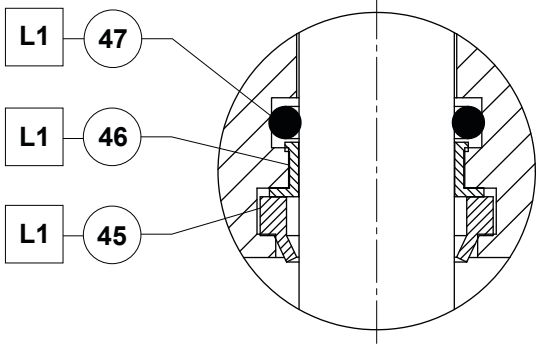
APPLY LUBRICANT OR SEALANT⁽¹⁾:
 L1 = MULTI-PURPOSE PTFE LUBRICANT
 S = MULTI-PURPOSE PTFE THREAD SEALANT

1. Lubricants and sealants must be selected such that they meet the temperature requirements.

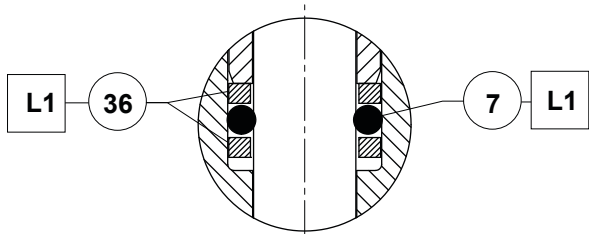
Figure 6. Type MR105 Direct-Operated Pressure Reducing Regulator Assemblies (continued)



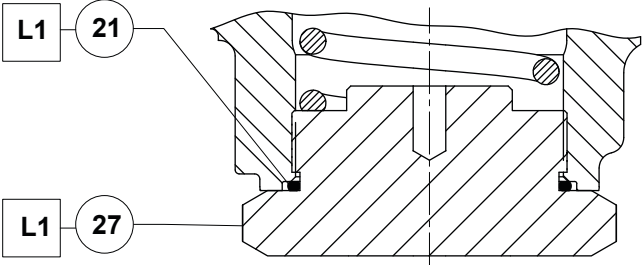
DETAIL Y



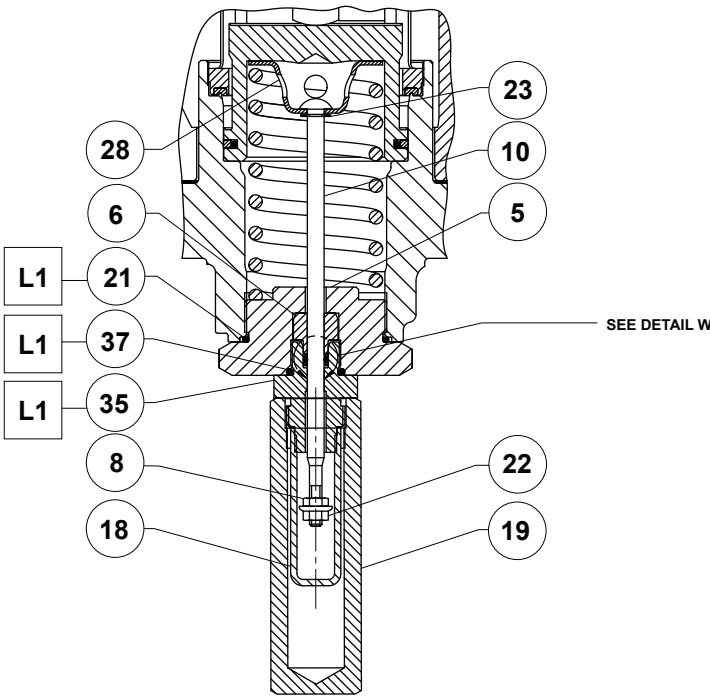
DETAIL Z



DETAIL W



NO TRAVEL INDICATOR



TYPE MR105 WITH OPTIONAL TRAVEL INDICATOR

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□ APPLY LUBRICANT⁽¹⁾:
L1 = MULTI-PURPOSE PTFE LUBRICANT

1. Lubricants and sealants must be selected such that they meet the temperature requirements.

Figure 6. Type MR105 Direct-Operated Pressure Reducing Regulator Assemblies (continued)

Type MR105

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