

March 2022

T205 Series Tank Blanketing Regulators

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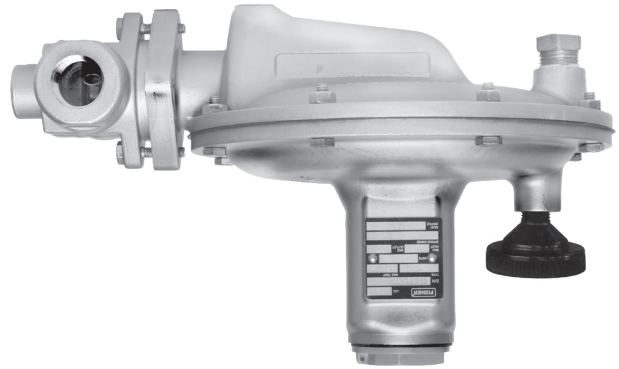


Figure 1. Type T205 Tank Blanketing Regulator

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. instructions.

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

Call a qualified service person to service the unit. Installation, operation and maintenance procedures performed by unqualified person may result

in improper adjustment and unsafe operation. Either condition may result in equipment damage or personal injury. Only a qualified person must install or service the T205 Series Regulator.

Introduction

Scope of the Manual

This Instruction Manual provides instruction for installation, startup, maintenance and parts ordering information for the T205 Series Tank Blanketing Regulators.

Product Description

T205 Series Tank Blanketing Regulator is a direct-operated and spring-loaded regulator. The regulator prevents a stored liquid from vaporizing into the atmosphere, reduces liquid combustibility and prevents oxidation or contamination of the product by reducing its exposure to air. T205 Series maintains a slightly positive pressure and thereby reduces the possibility of tank wall collapse during pump out operation.

T205 Series

Specifications

The Specifications section on this page provides the ratings and other specifications for the T205 Series. Factory specification such as type, maximum inlet pressure, maximum temperature, maximum outlet pressure, spring range and orifice size are stamped on the nameplate fastened on the regulator at the factory.

Product Configurations

Type T205: Tank blanketing regulator with outlet pressure range of 1 in. w.c. to 7 psig / 2.5 mbar to 0.48 bar in seven different spring ranges and has internal pressure registration requiring no downstream control line.

Type T205M: Similar to Type T205 but has a blocked throat and a downstream control line connection for external pressure registration.

Type T205H: Similar to Type T205, except outlet (casing) pressure rating equals the inlet rating (both 150 psig / 10.3 bar) and low temperature to -20°F / -29°C.

Type T205HM: Similar to Type T205M, except outlet (casing) pressure rating equals the inlet rating (both 150 psig / 10.3 bar) and low temperature to -20°F / -29°C

Body Sizes and End Connection Styles

See Table 1

Maximum Allowable Inlet Pressure⁽¹⁾

See Table 1

Maximum Operating Inlet Pressure⁽¹⁾

See Table 2

Maximum Outlet (Casing) Pressure⁽¹⁾

Types T205 and T205M

Gray cast iron: 35 psig / 2.4 bar

WCC Carbon steel, LCC Carbon steel or

CF8M/CF3M Stainless steel: 75 psig / 5.2 bar

Types T205H and T205HM

WCC Carbon steel or CF8M/CF3M Stainless steel:

150 psig / 10.3 bar

Outlet (Control) Pressure Ranges⁽¹⁾

See Table 3

Shutoff Classification per ANSI/FCI 70-3-2004

Class VI (Soft Seat)

Pressure Registration

Types T205 and T205H: Internal

Types T205M and T205HM: External

Material Temperature Capabilities⁽¹⁾⁽²⁾⁽⁴⁾

Elastomer Parts

Nitrile (NBR):

Types T205 and T205M: -40 to 180°F / -40 to 82°C

Types T205H and T205HM: -20 to 180°F /

-29 to 82°C

Fluorinated Ethylene Propylene (FEP)⁽³⁾:

-20 to 180°F / -29 to 82°C

Fluorocarbon (FKM)⁽³⁾: 40 to 300°F / 4 to 149°C

Ethylene Propylene Diene (EPDM)⁽³⁾:

-20 to 225°F / -29 to 107°C

Perfluoroelastomer (FFKM)⁽³⁾:

0 to 300°F / -18 to 149°C

Body Materials

Gray cast iron⁽³⁾: -20 to 300°F / -29 to 149°C

WCC Carbon steel: -20 to 300°F / -29 to 149°C

LCC Carbon steel: -40 to 300°F / -40 to 149°C

CF8M/CF3M Stainless steel:

-40 to 300°F / -40 to 149°C

Spring Case Vent Connection

1/4 NPT

Diaphragm Case Control Line Connection (Types T205M and T205HM)

1/2 NPT

Approximate Weight

17.7 lbs / 8 kg

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

2. See Table 5 for operating temperature ranges for available trim combinations.

3. Not available for Types T205H and T205HM.

4. Special low temperature constructions for process temperatures between -76 to 180°F / -60 to 82°C are available by request. The low temperature construction passed Emerson laboratory testing for lockup and external leakage down to -76°F / -60°C.

Table 1. Body Sizes, End Connection Styles and Maximum Allowable Inlet Pressures

BODY SIZE		BODY MATERIAL	END CONNECTION STYLES ⁽¹⁾	MAXIMUM ALLOWABLE INLET PRESSURE	
In.	DN			psig	bar
3/4 or 1	20 or 25	Gray cast iron ⁽²⁾	NPT	150	10.3
		WCC Carbon steel, LCC Carbon steel or CF8M/CF3M Stainless steel ⁽⁴⁾	NPT	200 ⁽³⁾	13.8 ⁽³⁾
3/4 or 3/4 x 1 ⁽⁵⁾	20 or 20 x 25	WCC Carbon steel, LCC Carbon steel or CF8M/CF3M Stainless steel ⁽⁴⁾	CL150 RF, CL300 RF or PN 16/25/40 RF	200 ⁽³⁾	13.8 ⁽³⁾

1. All flanges are welded. Weld-on flange dimension is 14 in. / 356 mm face-to-face.

2. Not available for Types T205H and T205HM.

3. Inlet pressure is limited to 150 psig / 10.3 bar for Types T205H and T205HM.

4. Pipe nipples and flanges are 316 Stainless steel for flanged body assemblies.

5. 3/4 x 1 in. / DN 20 x 25 flanged construction uses 3/4 in. / DN 20 body.

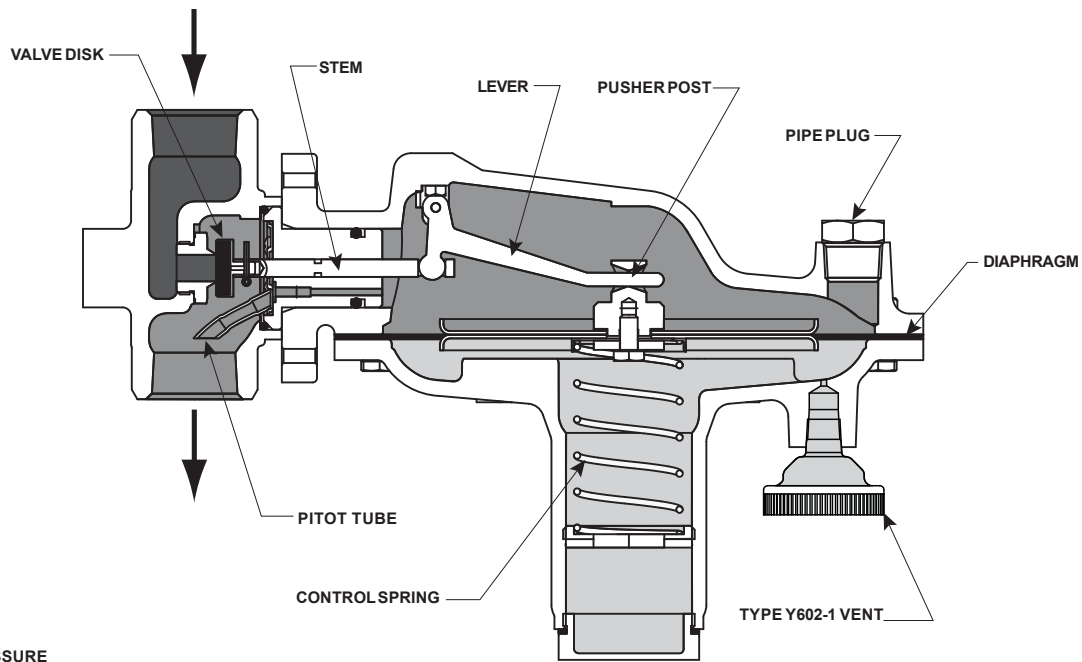


Figure 2. Types T205 and T205H with Internal Registration Operational Schematics

Table 2. T205 Series Maximum Operating Inlet Pressure

ORIFICE SIZE		MAXIMUM OPERATING INLET PRESSURE ⁽¹⁾													
		1 to 2.5 In. w.c. / 2.5 to 6.2 mbar Outlet (Control) Pressure Setting		2.5 to 7 In. w.c. / 6.2 to 17 mbar Outlet (Control) Pressure Setting		7 to 16 In. w.c. / 17 to 40 mbar Outlet (Control) Pressure Setting		0.5 to 1.2 psig / 34 to 83 mbar Outlet (Control) Pressure Setting		1.2 to 2.5 psig / 83 to 172 mbar Outlet (Control) Pressure Setting		2.5 to 4.5 psig / 0.17 to 0.31 bar Outlet (Control) Pressure Setting		4.5 to 7 psig / 0.31 to 0.48 bar Outlet (Control) Pressure Setting	
In.	mm	psig	bar	psig	bar	psig	bar	psig	bar	psig	bar	psig	bar	psig	bar
3/4 In. / DN 20 Body Size															
1/8	3.2	200 ⁽²⁾	13.8 ⁽²⁾	200 ⁽²⁾	13.8 ⁽²⁾	200 ⁽²⁾	13.8 ⁽²⁾	200 ⁽²⁾	13.8 ⁽²⁾	200 ⁽²⁾	13.8 ⁽²⁾	200 ⁽²⁾	13.8 ⁽²⁾	200 ⁽²⁾	13.8 ⁽²⁾
1/4	6.4	125	8.62	175 ⁽²⁾	12.1 ⁽²⁾	200 ⁽²⁾	13.8 ⁽²⁾	200 ⁽²⁾	13.8 ⁽²⁾	200 ⁽²⁾	13.8 ⁽²⁾	200 ⁽²⁾	13.8 ⁽²⁾	200 ⁽²⁾	13.8 ⁽²⁾
3/8	9.5	60	4.14	80	5.52	200 ⁽²⁾	13.8 ⁽²⁾	200 ⁽²⁾	13.8 ⁽²⁾	200 ⁽²⁾	13.8 ⁽²⁾	200 ⁽²⁾	13.8 ⁽²⁾	200 ⁽²⁾	13.8 ⁽²⁾
1/2	13	30	2.07	40	2.76	125	8.62	150	10.3	200 ⁽²⁾	13.8 ⁽²⁾	200 ⁽²⁾	13.8 ⁽²⁾	200 ⁽²⁾	13.8 ⁽²⁾
9/16	14	20	1.38	30	2.07	100	6.89	125	8.62	200 ⁽²⁾	13.8 ⁽²⁾	200 ⁽²⁾	13.8 ⁽²⁾	200 ⁽²⁾	13.8 ⁽²⁾
1 In. / DN 25 Body Size															
1/8	3.2	200 ⁽²⁾	13.8 ⁽²⁾	200 ⁽²⁾	13.8 ⁽²⁾	200 ⁽²⁾	13.8 ⁽²⁾	200 ⁽²⁾	13.8 ⁽²⁾	200 ⁽²⁾	13.8 ⁽²⁾	200 ⁽²⁾	13.8 ⁽²⁾	200 ⁽²⁾	13.8 ⁽²⁾
1/4	6.4	100	6.89	150	10.3	150	10.3	150	10.3	200 ⁽²⁾	13.8 ⁽²⁾	200 ⁽²⁾	13.8 ⁽²⁾	200 ⁽²⁾	13.8 ⁽²⁾
3/8	9.5	40	2.76	80	5.52	150	10.3	150	10.3	200 ⁽²⁾	13.8 ⁽²⁾	200 ⁽²⁾	13.8 ⁽²⁾	200 ⁽²⁾	13.8 ⁽²⁾
1/2	13	30	2.07	40	2.76	125	8.62	150	10.3	200 ⁽²⁾	13.8 ⁽²⁾	200 ⁽²⁾	13.8 ⁽²⁾	200 ⁽²⁾	13.8 ⁽²⁾
9/16	14	20	1.38	15	1.03	100	6.89	125	8.62	200 ⁽²⁾	13.8 ⁽²⁾	200 ⁽²⁾	13.8 ⁽²⁾	200 ⁽²⁾	13.8 ⁽²⁾

1. At maximum inlet pressure, minimum achievable setpoints may vary based on process conditions.
2. Inlet pressure is limited to 150 psig / 10.3 bar for gray cast iron bodies and for Types T205H and T205HM.

Table 3. Outlet (Control) Pressure Ranges and Spring Information

OUTLET (CONTROL) PRESSURE RANGE		SPRING PART NUMBER	SPRING COLOR	SPRING WIRE DIAMETER		SPRING FREE LENGTH	
In. w.c.	mbar			In.	mm	In.	mm
1 to 2.5 ⁽¹⁾⁽²⁾	2.5 to 6.2 ⁽¹⁾⁽²⁾	1B558527052	Orange	0.072	1.8	3.25	82.6
2.5 to 7 ⁽¹⁾	6.2 to 17 ⁽¹⁾	1B653827052	Red	0.085	2.2	3.63	92.2
7 to 16	17 to 40	1B653927022	Unpainted	0.105	2.7	3.75	95.2
0.5 to 1.2 psig	34 to 83	1B537027052	Yellow	0.114	2.9	4.31	109
1.2 to 2.5 psig	83 to 172	1B537127022	Green	0.156	4.0	4.06	103
2.5 to 4.5 psig	0.17 to 0.31 bar	1B537227022	Light Blue	0.187	4.8	3.94	100
4.5 to 7 psig	0.31 to 0.48 bar	1B537327052	Black	0.218	5.5	3.98	101

1. To achieve the published outlet pressure range the spring case must be installed pointing down.
2. Do not use Fluorocarbon (FKM) diaphragm with this spring at diaphragm temperatures lower than 60°F / 16°C.

T205 Series

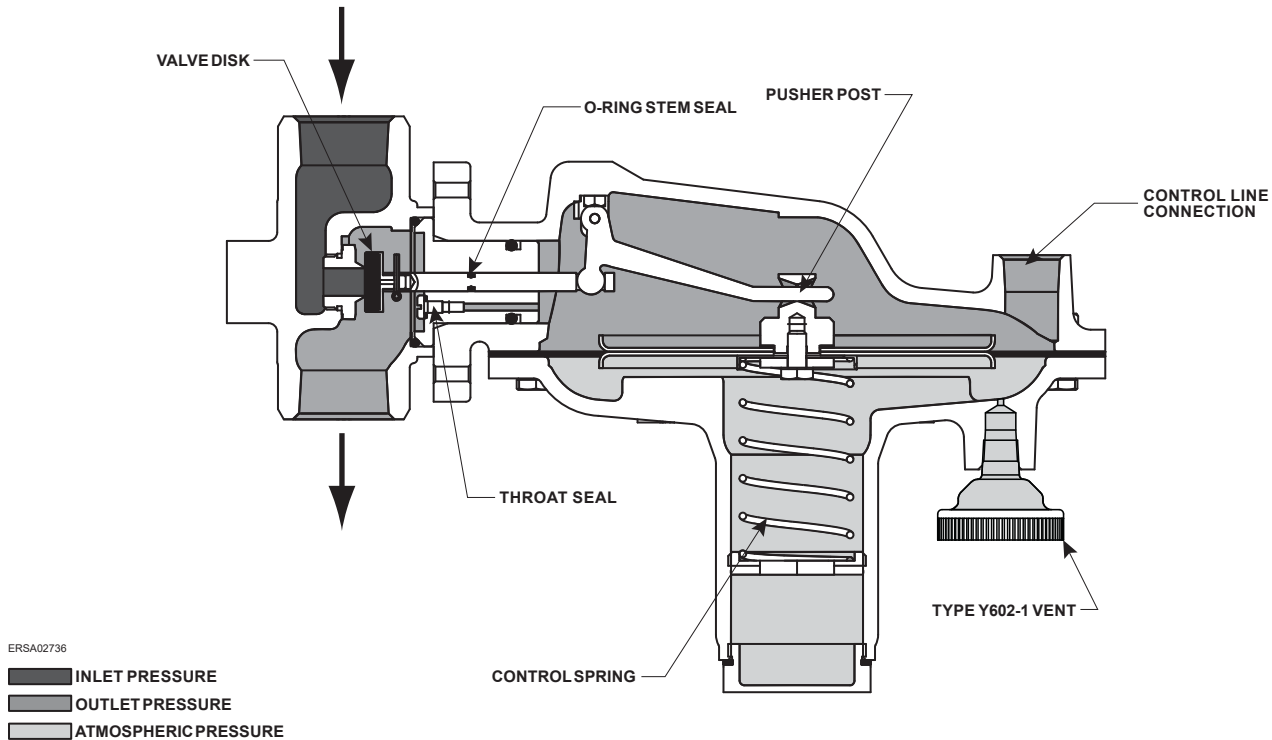


Figure 3. Types T205M and T205HM with External Registration Operational Schematics

T205 Series is available in four configurations: Types T205 and T205H for internal pressure registration requiring no downstream control line and Types T205M and T205HM which have a blocked throat and a downstream control line connection for external pressure registration.

Principle of Operation

The T205 Series Tank Blanketing Regulator controls the vapor space pressure over a stored liquid. When liquid is pumped out of the tank or vapors in the tank condense, the pressure in the tank decreases. Tank pressure is sensed by the actuator diaphragm. Spring force pushes the pusher post assembly upward, the valve disk moves away from the orifice, allowing the gas flow to increase to maintain tank pressure. See Figures 2 and 3.

When pressure in the tank increases, the actuator diaphragm is pushed downward. Through the action of the pusher post assembly, lever and valve stem, the valve disk moves closer to the orifice reducing gas flow.

Installation

WARNING

Personal injury, property damage, equipment damage or leakage due to escaping gas or bursting of pressure-containing parts may result if this regulator is overpressured or installed where service conditions could exceed the limits given in the Specifications section or where conditions exceed any ratings of the adjacent piping or piping connections. Refer to Overpressure Protection section for recommendations on how to prevent service conditions from exceeding those limits.

To avoid such injury or damage, provide pressure-relieving or pressure-limiting devices (as required by the appropriate code, regulation or standard) to prevent service conditions from exceeding limits.

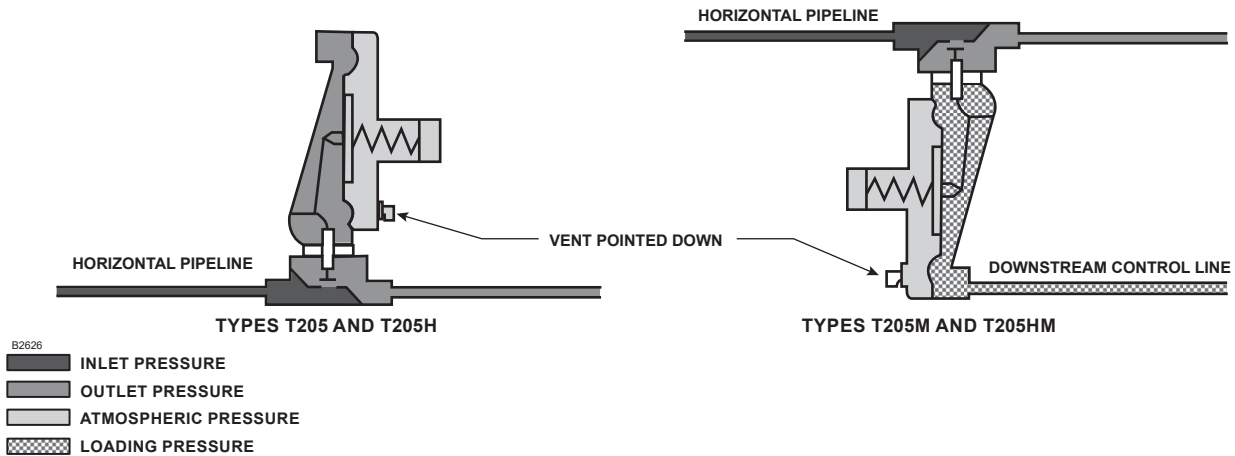


Figure 4. T205 Series Actuator Casing Drainage Schematics

Additionally, physical damage to the regulator could cause personal injury or property damage due to escaping gas. To avoid such injury or damage, install the regulator in a safe location.

Note

If the regulator is shipped mounted on another unit, install that unit according to the appropriate Instruction Manual.

1. Only personnel qualified through training and experience shall install, operate and maintain a regulator. For a regulator that is shipped separately, make sure there is no damage to or debris in the regulator. Also ensure that all tubing and piping are clean and unobstructed.
2. The regulator may be installed in any position as long as the flow through the body is in the direction indicated by the arrow on the body. When using a T205 Series regulator, for proper operation to achieve the published capacities at low setpoint, the spring case barrel should be installed pointed down as shown in Figure 1. For complete actuator drainage, the regulator should be installed as shown in Figure 4. If continuous operation of the system is required during inspection or maintenance, install a three-valve bypass around the regulator.

Vent a regulator in hazardous gas service to a remote, safe location away from air intakes or any hazardous area. The vent line or stack opening must be protected against condensation or clogging.

3. To keep the spring case vent (key 26, Figures 7 to 10) from being plugged or the spring case from collecting moisture, corrosive chemicals or other foreign material, point the vent down or otherwise protect it. The diaphragm casing (key 4, Figures 7 to 10) may be rotated in order to obtain desired positioning.
4. To remotely vent the regulator, remove the vent (key 26, Figures 7 to 10) and install obstruction-free tubing or piping into the 1/4 NPT vent tapping. Provide protection on a remote vent by installing a screened vent cap into the remote end of the vent pipe.
5. Types T205M and T205HM require a downstream control line. Be sure to install the control line before putting the regulator into operation. Make the control line as short and straight as possible and do not install it in a location where flow may be turbulent. Restrictions in the control line can prevent proper pressure registration. When using a hand valve, it should be a full flow valve, such as a full port ball valve. Install the control line sloping downward toward the tank to prevent condensation buildup and avoid low points (or traps) that could catch liquid. The sensing line must enter the tank above the liquid level at a point that senses the vapor space pressure and is free from turbulence associated with tank nozzles or vents. The control line pipe should be at least 1/2 in. / 13 mm in diameter and increase 1 pipe size for every 10 ft. / 3.05 m of control line, with setpoint less than 5 in. w.c. / 12 mbar.

WARNING

A regulator may vent some gas to the atmosphere. In hazardous or flammable gas service, vented gas may accumulate and cause personal injury, death or property damage due to fire or explosion.

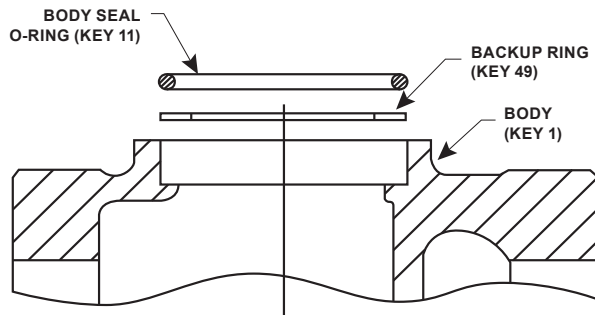


Figure 5. Expanded View of the Body Area Showing the Body Seal O-ring and Backup Ring Placement

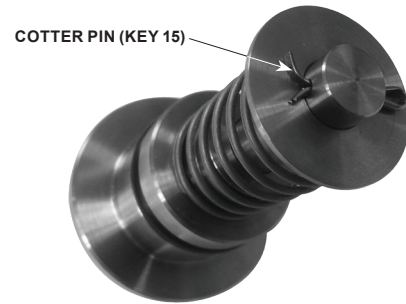


Figure 6. Proper Bending of Cotter Pin (key 15)

- An upstream shutoff valve is recommended to simplify maintenance to the regulator. It is advisable to install a pressure gauge between the upstream shutoff valve and the blanketing valve.

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.

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.

Types T205 and T205M Regulators have an outlet pressure rating lower than their inlet pressure rating. Types T205H and T205HM Regulators have an outlet pressure rating equal to 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. Common methods of external overpressure protection include relief valves, monitoring regulators, shut-off devices and series regulation. 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.

Startup, Adjustment and Shutdown

Note

The Specifications section and Tables 1 and 2 provide the maximum pressure capabilities for each regulator construction. Use pressure gauges to monitor inlet pressure and outlet pressure during startup.

Startup

1. Open shutoff valves between the tank blanketing regulator and the tank (both sensing and outlet).
2. Slowly open the supply line shutoff valve (to the blanketing valve) and leave it fully open.
3. Monitor the tank vapor space pressure.

Adjustment



WARNING

To avoid personal injury, property damage or equipment damage caused by bursting of pressure containing parts or explosion of accumulated gas, never adjust the control spring to produce an

Table 4. Body Materials and Part Numbers (Body, key 1)

BODY MATERIAL	END CONNECTION STYLE ⁽¹⁾	PART NUMBER		
		3/4 in. / DN 20 Body	3/4 x 1 in. / DN 20 x 25 Body	1 in. / DN 25 Body
Gray cast iron ⁽²⁾	NPT	ERSA01588A0	-----	ERSA01755A0
WCC Carbon steel	NPT	ERSA00230A1	-----	ERSA00194A1
	CL150 RF	ERSA01469A0	ERSA01469A1	-----
	CL300 RF	ERSA01469A2	ERSA01469A3	-----
	PN 16/25/40 RF	ERSA01469A4	ERSA01469A5	-----
LCC Carbon steel	NPT	ERSA00230A8	-----	ERSA00194A5
CF8M/CF3M Stainless steel	NPT ⁽³⁾	ERSA00230A0	-----	ERSA00194A0
	CL150 RF	ERSA01469A6	ERSA01469A7	-----
	CL300 RF	ERSA01469A8	ERSA01469A9	-----
	PN 16/25/40 RF	ERSA01469B0	ERSA01469B1	-----

1. All flanges are welded. Weld-on flange dimension is 14 in. / 356 mm face-to-face.
 2. Gray cast iron is not available for Types T205H and T205HM.
 3. NACE Standard MR0175-2002.

outlet pressure higher than the upper limit of the outlet pressure range (see Table 2) for that particular spring. If the desired outlet pressure is not within the range of the control spring, install a spring of the proper range according to the Diaphragm and Spring Case Area section of the maintenance procedure.

Adjust the regulator control pressure setting to meet the requirements of the specific application. With a spring-loaded regulator, the pressure setting may be adjusted to a value within the spring range shown in Table 3. To adjust the pressure setting, perform the following steps (key numbers are referenced in Figures 7 to 10):

For internal flat circular adjusting screw:

1. Remove the closing cap (key 22).
2. Use a 1 in. / 25 mm hex rod or flat screwdriver to turn the adjusting screw (key 35) either clockwise to increase outlet pressure or counterclockwise to decrease outlet pressure. The regulator will go into immediate operation. To ensure correct operation, always use a pressure gauge to monitor the tank blanketing pressure when making adjustments.
3. After making the adjustment, replace the closing cap gasket (key 25) and install the closing cap (key 22).

For external square head adjusting screw:

1. Loosen the locknut (key 20).
2. Turn the adjusting screw (key 35) either clockwise to increase outlet pressure or counterclockwise to decrease outlet pressure. Always use pressure gauge to monitor the tank blanketing gas pressure when making adjustments.
3. After making the adjustment, tighten the locknut (key 20).

Shutdown

1. Close the nearest upstream shutoff valve.
2. Close the nearest downstream shutoff valve to vent the regulator properly.
3. For a regulator with control line: Close the valve in the control line and vent the diaphragm casing to the atmosphere.
4. Open the vent valve between the regulator and the downstream shutoff valve nearest to it. All pressure between these shutoff valves is released through the open vent valve, since a T205 Series remains open in response to the decreasing downstream pressure.

Maintenance

Regulator parts are subject to normal wear and must be inspected and replaced as necessary. The frequency of inspection and replacement of parts depends upon the severity of service conditions or the requirements of local, state and federal regulations. Due to the care Emerson takes in meeting all manufacturing requirements (heat treating, dimensional tolerances, etc.), use only replacement parts manufactured or furnished by Emerson.



To avoid personal injury, property damage or equipment damage caused by sudden release of pressure or explosion of accumulated gas, do not attempt any maintenance or disassembly without first isolating the regulator from system pressure and relieving all internal pressure from the regulator.

T205 Series

Table 5. T205 Series Trim Option Code

TRIM OPTION CODE	DIAPHRAGM MATERIAL	DISK AND O-RING MATERIAL	OPERATING TEMPERATURE RANGE ⁽³⁾⁽⁴⁾
Standard	Nitrile (NBR) ⁽²⁾	Nitrile (NBR)	Types T205 and T205M: -40 to 180°F / -40 to 82°C Types T205H and T205HM: -20 to 180°F / -29 to 82°C
EE	EPDM	EPDM	-20 to 225°F / -29 to 107°C
FDA ⁽⁵⁾			
VV	Fluorocarbon (FKM)	Fluorocarbon (FKM)	40 to 300°F / 4 to 149°C
TN	Fluorinated Ethylene Propylene (FEP)	Nitrile (NBR)	-20 to 180°F / -29 to 82°C
TV	Fluorinated Ethylene Propylene (FEP)	Fluorocarbon (FKM)	40 to 180°F / 4 to 82°C
TK ⁽¹⁾	Fluorinated Ethylene Propylene (FEP)	Perfluoroelastomer (FFKM)	0 to 180°F / -18 to 82°C
TE	Fluorinated Ethylene Propylene (FEP)	EPDM	-20 to 180°F / -29 to 82°C

1. Includes 316 Stainless steel trim parts.
2. Types T205 and T205HM are only available with Nitrile (NBR) diaphragm.
3. Gray Cast iron and WCC Carbon steel bodies are limited to -20 to 300°F / -29 to 149°C.
4. Special low temperature constructions for process temperatures between -76° to 180°F / -60 to 82°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. EPDM option available with FDA / USP Class VI approved / ADI-free elastomers (wetted components only).

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 startup procedures.

General Maintenance

1. Visually inspect the regulator and its parts for any damage.
2. Ensure tight connections, tight seals and safe operation. If there is evidence of leakage or unstable internal motion, a rebuild with seal replacement and relubrication may be necessary.
3. Observe the blanketing pressure.
4. Inspect the inlet pressure for the proper pressure (stamped on the regulator nameplate).

Body Area

Perform the following procedure to gain access to the disk assembly, orifice, body O-ring and pitot tube if used. Release all pressure from the diaphragm casing and open the disk assembly before performing the following steps. Key numbers are referenced in Figures 7 to 10.

1. Remove the cap screws (key 2) and separate the diaphragm casing (key 4) from the body (key 1).
2. Remove and inspect the body seal O-ring (key 11) and the backup ring (key 49). See Figure 5.
3. Inspect and replace the orifice (key 5) if necessary. Protect the orifice seating surface during disassembly and assembly. Lubricate the threads of the replacement orifice with a good grade of light grease and install with 340 to 470 in-lbs / 38.5 to 53.1 N•m of torque.
4. Remove the cotter pin (key 15) to replace the disk assembly (key 13). If not necessary, skip to step 8.

5. To replace the pitot tube (key 32, Figures 7 and 9) on the Types T205 and T205H, remove the pitot tube machine screws (key 17), install the new pitot tube and secure with the pitot tube machine screws (key 17) using 14 to 19 in-lbs / 1.6 to 2.1 N•m of torque. Position the pitot tube so that it points into the outlet of the body by rotating the guide insert (key 18).
6. To inspect the throat seal O-ring (key 31, Figures 8 and 10) on the Types T205M and T205HM, remove the machine screw (key 34, Figures 8 and 10). Replace if necessary and reassemble.
7. Install the disk assembly (key 13) and secure it with the cotter pin (key 15). Bend the cotter pin end using pliers or equivalent tool (see Figure 6).
8. Place back-up ring (key 49) into the body (key 1). Then place the body seal O-ring (key 11) into the body. See Figure 5.
9. Place the diaphragm casing (key 4) on the body (key 1). Secure the diaphragm casing to the body with the cap screws (key 2) using 90 to 126 in-lbs / 10.2 to 14.2 N•m of torque.

Diaphragm and Spring Case Area

Perform the following procedure to gain access to the spring, diaphragm, lever assembly and stem. Release all pressure from the diaphragm casing before performing the following steps.

Note

Remove any remote control drive unit used with a T205 Series Regulator from the spring case (key 3) before performing these steps.

1. **For internal flat circular adjusting screw** – remove the closing cap (key 22) and closing cap gasket (key 25).
For external square head adjusting screw – loosen the locknut (key 20).

2. Turn the adjusting screw (key 35) counterclockwise to remove all the compression from the control spring (key 6).
3. If the only maintenance procedure to be performed is the changing of the control spring (key 6):

For internal flat circular adjusting screw:

 - a. Remove the adjusting screw (key 35).
 - b. Take out the control spring and replace with the desired spring.
 - c. Reinstall the adjusting screw.
 - d. Adjust the outlet pressure to the desired control pressure setting, refer to steps 2 and 3 of Adjustment section.
 - e. Change the stamped spring range on the nameplate. Skip to step 13.

For external square head adjusting screw:

 - a. Remove the adjusting screw (key 35) and locknut (key 20).
 - b. Remove the closing cap (key 22), closing cap gasket (key 25) and upper spring seat (key 19).
 - c. Take out the control spring and replace with the desired spring.
 - d. Reinstall the upper spring seat, closing cap gasket, closing cap, locknut and adjusting screw.
 - e. Adjust the outlet pressure to the desired control pressure setting, refer to steps 2 and 3 of Adjustment section.
 - f. Change the stamped spring range on the nameplate. Skip to step 13.
4. If further maintenance to the internal diaphragm casing parts is required, remove the hex nuts (key 23) and spring case cap screws (key 24). Remove the diaphragm (key 10) plus attached parts by tilting them so that the pusher post (key 8) slips off the lever assembly (key 16). To separate the diaphragm from the attached parts, unscrew the diaphragm cap screw (key 38) from the pusher post. If the only maintenance is the replacement of the diaphragm components, skip to step 7.
5. To replace the lever assembly (key 16), remove the machine screws (key 17). To replace the stem (key 14), also perform Body Area Maintenance procedure steps 1 and 4 and pull the stem out of the lower casing (key 4). With Types T205M and T205HM, grease the replacement stem seal O-ring (key 30) with a good grade of lubricant and install it on the stem (key 14).
6. Install the stem into the lower casing and perform Body Area Maintenance procedure steps 7 through 9 as necessary.
7. Install the lever assembly (key 16) into the stem (key 14) and secure the lever assembly with the machine screws (key 17) using 14 to 19 in-lbs / 1.6 to 2.1 N•m of torque.
8. Hold the pusher post and place diaphragm assembly parts on the pusher post in the following order:
 - diaphragm head gasket (key 45)
 - diaphragm head (key 7 - Types T205 and T205M; key 54 - Types T205H and T205HM)
 - diaphragm (key 10)
 - diaphragm head (key 7)
 - lower spring seat (key 50)
 - washer (key 36)
 Secure with diaphragm cap screw (key 38) using the following torque:
 - Types T205 and T205M - 60 to 72 in-lbs / 6.8 to 8.1 N•m
 - Types T205H and T205HM - 120 to 144 in-lbs / 13.6 to 16.3 N•m.
9. Install the pusher post (key 8) and attached parts onto the lever (key 16).
10. Install the spring case (key 3) on the lower casing (key 4) so that the vent assembly (key 26) is correctly oriented and secure them with the spring case cap screws (key 24) and hex nuts (key 23) to finger tightness only.
11. Install the parts into the spring case (key 3). Follow the order below:

For internal flat circular adjusting screw:

 - a. control spring (key 6)
 - b. adjusting screw (key 35)

For external square head adjusting screw:

 - a. control spring (key 6)
 - b. upper spring seat (key 19)
 - c. closing cap gasket (key 25)
 - d. closing cap (key 22)
 - e. locknut (key 20)
 - f. adjusting screw (key 35)
12. Turn the adjusting screw (key 35) clockwise until there is enough control spring force to provide proper slack to diaphragm (key 10). Using a crisscross pattern, finish tightening the spring case cap screws (key 24) and hex nuts (key 23) with the following torque:
 - Types T205 and T205M - 98 to 126 in-lbs / 11.1 to 14.2 N•m
 - Types T205H and T205HM - 192 to 228 in-lbs / 21.7 to 25.8 N•m
 Adjust the outlet pressure to the desired control pressure setting, refer to the Adjustment section.
13. For Types T205M and T205HM, connect the downstream control line. Refer to the Startup section before putting the regulator back in operation.

T205 Series

To Convert Constructions

From Type T205 to Type T205M or Type T205H to Type T205HM

A control line is needed. New parts required: keys 30, 31 and 17.

1. Remove pipe plug (key 27, Figures 7 and 9) from the lower casing (key 4). Use this port to connect the control line from downstream. See item number 5 in the Installation section.
2. Refer to steps 1 and 5 in the Body Area Maintenance section to remove the four pitot tube machine screws (key 17) and pitot tube (key 32, Figures 7 and 9).
3. Insert the throat seal O-ring (key 31, Figures 8 and 10) and one machine screw (key 34).
4. Insert the stem seal O-ring (key 30, Figures 8 and 10) by following steps 1 through 6 in the Diaphragm and Spring Case Area Maintenance section.

From Type T205M to Type T205 or Type T205HM to Type T205H

New parts required: keys 27, 32 and 17.

1. Insert pipe plug (key 27, Figures 7 and 9) in the lower casing (key 4).
2. Follow steps 1, 3 and 4 of Diaphragm and Spring Case Area Maintenance Section to remove one machine screw (key 34, Figures 8 and 10), the stem seal O-ring (key 30, Figures 8 and 10) and the throat seal O-ring (key 31, Figures 8 and 10) blocking the registration port.
3. Insert pitot tube (key 32, Figures 7 and 9) and four pitot tube machine screws (key 17) using 14 to 19 in-lbs / 1.6 to 2.1 N•m of torque as outlined in step 5 of the Body Area Maintenance section.

Parts Ordering

When corresponding with your local Sales Office about this regulator, include the type number and all other pertinent information stamped on the nameplate. Specify the eleven-character part number when ordering new parts from the following parts list.

Parts List

Key	Description	Part Number
	Spare Parts Kit (Included are keys 9, 10, 11, 12, 15, 25 and 45) (see Table 6 for Trim Option Codes)	
	Standard Trim	RT205XXDD12
	EE Trim	RT205XXEE12
	FDA Trim	RT205XFDA12
	VV Trim	RT205XXVV12
	TN Trim	RT205XXTN12
	TV Trim	RT205XXTV12
	TK Trim	RT205XXTK12
	TE Trim	RT205XXTE12
1	Body	See Table 4
2	Cap Screw (2 required) For WCC Carbon steel or Gray cast iron casing For LCC Carbon steel or CF8M/CF3M Stainless steel casing	1C856228992 18B3456X012
3	Spring Case For Types T205 and T205M Gray cast iron WCC Carbon steel LCC Carbon steel CF8M/CF3M Stainless steel	ERSA02558A0 ERSA00195A1 ERSA00195B0 ERSA00195A0
3A	Spring Case Types T205H and T205HM WCC Carbon steel CF8M/CF3M Stainless steel	ERAA12947A1 ERAA12799A0
4	Lower Casing Gray cast iron WCC Carbon steel For Types T205 and T205M For Types T205H and T205HM LCC Carbon steel For Types T205 and T205M CF8M/CF3M Stainless steel For Types T205 and T205M For Types T205H and T205HM	47B2271X012 ERSA00196A1 ERAA13233A1 ERSA00196C3 ERSA00196A0 ERAA13233A0
5*	Orifice Stainless steel (standard) 1/8 in. / 3.2 mm 1/4 in. / 6.4 mm 3/8 in. / 9.5 mm 1/2 in. / 13 mm 9/16 in. / 14 mm Stainless steel (NACE) ⁽¹⁾ 1/8 in. / 3.2 mm 1/4 in. / 6.4 mm 3/8 in. / 9.5 mm 1/2 in. / 13 mm 9/16 in. / 14 mm	1A936735032 0B042035032 0B042235032 1A928835032 1C425235032 1A9367X0022 0B0420X0012 0B0422X0012 1A9288X0012 1C4252X0022
6	Spring	See Table 3
7	Diaphragm Head, Stainless steel	17B9723X032
8	Pusher Post For Nitrile (NBR), EPDM or Fluorocarbon (FKM) diaphragm Stainless steel (standard) Stainless steel (NACE) ⁽¹⁾ For Fluorinated Ethylene Propylene (FEP) diaphragm Stainless steel (NACE) ⁽¹⁾	18B3462X032 18B3462X012 ERSA00876A0

*Recommended spare part
1. NACE Standard MR0175-2002.

T205 Series

Key	Description	Part Number	Key	Description	Part Number
9*	Diaphragm Gasket For Fluorinated Ethylene Propylene (FEP) diaphragm Nitrile (NBR)	ERSA00713A0	23	Hex Nut (8 required) Types T205 and T205M For WCC Carbon steel or Gray cast iron casing For LCC Carbon steel or CF8M/CF3M Stainless steel casing	1A345724122 1A3457K0012
10*	Diaphragm Nitrile (NBR) For Types T205 and T205M For Types T205H and T205HM Fluorocarbon (FKM) For Types T205 and T205M Fluorinated Ethylene Propylene (FEP) For Types T205 and T205M EPDM ⁽³⁾ For Types T205 and T205M	17B9726X012 ERAA12717A0 23B0101X052 ERSA00193A0 17B9726X032	24	Spring Case Cap Screw (8 required) Types T205 and T205M For WCC Carbon steel or Gray cast iron casing For LCC Carbon steel or CF8M/CF3M Stainless steel casing Types T205H and T205HM For WCC Carbon steel casing For CF8M/CF3M Stainless steel casing	1A579724052 1A5797T0012 ERCA00100A0 ERCA00100A1
11*	Body Seal O-ring Nitrile (NBR) Fluorocarbon (FKM) Perfluoroelastomer (FFKM) EPDM EPDM ⁽³⁾	1H993806992 1H9938X0012 1H9938X0042 1H9938X0022 1H9938X0112	25*	Closing Cap Gasket, Neoprene (CR)	1P753306992
12*	Insert Seal O-ring Nitrile (NBR) Fluorocarbon (FKM) Perfluoroelastomer (FFKM) EPDM EPDM ⁽³⁾	1B885506992 1B8855X0012 1B8855X0062 1B8855X0022 1B8855X0112	26	Vent Assembly Spring Case Sideways (standard) (Type Y602-12) Spring Case Down (Type Y602-1) Spring Case Up (Type Y602-11)	27A5516X012 17A6570X012 17A5515X012
13*	Disk Assembly Stainless steel (standard) Nitrile (NBR) Fluorocarbon (FKM) EPDM Stainless steel (NACE) ⁽²⁾ Nitrile (NBR) Fluorocarbon (FKM) Perfluoroelastomer (FFKM) EPDM EPDM ⁽³⁾	1C4248X0202 1C4248X0052 1C4248X0302 1C4248X0252 1C4248X0192 1C4248X0332 1C4248X0152 1C4248X1242	27	Pipe Plug (Types T205 and T205H only) Carbon steel (standard) Stainless steel (NACE) ⁽²⁾	1A369224492 1A369235072
14	Stem Stainless steel (standard) Stainless steel (NACE) ⁽²⁾	17B3423X012 17B3423X022	30*	Stem Seal O-ring (Types T205M and T205HM only) Nitrile (NBR) Fluorocarbon (FKM) Perfluoroelastomer (FFKM) EPDM EPDM ⁽³⁾	1H2926G0012 1H2926X0022 1H2926X0042 1H2926X0012 1H2926X00A0
15*	Cotter Pin, Stainless steel	1A866537022	31*	Throat Seal O-ring (Types T205M and T205HM only) Nitrile (NBR) Fluorocarbon (FKM) Perfluoroelastomer (FFKM) EPDM EPDM ⁽³⁾	1D682506992 1D6825X0012 1D6825X0032 1D6825X0042 1D6825X0102
16	Lever Assembly, Stainless steel For WCC Carbon steel casing For CF8M/CF3M Stainless steel casing	1B5375000B2 1A352724122 1E9440X0352	32	Pitot Tube (Types T205 and T205H), Stainless steel	17B4479X012
17	Machine Screw, Stainless steel Types T205 and T205H (6 required) Types T205M and T205HM (2 required)	19A7151X022 19A7151X022	34	Machine Screw, Types T205M and T205HM only Stainless steel	18A0703X022
18	Guide Insert, Stainless steel	27B4028X022	35	Adjusting Screw Internal Flat Circular (standard) Steel For Green and Light Blue spring For Black spring	1B537944012 10B3080X012 1D995448702 GE06080X012 1D9954X0032
19	Upper Spring Seat, Steel ⁽¹⁾ Optional	1J618124092	36	Washer, Plated carbon steel	18B3440X012
20	Lock Nut ⁽¹⁾ For Steel Adjusting Screw For Stainless steel adjusting screw	1A413224122 T1208735252	38	Diaphragm Cap Screw, Zinc-plated steel	1B290524052
22	Closing Cap For Internal Flat Circular Adjusting Screw Plastic Stainless steel For External Square Head Adjusting Screw Steel Stainless steel	T11069X0012 1E422735072 ERSA01809A0 ERSA01809A1	45*	Diaphragm Head Gasket, Composition EPDM ⁽³⁾	18B3450X012 18B3450X042
			46	Nameplate	-----
			47	Drive Screw, Stainless steel (2 required)	1A368228982
			48	Flow arrow	-----
			49	Backup Ring, Stainless steel	18B3446X012
			50	Lower Spring Seat, Zinc-plated steel	1B636325062
			51	NACE Tag	-----
			52	Tag Wire	-----
			54	Diaphragm Head	ERAA12718A0

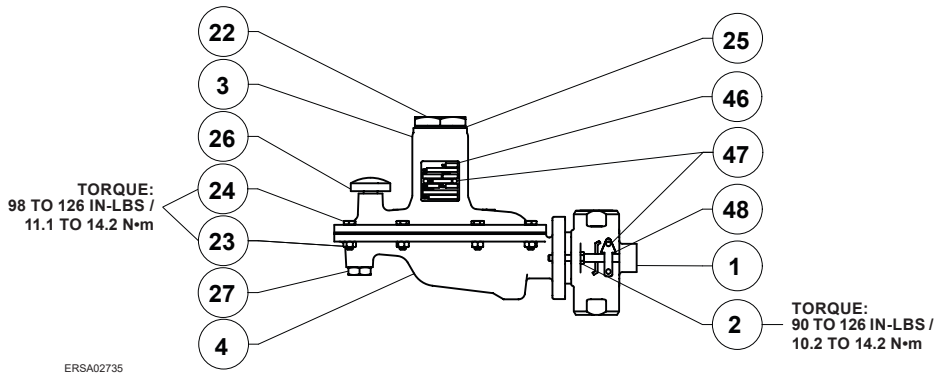
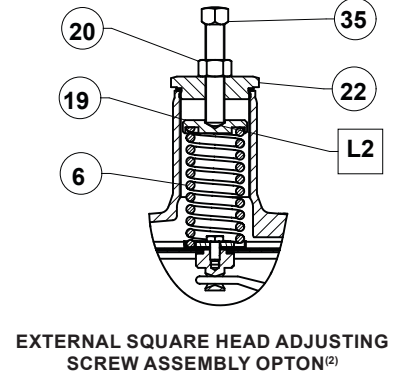
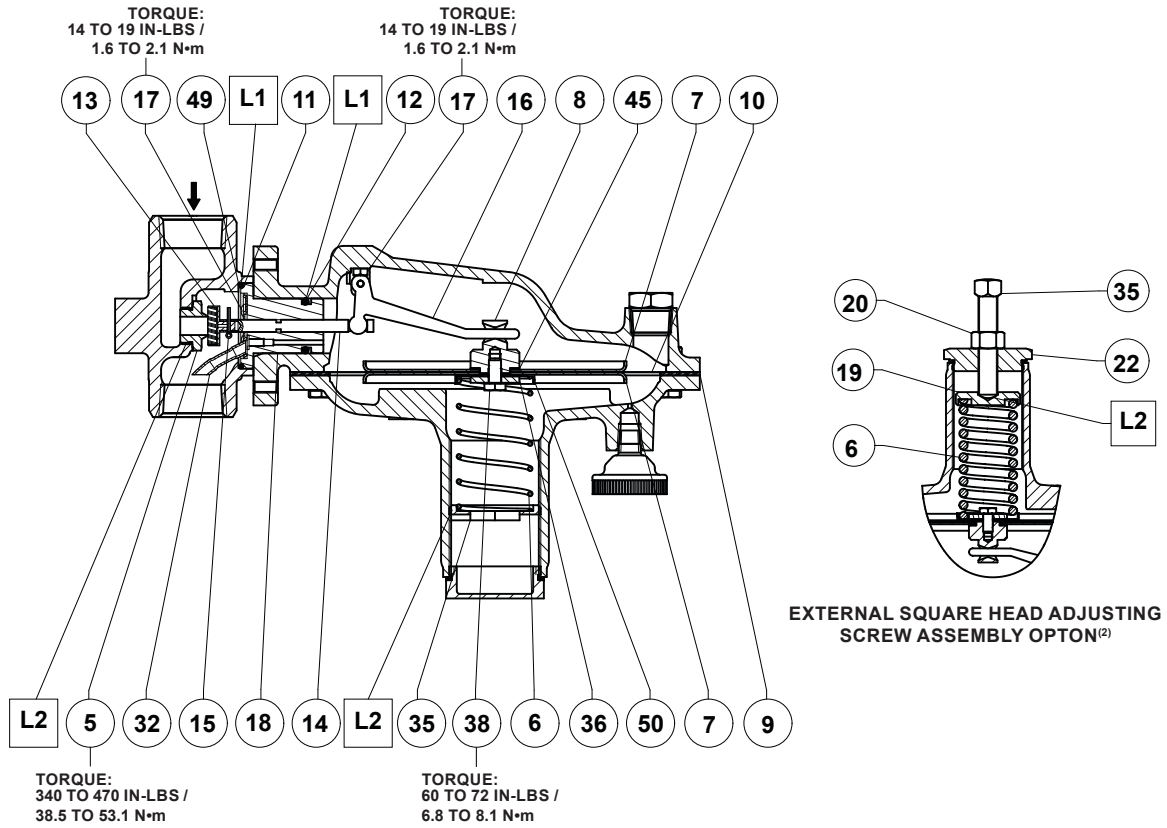
*Recommended spare part

1. Use for optional external square head adjusting screw assembly recommended for 1.2 to 2.5 psig / 83 to 172 mbar, 2.5 to 4.5 psig / 0.17 to 0.31 bar and 4.5 to 7 psig / 0.31 to 0.48 bar spring ranges only.

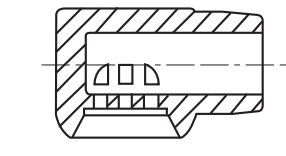
2. NACE Standard MR0175-2002.

3. FDA / USP Class VI approved / ADI-free.

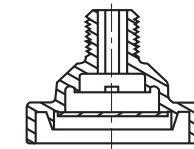
T205 Series



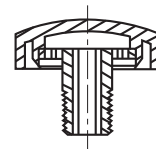
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SPRING CASE SIDWAYS
TYPE Y602-12 VENT



SPRING CASE DOWNWARD
TYPE Y602-1 VENT

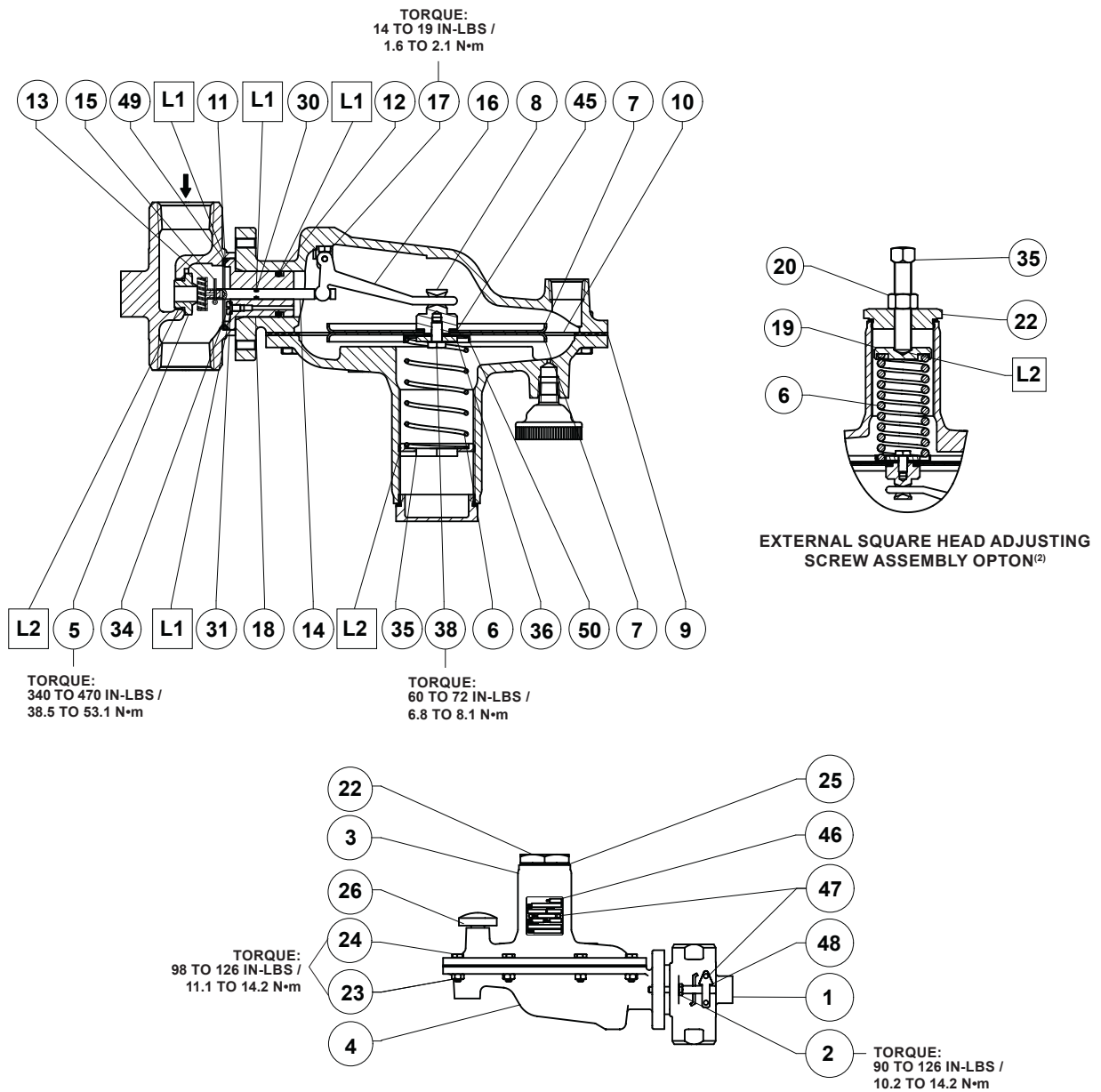


SPRING CASE UPWARD
TYPE Y602-11 VENT

- APPLY LUBRICANT⁽¹⁾;
L1 = SILICONE GREASE
L2 = ANTI-SEIZE COMPOUND

1. Lubricants must be selected such that they meet the temperature requirements.
2. For 1.2 to 2.5 psig / 83 to 172 mbar, 2.5 to 4.5 psig / 0.17 to 0.31 bar and 4.5 to 7 psig / 0.31 to 0.48 bar spring ranges only.

Figure 7. Type T205 Regulator Assembly with Internal Registration



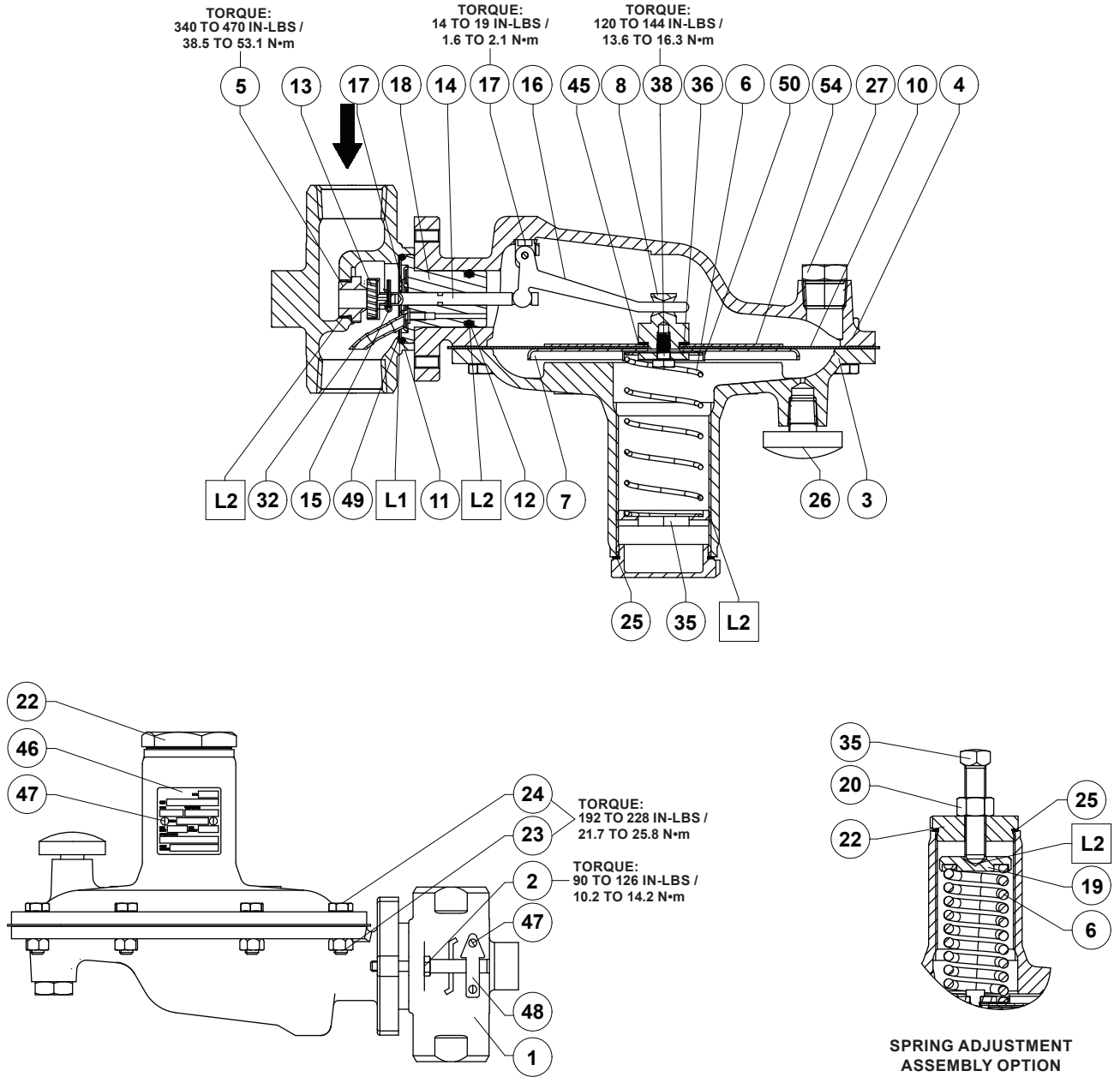
ERSA02736

□ APPLY LUBRICANT⁽¹⁾:
L1 = SILICONE GREASE
L2 = ANTI-SEIZE COMPOUND

1. Lubricants must be selected such that they meet the temperature requirements.
2. For 1.2 to 2.5 psig / 83 to 172 mbar, 2.5 to 4.5 psig / 0.17 to 0.31 bar and 4.5 to 7 psig / 0.31 to 0.48 bar spring ranges only.

Figure 8. Type T205M Regulator Assembly with External Registration

T205 Series



ERAA13000

- APPLY LUBRICANT⁽¹⁾:
- L1 = SILICONE GREASE
- L2 = ANTI-SEIZE COMPOUND

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

Figure 9. Type T205H Regulator Assembly with Internal Registration

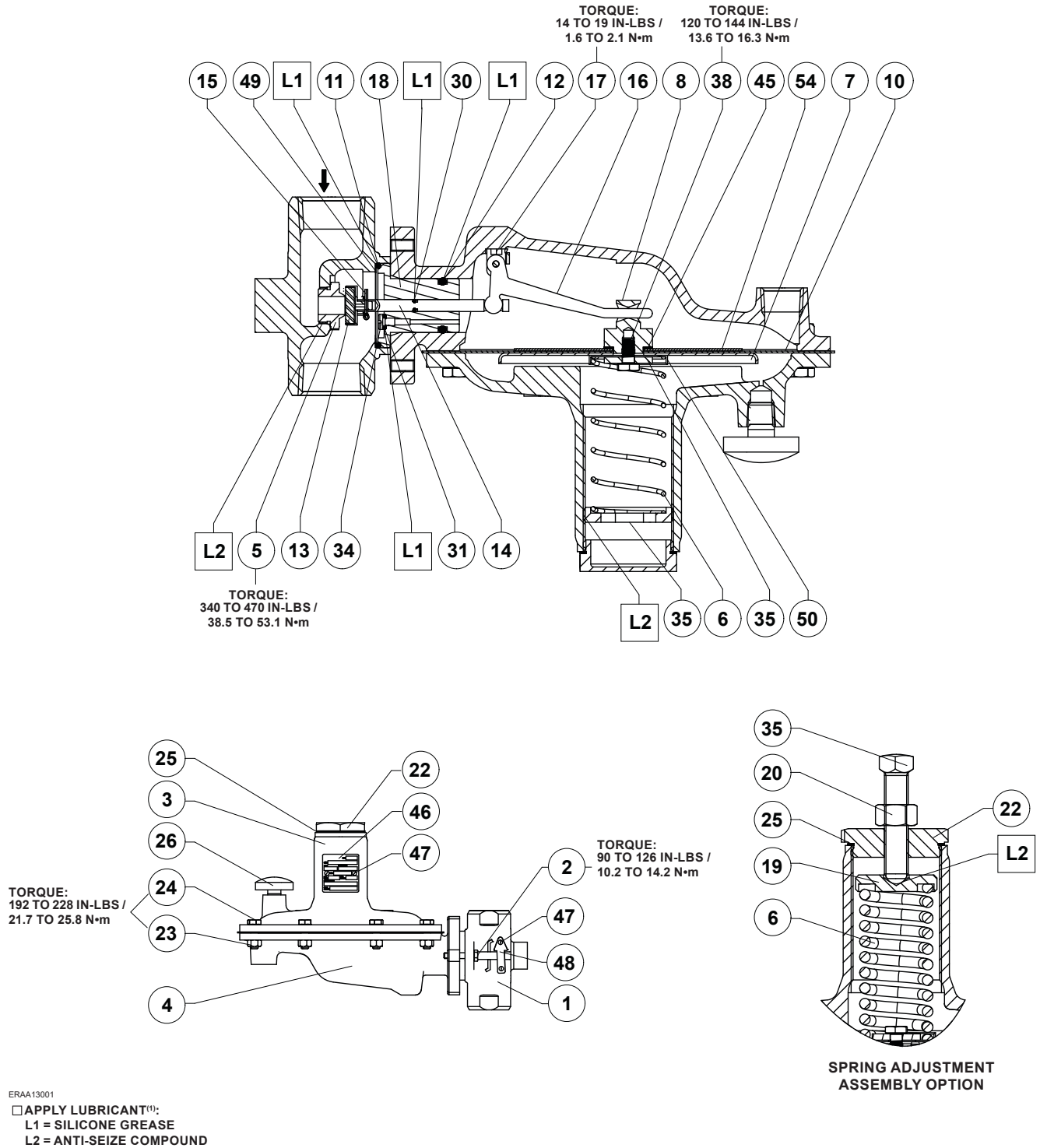


Figure 10. Type T205HM Regulator Assembly with External Registration

T205 Series

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