November 2008

Types 66, 66Z, and 66ZZ Pressure Reducing Regulators

WARNING

Failure to follow these instructions or to properly install and maintain this equipment could result in an explosion and/or fire 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 Fisher 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.

Call a gas service person to service the unit. Only a qualified person must install or service the regulator.

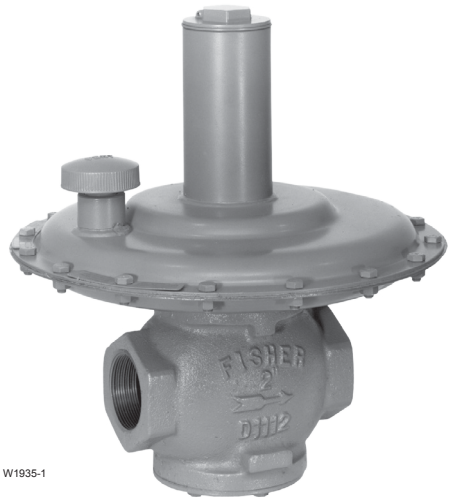

Figure 1. *Type 66 Self-Operated Pressure Reducing Regulator*

Introduction

Scope of the Manual

This instruction manual provides instructions for the installation, adjustment, and maintenance of the Types 66, 66Z, and 66ZZ pressure reducing regulators. Parts ordering information is also provided. Other 66 Series regulators and accessories are covered in other manuals.

Description

The Type 66 self-operated regulator (Figure 1) maintains a reduced outlet pressure while satisfying the downstream flow demands. The Types 66Z and 66ZZ self-operated regulators (Figures 8 and 9) also control a reduced outlet pressure; however, both have springs sensitive to negative pressures and can be used for vacuum regulation. Each regulator type has a balancing diaphragm which increases accurate and sensitive response to pressure changes by reducing the unbalanced forces acting on the valve plug. This regulator and its installation should be checked for compliance with all applicable codes.

Specifications

The Specifications table lists the specifications for the Types 66, 66Z, and 66ZZ self-operated pressure reducing regulators. Some of the specifications for a given regulator as it comes from the factory appear on the regulator nameplate.

Principle of Operation

The cast iron Type 66 regulator uses a pitot tube to sense outlet pressure while the steel Type 66 regulator uses an external control line to sense outlet pressure as shown in Figure 6. Both pressure-sensing methods register the outlet pressure under the main diaphragm. When increased downstream demand lowers the outlet pressure, the lower pressure under the main diaphragm causes the regulator main spring and valve plug and stem assembly to open the regulator seat ring and to supply more gas to the downstream system.

D100247X012

Specifications

Body Sizes and End Connection Styles[1]

CONSTRUCTION	NOMINAL BODY SIZE, INCH (DN)	END CONNECTION STYLES AND RATINGS[1]	
		Standard Cast Iron Body	Optional Steel Body
Type 66, 66Z, 66ZZ, or 66 vacuum regulators or breakers	2 (50)	NPT or CL125 FF	NPT (all types), CL150 RF (all types), CL150 FF, CL300 RF
	3, 4 (80, 100)	CL125 FF	CL150 RF

Maximum Allowable Inlet Pressures[1]

Emergency Inlet Pressure:
Type 66, 66Z, 66ZZ, or 66 Series Vacuum Breakers: 25 psig (1,72 bar) positive pressure
66 Series Vacuum Regulators: 8 psig or 16.3-inches of mercury (0,55 bar differential) vacuum

Maximum Safe Pressure to Avoid Internal Parts Damage:
Type 66: 10 psig (0,69 bar)
Type 66Z: 5 psig (0,34 bar)
Type 66ZZ: 2 psig (0,14 bar)
66 Series Vacuum Regulators or Breakers: No more than 1 psig (0,07 bar differential) change from spring setting

Maximum Operating Inlet Pressure Recommended for Good Performance:
Type 66, 66Z, or 66 Series Vacuum Breakers: 5 psig (0,34 bar) positive pressure
Type 66ZZ: 2 psig (0,14 bar)
66 Series Vacuum Regulator: 6-inches w.c. or 0.4-inch of mercury (15 mbar differential) vacuum

Maximum Allowable Outlet Pressures[1]

Emergency Outlet (Casing) Pressure:
Type 66, 66Z, or 66ZZ: 8 psig (0,55 bar) positive pressure
66 Series Vacuum Regulator: 14.7 psi or 29.9-inches of mercury (1,01 bar differential) vacuum
66 Series Vacuum Breakers: 8 psi or 16.3-inches of mercury (0,55 bar differential) vacuum

Maximum Safe Pressure to Avoid Internal Parts Damage:
Type 66, 66Z, or 66ZZ: 1 psig (0,07 bar differential) above outlet pressure setting
66 Series Vacuum Regulator: No more than 1 psig (0,07 bar differential) change from spring setting

Maximum Operating Pressure Recommended for Good Performance (66 Series Vacuum Regulators or Breakers Only):
Vacuum Regulators: 10 psig or 20.4-inches of mercury (0,69 bar differential) vacuum
Vacuum Breakers: 6-inches w.c. or 0.4-inch of mercury (15 mbar differential) vacuum

Elastomer Temperature Capabilities

Nitrile (NBR) Standard Elastomers:
-40°to 180°F (-40°to 82°C)
Fluorocarbon (FKM) Elastomers:
0°to 350°F (-18°to 177°C)
Ethylenepropylene (EPDM) Elastomers:
-40°to 275°F (-40° to 135°C)

Pressure Registration

Type 66, 66Z, or 66ZZ
Cast Iron Body: Internal **(standard)** or external
Steel Body: External **(standard)** or internal
66 Series Vacuum Regulators or Breakers: External
Control Line when Used: 3/4-inch NPT standard
Bottom Flange Line when Used: 1/4-inch NPT standard with removable plug
Spring Case Vent: 3/4-inch NPT standard with removable Type Y602-10 vent assembly

Outlet (Control) Pressure Ranges
See Tables 1A through 1C

Control Line Connection
3/4-inch NPT

Flow and Sizing Coefficients
See Tables 2 and 3

Approximate Weights

2-inch (DN 50) Body
NPT: 50 pounds (22,7 kg)
Flanged: 55 pounds (25,0 kg)
3-Inch (DN 80) Flanged Body:
100 pounds (45,4 kg)
4-Inch (DN 100) Flanged Body:
155 pounds (70,3 kg)

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

Table 1A. *Outlet (Control) Pressure Ranges, 2-inch (DN 50) Body*

CONSTRUCTION	OUTLET (CONTROL) PRESSURE RANGE		CONTROL SPRING INFORMATION			
	Inches w.c. Unless Otherwise Designated	mbar	2-inch (DN 50) Body			
			Part Number	Color Code	Free Length, Inches (mm)	Wire Diameter, Inches (mm)
Type 66	4 to 11[1] 8 to 28[1]	10 to 27[1] 20 to 70[1]	0B019727052 1E611427022	Purple None	6.00 (152) 6.00 (152)	0.148 (3,76) 0.200 (5,08)
	2 to 5 4 to 8	5 to 12 10 to 20	1D892527022 1D892627022	Brown Red	6.12 (155) 7.53 (191)	0.109 (2,77) 0.112 (2,85)
	7 to 12 10 to 17 14 to 28	17 to 30 25 to 42 35 to 70	1D892727012 1D892827032 1D892927032	Black Orange stripe Unpainted	7.88 (200) 7.75 (197) 7.53 (191)	0.130 (3,30) 0.148 (3,76) 0.162 (4,12)
	0.75 to 1.5 psig 1 to 2 psig 1.5 to 3 psig 3 to 5 psig	0,05 to 0,10 bar 0,07 to 0,14 bar 0,10 to 0,21 bar 0,21 to 0,34 bar	1D765727032[2] 1D765827032[2] 1D962627032[2] 1N506427142[3]	Unpainted	6.09 (155) 6.00 (152) 6.25 (159) 6.31 (160)	0.207 (5,26) 0.225 (5,72) 0.262 (6,66) 0.283 (7,19)
Type 66Z	-1 to 2	-2 to 5	1D892527022	Brown	6.12 (155)	0.109 (2,77)
Type 66ZZ	-0.25 to 0.25	-0,62 to 0,62	1E991427012	Unpainted	5.62 (143)	0.085 (2,16)
66 Series vacuum regulators or breakers	0 to -2 -0.2 to -0.8 -2 to -6	0 to -5 -0,74 to -2 -5 to -15	1J196527012 1H387327012 1N152427012		5.62 (143) 5.62 (143) 5.62 (143)	0.102 (2,59) 0.095 (2,41) 0.112 (2,85)

1. 1 psig (0,07 bar) minimum differential pressure required with this range.
2. Heavy head construction required.
3. Extra heavy head construction required.

Table 1B. *Outlet (Control) Pressure Ranges, 3-inch (DN 80) Body*

CONSTRUCTION	OUTLET (CONTROL) PRESSURE RANGE		CONTROL SPRING INFORMATION			
	Inches w.c. Unless Otherwise Designated	mbar	3-inch (DN 80) Body			
			Part Number	Color Code	Free Length, Inches (mm)	Wire Diameter, Inches (mm)
Type 66	4 to 11[1] 8 to 28[1]	10 to 27[1] 20 to 70[1]	1D479927032 1D527327022	Unpainted	6.00 (152) 6.00 (152)	0.162 (4,12) 0.207 (5,26)
	2 to 5 4 to 8	5 to 12 10 to 20	1D893027022 1D893127012		6.12 (155) 7.12 (181)	0.112 (2,85) 0.125 (3,18)
	7 to 12 10 to 17 14 to 28	17 to 30 25 to 42 35 to 70	1D892827032 1D893227032 1D893327032	Orange Stripes Gray with White Stripe Green	7.75 (197) 7.50 (191) 7.25 (184)	0.148 (3,76) 0.156 (3,96) 0.182 (4,62)
	0.75 to 1.5 psig 1 to 2 psig 1.5 to 3 psig 3 to 5 psig	0,05 to 0,10 bar 0,07 to 0,14 bar 0,10 to 0,21 bar 0,21 to 0,34 bar	1D765827032[2] 1D962627032[2] 1E204427032[2] 1N506527142[3]	Unpainted	6.00 (152) 6.25 (159) 6.38 (162) 6.38 (162)	0.225 (5,72) 0.262 (6,66) 0.306 (7,77) 0.362 (9,20)
Type 66Z	-1 to 2	-2 to 5	1D893027022		6.12 (155)	0.112 (2,85)
Type 66ZZ	-0.25 to 0.25	-0,62 to 0,62	1E991527012		8.62 (219)	0.100 (2,54)
66 Series vacuum regulators or breakers	0 to -2 -2 to -6	0 to -5 -5 to -15	1J196627012 1K384427012		5.62 (143) 5.62 (143)	0.114 (2,90) 0.120 (3,05)

1. 1 psig (0,07 bar) minimum differential pressure required with this range.
2. Heavy head construction required.
3. Extra heavy head construction required.

Table 1C. *Outlet (Control) Pressure Ranges, 4-inch (DN 100) Body*

CONSTRUCTION	OUTLET (CONTROL) PRESSURE RANGE		CONTROL SPRING INFORMATION			
	Inches w.c. Unless Otherwise Designated	mbar	4-inch (DN 100) Body			
			Part Number	Color Code	Free Length, Inches (mm)	Wire Diameter, Inches (mm)
Type 66	4 to 11[1] 8 to 28[1]	10 to 27[1] 20 to 70[1]	1D527527022 1D527627032	Unpainted	7.75 (197) 7.75 (197)	0.170 (4,32) 0.225 (5,72)
	2 to 5 4 to 8	5 to 12 10 to 20	1D892627022 1D893427022		7.53 (191) 7.75 (197)	0.112 (2,85) 0.135 (3,43)
	7 to 12 10 to 17 14 to 28	17 to 30 25 to 42 35 to 70	1D893227032 1D893527032 1D893627032	Gray Unpainted Unpainted	7.50 (191) 7.75 (197) 7.81 (198)	0.156 (3,96) 0.170 (4,32) 0.207 (5,26)
	0.75 to 1.5 psig 1 to 2 psig 1.5 to 3 psig 3 to 5 psig	0,05 to 0,10 bar 0,07 to 0,14 bar 0,10 to 0,21 bar 0,21 to 0,34 bar	1D771227032[2] 1D771327032[2] 1E204527032[3] - - - -	Unpainted Unpainted Unpainted - - - -	7.75 (197) 7.75 (197) 7.53 (191) - - - -	0.262 (6,66) 0.283 (7,19) 0.331 (8,41) - - - -
Type 66Z	-1 to 2	-2 to 5	1D892627022	Red	7.53 (191)	0.112 (2,85)
Type 66ZZ	-0.25 to 0.25	-0,62 to 0,62	1E937227012	Unpainted	11.06 (281)	0.112 (2,85)
66 Series vacuum regulators or breakers	0 to -2 -0.2 to -0.8 -2 to -6 0 to 1.5	0 to -5 -0,74 to -2 -5 to -15 0 to 4	1J196727012 1E937227012 1K418127012 1J823827012		11.06 (281) 11.06 (281) 11.50 (292) 11.56 (294)	0.154 (3,91) 0.112 (2,85) 0.162 (4,12) 0.135 (3,43)

1. 1 psig (0,07 bar) minimum differential pressure required with this range.
2. Heavy head construction required.
3. Extra heavy head construction required.

Table 2. *Flow Coefficients*

OUTLET PRESSURE RANGE, PSIG (bar)	DROOP, PSIG (bar)	REGULATING C_g			REGULATING C_v			WIDE-OPEN C_g			WIDE-OPEN C_v			C_1
		2-inch (DN 50)	3-inch (DN 80)	4-inch (DN 100)	2-inch (DN 50)	3-inch (DN 80)	4-inch (DN 100)	2-inch (DN 50)	3-inch (DN 80)	4-inch (DN 100)	2-inch (DN 50)	3-inch (DN 80)	4-inch (DN 100)	
0.75 to 1.5 (0,05 to 0,10)	0.2 (0,01) 0.3 (0,02)	765 1150	1865 2800	3330 5000	21.9 32.9	53.3 80	95.1 143	1260	3400	5250	36	97.1	150	35
1 to 2 (0,07 to 0,14)	0.3 (0,02) 0.4 (0,03)	825 1100	1650 2200	3150 4200	23.6 31.4	47.1 62.9	90 120							
1.5 to 3 (0,10 to 0,21)	0.4 (0,03) 0.6 (0,04)	665 1000	1165 1750	2500 3750	19 28.6	33.3 50	71.4 107							
3 to 5 (0,21 to 0,34)	0.6 (0,04) 0.8 (0,06) 1.0 (0,07)	540 720 900	725 970 1210	- - - -	15.4 20.6 25.7	20.7 27.7 34.6	- - - -							

Table 3. *IEC Sizing Coefficients*

BODY SIZE, INCH (DN)	X_T	F_D	F_L
2 (50)	0.775	0.35	0.89
3 (80)		0.34	
4 (100)		0.30	

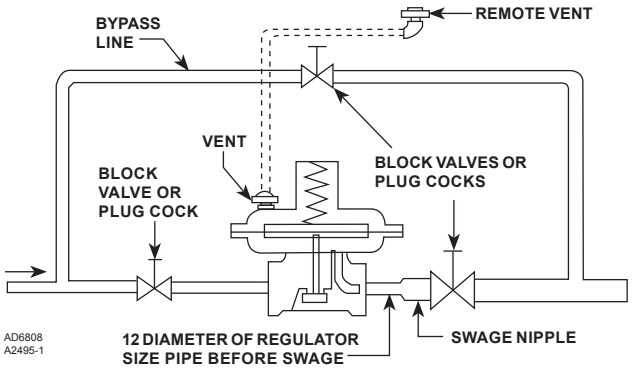

Figure 2. *Type 66 Regulator in Pressure-Reducing Application*

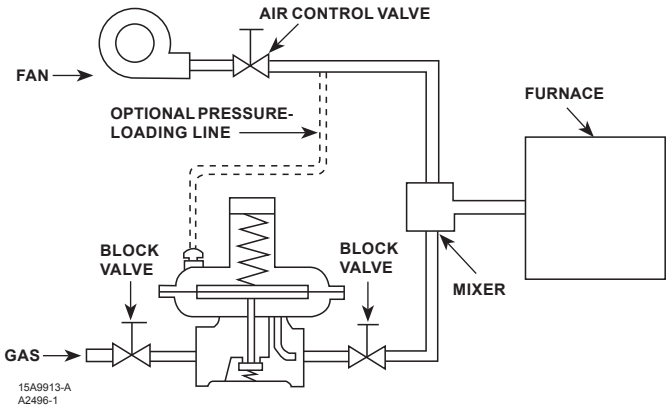

Figure 3. *Type 66Z Regulator in Gas-Mixing Application*

When decreased downstream demand raises the outlet pressure, the higher pressure under the main diaphragm opposes the regulator main spring causing the valve plug and stem assembly to close the regulator seat ring and to supply less gas to the downstream system.

The Types 66Z and 66ZZ regulators are identical to the Type 66 regulator in operation but different in construction. The Type 66Z regulator (Figure 8) has a counter spring under the valve plug and disk assembly which counters the main spring force to allow settings below atmospheric pressures. The Type 66ZZ regulator (Figure 9) has a longer spring case where the main spring, a low rate tension spring, is stretched between the adjusting screw and the valve plug stem, also providing below atmospheric settings and more sensitive pressure regulation than the Types 66 and 66Z regulators.

Installation

WARNING

Exposure of the regulator to physical damage and to corrosive material can cause improper operation or release of pressure. Either condition may result in equipment damage or personal injury. Properly install the regulator in a safe location.

CAUTION

Use of this regulator where service conditions can exceed Specifications limits may cause equipment damage or injury to personnel. Be sure the regulator service conditions do not exceed Specifications limits.

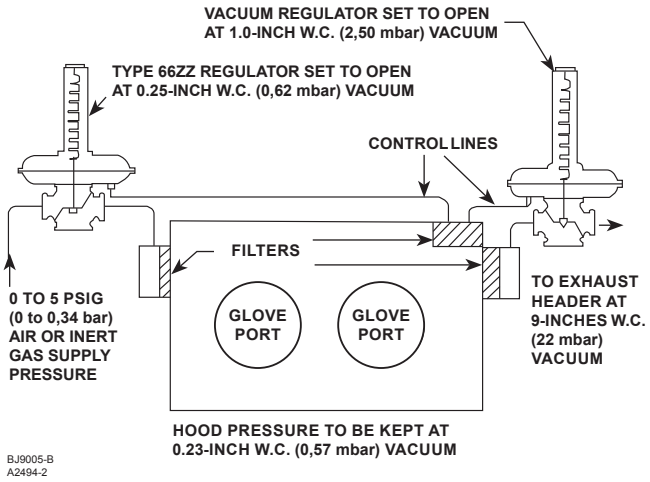

Figure 4. *Type 66ZZ Regulator Installation in Hood Control System*

Regulator operation within Specifications limits and applicable codes does not eliminate the possibility of damage from external sources or from debris in the line. The regulator should be inspected for damage regularly and after any condition exceeding Specifications limits.

Complete downstream protection is needed with a Type 66, 66Z, or 66ZZ regulator if the actual inlet pressure can exceed the regulator outlet pressure rating or the pressure ratings of any downstream equipment. Provide adequate overpressure protection for the regulator and any downstream equipment.

Make sure that there is no damage to or foreign material in the regulator and that all tubing and piping is clean and unobstructed. Install the regulator so that flow through it matches the arrow marked on the regulator body. Some typical 66 Series regulator installations are shown in Figures 2, 3, and 4.

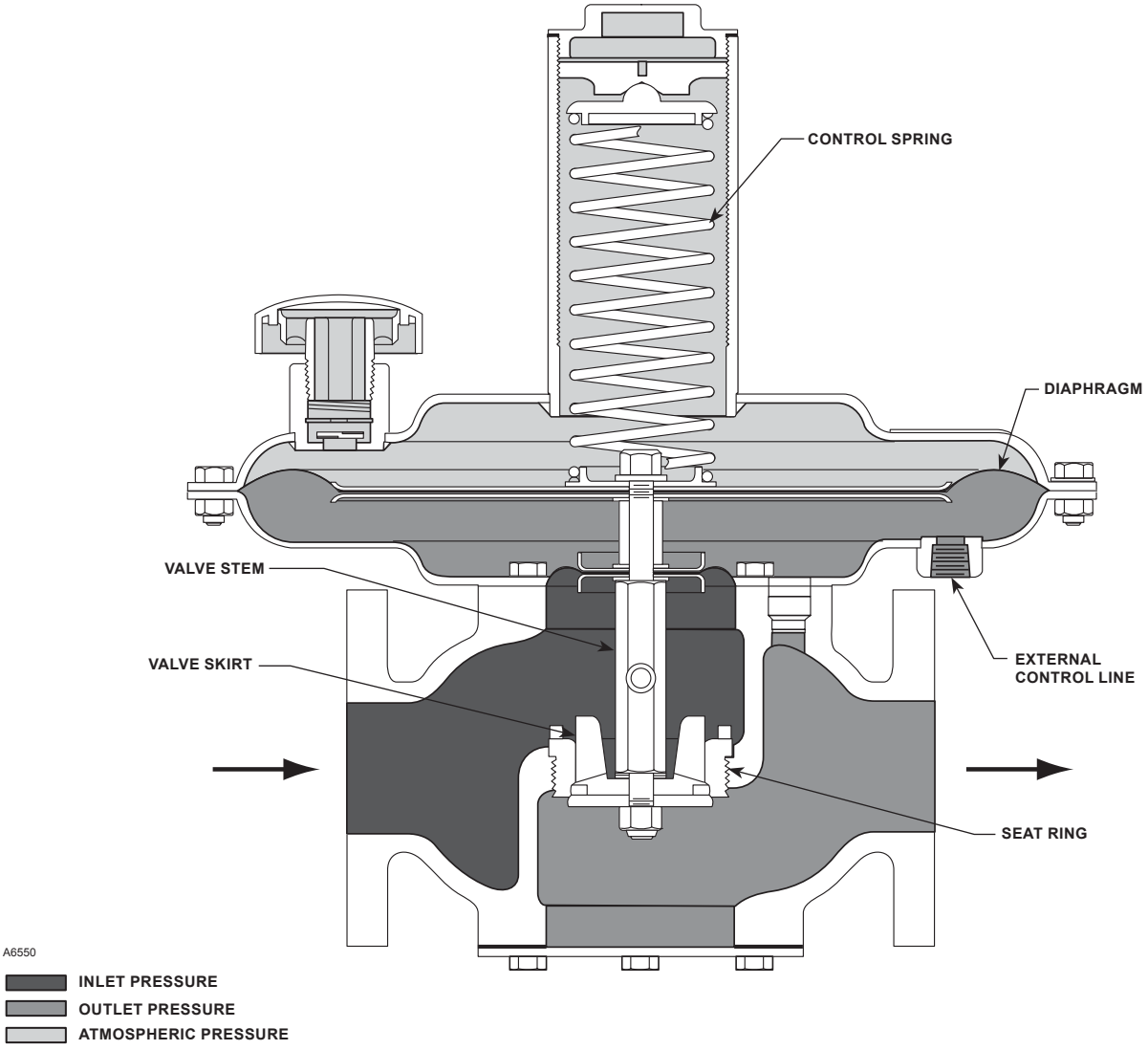

Figure 5. *Standard Steel Body Operational Schematic*

Install the Types 66, 66Z, and 66ZZ regulators horizontally with the spring case vertically above the valve body. Other orientations change the regulator set point and controlled pressure range due to the weight of the internal parts.

If threaded connections are used, apply a good grade of pipe compound to only the male pipeline threads. If flanged connections are used, use good bolting practices and suitable gaskets.

If continuous operation of the system is required during inspection and maintenance, install a three-valve bypass around the regulator. If an upstream strainer is not provided for the entire unit, an optional filter may be installed on the optional external control line to help protect the pressure sensing parts.

WARNING

The Type 66, 66Z, or 66ZZ regulator upper diaphragm casing vent must remain clear and unobstructed. A clogged vent may cause equipment damage or personal injury due to improper regulator functioning. Install and maintain the regulator so that dust, insects, and weather conditions do not clog or obstruct the vent.

The vented gas must not be allowed to accumulate where it can cause a hazardous condition. In pit, underground, or indoor installations,

vented gas can become an explosion, fire, or toxic hazard. Provide piping to remotely vent the gas to a safe area away from buildings, air intakes, or any hazardous location. The line or stack opening must be protected against condensation, freezing, or any clogging substance.

If a remote vent is needed, remove the upper diaphragm casing vent and connect 3/4-inch threaded NPT piping to the upper diaphragm casing. The piping should be as short as possible, have as few bends as possible, must vent the gas to a safe location, and should have a screened vent on the exhaust end.

With steel bodies, an external control line is required. Connect 3/4-inch threaded NPT control line to the lower diaphragm casing connection from the point where the downstream pressure is to be sensed. A needle valve should be installed in the control line for isolating the regulator and for damping out control line pulses.

The regulator set pressure is adjusted at the factory for the reduced pressure specified on the order. If no pressure is specified, the regulator is set for a pressure approximately in the middle of the main spring pressure range. Check the spring setting to make sure it is correct for the application.

Startup

CAUTION

If the regulator is in a system already pressurized (either positive or negative pressure), use care when placing the Type 66, 66Z, or 66ZZ regulator in service. Use pressure gauges to monitor upstream, control line, if one is used, and downstream pressure. If the limits in Specifications are exceeded during start-up, damage to the regulator may result.

With proper installation completed and downstream equipment properly adjusted, slowly open the upstream and downstream block valves while using pressure gauges to monitor pressure. Regulator outlet pressure may be monitored on a gauge installed at some point downstream from the regulator.

If outlet pressure adjustment is necessary for Types 66, 66Z, 66ZZ regulators, monitor the outlet pressure with a gauge during adjustment. Make sure there is flow through the regulator when checking outlet pressure setting. Remove the closing cap (key 27, Figures 6, 7, 8, and 9) and turn the adjusting screw (key 25, Figures 6, 7, 8, and 9) clockwise, or toward, the spring case to increase the downstream reduced pressure. Turn the adjusting screw counterclockwise, or away from, the spring case to decrease the downstream reduced pressure. For vacuum service, turning the adjusting screw toward the spring case decreases the vacuum downstream. Turning the adjusting screw away from the spring case increases the vacuum downstream.

Shutdown

To remove the Type 66, 66Z, or 66ZZ regulator from positive pressure service, first close the upstream and then the downstream block valve. Close the needle valve in the external control line, if one is used, and vent the regulator body and lower diaphragm casing to release any trapped pressure.

To remove the Types 66Z and 66ZZ regulators from negative pressure service, close the upstream and downstream block valves. If a control line is used, close the control line needle valve. Vent the regulator body and lower diaphragm casing.

Maintenance

Regulator parts are subject to normal wear and must be inspected and replaced as necessary. Inspection and maintenance frequency depends upon the severity of service conditions.

WARNING

To avoid personal injury or equipment damage from the sudden release of pressure, isolate the reducing regulator from the pressure system and release all pressure from the regulator before performing maintenance operations.

Maintenance steps are in two general sections. Replacing the Valve Plug O-Ring or the Metal-Seated Valve Plug is the first section. Replacing the Main Spring, the Main and Balancing Diaphragms, and the Seat Ring is the second section. Complete the necessary maintenance steps in the appropriate section, inspecting and replacing parts as required.

These maintenance procedures refer to all three regulator types unless otherwise indicated.

All key numbers refer to Figures 6, 7, 8, and 9 unless otherwise indicated.

Replacing Plug O-Ring or Metal Seated Valve Plug

1. Remove hex screws (key 20) from the bottom flange (key 7).
2. Remove the bottom flange and bottom flange gasket (key 19). With the Type 66Z regulator, the counter spring (key 38) will fall out when the bottom flange is removed.
3. Remove the pipe plug from the side of the valve body. To keep the valve stem (key 13) from rotating, insert a 5/16-inch (7,94 mm) or smaller rod into the pipe plug hole and through the hole in the valve stem.
4. **For all regulators with a valve plug O-ring,** remove the stop nut (key 23), the disk retainer (key 9), the plug skirt (key 10), the sealing washer (key 37), and the plug O-ring (key 8). For the Type 66Z regulator, also remove the lower spring seat (key 17).

   For a Type 66 metal-seated regulator, remove the stop nut (key 23) and the plug skirt (key 10).
5. **For all regulators with a valve plug O-ring,** place the sealing washer, the plug skirt, the O-ring, and the disk retainer on the plug stem in the order shown in Figures 6, 7, 8 and 9. For the Type 66Z regulator, also place the counter spring seat on the plug stem.

   For a Type 66 metal-seated regulator, place the plug skirt (key 10) on the plug stem (key 13).
6. Secure the stop nut (key 23) to the plug stem.
7. **For the Type 66Z regulator,** place the counter spring (key 38) against the lower spring seat (key 17).
8. Install the bottom flange gasket (key 19) and the bottom flange (key 7) on the valve body. Secure the flange with the cap screws (key 20).
9. Remove the 5/16-inch (7,94 mm) or smaller rod rod and replace the pipe plug (key 31) in the valve body.

Replacing Main Spring, Main and Balancing Diaphragms, and Seat Ring

Disassembly

1. **For all regulators,** remove the closing cap (key 27) and closing cap gasket (key 26).

   Remove all compression in the spring (key 6) by turning the adjusting screw (key 25) out of the spring case.

   For the Types 66 and 66Z regulators, remove the adjusting screw (key 25), the upper spring seat (key 24), and the spring (key 6).

   For the Type 66ZZ regulator (Figure 9), tip the adjusting screw (key 25) to one side so that it can be grasped and pull it, the spring retainer (key 43), and the ten ball bearings (key 54) out of the spring case. Unhook the spring (key 6) and leave the spring retainer (key 43) and the ten ball bearings (key 54) in the adjusting screw (key 25).

   Note

   If a spring change is the only maintenance required for the Type 66 or 66Z regulator, proceed to steps 16 through 19 in the Assembly section. For further disassembly, proceed to step 2.
2. Unscrew the diaphragm casing hex nuts (key 22) and remove the cap screws (key 21).
3. If a special spring case orientation is required for remote venting, mark the side of the diaphragm casing flanges to aid in assembly. Remove the upper diaphragm casing (key 2).

   For the Type 66ZZ regulator, unhook the spring (key 6) from the plug stem (key 13).

   Note

   If the spring change is the only maintenance required for the Type 66ZZ regulator, proceed to steps 16 through 19 in the Assembly section. For further disassembly, proceed to step 4.
4. Remove the valve body pipe plug from the side of the body. To keep the valve plug from twisting, insert a 5/16-inch (7,94 mm) or smaller rod through the pipe plug hole and the hold in the plug stem (key 13).
5. Remove the upper stop nut (key 23), washer (key 36, except for the Type 66ZZ regulator), the lower spring seat (key 17, except for the Type 66ZZ regulator), and the upper diaphragm plate (key 4).
6. Remove and inspect the main diaphragm (key 5). If no further maintenance is needed, refer to steps 13 through 19 in the Assembly section for

instructions. Continue to step 7 if further disassembly is required.

7. Remove the lower diaphragm plate (key 4), the top stem gasket (key 18), the diaphragm spacer (key 16), the middle stem gasket (key 18), and the upper balancing diaphragm plate (key 15).

8. To aid in assembly, record the position of the lower diaphragm casing with respect to the valve body. Unscrew and remove the cap screws (key 20) and washers (key 34) that hold the lower diaphragm casing to the valve body (key 1). Remove the lower diaphragm casing (key 3).

9. Remove and inspect the balancing diaphragm (key 14) and the gasket (key 35).

   If no further maintenance is required, proceed to steps 5 through 19 in the Assembly section. For further disassembly, proceed with step 10.

10. Remove the lower balancing diaphragm plate (key 15) and the lower stem gasket (key 18).

11. Remove the 5/16-inch (7,94 mm) or smaller rod from the valve body pipe plug hole so that the valve plug and stem assembly can be moved. Slide a seat ring puller, T-wrench, or other suitable tool over the valve plug stem. Engage the tool with the seat ring lugs. If a suitable tool will not fit over the valve plug stem, remove the valve body bottom flange (key 7) using steps 1 and 2 of the Replacing Plug O-Ring or Metal Seated Valve Plug section and remove the valve plug and stem assembly. Unscrew the seat ring (key 11).

Assembly

1. Apply a good grade of piping compound to the seat ring (key 11) threads. Thread in the seat ring using the seat ring puller or a similar device. Wipe off any excess piping compound.

2. **If the valve plug and stem assembly was not removed,** proceed to step 3.

   If the valve plug and stem assembly was removed, place the assembly in the valve body and insert the 5/16-inch (7,94 mm) or smaller rod through the pipe plug and valve stem holes. Use steps 5 through 7 of the Replacing Plug O-Ring or Metal Seated Valve Plug section to secure the bottom flange (key 7).

3. Place the lower stem gasket (key 18) on the valve plug stem (key 13).

4. Place one balancing diaphragm plate (key 15) on the valve plug stem (key 13) with “cupped” side facing the valve plug.

5. Align the gasket (key 35) holes with the valve body pitot tube and cap screw holes and place the gasket on the valve body.

6. Align the balancing diaphragm (key 14), pitot tube (key 12), and cap screw holes with the holes in the valve body and place the balancing diaphragm on top of the gasket (key 35).

7. Align the lower diaphragm casing (key 3) using the position recorded in the Disassembly section step 8 so that the pitot tube (key 12) will be open. Secure the casing (key 3) with the washers (key 34) and cap screws (key 20), tightening the cap screws using an even, crisscross pattern.

8. Place the balancing diaphragm plate (key 15) on the balancing diaphragm so that the “cupped” side of the plate faces the main diaphragm (key 5).

9. Place the middle stem gasket (key 18) on top of the balancing diaphragm plate.

10. Slide the diaphragm spacer (key 16) onto the valve plug stem.

11. Place the upper stem gasket (key 18) on the valve plug stem.

12. Position a diaphragm plate (key 4) so that its “cupped” side faces the balancing diaphragm.

13. Align the main diaphragm cap screw holes with the diaphragm casing cap screw holes and place the diaphragm (key 5) on the diaphragm plate (key 4).

14. Place another diaphragm plate (key 4) on the main diaphragm (key 5) so that the plate “cupped” side faces the main spring (key 6).

15. **For the Types 66 and 66Z regulators,** place the lower spring seat (key 17) and the washer (key 36) on the valve plug stem. Secure these parts with the stop nut (key 23).

    For the Type 66ZZ regulator, screw on a stop nut (key 23) to secure the diaphragm plates (key 4).

16. **For the Types 66 and 66Z regulators,** align the upper diaphragm casing (key 2) using the marks made in the Disassembly section step 3. Place the upper diaphragm casing (key 2) on the diaphragm, fasten the cap screws and hex nuts (keys 21 and 22), tightening the cap screws using an even, crisscross pattern and put the spring (key 6) on the spring seat in the spring case.

    For the Type 66ZZ regulator, hook the spring (key 6) to the valve stem (key 13). Align the upper diaphragm casing (key 2) using the marks made in the Disassembly section step 3, put the spring (key 6) in the spring case while placing the upper diaphragm casing (key 2) on the diaphragm. Fasten the cap screws and hex nuts (keys 21 and 22) together tightening them using an even, crisscross pattern.

17. **For the Types 66 and 66Z regulators,** place the upper spring seat (key 24) on the spring (key 6).

    For the Type 66ZZ regulator, apply an appropriate lubricant to the ball bearings, pull the spring out of the spring case using a stiff wire hook or similar tool. Holding the adjusting screw (key 25), spring retainer (key 43), and ten ball bearings (key 54) together, hook the spring (key 6) into the spring retainer (key 43).

18. Thread the adjusting screw (key 25) into the spring case. Apply a good grade of piping compound to the adjusting screw threads, remove the rod and thread the pipe plug (key 31) into the body, and adjust the regulator following the steps in the Start-Up section.

19. Thread the closing cap (key 27) onto the spring case.

Parts Ordering

The Types 66, 66Z, and 66ZZ regulators have a serial number stamped on a nameplate attached to the upper diaphragm casing. When corresponding with your local Sales Office, always refer to this serial number of each needed part as found in the following parts list.

Parts List

Key	Description	Part Number
	Note	
	In this parts list, parts marked NACE are intended for corrosion-resistant service as detailed in the NACE International standards MR0175/ISO 15156 and/or MR0103.	
	Parts Kits	
	Included are keys 5, 8, 14, 18, 19, 26, and 35	
	2-inch (DN 50) body	R66X0000022
	3-inch (DN 80) body	R66X0000032
	4-inch (DN 100) body	R66X0000042
1	Valve Body	
	2-inch (DN 50) body	
	NPT connection	
	Cast iron	2D474119012
	Steel	2K928522012
	NACE, Steel	2K9285X0012
	CL125 FF flanged	
	Cast iron	3E713919012
	CL150 RF flanged	
	Steel	2J838322012
	NACE, Steel	2J8383X0042
	CL150 FF flanged	
	Steel	24A4617X012
	NACE, Steel	24A4617X022
	CL300 RF flanged	
	Steel	2K655122012
	3-inch (DN 80) body	
	CL125 FF flanged	
	Cast iron	3D474319012
	CL150 RF flanged	
	Steel	2L291322012
	NACE, Steel	2L2913X0062
	4-inch (DN 100) body	
	CL125 FF flanged	
	Cast iron	2D474519012
	CL150 RF, flanged	
	Steel	2L291422012
	NACE, Steel	2L2914X0032
2	Upper Diaphragm Casing (**standard** and NACE)	
	2-inch (DN 50) body	1D4792000A2
	3-inch (DN 80) body	1D5391000A2
	4-inch (DN 100) body	1D5395000A2
3	Lower Diaphragm Casing	
	Standard	
	2-inch (DN 50) body	3D478728992
	3-inch (DN 80) body	3D478928992
	4-inch (DN 100) body	3D479128992
	With external control line	
	2-inch (DN 50) body	1F4421000A2
	2-inch (DN 50) body (NACE)	1F4421X0022
	3-inch (DN 80) body	1F4419000A2
	3-inch (DN 80) body (NACE)	1F4419X0022
	4-inch (DN 100) body	1F1319000A2
	4-inch (DN 100) body (NACE)	1F1319X0012

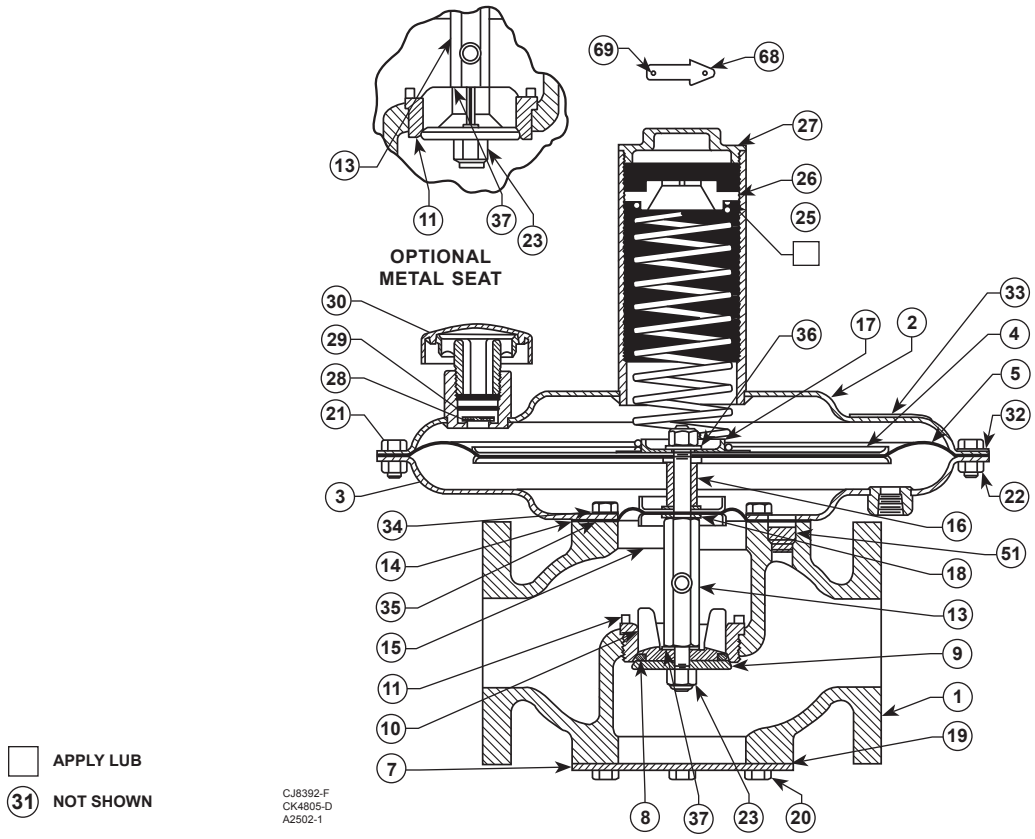

Figure 6. *Soft-Seated Type 66 Regulator (with external control line)*

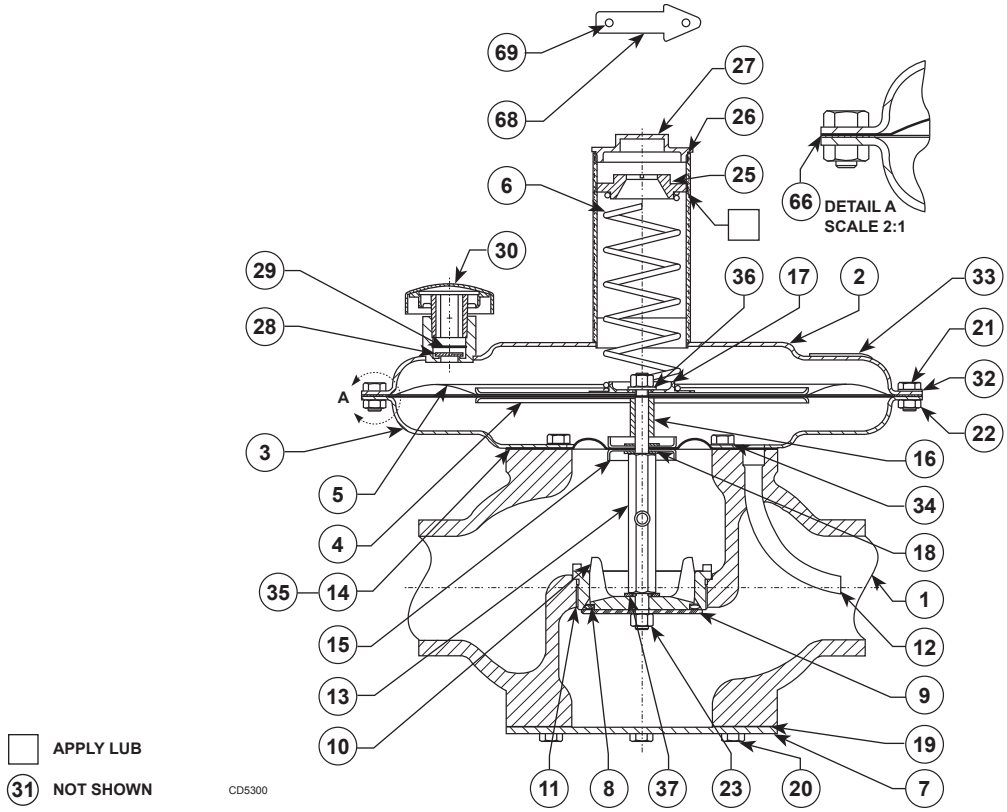

Figure 7. *Type 66 Regulator Assembly (with pitot tube)*

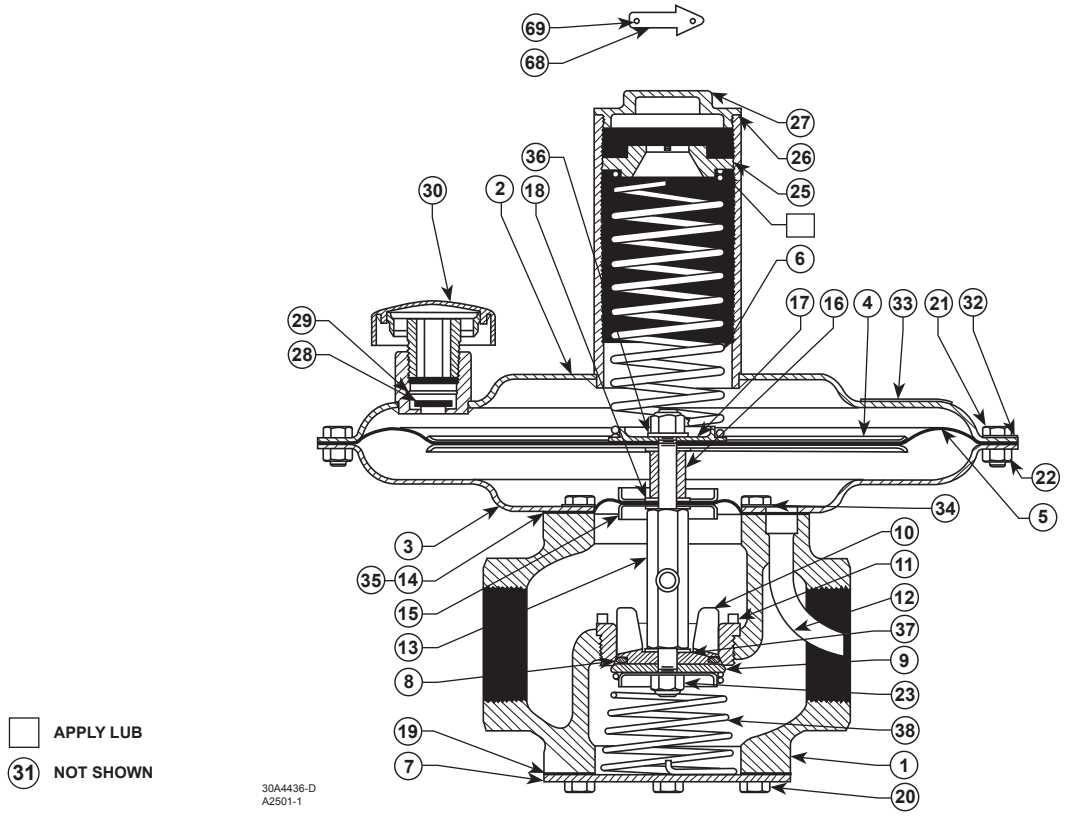

Figure 8. *Type 66Z Regulator*

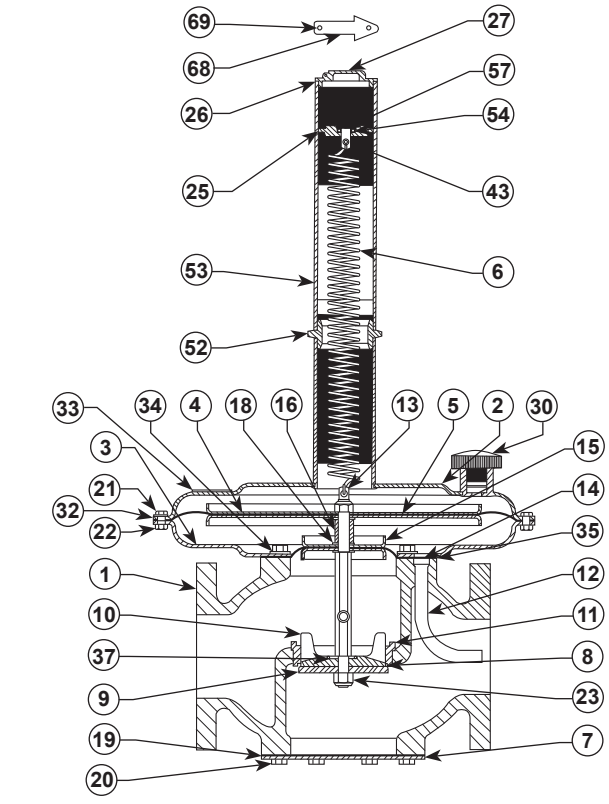

Figure 9. *Type 66ZZ Regulator*

Key	Description	Part Number
4	Diaphragm Plate, Plated steel (2 required)	
	2-inch (DN 50) body	1D255625072
	3-inch (DN 80) body	1D477328992
	4-inch (DN 100) body	1D477425062
5*	Diaphragm	
	Nitrile (NBR)/Nylon (PA)	
	2-inch (DN 50) body	1D477002072
	3-inch (DN 80) body	1D477102072
	4-inch (DN 100) body	1D477202072
	Fluorocarbon (FKM)	
	2-inch (DN 50) body	1D477002332
	3-inch (DN 80) body	1D477102332
	4-inch (DN 100) body	1D477202332
6	Spring	See Tables 1A to 1C
7	Bottom Flange, Zinc plated steel	
	Standard	
	2-inch (DN 50) body	1D477825062
	3-inch (DN 80) body	
	Type 66	17A9250X012
	Types 66Z and 66ZZ	17A9250X012
	4-inch (DN 100) body	1D478025062
	Type 66 with external control line and adjustable travel stops	
	2-inch (DN 50) body	1N9449000A2
	4-inch (DN 100) body	1V1716X0012
8*	O-Ring	
	Nitrile (NBR)	
	2-inch (DN 50) body	1D785306992
	3-inch (DN 80) body	1D785406992
	4-inch (DN 100) body	1D785506992
	4-inch (DN 100) body (NACE)	1D785506992
	Fluorocarbon (FKM)	
	2-inch (DN 50) body	1N115606382
	3-inch (DN 80) body	1N115706382
	4-inch (DN 100) body	1D2658X0022
9	Disk Retainer	
	Brass	
	2-inch (DN 50) body	1D475814012
	3-inch (DN 80) body	1D475914012
	4-inch (DN 100) body	1D476014012
	Stainless steel (also NACE)	
	2-inch (DN 50) body	1D475835072
	3-inch (DN 80) body	1D475935072
	4-inch (DN 100) body	1D476035072
10	Valve Plug Skirt	
	With soft seats	
	Brass	
	2-inch (DN 50) body	1D476112012
	3-inch (DN 80) body	1D476212012
	4-inch (DN 100) body	1D476312012
	Stainless steel (also NACE)	
	2-inch (DN 50) body	1D476133092
	3-inch (DN 80) body	1D476233092
	4-inch (DN 100) body	1D476333092
	Metal-to-Metal Seats	
	Brass	
	2-inch (DN 50) body	1E322712012
	3-inch (DN 80) body	1E121512012
	4-inch (DN 100) body	1J423612012
	Stainless steel	
	2-inch (DN 50) body	1D783012022
	3-inch (DN 80) body	1D783112022
	4-inch (DN 100) body	1D783212022

Key	Description	Part Number
11	Seat Ring	
	Standard	
	Brass	
	2-inch (DN 50) body	1D783012022
	3-inch (DN 80) body	1D783112022
	4-inch (DN 100) body	1D783212022
	Stainless steel (also NACE)	
	2-inch (DN 50) body	1D783033092
	3-inch (DN 80) body	1D783133092
	4-inch (DN 100) body	1D783233092
	Metal-to-Metal Seats	
	Brass	
	2-inch (DN 50) body	1E323512022
	3-inch (DN 80) body	1E121412022
	4-inch (DN 100) body	1J423812022
	Stainless steel	
	2-inch (DN 50) body	1E323533092
	3-inch (DN 80) body	1E121433092
	4-inch (DN 100) body	1J423833092
12	Pitot Tube	
	2-inch (DN 50) body	
	With NPT connection and brass trim, Copper	1D475117012
	With NPT connection and stainless steel trim, 304 Stainless steel	1D475138072
	With flanged connection and brass trim, Copper	1E737917012
	With flanged connection and stainless steel trim, 304 Stainless steel	1E737938072
	3-inch (DN 80) body	
	With brass trim, Copper	1D475217012
	With stainless steel trim, 304 Stainless steel	1D475238072
	4-inch (DN 100) body	
	With brass trim, Copper	1D475317012
	With stainless steel trim, 304 Stainless steel	1D475338072
13	Valve Plug Stem	
	For Types 66 and 66Z standard and with external control line	
	2-inch (DN 50) body	
	Brass	1D475414012
	Stainless steel (also NACE)	1D475435072
	3-inch (DN 80) body	
	Cast iron bodies only	
	Brass	1D475514012
	Stainless steel	1D475535072
	3-inch (DN 80) body, Steel bodies only	
	Brass	1N445614012
	Stainless steel (also NACE)	1N445635072
	4-inch (DN 100) body	
	Brass	1D475614012
	Stainless steel (also NACE)	1D475635072
	For Type 66 with metal-to-metal seating	
	2-inch (DN 50) body	
	Brass	1E322814012
	Stainless steel	1E322835072
	3-inch (DN 80) body	
	Brass	1E121314012
	Stainless steel	1E121335072
	4-inch (DN 100) body	
	Brass	1J423714012
	Stainless steel	1J423735072

*Recommended Spare Parts

Types 66, 66Z, and 66ZZ

Key	Description	Part Number
13	Valve Plug Stem (continued)	
	For Type 66ZZ	
	2-inch (DN 50) body	
	Brass	1E991614012
	3-inch (DN 80) body	
	Brass	1E991714012
	4-inch (DN 100) body	
	Brass	1E868914012
14*	Balancing Diaphragm	
	Types 66 and 66Z	
	Nitrile (NBR)	
	2-inch (DN 50) body	1D476702042
	3-inch (DN 80) body	1D476802042
	4-inch (DN 100) body	1D476902042
	Fluorocarbon (FKM)	
	2-inch (DN 50) body	1H7370X0012
	3-inch (DN 80) body	1J1981X0012
	4-inch (DN 100) body	1H7275X0012
	Type 66ZZ	
	Nitrile (NBR)	
	2-inch (DN 50) body	1D476702042
	3-inch (DN 80) body	1D476802042
	4-inch (DN 100) body	1D476902042
15	Sealing Diaphragm Plate,	
	Zinc-plated steel (2 required)	
	Types 66 and 66Z	
	2-inch (DN 50) body	1D475725062
	2-inch (DN 50) body (NACE)	1D4757X0022
	3-inch (DN 80) body	1D479325062
	3-inch (DN 80) body (NACE)	1D479325062
	4-inch (DN 100) body	1D479425062
	4-inch (DN 100) body (NACE)	1D4794X0012
	Type 66ZZ	
	2-inch (DN 50) body	1D475725062
	3-inch (DN 80) body	1D479325062
	4-inch (DN 100) body	1D479425062
16	Diaphragm Spacer	
	Zinc-plated steel	
	2 and 3-inch (DN 50 and 80) bodies	1D477626092
	4-inch (DN 100) body	1D477726092
17	Lower Spring Seat, Types 66 and 66Z only	
	Aluminum	0X014744012
18*	Stem Gasket, (3 required) Composition	
	2 and 3-inch (DN 50 and 80) bodies	1D255304022
	4-inch (DN 100) body	1D478404022
19*	Bottom Flange Gasket, Composition	
	2-inch (DN 50) body	1D476404022
	3-inch (DN 80) body	1D476504022
	4-inch (DN 100) body	1D476604022
20	Cap Screw, Zinc-plated steel	
	2-inch (DN 50) Cast iron	
	body (12 required)	1C631224052
	2-inch (DN 50) Steel	
	body (12 required)	1C275224052
	2-inch (DN 50) Steel	
	body (NACE 12 required)	1C2752X0032
	3-inch (DN 80)	
	body (16 required)	1D529824052
	3-inch (DN 80)	
	body (NACE 16 required)	1D5298X0012

Key	Description	Part Number
20	Cap Screw, Zinc-plated steel (continued)	
	4-inch (DN 100)	
	body (16 required)	1D530824052
	4-inch (DN 100)	
	body (NACE 16 required)	1D5308X0022
21	Cap Screw, Zinc-plated steel	
	2-inch (DN 50)	
	body (16 required)	1D529624052
	3-inch (DN 80)	
	body (20 required)	1D529624052
	4-inch (DN 100)	
	body (24 required)	1D529624052
22	Hex Nut, Plated steel	
	2-inch (DN 50)	
	body (16 required)	1A309324122
	3-inch (DN 80)	
	body (20 required)	1A309324122
	4-inch (DN 100)	
	body (24 required)	1A309324122
23	Stop Nut (2 required)	
	Types 66 and 66Z	
	Brass	
	2 and 3-inch (DN 50 and 80) bodies	1D529718992
	4-inch (DN 100) body	1D530918992
	Stainless steel	
	2 and 3-inch (DN 50 and 80) bodies	1D5297X0022
	2 and 3-inch (DN 50 and 80) bodies (NACE)	1D6496X0012
	4-inch (DN 100) body	1D5309X0052
	4-inch (DN 100) body (NACE)	1D5309X0042
	Type 66ZZ	
	Brass	
	2 and 3-inch (DN 50 and 80) bodies	1D529718992
	4-inch (DN 100) body	1D530918992
25	Adjusting Screw	
	For Types 66 and 66Z, Aluminum	1L928608012
	For Type 66ZZ, Brass	1E869214012
26*	Closing Cap Gasket	
	Neoprene (CR)	1N446206992
27	Closing Cap	
	For Type 66 with external control line and adjustable travel stops	1N756414012
	For all others, Zinc	1A589544022
28	Flapper Valve, Brass	1C901715072
29	Snap Ring, Bronze	1D178016012
30	Type Y602-10 Vent Assembly, Stainless steel/Zinc	1D5295000A2
31	Pipe Plug, Steel (not shown)	1A369224492
34	Washer, Zinc-plated steel	
	2-inch (DN 50)	
	body (6 required)	1D793624152
	3-inch (DN 80)	
	body (8 required)	1D716228982
	4-inch (DN 100)	
	body (8 required)	1D716328982

*Recommended Spare Parts

Key	Description	Part Number
35*	Gasket, Neoprene (CR)	
	2-inch (DN 50) body	1D843604082
	3-inch (DN 80) body	1D843704082
	4-inch (DN 100) body	1D843804082
36	Washer, Types 66 and 66Z only	
	2 and 3-inch (DN 50 and 80)	
	Zinc-plated steel	1H723125072
37	Sealing Washer, Steel	
	2 and 3-inch (DN 50 and 80) bodies	1F990428982
	4-inch (DN 100) body	1N720799012
38	Counter Spring, Type 66Z only	
	Zinc-plated steel	
	2-inch (DN 50) body	1D891527022
	3-inch (DN 80) body	1D891627022
	4-inch (DN 100) body	1D891727022
43	Spring Retainer, Type 66ZZ only	
	Brass	1E869414012
44	Set Screw, for Type 66 with external control line and adjustable travel stops, Steel (2 required)	1A279128982
45	Hex Nut, for Type 66 with external control line and adjustable travel stops	
	Zinc-plated steel (2 required)	1A352424122
46	Adjusting Screw Cap, for Type 66 with external control line and adjusting travel stops, Brass (2 required)	1J944114012
47	Adjusting Cap Gasket, for Type 66 with external control line and adjusting travel stops, Composition (2 required)	1J944004022
48	Upper Travel Stop, for Type 66 with external control line and adjusting travel stops, Brass	
	2-inch (DN 50) body	1N930114012
	4-inch (DN 100) body	1U965414012
49	Lower Travel Stop, for Type 66 with external control line and adjusting travel stops, Brass	
	2-inch (DN 50) body	1N930214012
	4-inch (DN 100) body	1U965514012
50	Lock Washer, for Type 66 with external control line and adjusting travel stops, Steel (2 required)	
	2-inch (DN 50) body	1A339828992
	4-inch (DN 100) body	1A343628992
51	Plug	
	Types 66 and 66Z	
	Brass	
	2 and 3-inch (DN 50 and 80) bodies	1D781714012
	4-inch (DN 100) body	1D782114012
	Stainless steel	
	2 and 3-inch (DN 50 and 80) bodies	1D781735232
	4-inch (DN 100) body	1D782135132
	Type 66ZZ	
	Brass	1D781714012
52	Spring Case Coupling, Type 66ZZ only	
	Brass	1E869214012
53	Spring Case Extension, Type 66ZZ only	
	Steel	
	2-inch (DN 50) body	1E869026012
	Cast iron	
	2-inch (DN 50) body	1E869026012
	3-inch (DN 80) body	1N153126012
	4-inch (DN 100) body	1E937326012
54	Ball, Type 66ZZ only (10 required)	
	Stainless steel	1B793546202
57	Retaining Ring, Type 66ZZ only	
	Steel	10A3074X012
66*	Casing Gasket, Fluorocarbon (FKM)	
	2-inch (DN 50) body	1U6985X0012
	3-inch (DN 80) body	1U6986X0012
	4-inch (DN 100) body	1U6989X0012
68	Flow Arrow, 18-8 Stainless steel	1V105938982
69	Drive Screw, 18-8 Stainless steel (2 required)	1A368228982
70	Tag, NACE, Stainless steel	19A6034X012
71	Tag Wire, 304 Stainless steel	1U7581X0022

*Recommended Spare Parts

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