September 2009

Types 98LD and 98HD Differential Pressure Relief Valves

TYPE 98LD

TYPE 98HD

Figure 1. *Types 98LD and 98HD Differential Pressure Relief Valves*

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® relief valves 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 a leak develops or if the outlet continually vents gas, service to the unit may be required. Failure to correct trouble could result in a hazardous condition. Only a qualified person must install or service the unit.

Installation, operation, and maintenance procedures performed by unqualified personnel may result in improper adjustment and unsafe operation. Either condition may result in equipment damage or personal injury. Use qualified personnel when installing, operating, and maintaining the Types 98LD and HD differential pressure relief valves.

Introduction

Scope of the Manual

This manual provides instructions for the installation, maintenance, and parts ordering information of Types 98LD and 98HD Differential Relief Valves. Instructions and parts lists for other equipment mentioned in this instruction manual are found in separate manuals.

D100259X012

Specifications

Available Configurations

Type 98LD: Pressure-loaded with handwheel adjustment. Relief pressure ranges are 2 to 38 psig (0,14 to 2,62 bar).

Type 98HD: Direct-operated with standard adjusting screw. Relief pressure ranges are 15 to 200 psig (1,03 to 13,8 bar).

Body Sizes and End Connection Styles

TYPE	BODY MATERIAL	
	Cast Iron	WCC Steel, CF8M Stainless steel, Hastelloy® C, Monel®
98LD	NPS 1/4, 1/2, 3/4, 1, NPT	NPS 1/4 through 1, NPT; NPS 1/2 through 1, SWE, CL150 RF, CL300 RF, PN 16/25/40 RF
98HD	NPS 1/4, 1/2, 3/4, 1, 1-1/2, 2, NPT	NPS 1/4 through 2, NPT; NPS 1/2 through 2, SWE, CL150 RF, CL300 RF, PN 16/25/40 RF

Maximum Cold Working Pressures of Body Size and Material[1][2]

REGULATOR	BODY SIZE	BODY AND SPRING CASE MATERIALS	MAXIMUM INLET PRESSURE[3], PSIG (bar)
Type 98LD	All Sizes	Cast Iron Steel Stainless Steel	60 (4,1) 150 (10,3) 150 (10,3)
Type 98HD	All Sizes	Cast Iron Steel Stainless Steel	300 (20,7) 300 (20,7) 400 (27,6)

Flow Coefficient

C_1: 35

IEC Sizing Coefficients

BODY SIZE, NPS (DN)	X_T	F_D	F_L	K_m
1/4	0.78	0.50	0.91	0.83
1/2 (15)			0.83	0.69
3/4 and 1 (20 and 25)			0.88	0.77
1-1/2 and 2 (40 and 50)			0.92	0.85

Relief Pressure Ranges

See Table 1

Shutoff Classification Per ANSI/FCI 70-3-2004

Metal Seats: Class IV
PTFE: Class IV
Elastomer Seats: Class VI

Maximum Spring Case Loading Pressures, Psig (bar) (Spring Setting Plus Loading Pressure)[1]

TYPE NUMBER	STEEL (WCC) OR STAINLESS STEEL BODY, SST / ALL TRIMS TO 150°F[2] (66°C)	CAST IRON BODY		
		All Trims to 150°F[3] (66°C)	Metal Trims	
			To 315°F (157°C)	To 406°F (208°C)
98LD	125 (8,62)	50 (3,4)	50 (3,4)	50 (3,4)
98HD	300 (20,7)	250 (17,2)	- - - -	- - - -

Maximum Temperature Ranges of Diaphragm and Seat Materials[1][4]

MATERIAL	TEMPERATURE RANGE, °F (°C)
Metal (All)	-40° to 450°F (-40° to 232°C)
Nitrile (NBR)	-20° to 180°F (-29° to 82°C)
Neoprene (CR)	-40° to 180°F (-40° to 82°C)
Fluorocarbon (FKM)	0° to 300°F (-18° to 149°)
Ethylenepropylene (EPDM)	-40° to 450°F (-40° to 232°)
Polytetrafluoroethylene (PTFE)	-40° to 450°F (-40° to 232°)
PerFluorocarbon (FKM) (FFKM)	-20° to 450°F (-29° to 232°)

Maximum Temperature Ranges of Body Materials[1][4]

REGULATOR	BODY AND SPRING CASE MATERIALS	TEMPERATURE RANGE
Type 98LD Type 98HD	Cast Iron Steel Stainless Steel	-40° to 406°F (-40° to 208°C) -20° to 450°F (-29° to 232°C) -40° to 450°F (-40° to 232°C)

Pressure Registration

Internal

Approximate Weights

Type 98HD

NPS 1/4 Body: 7 pounds (3 kg)
NPS 1/2 (DN 15) Body: 7 pounds (3 kg)
NPS 3/4 (DN 20) Body: 16 pounds (7 kg)
NPS 1 (DN 25) Body: 16 pounds (7 kg)
NPS 1-1/2 (DN 40) Body: 55 pounds (25 kg)
NPS 2 (DN 50) Body: 55 pounds (25 kg)

Type 98LD

NPS 1/4 Body: 6 pounds (3 kg)
NPS 1/2 (DN 15) Body: 13 pounds (6 kg)
NPS 3/4 (DN 20) Body: 30 pounds (14 kg)
NPS 1 (DN 25) Body: 30 pounds (14 kg)

1. The pressure/temperature limits in this Instructional Manual and any applicable standard or code limitation should not be exceeded.
2. Temperature and/or the body end connection may decrease these maximum pressures.
3. Maximum inlet pressure is equal to set pressure plus build-up.
4. Pressure and/or the body end connection may decrease these maximum temperatures.
5. Fluorocarbon is limited to 200°F (93°C) hot water.

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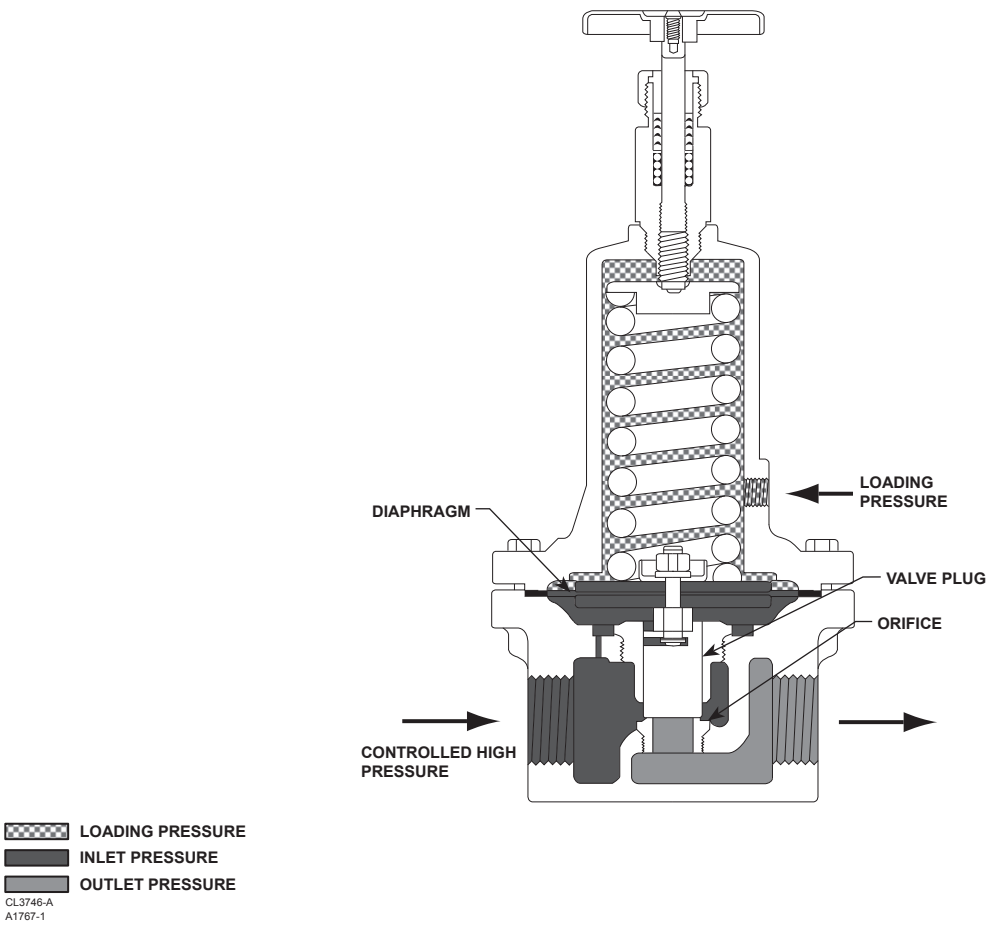

Figure 2. *Type 98HD Relief Valve Operational Schematic*

Product Description

The Types 98LD and 98HD (see Figure 1) are differential pressure relief valves that are suitable for service on water, steam, air, gas, oil, and other fluids. They are used to maintain differential pressure control on testing fixtures, wash tanks, sterilizers, steam tables, fuel lines, and plant air supplies.

Type 98LD bodies are available in sizes NPS 1/4 to 1 (DN 25). Type 98HD bodies are available in sizes NPS 1/4 to 2 (DN 50). There are four relief pressure ranges for each relief valve. For Type 98LD, the ranges are between 2 and 38 psig (0,14 and 2,6 bar). For Type 98HD, they are between 15 and 200 psig (1,0 and 13,8 bar).

Specifications

The Specifications section gives some general specifications for the Types 98LD and 98HD regulators. The nameplates give detailed information for a particular regulator as it comes from the factory.

Principle of Operation

See Figures 2 and 3. The Types 98LD and 98HD relief valves are used to maintain a differential between the controlled pressure and loading pressure of a system. The spring setting determines the differential. The Types 98LD and 98HD can also be pressure loaded to remotely change the relief setpoint.

The relief valve responds to both controlled pressure and loading pressure and opens or closes as these pressures change. If the loading pressure increases, pressure on the upper side of the diaphragm increases. The valve plug moves closer to the orifice and restricts the flow through the relief valve. When loading pressure decreases, pressure on the upper side of the diaphragm decreases. This allows the valve plug to move away from the orifice and allow more flow through the relief valve (to atmosphere or back into the system). The relief valve opens and closes in response to changes in the controlled pressure. In this way, the differential pressure between the controlled and uncontrolled pressures is maintained.

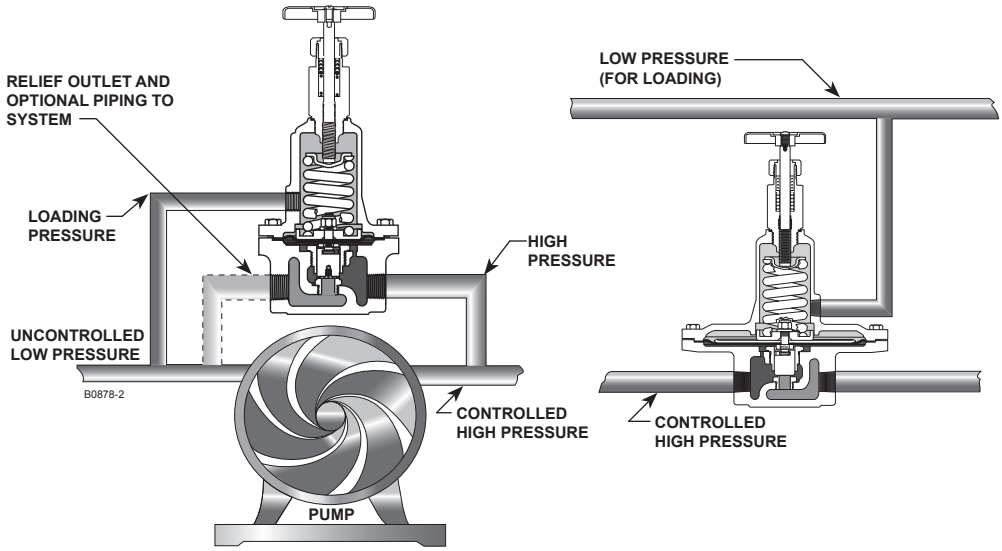

Figure 3. *Installation Schematics for Types 98LD and 98HD Relief Valves*

Table 1. *Differential Relief Pressure Ranges*

BODY SIZE, INCHES (DN)	TYPE 98LD(1)		TYPE 98HD(1)		COLOR CODE	PART NUMBER	SPRING WIRE DIAMETER, INCHES (mm)	SPRING FREE LENGTH, INCHES (mm)
	Psi	bar	Psi	bar				
1/4	2 to 7	0,14 to 0,48	15 to 35	1,03 to 2,4	Yellow	1E392527022	0.148 (3,76)	2.00 (50,8)
	6 to 14	0,41 to 0,97	25 to 75	1,7 to 5,2	Green	1E392627012	0.170 (4,32)	2.00 (50,8)
	12 to 25	0,83 to 1,7	70 to 140	4,8 to 9,7	Red	1E392727142	0.207 (5,26)	1.93 (49,0)
	20 to 38	1,4 to 2,6	130 to 200	9,0 to 13,8	Blue	1L346127142	0.225 (5,72)	2.08 (52,8)
1/2 (15)	2 to 7	0,14 to 0,48	15 to 35	1,03 to 2,4	Yellow	1E395627022	0.207 (5,26)	2.50 (63,5)
	6 to 14	0,41 to 0,97	25 to 75	1,7 to 5,2	Green	1D7455T0012	0.234 (5,94)	1.02 (25,9)
	12 to 25	0,83 to 1,7	70 to 140	4,8 to 9,7	Red	1E395727192	0.281 (7,14)	2.44 (62,0)
	20 to 38	1,4 to 2,6	130 to 200	9,0 to 13,8	Blue	1L380027142	0.331 (8,41)	2.25 (57,2)
3/4 and 1 (20 and 25)	2 to 7	0,14 to 0,48	15 to 35	1,03 to 2,41	Yellow	1E398927022	0.306 (7,77)	4.00 (102)
	6 to 14	0,41 to 0,97	25 to 75	1,7 to 5,2	Green	1E399027142	0.343 (8,71)	4.00 (102)
	12 to 25	0,83 to 1,7	70 to 140	4,8 to 9,7	Red	1E399127162	0.406 (10,3)	4.00 (102)
	20 to 38	1,4 to 2,6	130 to 200	9,0 to 13,8	Blue	1L380127092	0.468 (11,9)	3.75 (95,3)
1-1/2 and 2 (40 and 50)	- - - -	- - - -	5 to 35	0,34 to 2,4	Dark Gray	1E792327092	0.468 (11,9)	6.56 (167)
	- - - -	- - - -	20 to 65	1,4 to 4,5	Light Blue	1E795327082	0.531 (13,5)	6.56 (167)
	- - - -	- - - -	50 to 100	3,5 to 6,9	Light Gray	1E795427082	0.562 (14,2)	6.56 (167)
	- - - -	- - - -	80 to 170	5,5 to 11,7	Black	1P788827082	0.625 (15,9)	6.56 (167)

1. All springs may be backed off to 0 psig (0 bar). However, highest capacities and best performances are obtained by using these springs in their recommended ranges.

Installation

Unbox and inspect the valve. Remove pipe scale and other foreign material from the connecting pipeline. Apply a suitable pipe compound to the male threads.

The relief valve can be installed in any position as long as the flow is in the direction indicated by the arrow cast on the body. The design of the valve isolates diaphragm and pressure response chamber from the main flow stream. The higher pressure is measured inside the body through a registration hole on the inlet side of the body. Connect the low pressure line to the NPT connection in the spring case (see Figure 2). This connection is 1/8 NPT for NPS 1/4 and 1/2 (DN 15) bodies, and 1/2 NPT for NPS 3/4 and 1 (DN 20 and 25) bodies.

Maximum operating temperatures for the Types 98LD and 98HD relief can be seen in the Specifications section.

WARNING

Personal injury or system damage may result if this relief valve is installed where service conditions could exceed the limits given on the Specifications section or regulator nameplate. Installations should be adequately protected from physical damage.

Overpressuring any portion of this equipment may cause equipment damage, leaks in the relief valve, or personal injury due to bursting of pressure-containing parts. System operation within the limits shown in the Specifications section does not eliminate the possibility of damage from external sources or debris in the

pipeline. The relief valve regulator should be inspected for damage regularly and after any overpressure condition.

Overpressure Protection

WARNING

Overpressuring any portion of this equipment may result in equipment damage, leaks in the relief valve, or personal injury due to bursting of pressure-containing parts. The system should be inspected after any overpressure condition.

Relief pressure ranges are from 2 to 200 psig (0,14 to 13,8 bar). The individual spring range of your relief valve is stamped on the nameplate. Maximum inlet pressures depend upon body materials and temperatures. See Specifications for the maximum inlet pressures and maximum spring case loading pressures for Types 98LD and 98HD relief valves.

Relief Valve Outlet

WARNING

If using a Type 98LD or 98HD Relief Valves on hazardous or flammable gas service, personal injury and property damage could occur due to fire or explosion of vented gas that may have accumulated.

To prevent such injury or damage, provide piping or tubing to vent the gas to a safe, well-ventilated area. Also, when venting a hazardous gas, the piping or tubing should be located far enough away from any buildings or windows so not to create a further hazard, and the vent opening should be protected against anything that could clog it.

If remote venting is necessary, install a remote vent line in the outlet connection of the relief valve. The vent line must have the largest practical diameter and be as short as possible with a minimum number of bends or elbows.

Startup

Note

The Specifications section and Table 1 show the maximum inlet and the differential pressures for specific constructions. Use pressure gauges to monitor inlet pressure, outlet pressure, and any intermediate pressure during startup.

With proper installation completed and system equipment properly adjusted, close any block and vent valves, and back out the adjusting screw by turning it counterclockwise (or by turning the handwheel in the same manner).

Slowly open the following valves in this order: loading supply and control line, inlet block valve and outlet block valve.

Set pressure is adjusted by following the Adjustment procedure.

Adjustment

Each unit is factory set for the pressure setting specified on the order. The allowable spring range is stamped on the nameplate. If a pressure setting beyond the indicated range is required, substitute the appropriate spring. Be sure to label the relief valve to indicate the new pressure range.

Always use a pressure gauge to monitor pressure when making adjustments. If the differential pressure needs to be increased, turn the handwheel (key 38, Figure 4 or 5) clockwise. Turn the handwheel counterclockwise to decrease the differential pressure.

Shutdown

Close the upstream shutoff valve and release all pressure from the relief valve.

Maintenance

WARNING

To avoid personal injury and equipment damage, isolate the relief valve from all pressure. Cautiously release pressure from the relief valve before attempting disassembly.

Due to normal wear and damage that may occur from external sources, relief valve parts such as the O-rings, gaskets, diaphragm, orifice, and valve plug should be inspected periodically and replaced as necessary. The frequency of inspection and replacement depends upon the severity of service conditions or the requirements of state and federal laws.

Instructions are given below for disassembly of the Types 98LD and 98HD relief valves. These relief valves do not have to be removed from the pipeline

to inspect internal parts. Suitable lubricants are indicated on the assembly drawings. Apply the lubricant as the relief valve is being reassembled. Refer to Figure 4 or 5 while servicing the relief valve.

Disassembly to Replace Diaphragm and Seats

If the relief valve is leaking, the diaphragm may be ruptured or the seating surfaces nicked or scratched. Proceed as follows to replace or repair the diaphragm, orifice, and valve plug.

1. Release all spring compression by turning the adjusting screw (key 33) counterclockwise until it turns freely without resistance from the spring.

2. Remove cap screws (key 16) and lift off the spring case (key 2), spring (key 11), upper spring seat (key 9), and diaphragm assembly. (The diaphragm assembly includes the locknut (key 26); pusher post (key 6); lockwasher (key 23); lower spring seat (key 8); diaphragm (key 12); gasket (key 10); and valve plug (key 4). In Type 98LD, there is also a diaphragm head (key 25). Type 98HD has another washer (key 7); and an O-ring (key 45)).

Note

Two diaphragms are used if the diaphragm material is metal or Fluorocarbon (FKM) except only for Type 98LD, NPS 1/4, 2 to 7 psi (0,14 to 0,48 bar) range which uses only one metal diaphragm.

3. Check the orifice (key 3). If it needs replacing or repairing, unscrew the valve plug guide (key 5) and then the orifice. The valve plug can be removed by sliding it off of the pusher post.

Note

If damage to elastomer or metal seating surfaces is severe, replace the orifice and valve plug O-ring with new parts. However, by following the lapping procedure below, it is possible to repair metal seating surfaces if they are only slightly worn or scratched.

4. Lapping procedure:

   a. Place a small amount of 500-grit silicon carbide or aluminum oxide lapping compound on a flat surface such as a piece of heavy plate glass.

   b. Take the valve plug or orifice and move it in a Figure 8 motion on the lapping compound. Do not allow the part to tip or rock since this would round the corners.

   c. Repeat step b for each part, using an 800-grit or 1000-grit silicon carbide or aluminum oxide lapping compound.

   d. Wash away all traces of the lapping compound. To help prevent scratching the seating surfaces, a light coat of oil may be applied before returning the valve plug and orifice to the body.

5. Return the orifice and valve plug guide to the body.

6. To replace the valve plug O-ring (key 22), remove the screw (key 24) and O-ring retainer (key 21) from the plug. Remove and replace the O-ring.

7. Remove the locknut from the pusher post in order to separate the parts of the diaphragm assembly. Inspect and replace if necessary, the diaphragm, diaphragm gasket (key 19, Type 98LD), and pusher post gaskets (key 10, Type 98LD).

Note

These relief valves have either a metal or elastomer diaphragm. If a metal diaphragm is to be replaced with an elastomer diaphragm, or an elastomer diaphragm with a metal diaphragm, a new pusher post is required.

8. If the regulator unit has metal diaphragms:

   a) Find the pusher post (key 6) and place on a surface with the larger flat surface down and the thread stem up (metal diaphragm pusher post has a recessed diameter in the bottom surface). Then, find one smaller composition gasket (key 10) and fit it over the threaded end of the pusher post. Find and take one of the diaphragm heads and slip it over the threaded end of the pusher post with the chamfered side of the diaphragm head toward the gasket. Take a second gasket and place it over the threaded end of the pusher post on top of the diaphragm head.

   b) Replace one of the two large diaphragm gaskets (key 19) on the surface of the body that will support the diaphragms. There will be two diaphragms used per regulator, except for Type 98LD, NPS 1/4 with 2 to 7 psi (0,14 to 0,48 bar) outlet setting which uses only one metal

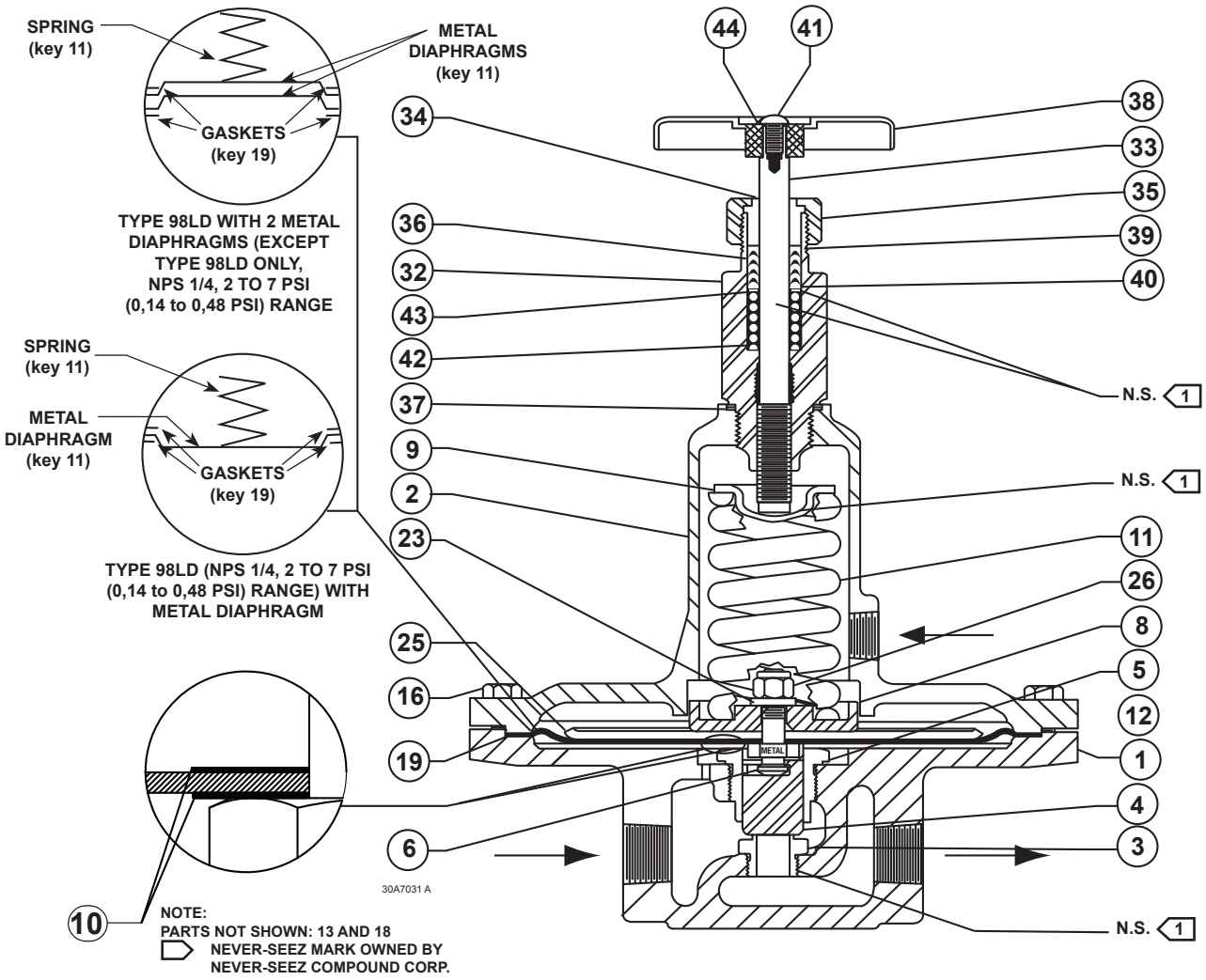

Figure 4. *Type 98LD Relief Valve Assembly*

Table 2. *Torque Specifications*

BODY SIZE, NPS (DN)	SPRING CASE, FOOT-POUND (N•m)	ORIFICE, FOOT-POUND (N•m)
1/4	6 to 8 (8,1 to 10,8)	8 to 12 (10,8 to 16,3)
1/2 (15)	10 to 13 (13,6 to 17,6)	29 to 35 (39,3 to 47,5)
3/4 to 1 (20 to 25)	24 to 30 (32,5 to 40,7)	33 to 42 (44,7 to 56,9)
1-1/2 to 2 (40 to 50)	40 to 50 (54,2 to 67,8)	140 to 170 (190 to 231)

diaphragm (the metal diaphragm is in between two diaphragm gaskets). Another diaphragm gasket is placed above the second diaphragm. The raised surfaces of the metal diaphragms should be placed in the unit so that they are facing toward the assembler (toward the spring) except only when one metal diaphragm is being used then the raised surface should be facing down (towards the body). See Figures 4 and 5 as references.

9. Put the diaphragm assembly into position in the body.

10. Replace the packing as instructed below.

Disassembly to Replace Packing

Leakage around the adjusting screw may be caused by worn packing in the packing box. To check the packing, follow the instructions below.

1. Before returning the upper spring case to the body, replace the packing (key 36) in the packing box (key 32).

2. Take out the machine screw (key 41) and lift off the washer (key 44) and handwheel (key 38).

3. Unscrew the packing box. Unscrew the packing nut (key 35) and take it and the packing follower (key 34) off of the adjusting screw (key 33).

4. Unscrew and pull the adjusting screw out through the bottom of the packing box.

5. Pull out the packing (key 36) and replace it. Replace the packing box gasket (key 37).

6. Reassemble the packing box unit by returning the adjusting screw to the inside of the packing box. Slip the packing follower onto the adjusting screw and into the packing box. Screw on the packing nut. See Table 2 for torque specifications.
7. Put the packing box onto the spring case. Set the handwheel and washer on the adjusting screw and screw in the machine screw.
8. Set the spring and upper spring seat over the lower spring seat. Place the spring case on the body, tightening the cap screws finger-tight only.
9. To ensure proper slack in the diaphragm, apply some spring compression by turning the adjusting screw clockwise. Tighten the cap screws.

Parts Ordering

When corresponding with your local Sales Office about this equipment, always reference the equipment serial number stamped on the nameplate.

When ordering replacement parts, specify the complete 11-character part number of each required 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 MR0175-92.

Key	Description	Part Number
	Parts kit (included are keys 3, 4, 10, 12, 19, 21, 22 and 24)	
	Type 98HD	
	Elastomer Trim	
	NPS 1/4 body	R98HX000012
	NPS 1/2 (DN 15) body	R98HX000022
	NPS 3/4 and 1 (DN 20 and 25) bodies	R98HX000032
	NPS 1-1/2 and 2 (DN 40 and 50) bodies	R98HX000072
	Metal Trim	
	NPS 1/4 body	R98HX000042
	NPS 1/2 (DN 15) body	R98HX000052
	NPS 3/4 and 1 (DN 20 and 25) body	R98HX000062
	NPS 1-1/2 and 2 (DN 40 and 50) bodies	R98HX000082
	Type 98LD	
	Elastomer Trim	
	NPS 1/4 body	R98LX000012
	NPS 1/2 (DN 15) body	R98LX000022
	NPS 3/4 and 1 (DN 20 and 25) bodies	R98LX000032
	Metal Trim	
	NPS 1/4 body	R98LX000042
	NPS 1/2 (DN 15) body	R98LX000052
	NPS 3/4 and 1 (DN 20 and 25) bodies	R98LX000062
1	Body	See following table
2	Spring Case	
	Type 98HD	
	Steel	
	NPS 1/4 body	2L443222012
	NPS 1/2 (DN 15) body	2L324122012
	NPS 3/4 and 1 (DN 20 and 25) bodies	3E408822012
	316 SST	
	NPS 1/4 body	2L443233092
	NPS 1/2 (DN 15) body	2L3241X0012
	NPS 3/4 and 1 (DN 20 and 25) bodies	3E4088X00A2
	Type 98LD	
	Steel	
	NPS 1/4 body	2L443422012
	NPS 1/2 (DN 15) body	3L324222012
	NPS 3/4 and 1 (DN 20 and 25) bodies	4F432322012
	316 SST	
	NPS 1/4 body	2L4434X0012
	NPS 1/2 (DN 15 body)	3L3242X0012
	NPS 3/4 and 1 (DN 20 and 25) bodies	4F4323X0022
3*	Orifice	See following table
4*	Valve Plug	See following table
5	Valve Plug Guide	
	416 SST	
	NPS 1/4 body	1L345835132
	NPS 1/2 (DN 15) body	1L341635132
	NPS 3/4 and 1 (DN 20 and 25) bodies	1L342935132
	316 SST	
	NPS 1/4 body (NACE)	1L345835072
	NPS 1/2 (DN 15) body (NACE)	1L3416X0102
	NPS 3/4 and 1 (DN 20 and 25) bodies (NACE)	1L342935072
6	Pusher Post	See following table
7	Washer (elastomer diaphragm only)	
	416 SST	
	NPS 1/4 body	1L344736012
	NPS 1/2 (DN 15) body	1L339836012
	NPS 3/4 and 1 (DN 20 and 25) bodies	1L342836012
	316 SST	
	NPS 1/4 body (NACE)	1L344736142
	NPS 1/2 (DN 15) body (NACE)	1L339835072
	NPS 3/4 and 1 (DN 20 and 25) bodies (NACE)	1L342836142
8	Lower Spring Seat	
	NPS 1/4 body, Aluminum	1L344609012
	NPS 1/2 (DN 15) body, Aluminum	1L339708012
	NPS 3/4 and 1 (DN 20 and 25) bodies, Aluminum	1L342708012
9	Upper Spring Seat, Steel	
	NPS 1/4 body	1B798525062
	NPS 1/2 (DN 15) body	1D667125072
	NPS 3/4 and 1 (DN 20 and 25) bodies	1E398725072
10*	Gasket, Composition	
	(2 required for metal diaphragm)	
	NPS 1/4 body	1L344804022
	NPS 1/2 (DN 15) body	1L341104022
	NPS 3/4 and 1 (DN 20 and 25) bodies	1L343404022
11	Relief Valve Spring	
	Steel plate	See following table
12*	Diaphragm	
	NPS 1/4 body	
	Type 98LD	
	Neoprene (CR)	1L345302112
	Fluorocarbon (FKM) (2 required)	1L345302402
	302 SST (2 required)	1L345436012
	Type 98HD	
	Neoprene (CR)	1L344902112
	Fluorocarbon (FKM) (2 required)	1L344902402
	302 SST (2 required)	1L345036012

*Recommended spare part.

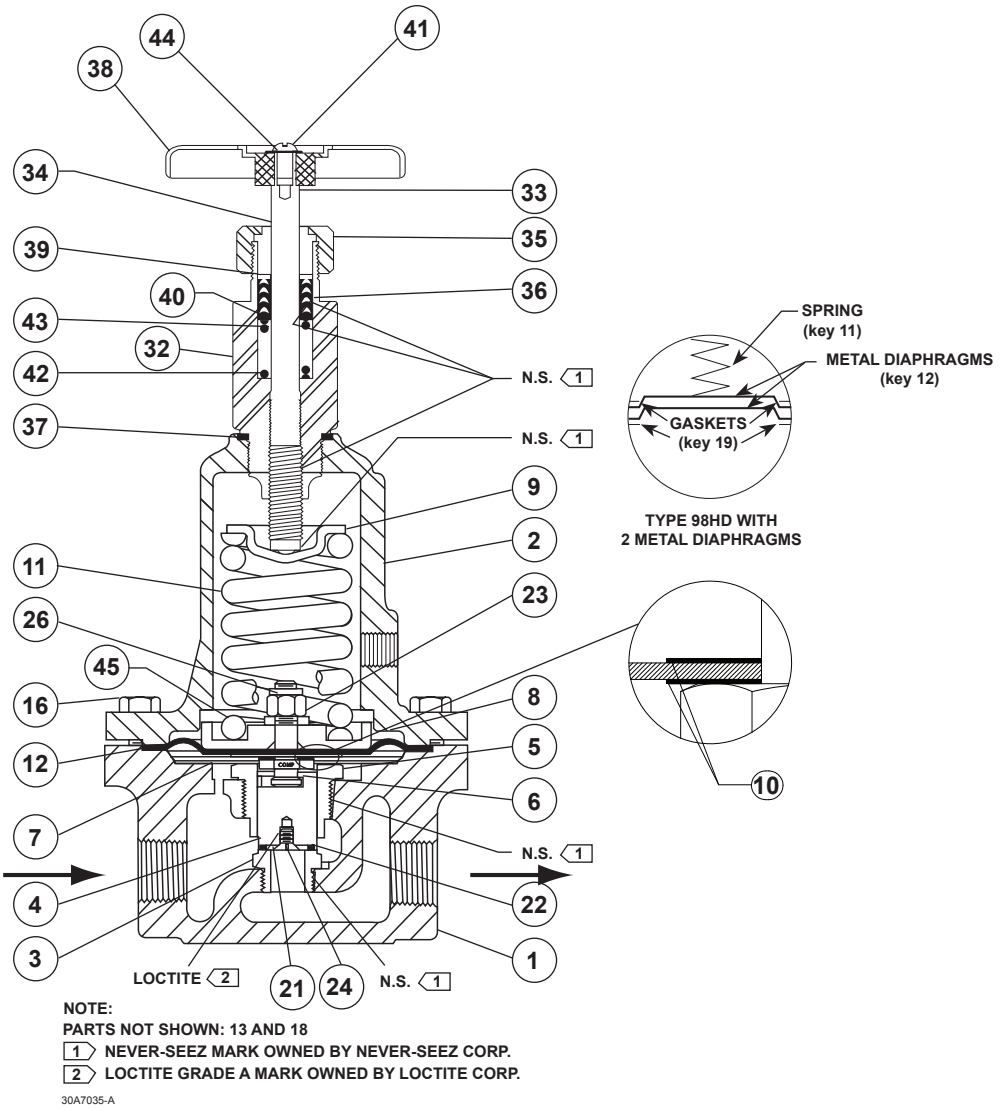

Figure 5. *Type 98HD Relief Valve Assembly*

Key	Description	Part Number
12*	Diaphragm (continued)	
	NPS 1/2 (DN 15) body	
	Type 98LD	
	Neoprene (CR)	1L341302112
	Fluorocarbon (FKM) (2 required)	1L341302402
	302 SST (2 required)	1L341436012
	Type 98HD	
	Neoprene (CR)	1L341202112
	Fluorocarbon (FKM) (2 required)	1L341202402
	302 SST (2 required)	1L339936012
	NPS 3/4 and 1 (DN 20 and 25) bodies	
	Type 98LD	
	Neoprene (CR)	1L342302112
	Fluorocarbon (FKM) (2 required)	1L342302402
	302 SST (2 required)	1L342236012
	Type 98HD	
	Neoprene (CR)	1L343302112
	Fluorocarbon (FKM) (2 required)	1L3433X0032
	302 SST (2 required)	1L343236012
13	Nameplate	- - - - - - - - - -
16	Cap Screw, Steel plate	
	Type 98LD	
	NPS 1/4 body (10 required)	1A407824052
	NPS 1/2 (DN 15) body (10 required)	1A381624052
	NPS 3/4 and 1 (DN 20 and 25) bodies (12 required)	1A336924052
	Type 98HD	
	NPS 1/4 body (6 required)	1A391724052
	NPS 1/2 (DN 15) body (8 required)	1A352624052
	NPS 3/4 and 1 (DN 20 and 25) bodies (8 required)	1A341824052
18	Drive Screw, SST (2 required) (not shown)	1A368228982
19*	Diaphragm Gasket	
	(Use with 302 SST diaphragm)	
	Type 98LD	
	NPS 1/4 body (2 required)	1E394004022
	NPS 1/2 (DN 15) body (2 required)	1E397004022
	NPS 3/4 and 1 (DN 20 and 25) bodies (2 required)	1E390404022

*Recommended spare part.

Types 98LD and 98HD

Key	Description	Part Number
19*	Diaphragm Gasket (continued)	
	(Use with 302 SST diaphragm)	
	Type 98HD	
	NPS 1/4 body (2 required)	1E393104022
	NPS 1/2 (DN 15) body (2 required)	1E397004022
	NPS 3/4 and 1 (DN 20 and 25) bodies (2 required)	1E399304622
21	O-Ring Retainer (elastomer seat only)	
	NPS 1/4 body	
	416 stainless steel	1L346035132
	316 stainless steel (NACE)	1L346035072
	NPS 1/2 (DN 15) body	
	416 stainless steel	1L341535232
	316 stainless steel (NACE)	1L341535072
	NPS 3/4 and 1 (DN 20 and 25) bodies	
	416 stainless steel	1L343035132
	316 stainless steel (NACE)	1L343035072
22*	O-Ring (elastomer seat only)	
	NPS 1/4 body	
	Nitrile (NBR)	1C853806992
	Fluorocarbon (FKM)	1C8538X0052
	NPS 1/2 (DN 15) body	
	Nitrile (NBR)	1D288806992
	Fluorocarbon (FKM)	1N530106382
	NPS 3/4 and 1 (DN 20 and 25) bodies	
	Nitrile (NBR)	1C782106992
	Fluorocarbon (FKM)	1C7821X0072
23	Lockwasher, Steel	
	NPS 1/4 and 1/2 (DN 15) bodies	1C225628982
	NPS 3/4 and 1 (DN 20 and 25) bodies	1H624328992
24	Machine Screw, Stainless steel	
	(Elastomer seat only)	
	NPS 1/4 body (NACE)	1L346238992
	NPS 1/2 (DN 15) body (NACE)	1J4159X0012
	NPS 3/4 and 1 (DN 20 and 25) bodies	1L343538992
	NPS 3/4 and 1 (DN 20 and 25) bodies (NACE)	1L3435X0012
25	Diaphragm Head	
	Type 98LD, Steel zinc-plated	
	NPS 1/4 body	1L345525072
	NPS 1/2 (DN 15) body	1L339625072
	NPS 3/4 and 1 (DN 20 and 25) bodies	1L342125072
26	Locknut, Steel zinc-plated	
	NPS 1/4 and 1/2 (DN 15) bodies	1L872324122
	NPS 3/4 and 1 (DN 20 and 25) bodies	1L872224122
32	Packing Box, Steel	
	NPS 1/4 body	1L449624092
	NPS 1/2, 3/4 and 1 (DN 15, 20 and 25) bodies	1L324024092
	NPS 1-1/2 and 2 (DN 40 and 50) bodies, Type 98H only	11A9809X022
33	Adjusting Screw, SST	
	NPS 1/4 body	1L449535232
	NPS 1/2 (DN 15) body	1L449735232
	NPS 3/4 and 1 (DN 20 and 25) bodies	1L324435232
	NPS 1-1/2 and 2 (DN 40 and 50) bodies, Type 98H only	21A9808X012
34	Packing Follower	
	NPS 1/4 body, 316 SST	1K885035072
	NPS 1/2, 3/4, and 1 (DN 15, 20, and 25) bodies	1K884924092
35	Packing Box Nut	
	Steel zinc-plated	0P077624102
36*	Packing, PTFE (3 required)	
	NPS 1/4 body	1C752601012
	NPS 1/2, 3/4, 1, 1-1/2, and 2 (DN 15, 20, 25, 40, and 50) bodies	1H784301012
37*	Packing Box Gasket, Steel/composition	
	NPS 1/4 body	1B487099202
	NPS 1/2, 3/4, 1 ,1-1/2, and 2 (DN 15, 20, 25, 40, and 50) bodies	1N499199202
38	Handwheel	
	NPS 1/4 body	1L217544992
	NPS 1/2, 3/4, and 1 (DN 15, 20, and 25) bodies	1L369644992
	NPS 1-1/2 and 2 (DN 40 and 50) bodies	1J410819042
39*	Female Adaptor, PTFE	
	NPS 1/4 body	1F124401012
	NPS 1/2, 3/4, 1, 1-1/2, and 2 (DN 15, 20, 25, 40, and 50) bodies	1H784401012
40*	Male Adaptor, PTFE	
	NPS 1/4 body	1F124801012
	NPS 1/2, 3/4, 1, 1-1/2, and 2 (DN 15, 20, 25, 40, and 50) bodies	1H784201012
41	Machine Screw, steel plate	
	NPS 1/4 body	1A340828992
	NPS 1/2, 3/4 and 1 (DN 15, 20 and 25) bodies	16A5763X012
	NPS 1-1/2 and 2-inch (DN 40 and 50) bodies	1A680324122
42	Spring, 316 stainless steel	1F125437012
43	Washer, 316 stainless steel	
	NPS 1/4 body	1F125236042
	NPS 1/2, 3/4, and 1 (DN 15, 20, and 25) bodies	1H981836042
44	Washer, Steel	
	NPS 1/4 body	1A329128982
	NPS 1/2, 3/4, and 1 (DN 15, 20, and 25) bodies	1A352332992
	NPS 1-1/2 and 2 (DN 40 and 50) bodies, Type 98H only	1E794128992
45*	O-Ring, Nitrile (NBR)	
	(Use with elastomer diaphragm)	
	NPS 1/4 and 1/2 (DN 15) bodies	1D687506992
	NPS 3/4 and 1 (DN 20 and 25) bodies	1E547706992
	NPS 1-1/2 and 2 (DN 40 and 50) bodies Type 98H only	1C782206992
51	NACE Tag	19A6034X012
52	Tag Wire (NACE)	1U7581X0022

*Recommended spare part.

Key 1 Regulator Body, NPT

BODY SIZE, NPS (DN)	TYPE 98HD BODY MATERIAL			TYPE 98LD BODY MATERIAL		
	Cast Iron	Steel	Stainless Steel	Cast Iron	Steel	Stainless Steel
1/4	1L346419012	1L372122012	1L372133092	1L346519012	1L372322012	1L372333092
1/2 (15)	2L339519012	2L368722012	2L368733092	2L339219012	2L368922012	2L368933092
3/4 (20)	2L342519012	2L373422012	2L373433092	2L341919012	2L318222012	2L318233092
1 (25)	2L342619012	2L373522012	2L373533092	2L342019012	2L318322012	2L318333092
1-1/2 (40)	3P786819012	3P786822012	3P786833092	- - - -	- - - -	- - - -
2 (50)	3P786719012	3P786722012	3P786733092	- - - -	- - - -	- - - -

Key 1 Regulator Body, ASME CL150 and CL300 Flanges

BODY SIZE, NPS (DN)	TYPE 98HD BODY MATERIAL				TYPE 98LD BODY MATERIAL			
	Steel		Stainless Steel		Steel		Stainless Steel	
	CL150 RF	CL300 RF	CL150 RF	CL300 RF	CL150 RF	CL300 RF	CL150 RF	CL300 RF
1/2 (15)	1V5178X0012	20A4987X0A2	1V5178X0022	20A4987X012	25A9930X022	20A4701X012	25A9930X012	20A4701X022
3/4 (20)	15A6098X022	23B9543X022	15A6098X012	23B9543X012	2V4264X0022	14B2317X012	2V4264X0012	14B2317X022
1 (25)	2V3805X0012	2U8048X0012	2V3805X00B2	2U8048X0022	2V3641X0022	2U8047X0012	2V3641X0012	2U8047X0062
1-1/2 (40)	21B0804X012	1V4541X0012	21B0804X022	1V4541X0022	- - - -	- - - -	- - - -	- - - -
2 (50)	10A0192X012	10A4986X012	10A0192X022	10A4986X052	- - - -	- - - -	- - - -	- - - -

Key 1 Regulator Body, SWE

BODY SIZE, NPS (DN)	TYPE 98HD BODY MATERIAL		TYPE 98LD BODY MATERIAL	
	Steel	Stainless Steel	Steel	Stainless Steel
1/2 (15)	2L9673X0022	2L9673X0012	2U8059X0012	2U8059X0022
3/4 (20)	2N443922012	2N4439X0012	2N4463X0012	2N4463X0022
1 (25)	2N414422012	2N4144X0012	2N445222012	2N4452X0012
1-1/2 (40)	3V4542X0012	3V4542X0022	- - - -	- - - -
2 (50)	30A0191X012	30A0191X032	- - - -	- - - -

Key 3 Orifice*

BODY SIZE, NPS (DN)	METAL TO METAL		ELASTOMER SEAT		
			NACE	For Other Than Sour Gas Corrosion Resistance Applications	
	416 SST	316 SST		416 SST	316 SST
1/4 1/2 (15) 3/4, 1 (20, 25)	1E391646172 1E395046172 1E398046172	1E391635072 1E395035072 1E398035072	1L345935072 1L341735072 1L343135072	1L345935132 1L341735132 1L343135132	1L345935072 1L341735072 1L343135072
Type 98HD only 1-1/2, 2 (40, 50)	2P787046172	2P787035072	1P787135072	1P787135132	1P787135072

Key 4 Valve Plug*

BODY SIZE, NPS (DN)	METAL TO METAL		ELASTOMER SEAT		
			NACE	For Other Than Sour Gas Corrosion Resistance Applications	
	416 SST	316 SST		416 SST	316 SST
1/4 1/2 (15) 3/4, 1 (20, 25)	1L345246172 1L344146172 1L343746172	1L345235072 1L344135162 1L343735162	1L345135072 1L344335072 1L343635072	1L345135132 1L344335132 1L343635132	1L345135072 1L344335072 1L343635072
Type 98HD only 1-1/2, 2 (40, 50)	1P787246172	1P787235072	1P787335072	1P787346172	1P787335072

*Recommended spare part.

Key 6 Pusher Post

BODY SIZE, NPS (DN)	METAL TO METAL		ELASTOMER SEAT		
			NACE	For Other Than Sour Gas Corrosion Resistance Applications	
	416 SST	316 SST		416 SST	316 SST
1/4 1/2 (15) 3/4, 1 (20, 25)	1L345735132 1L344535132 1L343935132	1L345735072 1L344535072 1L343935072	1L345635072 1L344235072 1L343835072	1L345635132 1L344235132 1L343835132	1L345635072 1L344235072 1L343835072
Type 98HD only 1-1/2, 2 (40, 50)	1P788335132	1P788335072	1P788435072	1P788435132	1P788435072

Key 11 Relief Valve Spring

BODY SIZE, NPS (DN)	TYPE 98LD RANGE		TYPE 98HD RANGE		COLOR CODE	PART NUMBER
	Psi	bar	Psi	bar		
1/4	2 to 7 6 to 14 12 to 25 20 to 38	0,14 to 0,48 0,41 to 0,97 0,83 to 1,7 1,4to 2,6	15 to 35 25 to 75 70 to 140 130 to 200	1,0 to 2,4 1,7 to 5,2 4,8 to 9,7 9,0 to 13,8	Yellow Green Red Blue	1E392527022 1E392627012 1E392727142 1L346127142
1/2 (15)	2 to 7 6 to 14 12 to 25 20 to 38	0,14 to 0,48 0,41 to 0,97 0,83 to 1,7 1,4 to 2,6	15 to 35 25 to 75 70 to 140 130 to 200	1,0 to 2,4 1,7 to 5,2 4,8 to 9,7 9,0 to 13,8	Yellow Green Red Blue	1E395627022 1D7455T0012 1E395727192 1L380027142
3/4 and 1 (20 and 25)	2 to 7 6 to 14 12 to 25 20 to 38	0,14 to 0,48 0,41 to 0,97 0,83 to 1,7 1,4 to 2,6	15 to 35 25 to 75 70 to 140 130 to 200	1,0 to 2,4 1,7 to 5,2 4,8 to 9,7 9,0 to 13,8	Yellow Green Red Blue	1E398927022 1E399027142 1E399127162 1L380127092
1-1/2 and 2 (40 and 50)	- - - - - - - - - - - -	- - - - - - - - - - - -	5 to 35 20 to 65 50 to 100 80 to 170	0,34 to 2,4 1,4 to 4,5 3,4 to 6,9 5,5 to 11,7	Dark Gray Light Blue Lighy Gray Black	1E792327092 1E795327082 1E794527082 1P788827082

Industrial Regulators

Emerson Process Management
Regulator Technologies, Inc.

USA - Headquarters
McKinney, Texas 75069-1872 USA
Tel: 1-800-558-5853
Outside U.S. 1-972-548-3574

Asia-Pacific
Shanghai, China 201206
Tel: +86 21 2892 9000

Europe
Bologna, Italy 40013
Tel: +39 051 4190611

Middle East and Africa
Dubai, United Arab Emirates
Tel: +971 4811 8100

Natural Gas Technologies

Emerson Process Management
Regulator Technologies, Inc.

USA - Headquarters
McKinney, Texas 75069-1872 USA
Tel: 1-800-558-5853
Outside U.S. 1-972-548-3574

Asia-Pacific
Singapore, Singapore 128461
Tel: +65 6777 8211

Europe
Bologna, Italy 40013
Tel: +39 051 4190611
Gallardon, France 28320
Tel: +33 (0)2 37 33 47 00

TESCOM

Emerson Process Management
Tescom Corporation

USA - Headquarters
Elk River, Minnesota 55330-2445 USA
Tel: 1-763-241-3238

Europe
Selmsdorf, Germany 23923
Tel: +49 (0) 38823 31 0

For further information visit www.emersonprocess.com/regulators