HSME®
Valves & Fittings

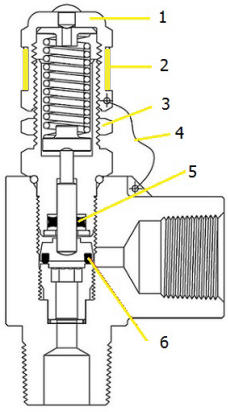
VR Series Proportional Relief Valves
Liquid and Gas Service

Catalog No. VR-2
October 2014

Features

- Valves are designed to open at pre-set pressure and direct fluids through the outlet port that discharges to a different location in the system.
- Valves are designed to protect gauges, instruments, and devices from over-pressure.
- Valves are proportional relief valves that open more as the inlet pressure increases beyond the set pressure.

VR3 Series



1.Cap allows
set pressure adjustment externally

2.Label indicates
Set pressure ranges

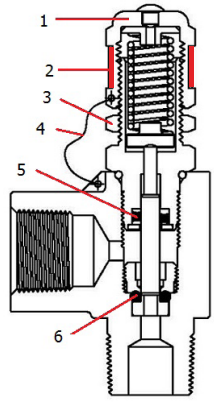
3.Lock Nut
allows lockout of cap

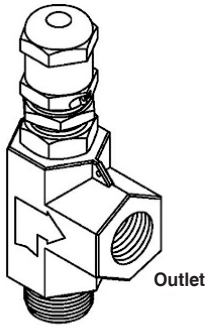
4.Lock Wire
to be set after valve is preset

5.Stem Quad Seal
protects spring from fluid contamination

6.Seat O-Ring
provides elastromer-to-metal
sealing at seat

VR6 Series





Technical Information

Series	VR3 Series	VR6 Series
Working Pressure	3000 psig (206 barg)	6000 psig (413 barg)
Orifice	4.8 mm (0.19 in.)	3.4 mm (0.13 in.)
Cv	0.60	0.41
Set Pressure Range	One Spring	Multiple Springs
	10 to 250 psig	50 to 6000 psig
	(0.68 to 17.2 barg)	(3.4 to 413 barg)

Temperature Rating

The temperature rating of Stainless Steel VR Series valves is -40 to 148 °C (-40 to 300 °F).

When combining seal material, the temperature rating of the seal may become the limiting factor on the valve's temperature rating.

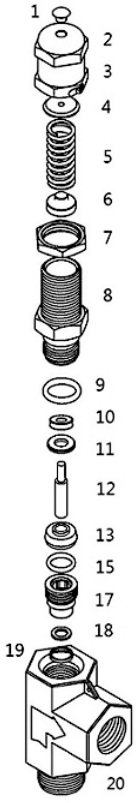
Seal Material Temperature Ratings

FKM seal is standard.

Seal Material	Designator	Temperature Rating, °C (°F)
FKM	VT	-20 to 180 (-4 to 356)
NBR	BN	-23 to 120 (-9 to 248)
EPDM	EP	-40 to 140 (-40 to 284)
NEOPRENE	CR	-23 to 148 (-9 to 298)

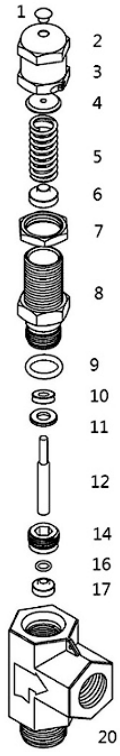
Materials of Construction

VR3 Series



Components		Stainless Steel Body Material	
		Material Grade / ASTM Standard	
		Valve Series	
		VR3	VR6
1	Cap Plug	Polypropylene	
2	Cap	SS316/A276, A479	
3	Label	Yellow Polyester	Red Polyester
4	Upper Positioner	SS316/A276, A479	
5	Spring	SS 17700 Type 631/A313	
6	Lower Positioner	SS316/A276, A479	
7	Lock nut		
8	Bonnet		
9	Bonnet Seal	FKM	
10	Quad seal	FKM, Optional NBR, EPDM, NEOPRENE	
11	Seal Retainer	SS316/A276, A479	
12	Stem		
13	Stem Disc	SS316/A276	-
14	Seat Retainer	-	SS316/A276
15, 16	Seat O-ring	FKM, Optional NBR, EPDM, NEOPRENE	
17	Insert	SS316/A276, A479	
18	Gasket	SS316/A276	-
19	Gasket Ring	PTFE/D1710	-
20	Body	F316/A182	
21	Lock Wire	Stainless wire with clamp seal	

VR6 Series

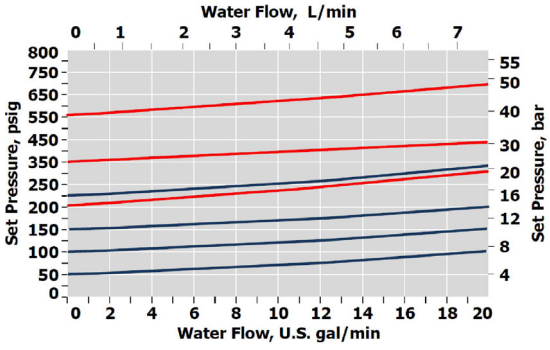


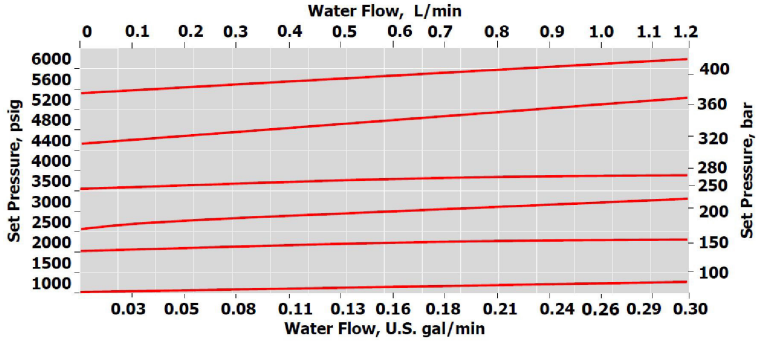
Flow Data

VR3 Series

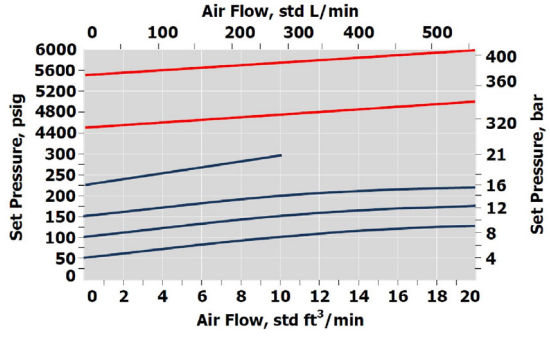
VR6 Series

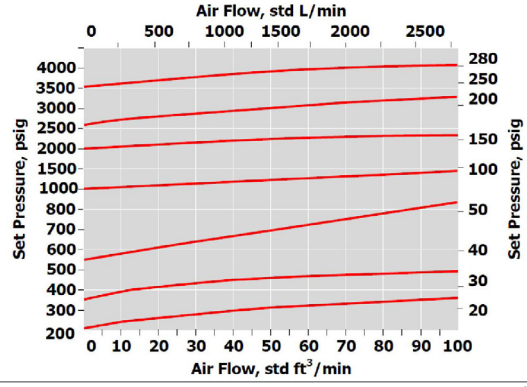
Water @ 70 °F (21°C)



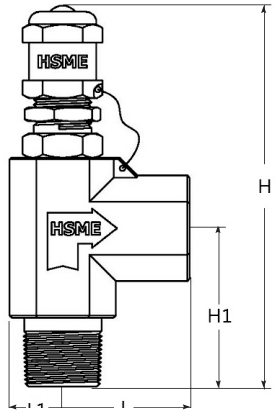


Air @ 70 °F (21 °C)





Ordering Information and Dimensions



Basic Ordering Number		End Connections		Dimensions mm (in.)			
		Inlet	Outlet	L	L1	H	H1
VR3-VR6-	A4T-	1/4 in. OD M Tube Fitting		40.6 (1.6)	10.9 (0.43)	100.0 (3.94)	36.6 (1.44)
	A8T-	1/2 in. OD M Tube Fitting		46.5 (1.83)		105.0 (4.13)	46.5 (1.83)
	A6M-	6mm OD M Tube Fitting		40.6 (1.6)		100.0 (3.94)	36.6 (1.44)
	A8M-	8mm OD M Tube Fitting					
	A12M-	12mm OD M Tube Fitting		46.5 (1.83)		105.0 (4.13)	46.5 (1.83)
	MA8N8T-	1/2 in. Male NPT	1/2 in. OD M Tube Fitting	46.5 (1.83)		98.0 (3.85)	36.3 (1.43)
	MA8N12M-		12mm OD M Tube Fitting				
	MF4N-	1/4 in. Male/Female NPT		29.7 (1.17)		94.0 (3.70)	30.2 (1.19)
	MF6N-	3/8 in. Male/Female NPT		34.5 (1.36)			
	MF8N-	1/2 in. Male/Female NPT		36.3 (1.43)		98.0 (3.85)	36.3 (1.43)
	MF4R-	1/4 in. ISO Male/Female Tapered		29.7 (1.17)		94.0 (3.70)	30.2 (1.19)
	MF6R-	3/8 in. ISO Male/Female Tapered		34.5 (1.36)			
	MF8R-	1/2 in. ISO Male/Female Tapered		36.3 (1.43)		98.0 (3.85)	36.3 (1.43)

All dimensions shown are reference only and subject to change. Dimensions with M Tube Fitting nuts are in finger-tight position.

Operation

- When excess pressure overcomes the set-pressure, the valve opens to bypass the system fluid to a different location in the system through the outlet port.
- Valve closes when the system pressure falls down below the set pressure.
- Valve mounting position is vertical with the cap on top.
- Valves that are not actuated for a period of time may initially crack above the set pressure.

Set Pressure (Cracking Pressure)

Cracking pressure is the system pressure that opens valve, being repeatable not more than 5% above or below of each valve after initial cracking at room temperature.

Optional Set-Pressure at Factory

To set valve to a specific cracking pressure at factory, select valve ordering number, specify the spring designator and the desired set-pressure either in bar or in psig in the valve ordering number. Example: VR6-A4T-**RS3-90BAR**-SS
The valves are set at factory for the desired cracking pressure and supplied with wire clamped; lock-nut locked out, labeled, and marking indicating the set pressure on the body.

Resealing Pressure

Valves are resealed by the spring force when the inlet cracking pressure falls down below the set pressure. Refer to Table 3 for reseal pressure information.

"VR3 Series" Back Pressure

Back pressure (backflow from outlet) may press the seat to form a seal in addition to the spring force in VR3 Series Valves. To operate VR3 Series valve properly, follow the steps below.

Step 1.
Identify valve set pressure and system back pressure.
Example: Valve set pressure is 220 psig and the system back pressure is 20 psig.
Step 2. Multiply the back pressure by 0.8: 20 psig x 0.8 = 16 psig.
Step 3. Subtract it from the valve set pressure:
220 psig – 16 psig = 204 psig.
Step 4. Pre-set the valve to 204 psig.

- Back pressure should never exceed the working pressure of the valve.

Table 1. VR3 Series Set Pressure Range

Spring Designator	Set Pressure Range		Color Code	Spring Kit Number
	psig	bar		
RS0	10 to 250	0.68 to 17.2	Red	MK-RS0

Table 2. VR6 Series Multiple Set Pressure Range

Spring Designator	Set Pressure Range		Color Code	Spring Kit Number
	psig	bar		
RS1	50 to 350	3.4 to 24	White	MK-RS1
RS2	350 to 750	24 to 51.6	Blue	MK-RS2
RS3	750 to 1500	51.6 to 103	Clear	MK-RS3
RS4	1500 to 2250	103 to 155	Black	MK-RS4
RS5	2250 to 3000	155 to 206	Green	MK-RS5
RS6	3000 to 4000	206 to 275	Yellow	MK-RS6
RS7	4000 to 5000	275 to 344	Brown	MK-RS7
RS8	5000 to 6000	344 to 413	Orange	MK-RS8

Spring Kit
Contains spring, label, and lock wire with clamping seal.

Factory Test

Every valve that contains spring is factory-tested for set pressure and resealing performance.

Table 3.

Series	Set Pressure, psig (bar)	Average Reseal Pressure
VR3 VR6	10 to 100 (0.68 to 6.9)	50% of Set Pressure
	100 to 500 (6.9 to 34.5)	80% of Set Pressure
	500 to 1000 (34.5 to 68.9)	90% of Set Pressure
	1000 to 6000 (68.9 to 413)	95% of Set Pressure

For valves that do not contain spring, the seat is tested @ 1000 psig (69 bar) nitrogen for no detectable leakage.

Set-Pressure Adjustment Procedure

1. Select and install spring that covers the required set pressure.
2. Turn lock nut on bonnet clockwise until it sits on the bottom thread of bonnet.
3. Turn cap counter-clockwise until spring fully relaxes.
4. Pressurize the valve into inlet port.
5. Check the pump pressure on gauge until it reaches required set-pressure while you turn cap clockwise to compress spring.
6. Once the valve is preset to the required set-pressure, valve seat closes indicating no flow in outlet port.
7. De-pressurize the pressure thoroughly from the valve and turn lock nut clockwise until it locks out cap.
8. Set the wire and apply matching label to cap.

Ordering Information

VR3 Series is supplied containing **"RS0"** spring that is not pre-set for cracking pressure unless "set-pressure at factory" is ordered.
VR6 Series may be supplied with spring separately. To order, select "valve ordering number" and "spring kit number" separately.

Ordering Steps

Step 1		Step 2	Step 3	Step 4	Complete Ordering Number
Select Valve Basic Ordering Number		Spring Designator Refer to table 1 & 2 on page 3.	Seal Material • FKM: Nil • NBR: BN • EPDM: EP • NEOPRENE: CR	Valve Body Material • SS316: SS	To order spring kit separately, select "Spring Kit" ordering number from the table 1 & 2 on page 3. Example: MK-RS3
VR3 Series:	VR3-A4T-	RS0-	EP	SS	VR3-A4T-RS0-EP-SS
VR6 Series	VR6-A4T-	RS3-	Not selected	SS	VR6-A4T-RS3-SS
	VR6-A4T-	Not selected	Not selected	SS	VR6-A4T-SS

Note: Valves that do not contain spring is supplied with no label on the cap.

Manual Override Handle

By having the manual override handle on the valve, the valve can be actuated either manually or automatically. Manual override handle opens the valve without changing the set pressure.

The way to adjust the set-pressure with the override handle on the valve is identical to the valve without the manual handle. Once the valve with the override handle is set to the desired cracking pressure, the valve performs automatically or manually.

Valve Series	Manual Override Handle Applicable Springs
VR3	RS0
VR6	RS1,RS2, and RS3

The handle consists of a round handle made of white-anodized aluminum, and a rod made of stainless steel.

Handle Diameter	Overall Height of valve with the handle in closed position
38.1mm (1.50 in.)	131mm (5.16 in.)

To order the valve with override handle, insert "**MH**" into the valve ordering number. Example: VR6-A4T-RS3-**MH**-SS

Manual Override Handle Kit

Valve Series	Kit Ordering Number
VR3	MH-VR3
VR6	MH-VR6

Kit contains Override handle, Cap, and applicable Label.

Safe Valve Selection

The selection of a valve for any application or system must be considered to ensure safe performance. Valve rating, valve function, material compatibility, proper installation, operation and maintenance remain the sole responsibility of the system designer and the user. HSME Corporation accepts no liability for any improper selection, compatibility, installation, operation or maintenance.