

# DUDCON DUNCON

THE RIGHT PRODUCT FOR YOUR APPLICATION



40 years

## AUTOMATIC RECIRCULATION CONTROL VALVE FOR CENTRIFUGAL PUMP PROTECTION, MODEL VRM-HPM

### BENEFITS

- The protection of centrifugal pumps that saves millions in maintenance
- Maximize the availability of the plant;
- Save on maintenance of the pump;
- Save the installation (smaller pump);
- Save in energy consumption (smaller driver).

### FEATURES:

A complete system with **SIX** essential features:

- 1 - Check valve in the main flow;
- 2 - Check valve in the bypass flow
- 3 - Measurement of pump to process flow
- 4 - MODULATING control of recirculation flow
- 5 - Recirculation multiple stage pressure reduction with anti-cavitation system
- 6 - Auto operated and compact

**Sizes:** 1" to 12"

- **Pressure classes:** 600 # to 2500#  
PN 100 to 420
- **Design and Construction:** ASME B16.34  
/ AD 2000
- **Connections:** Flanges ASME, DIN, BS,  
JIS and Butt Weld (BW)



## CENTRIFUGAL PUMPS REQUIRE PROTECTION

If you use centrifugal pumps for any type of fluid, such as boiler feed water, condensate or process fluids, you have made a significant investment in centrifugal pumps, driving and control systems.

An effective protection for the minimum flow rate of the centrifugal pump is essential during the start-up and operation with low flow demand. In case a reliable protection is not installed, you may face problems that may affect the performance and safe operation of the pump.

**VRM-HPM** provides cost-saving and safe protection against low flow and counterflow.

## PRINCIPLE OF OPERATION

The Automatic Recirculation Valve model **VRM-HPM** has been developed for the protection of high-pressure centrifugal pumps.

The most common applications include boiler feed water, petroleum and its by-products and descaling systems in hot steel rolling mills.

The valve operates automatically, without requiring air or electric power supply. The installation requires only three connections. The response is immediate, without the delays, so characteristic in conventional control systems.

The valve is installed on or near the pump discharge flange, just like a check valve would be installed. At the pump start-up, while there is no flow

to the process, the recirculation remains fully opened, ensuring the required minimum flow rate through the pump.

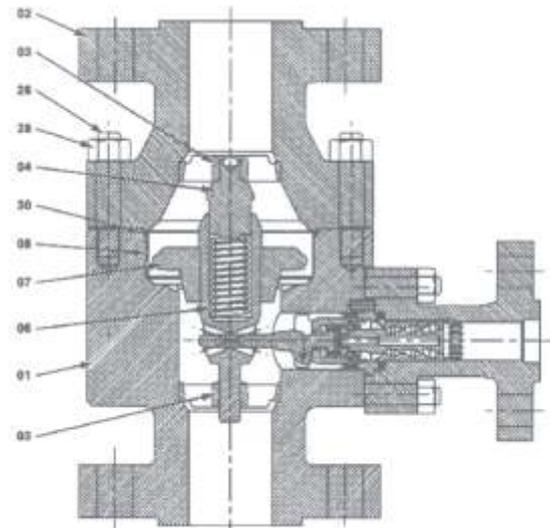
Once the demand by the process is started, the disc is raised against the spring and is kept in the position by the flow rate to the process. Such disc movement modulates the by-pass valve, which controls the recirculation as long as the flow rate to the process is lower than the minimum flow rate of the pump.

When the demand for the process exceeds the minimum recommended flow rates of the pump, the recirculation flow rate will close and the whole pump flow will be directed towards the process ensuring no waste of power.

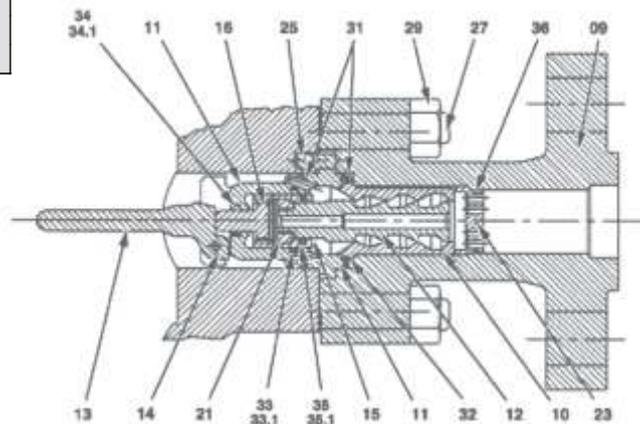
## CONSTRUCTION MATERIALS

Position	Description	Materials	Specifications
1	Lower body	A105 Carbon steel	ASME A 105
2	Upper body	A105 Carbon steel	ASME A 105
3	Valve stem guide	A105 Carbon steel	ASME A 105
4	Guide bolt	416 Stainless steel	ASTM A 582
6	Spring	302 Stainless steel	AISI 302
7	Check valve	416 Stainless steel	ASTM A 582
8	Liner	304 Stainless steel	ASTM A 276
9	By-pass branch	A105 Carbon steel	ASTE A 105
10	Vortex housing	* 416 Stainless steel	ASTM A 582
11	Control head	* 416 Stainless steel	ASTM A 582
12	Vortex plug	* 431 Stainless steel	MIL -S 18732D
13	Lever	* 431 Stainless steel	MIL -S 18732D
14	Pivot pin	* 316 Stainless steel	AISI 316
15	Vortex bushing	* 431 Stainless steel	MIL -S 18732D
16	Control piston	* 431 Stainless steel	MIL -S 18732D
21	Vortex plate	* 416 Stainless steel	ASTM A 582
23	Flow straightener	431 Stainless steel	MIL -S 18732D
25	Guide pin	316 Stainless steel	AISI 316
26	Stud	A193-B7 Steel	ASTM A 193 -B7
27	Stud	A193-B7 Steel	ASTM A 193 -B7
28	Hex nut	A194-2H Steel	ASTM A 194 -2H
29	Hex nut	A194-2H Steel	ASTM A 194 -2H
30	O-ring	+	
31	O-ring	* +	
32	O-ring	* +	
33	O-ring	* +	
33.1	Glyd-ring	* Filled PTFE	
34	O-ring	* +	
34.1	Glyd-ring	* Filled PTFE	
35	O-ring	* +	
35.1	Glyd-ring	* Filled PTFE	
36	O-ring	+	

- Recommended spare parts.
  - \* Supplied also as a complete recirculation set.
  - + Application Dependent
- For other materials, contact **DURCON-VICE**, indicating the service conditions.

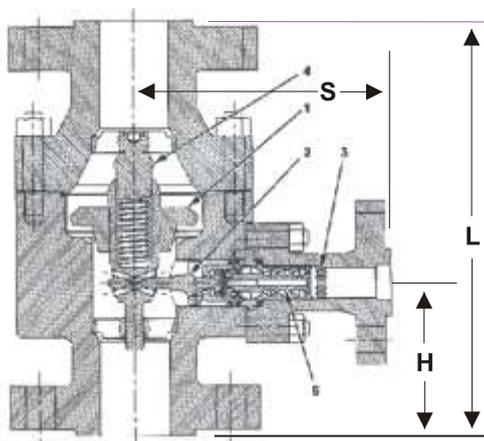


VRM-HPM 600 lb - 2500 lb



Recirculation control valve details

## ONE VALVE MANY FUNCTIONS



VRM-HPM 600 lb. - 2500 lb.

Model **VRM-HPM** recirculation valve provides five essential functions, as follows:

- 1. Check valve disc**, prevents counterflow and controls the open, modulating and closed recirculation as a function of the process flow rate demand.
- 2. Recirculation control valve** that modulates open when the process flow rate demand is smaller than the minimum flow rate of the pump. The pressure reduction is obtained in multiple stages to avoid flashing and cavitation.

**3. Recirculation flow straightener**, which eliminates turbulent discharge. Fluid leaves the valve as a spray instead as a jet. It eliminates erosion in the by-pass piping.

**4. Pulsation damper**, protects the system against water hammer in case of sudden changes in the process flow rate demand.

**5. Check valve in the recirculation** prevents the reverse flow in the recirculation in case of the recirculation flow of several valves discharging in a common collector.

## DIMENSIONS, WEIGHT AND MEASURES

GAUGE			MAXIMUM MAIN FLOW RATE		MAXIMUM RECIRCULATION FLOW RATE		MAXIMUM RECIRC. CV	WEIGHT		DIMENSIONS					
Main	Recirc.	ANSI	GPM	m <sup>3</sup> h	GPM	m <sup>3</sup> h		Pounds	KG	L (Inch)	L (mm)	H (Inch)	H (mm)	S (Inch)	S (mm)
1 1/2	1	600	150	34	60	14	1.3	70	32	10-1/4	260	3-9/16	90	7-1/2	190
		900					1.1	70	32	11-13/16	300	4-5/16	110	7-7/8	200
		1500					0.9	95	43	12-3/16	310	4-3/4	120	8-7/16	215
2	1	600	220	50	60	14	2.7	106	48	11-13/16	300	4-5/16	110	7-5/8	193
		900					1.7	106	48	13-3/8	340	5-1/8	130	8	203
		1500					1.6	130	59	13-3/4	350	5-1/8	130	9-3/16	233
2 1/2	1 1/2	600	330	75	150	34	3.5	152	68	13-3/8	340	4-15/16	125	8-11/16	220
		900					2.6	152	68	14-15/16	380	5-1/2	140	9-1/16	230
		1500					2.4	196	88	15-3/4	400	5-11/16	145	9-13/16	250
3	1 1/2	600	500	114	150	34	5.2	185	83	14-15/16	380	5-1/2	140	9-7/16	240
		900					4.0	185	83	16-1/8	410	5-7/8	150	9-13/16	250
		1500					3.5	268	121	17-11/16	450	6-1/2	165	10-13/16	275
4	2	600	900	204	250	57	8.5	277	125	16-15/16	430	6-1/8	155	10-1/2	266
		900					5.6	277	125	17-11/16	450	6-5/16	160	11	280
		1500					5.2	431	200	20-1/2	520	7-1/2	190	11-13/16	300
5	2 1/2	600	1100	250	400	91	11	455	205	19-11/16	500	6-7/8	175	12-3/16	310
		900					9.5	455	205	20-11/16	525	7-5/16	185	12-3/16	310
		1500					6.5	638	287	25-9/16	650	9-1/4	235	13-7/16	341
6	3	600	2000	454	550	125	14	636	286	21-5/8	550	7-1/2	190	13-3/16	335
		900					12	636	286	23-1/16	585	7-7/8	200	13-3/4	350
		1500					10	977	440	27-9/16	700	9-13/16	250	15-15/16	405
8	4	600	3300	749	900	204	22	1102	496	25-9/16	650	8-7/16	215	15-15/16	405
		900					20	1102	496	26-9/16	675	8-7/8	225	15-15/16	405
		1500					16	1727	783	33-7/16	850	11-5/8	295	18-11/16	475
10	6	600	4400	999	1230	279	35	1813	822	31-1/2	800	10-5/8	270	20-1/2	520
		900					25	1885	855	34-5/8	880	10-5/8	290	20-1/2	520
		1500					22	2825	1281	38-3/8	975	13	330	22-7/16	570
12	6	600	6600	1498	1900	431	55	3771	1710	41-3/8	1051	14-3/16	360	25-9/16	649
		900					35	3920	1778	41-3/8	1051	14-13/16	360	25-9/16	649
		1500					30	5876	2665	45-1/4	1149	15-3/4	400	27-9/16	700

Flow rates based on the temperature of 24°C and specific gravity 1.  
 Contact Durcon for sizes above 12" and pressure class 2500#.  
 Dimensions for BW connections are equal to the flanged valves.

## SELECTION AND SPECIFICATIONS

When inquiring please complete the following information:

Company \_\_\_\_\_ Contact: \_\_\_\_\_

Quantity: \_\_\_\_\_ Pump discharge, Size and ANSI class: \_\_\_\_\_

Service: \_\_\_\_\_

Main flow max. \_\_\_\_\_  GPM  m<sup>3</sup>/h @ \_\_\_\_\_  Psi  Bar

Main flow normal \_\_\_\_\_  GPM  m<sup>3</sup>/h @ \_\_\_\_\_  Psi  Bar

Recirculation flow \_\_\_\_\_  GPM  m<sup>3</sup>/h @ \_\_\_\_\_  Psi  Bar

Fluid: \_\_\_\_\_ @ \_\_\_\_\_  °F  °C

Fluid Specific Gravity (@ oper. Temp.): \_\_\_\_\_

Fluid Vapor Pressure (@ oper. Temp.): (PV): \_\_\_\_\_  Psi  Bar

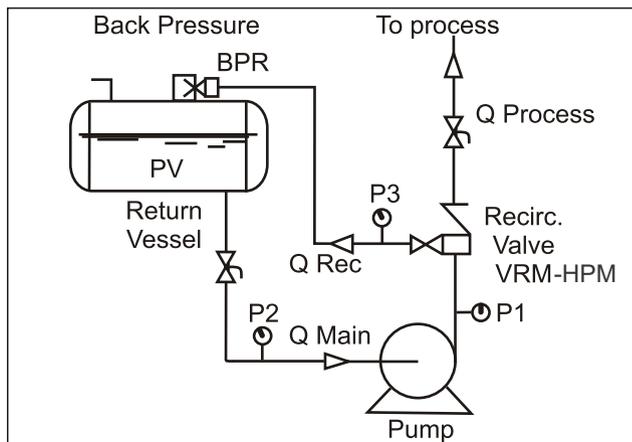
Viscosity: \_\_\_\_\_ Centipoise

Pump suction pressure (P2): \_\_\_\_\_  Psi  Bar

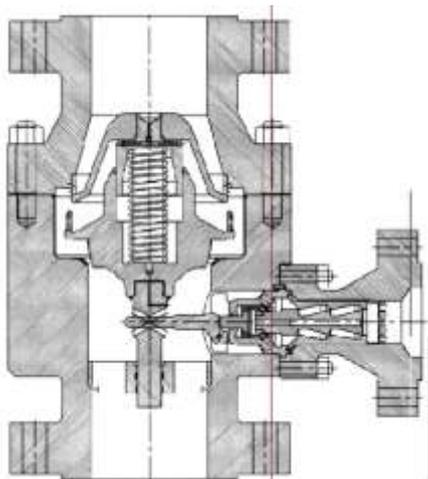
Back pressure (P3): \_\_\_\_\_  Psi  Bar

Installation: (V) Vertical or (H) Horizontal: \_\_\_\_\_

Seals material: \_\_\_\_\_ (If you have preference)



## PUMP PROTECTION AGAINST EXCESSIVE FLOW RATE



**Detail of VRM-HPM valve with maxi-flow function**

Usually, the centrifugal pump protection valve protect the pump only against minimum flow rate. However, excessive flow rate, may cause severe damages both to the centrifugal pump and to the driver.

Damage caused by excessive flow rate may be eliminated adding the "Maxi-Flow" function to the standard minimum flow rate valve.

This protection against excessive flow rate is achieved by installing in the valve body a cylinder with calibrated holes. Within the normal flow rate range, the fluid passes through these holes with minimum pressure loss. Besides that, a sleeve is added, which

has another line of holes. The disc reaches maximum movement when the fluid flow for the process achieves maximum flow rate. In such position, the holes in the cylinder and in the sleeve are aligned, avoiding additional flow rate.

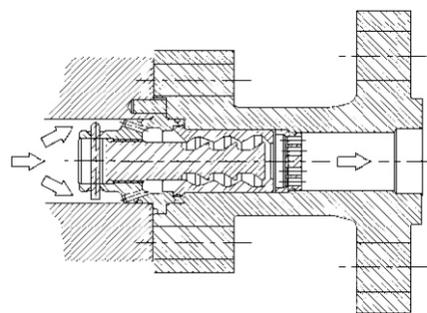
Such protection against excessive flow rate has been of help to prevent the water level in the boiler to exceed, even in case of failure (opened) of the level control valve.

Such accessory has been showing to be very useful also to prevent large leakages to the environment in process lines that present cracks due to corrosion.

## INTERNAL FOR START-UP

One of the most common problems that is arising in the valves during the plant start-up are the debris. Despite all care in the cleaning of piping, welds scales, pieces of wearing rings and other elements fall inside the control valves, causing damages in the sealing surfaces and causing earlier failures. It is possible to eliminate the risk of damages to the inside portion of the valve using an addition and optional element for the start-up.

This optional element replaces the inside components of the automatic recirculation control valve, and ensures continuous recirculation during the start-up helping to accumulate and eliminate the debris. If necessary, these component may be calibrated in field. Once the plant start-up is completed, this element may be easily replaced by the operational automatic control element, which has modulating control.



**Detail of internal for start-up**

## HOW TO SPECIFY

The centrifugal pump shall be protected by the VRM-HPM model automatic recirculation valve which is completely self-contained and fully automatic via flow activation. The valve protects the pump from reverse flow and prevents overheating during low process demand. Operation of the valve by-pass will be modulating so the sum of the main and by-pass flow will never be less than the minimum flow requirement of the pump.

Valve desing will incorporate a radial split body spring assisted check valve disc and multi-stage vortex plug by-pass assembly. Materials of construction will consist of a A-105 forged carbon steel body housing with stailless steel internals. (If service condition dictate other materials are available such as stailless stell, low temperature steel and other alloys). If recommendable as a function of the operation and fluid conditions, other materials shall be used, which meet these conditions.

The valve will be designed to operate without flashing or cavitation occurring during by-pass operation. Any necessary acessories such as orifices or anti-flash valves will be provided by DURCON to prevent flashing or cavitation in the by-pass piping.

**VALVE CODE VRM-HPM 25 \_\_\_\_\_(1) \_\_\_\_\_(2) \_\_\_\_\_(3) \_\_\_\_\_(4) \_\_\_\_\_(5).**

Body (1)		Pressure Class (2)		Construction (3)		Installation (4)		Sizes (5)	
1	Carbon Steel	2	600# - Pn100	A	AISI Flanges	V	Vertical	1.1/2"	5"
2	Stainless Steel	3	900# - PN150	D	DIN Flanges	H	Horizontal	2"	6"
3	Low Tem per Steel	4	1500# - PN250	S	Special			2.1/2"	8"
4	Special	5	2500# - PN450					3"	10"
								4"	12"

Other valve models for lower pressures: model NVL for pressure class up to 300#. Model NVM for pressure class 150# to 600#.

*The right product for your application.*

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