

FP/FS 400Y Torrent Valve

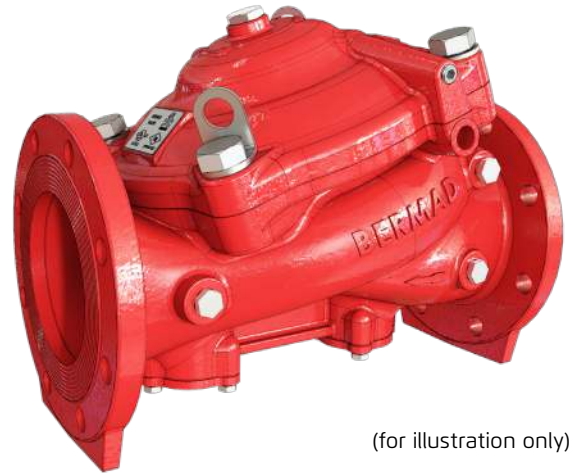
Engineering Data

The BERMAD FP/FS-400Y Torrent valve is designed specifically for the fire protection industry, with an emphasis on rugged reliability and high performance to comply with the most demanding standards. A straight-through, hydraulic, line pressure driven, elastomeric, rolling diaphragm globe valve approved for 25 bar/365 psi with an industry-leading flow rate. It is equally suited to vertical or horizontal installation and is available in pipe diameter sizes from 1½" to 16" (DN40 to DN400). The BERMAD 400Y is designed for flow control in deluge, pressure control deluge, remote on-off, monitor remote control, pre-action systems, pressure reducing and pressure relief. It is excellent for all fluids used in fire protection systems, from fire-water supplies to foam solution, seawater, foam concentrate and other corrosive liquids. It can be manufactured from various materials and coatings to suit a wide range of specifications and hazardous locations. It is certified and approved to the latest fire protection standards.

The 400Y's unique hydrodynamic Y shaped design provides very high flow capabilities with minimal head loss. It includes a straight-through Y-type body, with an unobstructed flow path, free of any supporting cage, in-line ribs, or shafts.

Providing resilient, drip-tight sealing, the internal design of the valve is based on innovative Vulcanized Radial Seal Disk technology (VRSD) that uses advanced rubber-based materials to achieve a solid, single-piece, elastomeric unit. This is composed of a flexible, fiber-reinforced diaphragm vulcanized with a rugged, radial seal disk. It is carefully balanced and peripherally supported to avoid tension and protect the elastomers, resulting in long life and dependable actuation, even under harsh conditions.

Quick in-line inspection and servicing is enabled by a detachable valve cover. The elastomeric assembly can easily be removed without taking the valve out of the line or removing the trim.



(for illustration only)



* Refer to specific model data sheets for applicable standards

Factory Fitted Options

- Local valve position indicator beacon:**

The valve can be equipped with a protective-covered, dual-color, quarter turn position indicator, readable from a distance of 50 meters

- Valve Limit Switches and position monitoring device:**

A limit switch unit with dual SPDT limit switches enclosed in a protective switch box that can interface for monitoring any Fire & Gas control system. The switch box incorporates a dual-color visual position indicator.

- Swivel Drain Valve unit:**

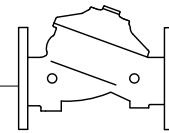
Installation in confined spaces is facilitated by the 360 degree swivel ability of the drain valve connections.

- Seat Insert:**

The seat insert option is designed for applications where there is a high potential for cavitation damage. Specify this option for pressure control applications having high pressure differentials or for relief valves having atmospheric discharge up to 175 psi / 12 bar. The seat insert option is also recommended for increasing the valve body lifetime.

- Seawater Resistance:**

The valve body and cover can be cast in various alloys to provide the required resistance to a corrosive internal fluid, such as seawater, or to a corrosive external environment, as with offshore applications or coastal environments. Corrosion resistance can also be provided by coating ductile iron or steel valves with highbuild fusion bonded epoxy with UV protection.



Construction Materials

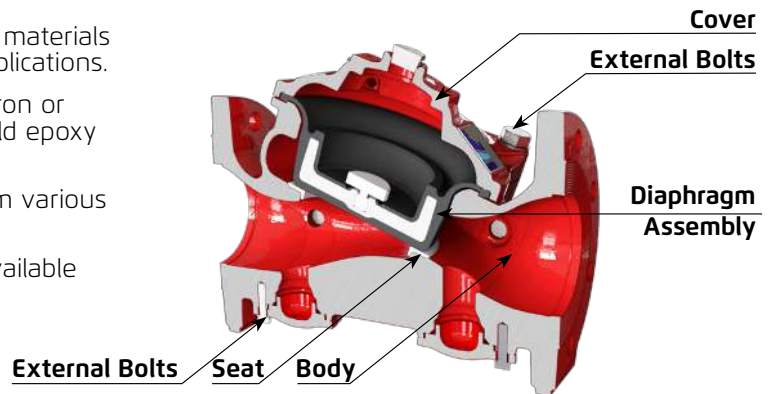
The BERMAD 400Y valve is available in a variety of materials to ensure optimal suitability for a wide range of applications.

To enable a higher corrosion resistance for ductile iron or steel valves a UV protected fusion bonded high build epoxy coating is optional.

The diaphragm assembly can be manufactured from various materials to suit different service temperatures.

See the Ordering Guide for a list of codes for the available construction materials

Basic Valve - Section View



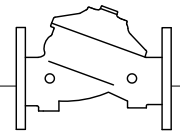
Materials

Part	Material
Body & Cover	Ductile Iron - ASTM A536 Grade 65-45-12
	Cast Steel - ASTM A216 Grade WCB
	Nickel Al Bronze - ASTM B148, Grade C95800
	Stainless Steel - 316 ASTM A351 Grade CF8M
	Super Duplex - ASTM A890 Grade 5A
	Hastelloy - ASTM B336 Grade C276
	Titanium - ASTM B367 Grade C2 / C3
Diaphragm Assembly	HTNR - Fabric Reinforced High Temperature Compound 80°C/175°F
	NBR - 80°C/175°F
	EPDM - 90°C/194°F
Bolting	Stainless Steel - 316 ASTM A276
Coating (Red RAL 3002)	Polyester - Electrostatic Powder Coating
	Epoxy - High Build, Fusion Bonded and UV Protected
Limit Switch / Position Indicator	Wetted internal parts - AISI 316, Monel 400, or Hastelloy C276

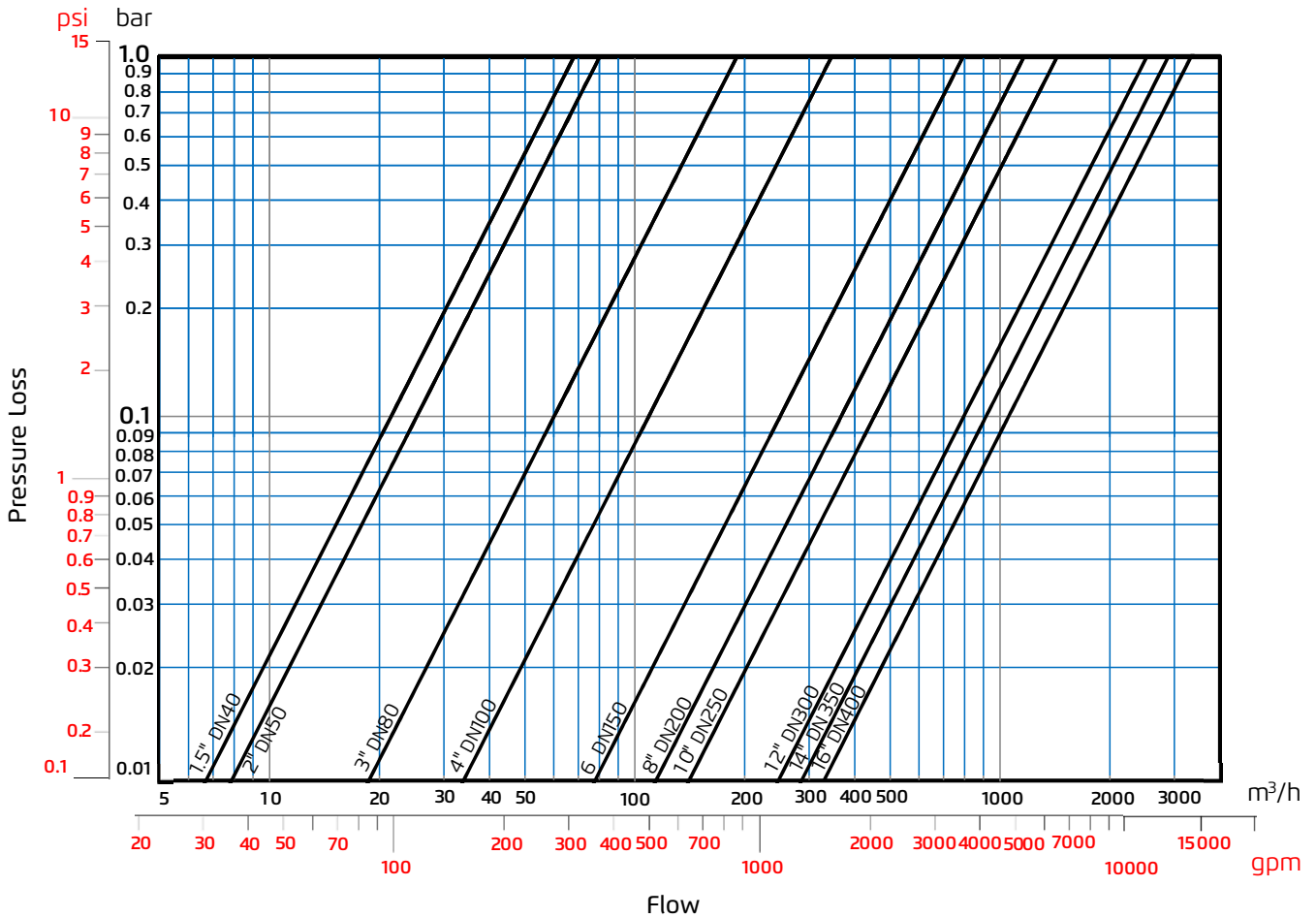
Material	Connection Type	Valve Size (inch)	Standard	Max. Working Pressure	
				Bar	psi
Ductile	Flanged #15ORF	1½, 2, 3, 4, 6, 8, 10, 12, 14 & 16	ASME/ANSI 16.42	16	235
	Flanged #30ORF	1½, 2, 3, 4, 6, 8, 10, 12, 14 & 16	ASME/ANSI 16.42	25	365
	Flanged PN16	1½, 2, 3, 4, 6, 8, 10, 12, 14 & 16	ISO 7005-2	16	235
	Flanged PN25	1½, 2, 3, 4, 6, 8, 10, 12, 14 & 16	ISO 7005-2	25	365
	Grooved PN16	1½, 2, 3, 4, 6 & 8	ANSI / AWWA C606	16	235
	Grooved PN25	1½, 2, 3, 4, 6 & 8	ANSI / AWWA C606	25	365
	Threaded PN25	1½ & 2	ISO -7-RP/NPT	25	365
Cast Steel & Stainless Steel	Flanged #15ORF	1½, 2, 3, 4, 6, 8, 10, 12, 14 & 16	ASME/ANSI 16.5	16	235
	Flanged #30ORF	1½, 2, 3, 4, 6, 8, 10, 12, 14 & 16	ASME/ANSI 16.5	25	365
	Flanged PN16	1½, 2, 3, 4, 6, 8, 10, 12, 14 & 16	ISO 7005-2	16	235
	Flanged PN25	1½, 2, 3, 4, 6, 8, 10, 12, 14 & 16	ISO 7005-2	25	365
Ni-Al Bronze	Flanged #15ORF	1½, 2, 3, 4, 6, 8, 10, 12, 14 & 16	ASME/ANSI 16.5	16	235
	Flanged #30ORF	1½, 2, 3, 4, 6, 8, 10, 12, 14 & 16	ASME/ANSI 16.5	25	365
	Flanged PN16	1½, 2, 3, 4, 6, 8, 10, 12, 14 & 16	ISO 7005-2	16	235
	Flanged PN25	1½, 2, 3, 4, 6, 8, 10, 12, 14 & 16	ISO 7005-2	25	365

Notes:

- Standard flange facing: Raised Face (RF), serrated finish Flat Face (FF) available on request.
- For any other material options/requests, contact BERMAD.



Flow Chart



Flow Properties

DN	40	50	80	100	150	200	250	300	350	400
Inch	1½"	2"	3"	4"	6"	8"	10"	12"	14"	16"
Kv	68	80	190	345	790	1160	1355	2370	2850	3254
Cv	79	92	219	398	912	1340	1565	2737	3292	3758
Leq (m) ¹	2	5	7	9	15	27	62	52	59	88
Leq (ft) ¹	7	16	23	30	49	89	203	171	194	289

Note:

(1) Leq: Equivalent pipe length for turbulent flow in clean commercial steel pipe schedule 40 (Leq values given are for general consideration only. Actual Leq may vary somewhat with different pipe manufacturers)

$$Cv = 1.155 Kv$$

To calculate pressure loss across the valve (fully opened), use this formula

$$\text{For Metric Units } \Delta p = SG (Q/Kv)^2 \quad \text{For US Units } \Delta p = SG (Q/Cv)^2$$

Δp = Differential pressure across the valve (bar;psi)

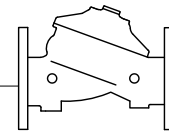
Kv = Valve flow coefficient (flow in m³/h at 1 bar diff press) – see table above

Cv = Valve flow coefficient (flow in gpm at 1 psi diff press) – see table above

Q = Flow rate (m³/h; gpm)

SG = Specific gravity of medium (water = 1.0)





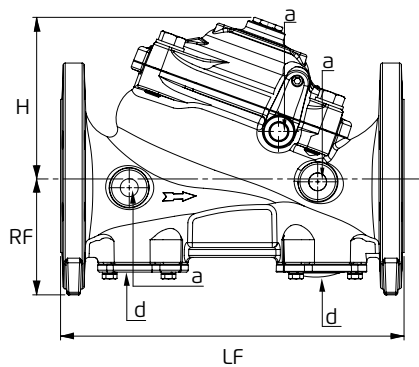
Si Metric Units

Valve Size	1½" DN40	2" DN50	3" DN80	4" DN100	6" DN150	8" DN200	10" DN250	12" DN300	14" DN350	16" DN400
LF ⁽¹⁾ ANSI#150RF / ISO-PN16 (mm)	230	230	310	350	480	600	730	850	980	1100
LF ANSI#300RF / ISO-PN25 (mm)	230	238	326	368	506	626	730	888	980	1100
LT ISO-Rp / NPT Threaded Ends (mm)	230	230	-	-	-	-	-	-	-	-
LG Grooved (mm)	230	230	310	350	480	600	-	-	-	-
W (mm)	152	152	247	264	372	490	490	658	658	658
H ⁽²⁾ (mm)	125	125	153	163	232	300	300	436	436	411
RF Flanged #150 (mm)	65	77	106	121	147	180	204	247	272	315
RF Flanged #300 (mm)	78	86	106	129	162	193	226	261	295	325
R G Grooved (mm)	24.1	30.2	44.5	57.2	84.2	110	-	-	-	-
R T Threaded (mm)	30	34.5	-	-	-	-	-	-	-	-
a Threaded	½"	½"	½"	½"	½"	½"	½"	½"	½"	½"
d ⁽³⁾ Drain Ø	¾"	¾"	1½"	2"	2"	2"	2"	2"	2"	2"
Weight ANSI#150RF / ISO-PN16 (kg)	9.4	10.8	25.5	35.5	78.8	142	172	315	348	394
Weight ANSI#300RF / ISO-PN25 (kg)	11.8	12.7	30.2	42.9	98.6	162	208	365	420	514
Weight Grooved (kg)	6.8	7.1	18	23.9	69.6	125	-	-	-	-
Weight Threaded (kg)	7.3	7.3	-	-	-	-	-	-	-	-
Control Chamber Volume (litres)	0.2	0.2	0.5	1	3	6	6	15	15	15

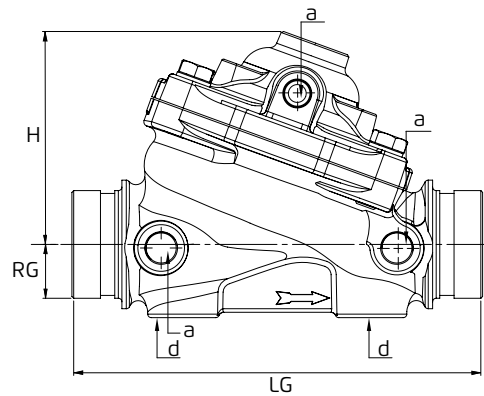
(1) Standard flange facing: Raised Face (RF). Flat Face (FF) flanges available on request

(2) Add 45 mm when using position indicator, and 120mm for enclosed limit switch

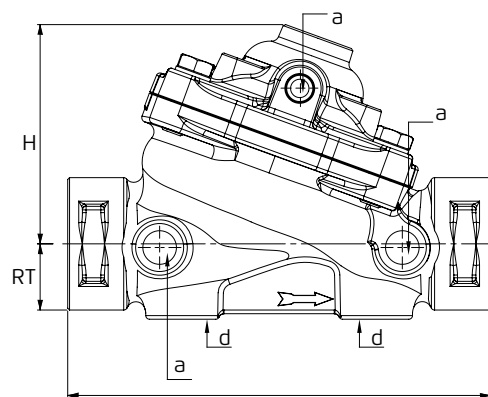
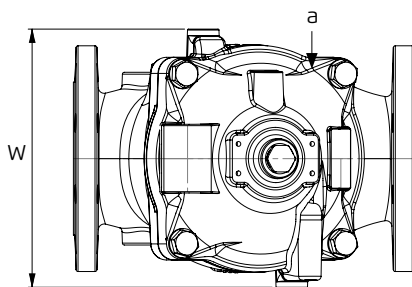
(3) 1½" and 2" valves drain ports are threaded. 3" and valves larger are provided with a 3-bolts flange connections



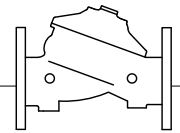
Flanged



Grooved



Threaded



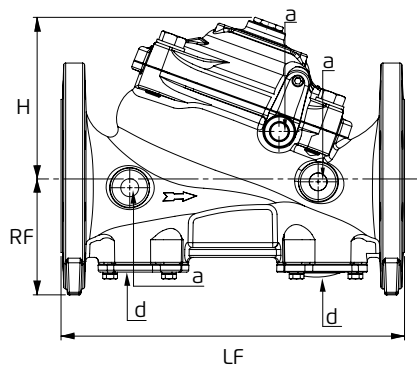
US Standard Units

Valve Size	1½" DN40	2" DN50	3" DN80	4" DN100	6" DN150	8" DN200	10" DN250	12" DN300	14" DN350	16" DN400
LF ⁽¹⁾ ANSI#150RF / ISO-PN16 (in)	9.06	9.06	12.21	13.79	18.91	23.64	28.76	33.49	38.61	43.34
LF ANSI#300RF / ISO-PN25 (in)	9.06	9.37	12.84	14.50	19.94	24.66	28.76	34.96	38.61	43.34
LT ISO-Rp / NPT Threaded Ends (in)	9.06	9.06	-	-	-	-	-	-	-	-
LG Grooved (in)	9.06	9.06	12.20	13.78	18.90	23.62	-	-	-	-
W (in)	5.99	5.99	9.73	10.40	14.66	19.31	19.31	25.93	25.93	25.93
H ⁽²⁾ (in)	4.93	4.93	6.03	6.42	9.14	11.82	11.82	17.18	17.18	16.19
RF Flanged #150 (in)	2.56	3.03	4.18	4.77	5.79	7.09	8.04	9.73	10.72	12.41
RF Flanged #300 (in)	3.11	3.38	4.17	5.01	6.37	7.59	8.89	10.28	11.61	12.80
RG Grooved (in)	0.95	1.19	1.75	2.25	3.31	4.33	-	-	-	-
R T Threaded (in)	1.18	1.36	-	-	-	-	-	-	-	-
a Threaded	½"	½"	½"	½"	½"	½"	½"	½"	½"	½"
d ⁽³⁾ Drain Ø	¾"	¾"	1½"	2"	2"	2"	2"	2"	2"	2"
Weight ANSI#150RF / ISO-PN16 (lbs)	21	24	56	78	174	313	379	695	767	869
Weight ANSI#300RF / ISO-PN25 (lbs)	26	28	67	95	217	357	459	805	926	1,133
Weight Grooved (lbs)	15	16	40	53	153	275	-	-	-	-
Weight Threaded (lbs)	16.06	16.06	-	-	-	-	-	-	-	-
Control Chamber Volume (pts)	0.42	0.42	1.05	2.1	6.3	12.6	12.6	31.5	31.5	31.5

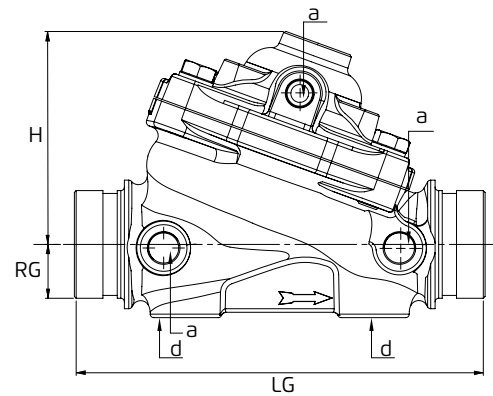
(1) Standard flange facing: Raised Face (RF). Flat Face (FF) flanges available on request

(2) Add 1¼" when using a position indicator, and 4¾" for an enclosed limit switch

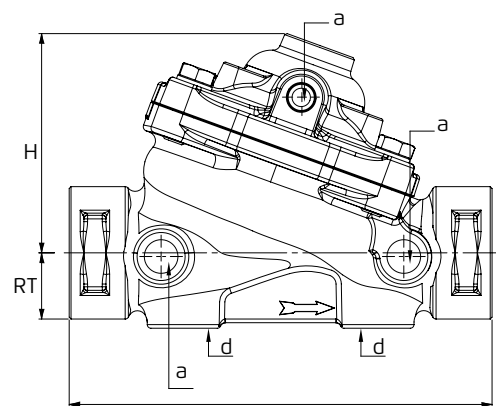
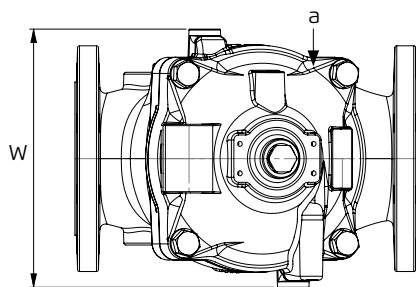
(3) 1½" and 2" valves drain ports are threaded. 3" and larger are provided with a 3-bolts flange connections



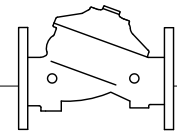
Flanged



Grooved



Threaded



ON/OFF Operation

In the closed position (Fig 1a): The water pressure supplied through the priming line (2) is trapped in the control chamber (1) by the operating valve (3) pressing the seal disc (4) down and thereby sealing the valve and keeping the system piping dry.

In the open position (Fig 1b): Pressure is released from the control chamber by way of the operating valve (3), which can be activated either electrically, hydraulically, pneumatically or manually. With no pressure in the control chamber the seal disc will open and allow an unrestricted water flow through the valve into the system piping.

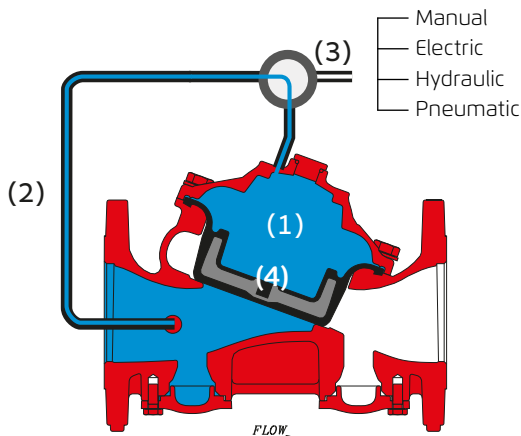


Fig 1a: Valve Closed

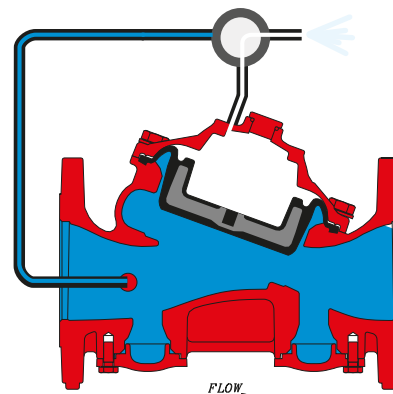


Fig 1b: Valve Open

Pressure Control

The BERMAD 400Y Torrent valve is highly suitable for pressure regulation in fire protection applications either for Pressure Reduction - Model 42T or for Pressure Relief - Model 43T.

The BERMAD Model 42T reduces water pressure automatically and accurately from a higher inlet pressure value to a lower set outlet value. It operates under both flow (Fig 2b) and non-flow (static) conditions (Fig 2a).

The pressure-reducing pilot valve [3] senses changes in outlet pressure and modulates pressure in main valve control chamber [1] to maintain the set outlet pressure.

When outlet pressure rises above the set pressure: The pilot valve throttles causing water pressure to accumulate in the control chamber (1) by way of the restriction orifice (2). This forces the main valve to close further and reduce outlet pressure.

When outlet pressure falls below the set pressure: The pilot valve opens wider than the passage presented by the restriction orifice, enabling more water to exit the valve control chamber via the pilot than can enter by way of the restriction orifice, releasing pressure from the control chamber. This causes the main valve to open and maintain the set pressure.

The restriction orifice also determines the valve's closing speed. For valves 8" and larger an adjustable needle valve is provided.

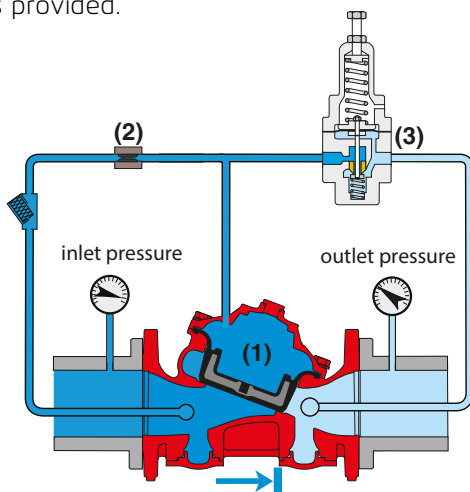


Fig 2a: Valve Closed (Static Condition)

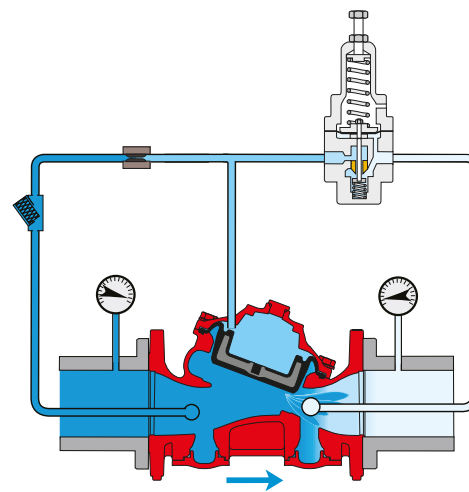
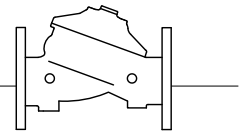


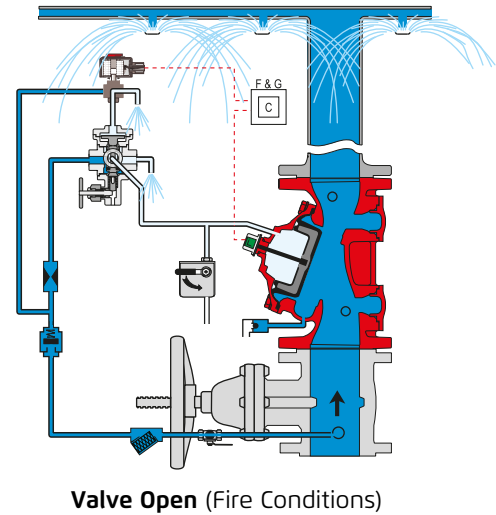
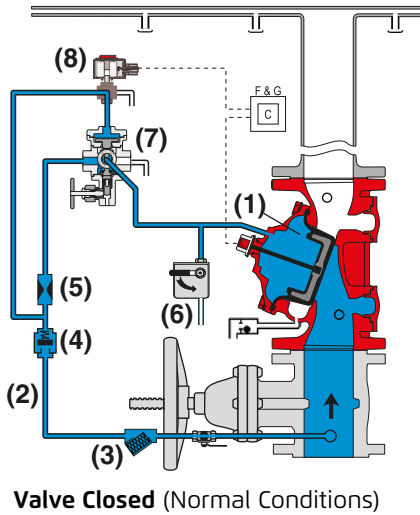
Fig 2b: Valve Open (Flowing Condition)



Deluge

The BERMAD 400Y is available in a wide variety of deluge configurations, controlled electrically, hydraulically pneumatically or electro-pneumatically, pre-action and dry pipe.

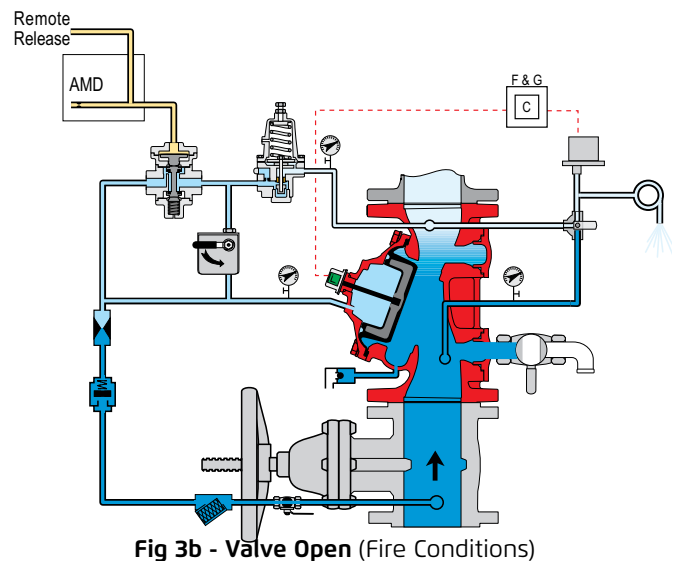
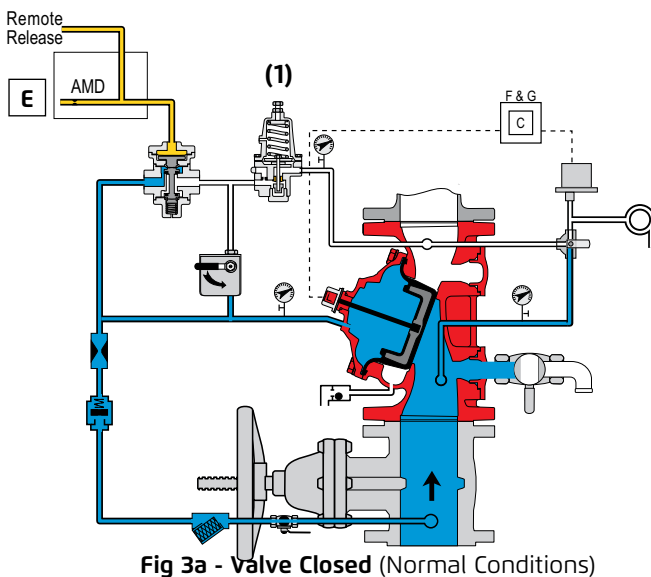
See below the principle of operation for the Electrically Controlled Deluge Valve with Manual Reset -model 400Y-3UM.

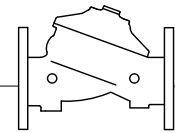


The BERMAD 400Y is held closed by water pressure in the control chamber [1]. Upon release of pressure from the control chamber the valve opens. Under NORMAL conditions, water pressure is supplied to the control chamber via the priming line [2] and is trapped in the control chamber by a relay valve (URV-M) [7] that is held in the supply position by hydraulic pressure supplied through a three-way solenoid valve [8]. Under FIRE conditions, water pressure is released from the control chamber, either with the manual emergency release [6], or by the URV-M switching to the release position in response to the solenoid valve being activated. This latches the 400Y deluge valve open, allowing water to flow into the system piping.

Combined - Deluge/Pressure Control

The BERMAD 400Y Pressure Control Deluge models are for use with high pressure water supplies or for varied pressure control requirements. These models are fitted with a pressure reducing pilot (1) fig 3a, integrated into the trim. This enables the dual function of a deluge valve whilst simultaneously reducing a higher upstream pressure to a lower and stable downstream pressure. See below the operation drawing for the Pneumatic Pressure Control On-Off Deluge Valve model 400Y 4DC, figures 3a & 3b.





Quarter Turn Position Indicator and Limit Switch

The BERMAD 400Y Torrent Valve can be factory fitted with a rotary position indicator beacon for visual confirmation of the valves status. When remote monitoring of the valves status is required, the 400Y Torrent valve can be fitted in the factory with Quarter turn Limit Switches, compatible with any fire & gas control system.



Fig 4: Indicator Beacon



For on-site visual confirmation of the valves status, the protective covered, dual color quarter turn position indicator beacon, readable from at least 50 meters / 150 ft

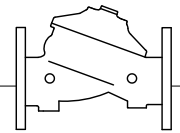
The indicator's rugged Lexan™ construction makes it highly resistant to impact damage and tolerant to most corrosive environments.



Fig 5: Limit Switch

For electronic monitoring of the valve status, the BERMAD 400Y Torrent valve can be factory fitted with a switch box with dual SPDT switches. The explosion proof, water tight and corrosion resistant enclosure is approved for use in Div. 1/Zone 1 hazardous areas.

In addition, the switch box incorporates a dual color quarter turn visual position indicator.



Installation Instructions

- The correct operation of the BERMAD 400Y Deluge Valves depends upon installation in accordance with the approved trim configuration.
- The 400Y valve must be trimmed with the correct trim components and accessories, and must be installed and maintained in compliance with the most recent BERMAD publications.
- Any deviation in trim size or arrangement may adversely affect the correct operation of the deluge valve.

Warning: The deluge valve and trim must be installed in areas where they are not subjected to freezing temperatures.

1. Allow enough room around the valve assembly for any adjustments and future maintenance.
2. Before the valve is installed, flush the pipeline to remove any dirt, scale, debris, etc.
3. Install the valve in the pipeline with valve flow arrow on the body pointing in the flow direction.
4. Ensure that all other components are positioned correctly as per the appropriate drawing.
5. The water supply priming line must be connected to the upstream of the system control valve.
6. All additional accessories, although not packed together with the BERMAD Deluge Valve, must be installed as shown in the relevant drawing and other illustrations.
7. After installation in the main line, carefully inspect/correct any damaged accessories, piping, tubing, or fittings; ensure that there are no leaks.

Swivel flange mounted drain valves adjustment

The drain valves on most Torrent 400Y models have a 360° swivel capability

To position the drain valves, loosen the 3 bolts on the drain flange just enough so as to allow the drains to be positioned to the most suitable direction for the particular installation. When the position is established, retighten the drain flange bolts.

For valves 1½" & 2" the drain valves are ¾" dia

For valves 2½" & 3" the drain valves are 1½" dia

For valves larger than 3" the drain valves are 2" dia

Placing in Service/Resetting

The deluge valve and the control trim shall be placed in service in accordance to the most recent IOM manual. After all relevant instructions have been performed, slowly open the supply-isolating valve and check that no water flows into the system downstream of the BERMAD deluge valve.

Maintenance

BERMAD Torrent Deluge Valves require no routine lubrication, packing or tightening

WARNING: Do not turn off the water supply to make repairs without placing a roving fire patrol in the area covered by the system. The patrol should continue until the system is back in service.

- Prior to turning off any valves or activating any alarms, notify local security guards and the central alarm station, so that a false alarm will not be raised.
- See NFPA Pamphlet No. 25 "Standard for the inspection, testing and maintenance of water based fire protection systems" and other relevant publications by authorities having jurisdiction.

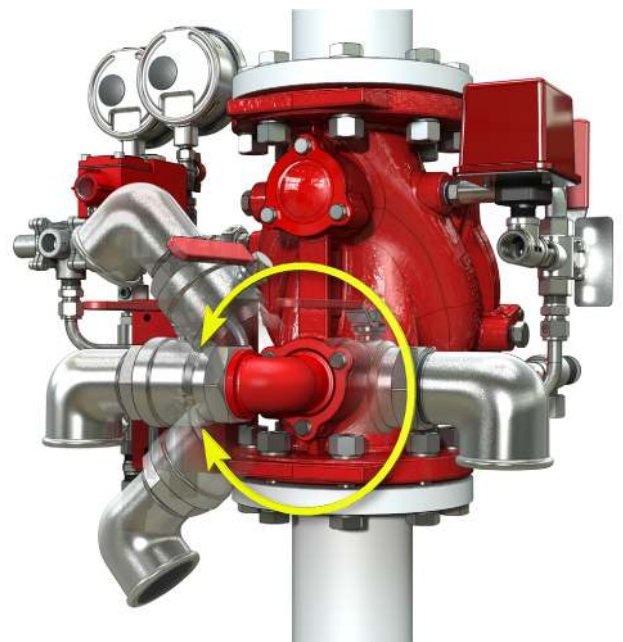
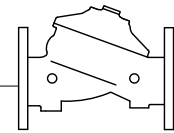


Fig 6 : Swivel flange mounted drain valves



Removal Instructions

WARNING: When taking a deluge system out of service, a fire patrol should be established in the system area. If automatic fire alarm signaling equipment is utilized, the proper authority the insuring body and owners representative should be notified that the system is being removed from service.

1. Shut off the main supply-isolating valve.
2. Close the priming line valve to the deluge valve control chamber.
3. Open all drain valves to drain all the water from the system .
4. Release the water pressure from the control chamber of the deluge valve by pulling the manual emergency release, or by tripping the electrical circuit (de-energize the Solenoid Valve)
5. If auxiliary power is used, disconnect all power supply and batteries.
6. Place "Fire Protection System Out of Service" signs in the area protected by the system

Inspection and Testing

Note: Refer to the IOM for the relevant valve model

WARNING: Do not turn the water supply off to make repairs without placing a roving fire patrol in the area covered by the system. The patrol should continue until the system is back in service.

1. Prior to turning off any valves or activating any alarms, notify local security guards and the central alarm station, to avoid signaling a false alarm. The deluge valve and the control trim shall be maintained in accordance to the most recent IOM procedures for the specific model. A periodic test schedule should be established also in accordance with the site conditions and owner regulations.
2. Take all additional measures as required by NFPA-25 "standard for the inspection, testing, and maintenance of water-based fire protection systems".
3. The system should be checked weekly for "Normal Conditions".
4. Clean the priming strainer prior to any resetting of the deluge valve.
5. The deluge valve must be activated at full flow at least annually. Take all necessary precautions to drain water and prevent damage in the area protected by the system.
6. After about five years of operation, a full inspection is recommended. Remove the cover, clean the valve body from sediments, clean the control tubing entry holes, and if needed install a new diaphragm assembly.



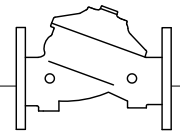
Fig 7: Diaphragm inspection inline and without trim removal

Inspection and Maintenance

For routine inspection and maintenance, access to the only moving part of the valve (the diaphragm unit) and complete access to the internal of the valve can be done by removing the four cover bolts (1½" to 6") or six cover bolts (8" and larger), inline and without removing of the trim.

Spare Parts

1. During standard use, the Diaphragm Assembly is the only spare part needed for the main deluge valve – see valve exploded drawing on page 12.
2. Rubber parts should be stored correctly and with time management (improper storage of rubber can cause hardening and cracking)



Wet Pilot Line Height Above the Main Valve

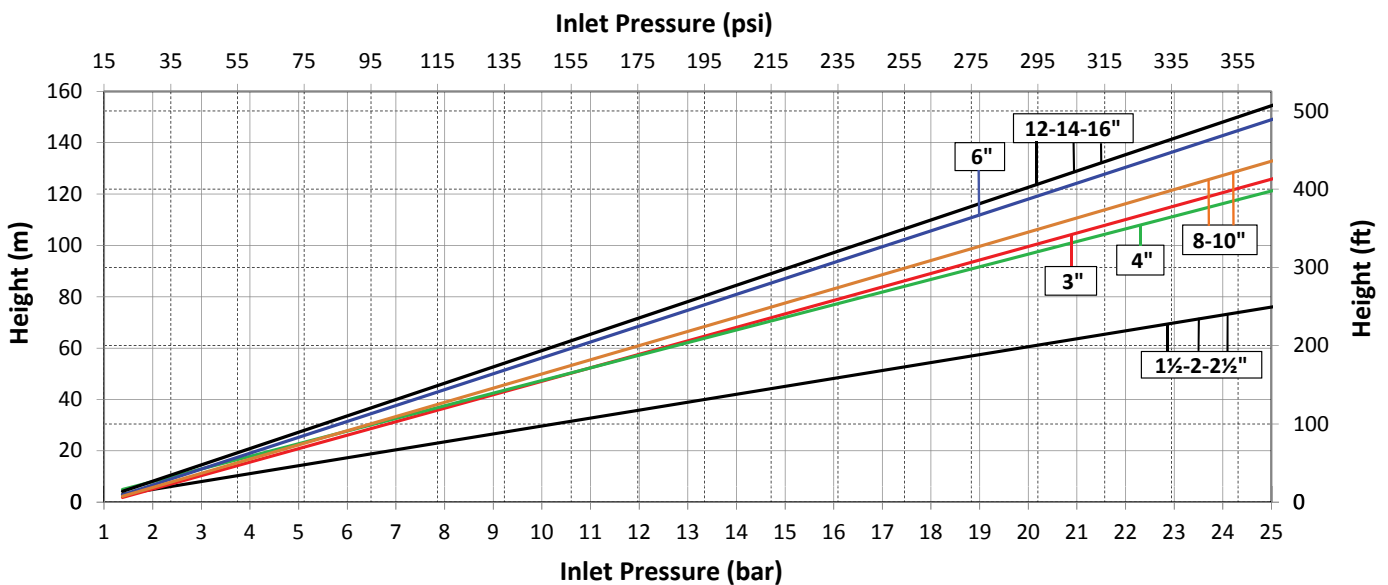
BERMAD Hydraulically Controlled Deluge valves are suitable for automatic or remote controlled water or foam systems that can include a wet pilot-line with closed fusible plugs (thermal releases) and piping systems.

The typical wet pilot-line is installed in the protected area and connected by piping to the valve trim. In fire conditions, operation of a release device on the wet pilot line releases pressure opening the Deluge Valve and allowing firewater or foam solution to enter the system piping.

With valves like the model 400Y-1M, where the wet pilot-line directly pressurizes the valve control chamber to keep the valve closed, the allowable height of the wet pilot-line above the deluge valve is dependant on the service or valve inlet pressure and should be calculated so as not to exceed the maximum height, as shown in the graph below.

This is to avoid the wet pilot-line column pressure being greater than the minimum pressure for assured valve opening.

Maximum Wet Pilot Line Height Above the Valve Vs. Service or Inlet Pressure



IMPORTANT:

Where the total length of the wet pilot line is not negligible the friction loss and subsequent back pressure must also be calculated and taken into account, if in doubt consult BERMAD.

Approvals

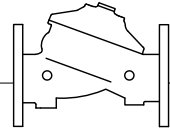
The BERMAD 400Y Torrent Deluge Valve is UL Listed and FM Approved when installed with specific components & accessories.

Refer to the current UL and/or FM fire protection equipment directory.

Consult BERMAD for any component approval recently to appear in any equipment directory.

All solenoid valves shall be UL Listed for compatible pressure ratings of the deluge valve for which it is intended to be used.

The BERMAD 400Y Torrent valve also carries the Type Approval of ABS, Lloyds Register and DNV.



Basic Valve - Exploded View

