BONETTI®

Piston Valves

INDEX

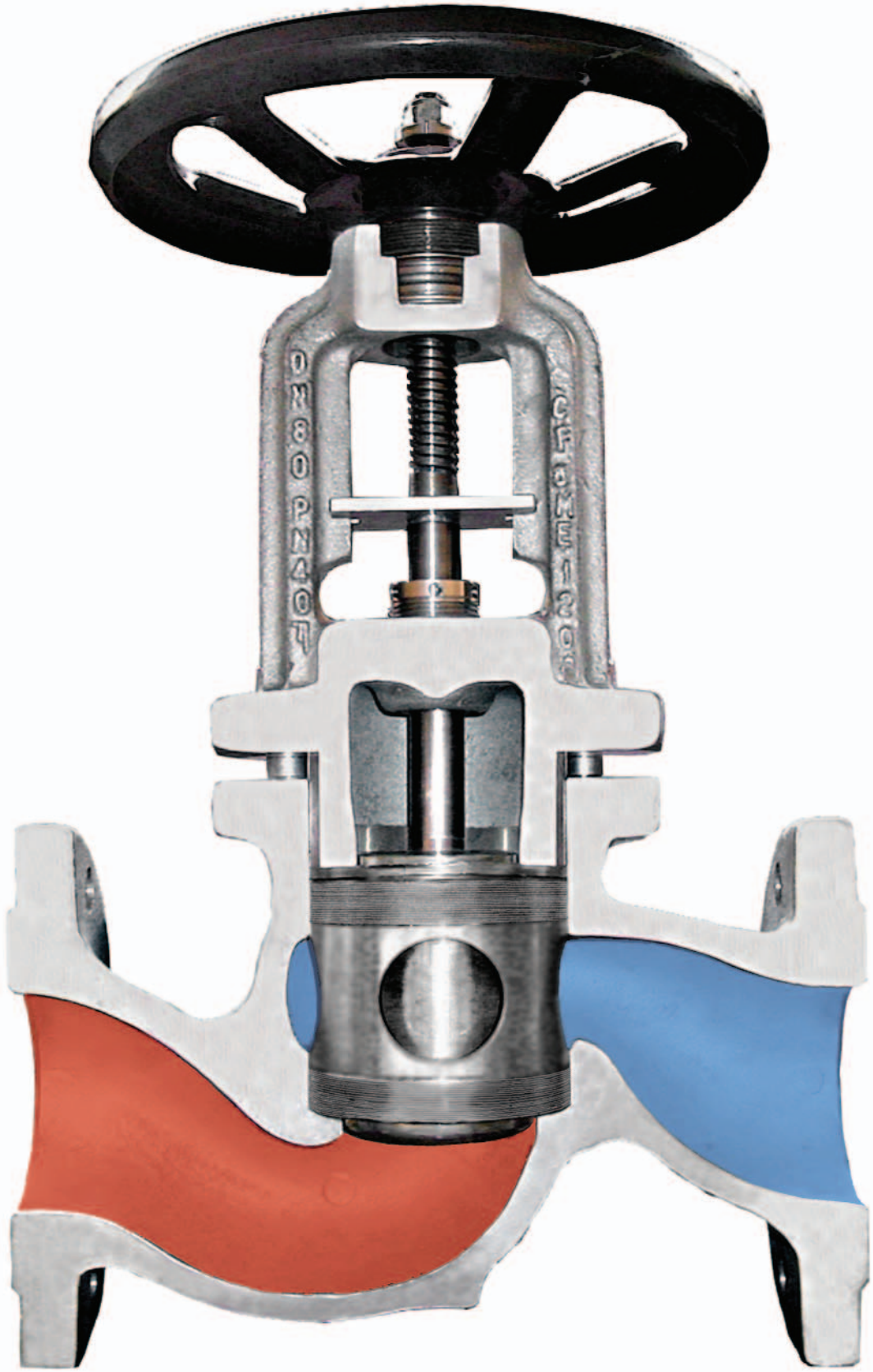
FIGURE NUMBER INDEX

Fig. 1061 - RATING for the Materials mentioned in this Bulletin

Max. Operating TEMPERATURE to DIN	Max. Operating PRESSURE to				
	DIN 2401 Class PN 16	DIN 2401 Class PN 16	DIN 2401 Class PN 40	DIN 2401 Class PN 40	DIN 2401 Class PN 63
	Mater. Sched. G	Mater. Sched. GS	Mater. Sched. GS	Mater. Sched. FS - F - M/H	Mater. Sched. FS - M/H
°C	bar	bar	bar	bar	bar
-10 +20	16	16	40	40	63
120	16	16	38	40	63
200	13	13	33	35	50
250	11	12	32	32	45
300	10	11	28	28	40
350	=	10	24	24	36
400	=	=	=	21	32

Max. Operating TEMPERATURE to ASME and API	Max. Operating PRESSURE to					
	ASME Class 150 Gr. 1.1	ASME Class 150 Gr. 2.2	ASME Class 300 Gr. 1.1	ASME Class 300 Gr. 2.2	API 602 Class 800 Gr. 1.1	API 602 Class 800 Gr. 2.2
°C	bar	bar	bar	bar	bar	bar
-29 +38	19.6	19.0	51.1	49.6	136.2	132.4
100	17.7	16.2	46.4	42.2	136.0	112.5
200	14.0	13.7	43.8	35.7	130.0	95.1
250	12.1	12.1	41.7	33.4	123.0	89.1
300	10.2	10.2	38.7	31.6	112.0	84.5
350	8.4	8.4	37.0	30.4	98.0	81.1
400	6.5	6.5	34.5	29.1	82.5	77.6
425	5.6	5.6	28.8	28.7	71.5	76.4

Max. Operating Conditions for Gr. 1.1 are related to valves of Carbon Steel (Mat. Sched. FS, F); for Gr. 2.2 to valves of Austenitic Stainless Steel (Mat. Sched. M/H).


DN 80 PN40F
ACCIAIO FUSO

BONETTI® Piston Valves

GENERAL INFORMATION

Seat tightness in a piston valve is obtained by a cylindrically shaped plug, connected to a spindle, and operated by a hand wheel, which enables it to move through the inner diameter of two packing rings. When the piston is in the high position, that is, held by only the upper valve ring, (which also ensures tightness to the atmosphere), the valve is open. When the piston is lowered and is held in place by both the upper and lower valve rings (and thus ensuring seat tightness between the valve inlet and outlet), the valve is closed. Because of the use of the packing rings, which have alternate layers of graphite and stainless steel, the piston valve is considered a "soft-seated" valve.

The contact between the piston and rings (sealing effect) is positively assured by means of the pressure exerted by stud bolts with Depending on valve material, belleville washers, are fitted to compensate expansion due to temperature variations.

A typical feature of piston valves - compared with globe valves - is that the piston is always held by at least one sealing ring. Therefore, there is no vibration during closing and opening operations.

Another primary feature of the piston valve is that the two cylindrical seating surfaces, the bottom valve ring and the piston, come in contact when the fluid flow is already nearly cut off. Another unique property of the BONETTI® Piston Valve is that with the valve completely open and the piston completely supported in the inner diameter of the upper valve ring, it is protected against erosive/corrosive elements as well as prevented from having foreign matter deposited upon it.

Piston valves - contrary to globe valves - are bi-directional. That is, they can be installed in a process line in both directions of flow. However, the most common installation is with the fluid inlet pressure below the valve piston.

Since no metallic sealing surfaces are present, there is perfect interchangeability of all components. A new set of spares can be immediately fitted without the need of adaptation to other existing parts. Therefore, inline reparability and maintenance is easy, does not require specialized personnel, and will always make the valve like new.

OPERATING RANGE

Engineering companies have been using our piston valves successfully for more than 75 years. Their first application, still widely used, was the tight shut-off of low and medium pressure steam.

In later years, piston valves have been selected to meet the severe demands of a large number of requirements in fluid handling applications in the industrial sector. As such, they are used in process lines containing many different fluids such as steam, superheated water, thermal transfer fluids, ammonia, LPG, hydrocarbons, acids, alkaloids, etc. Their ability to provide perfect seat shut off and packing tightness, and their long term trouble-free operation, ensured by our patented reinforced seal rings, have served to greatly expand the number and types of applications where the BONETTI® Piston Valves are used. This is particularly true of their use in the handling of harmful and flammable fluids where tight seat and packing shut off is essential.

Although the seat seal rings are suitable for use in temperatures in excess of 1022°F (550°C), their use is limited to the restrictions applicable to the body material, as well as that of other metallic pressure retaining valve components. It should be noted that carbon steel bodies can not be used in temperatures above 800°F (427°C).

DESIGN

Piston valves are usually T-pattern, straight through flow globe valves, with their stem perpendicular to the process line.

The present design is the result of our long experience in the design and manufacturing of this product, which began as early as 1926. Our latest designs reflect the remarkable progress in regards to the quality of the sealing rings, particularly for their application in valves size 2 ½" (DN 65) and larger, as well as for their application in handling high pressure fluids using balanced pistons and rising, non-rotating spindles. Kindly refer to the details on page 6, where the BVe valves are described. (Please note: "e" means balanced piston.)

OPERATIONS

Piston valves are typically shut-off valves. But by replacing the standard lantern bushing with a characterized regulating lantern bushing, the valves can be turned into control valves to provide a characterized flow pattern, having manual or automatic service. Since the piston is always held by the upper valve seal ring, no vibration can occur.

Piston type flow control valves, contrary to globe type flow control valves, offer perfect seal tight shut off. Thus, a very interesting application of piston valves is their use as regulating or modulating valves in severe service applications. (See details on page 16.)

RATINGS

For reference purposes, the maximum operating pressure of a piston valve is directly related to the operating temperatures as shown on table Figure 1061, on page 2. The actual maximum operating conditions are those stated in the ASME B16.34 tables for the given material and pressure class.

In cases where severe duty will be experienced, such as thermal shock vibrations, repeated stresses, condensate hammering, and the handling of harmful or dangerous fluids, the customer should consult with the factory for the proper selection of materials of construction. When soliciting a quotation or sending an inquiry, it is necessary that you supply the worst operating conditions, including type of fluid, inlet and outlet pressures, and temperatures.

MATERIAL SCHEDULES

The term "Material Schedule" refers to the types of materials of the various components of the valve. Kindly refer to Figure 1062 - Material Schedules, below.

All valves may contain some copper bearing alloys, externally and not in direct contact with the fluid. In cases where this is not desirable, the factory can substitute these materials for special alloys. In such cases, a special material schedule designation, "H", shall be used. (ie.: "G/H", "FS/H", "F/H", etc.).

Fig. 1062 - Material Schedules

Material Schedule	Materials	
	Body	Piston
G	Cast iron	Stainless steel
GS	Nodular iron	Stainless steel
FS	Forged steel	Stainless steel
F	Cast steel	Stainless steel
M/H	Stainless steel	Stainless steel

SIZES (DN)

Standard sizes are: from size 3/8" (DN10) up to size 8" (DN 200)

CONNECTIONS

BONETTI® Piston Valves are available for pipe connections to:
- Flanged to UNI (DIN, AFNOR etc) PN 16 and PN 40
- Flanged to ASME 16.5, classes 150 and 300
- Female threaded, NPT as per ASME 1.20.1 and B.S.P. (DIN 2999)
- Socket weld as per ASME B16.11
- Butt weld as per ASME B16.2 and as per DIN 3239

AUTOMATED VALVES

BONETTI® Piston Valves of any size, pressure class, or material schedule can be automated with pneumatic, hydraulic, or electric actuators for remote control. See details on page 10.

MAINTENANCE

In-line maintenance and repairs of BONETTI® Piston Valves are very simple and can be done without removing the valve from the line. However, there cannot be fluid flow through the valve while it is being serviced or maintained.

SHIPPING PREPARATION

BONETTI® Valves are shipped only after they have passed all required dimensional and functional tests. All valves are supplied with valve ends protected by means of polyethylene covers, as well as with externally painted surfaces for storage and shipping purposes. Wooden containers are recommended and typically used for overseas shipments.

QUALIFICATION

All BONETTI® products, including Piston valves, are manufactured under ISO 9001 procedures (see certification on page 19).

More than this, BONETTI® Piston Valves have been qualified according to:
- API 6 FA and BS 6775: Fire Safe
- TA Luft: German Clean Air, TUV Mannheim
- Druckbehalter verodnung 22: for railway and truck liquid tankers for service down to -40° F, TUV Munchen
- Pressure Equipment Directive 97/23/EC (“PED”)
- Equipment for use in potentially Explosive Atmospheres (ATEX) Directive 94/9/EC

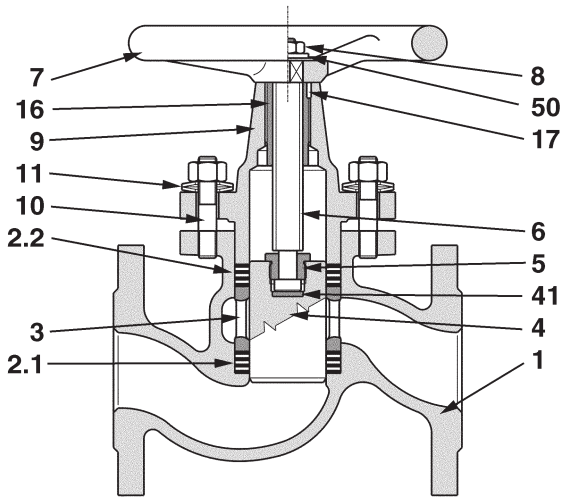


Fig. 1004

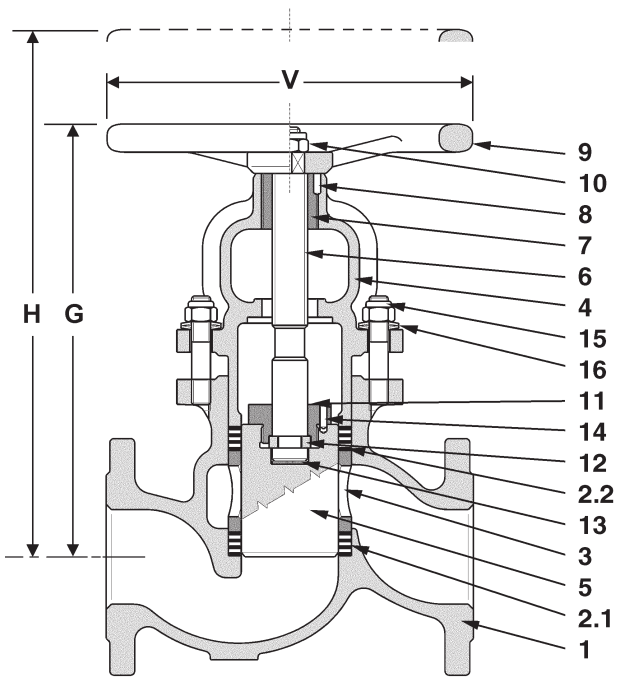
1	Body
2.1	Lower Valve Ring
2.2	Upper Valve Ring
3	Lantern Bush
4	Piston
5	Split Nut
6	Spindle
7	Handwheel
8	Handwheel Nut
9	Bonnet
10	Stud Bolt and Nut
11	Belleville Washer
16	Threaded Bush
17	Pin
41	Thrust Plate
50	Name Plate

Figure 1004 shows the basic design of a BONETTI® Piston Valve. The valve consists of a body (1), which is internally fitted with two sealing rings. The lower valve ring (2.1) ensures upstream/downstream seat tightness. The lantern bushing (3) is the spacer between the valve rings. The upper valve ring (2.2) ensures tightness to the atmosphere. The two valve rings are compressed by the bonnet (9), which is compressed by the stud bolts and nuts (10) and by the Belleville washers (11). The latter compensates for expansion due to temperature variations.

The piston (4) is connected to the spindle (6), which is actuated by the hand wheel (7). When the piston is in the high position and fully encircled by the upper valve ring, the valve is open. When the piston is lowered into the inner diameter of the lower valve ring, the valve is closed. The opening stroke ends when the split nut (5) contacts the bonnet (9). The closing stroke ends when the hand wheel (7) contacts the bonnet (9).
The following BONETTI® Piston Valves are manufactured in accordance to figure 1004.

- Size DN 10 (3/8") through DN 50 (2") for DIN PN 16 - PN 40 and for API 602 - ASME Class 800
- Size DN 65 (2 ½") through DN 150 (6") for DIN PN 16 and ASME Class 150

The valves, using this design, are fitted with non-balanced piston and are denominated BVn, where the "n" means "non-balanced." All valves are further fitted with anti-friction threaded bushings in the bonnet and a thrust plate between spindle and piston.



Type BK Fig. 1046

1	Body
2.1	Lower Valve Ring
2.2	Upper Valve Ring
3	Lantern Bush
4	Bonnet
5	Piston
6	Spindle
7	Threaded Bush
8	Pin
9	Handwheel
10	Handwheel Nut
11	Piston Nut
12	Split Ring
13	Thrust Plate
14	Pin
15	Stud Bolt and Nut
16	Belleville Washer

Figure 1046 shows a BONETTI® Piston Valve, type BK, which is essentially the same design as figure 1004 but which is suitable for high pressure service in sizes DN 65 (2 ½") to DN 150 (6").
The coupling between the threaded spindle (6) and the piston (5) is obtained by means of a split ring (12) and a piston nut (11).
Actual force for valve closing is exerted by a thrust plate (13). The overall dimensions of figure 1046 valves are identical to those of other valves having the same size and pressure class with regards to body length and flanges. However, there are some deviations in these dimensions, and they are:

DN	(mm)	**65**	**80**	**100**	**125**	**150**
ND	(in.)	**2.1/2”**	**3”**	**4”**	**5”**	**6”**
G	(mm)	320	365	420	470	530
	(in.)	*12.598*	*14.370*	*16.535*	*18.504*	*20.86*
H	(mm)	390	445	515	575	655
	(in.)	*15.354*	*17.520*	*20.276*	*22.638*	*25.787*
V	(mm)	250	300	350	350	400
	(in.)	*9.843*	*11.811*	*13780*	*13.780*	*15.748*

BONETTI® piston valves are particularly well suited for use in railway and truck tankers used for the transportation of liquids such as LPG, ammonia, and other hydrocarbons. Currently, many tankers are equipped with BONETTI® piston valves type BK. These valves have been approved by the German authority TUV.

Figure 1020 shows a BONETTI® Piston Valve type BVe with balanced piston (the "e" means balanced) and with rising, non-rotating stem. This design is required when the inlet pressure against the piston reaches such high values that the operation of the valve becomes difficult. By releasing some of the inlet fluid pressure through a hole in the balanced piston and against the bonnet (37) the piston is then in balance and the valve becomes easier to operate.
The valve is equipped with a standard gland nut (13) and packing rings (12.1 and 12.2). The following are also integral components of this new design of piston valves:
- Threaded stem (36) is rising and non-rotating.
- Integral anti-rotating device (23), which is also used as a stroke indicator.
- Perfect tightness when back seating is obtained by the back seating (32) wedging it self between the stem (36) and the bonnet (37) in an actual non-rotating motion
- Operating torque reduced by two roller bearings (30)

Valve Body Seal
Valve body seal tightness between body (1) and bonnet (37) is also ensured by an additional auto-sealing ring (35), which provides a tight seal. A perfect, durable body/bonnet seal is thus achieved. By so doing, we eliminate the need to use a third ring, which would take up considerable space and prevent the stud bolts from exerting the required pressure to the lower valve seat ring (2.1).
All BONETTI® Piston Valves are equipped with special graphite/metal alloy rings with the following features and advantages:
- Elimination of asbestos rings (environmentally sound practice).
- Wear and erosion resistance to nearly all types of fluid.
- Remarkable temperature stability and, consequently, substantial increase in the operating range, making it suitable for very high temperatures, since the limits of operation become a function of the body material and not of the seating rings.
- Reduced coefficient of friction resulting in longer life of both upper and lower sealing rings, as well as longer life for other components such as the threaded stem bushing, etc.

For special applications, PTFE valve rings can also be supplied on request.
The following BONETTI® piston valves are manufactured in accor-
- dance to figure 1020 BVe:
- Size from DN 65 (2. ½") to DN 200 (8") for:
  DIN PN 16 - PN 40 and ASME class 150 - 300

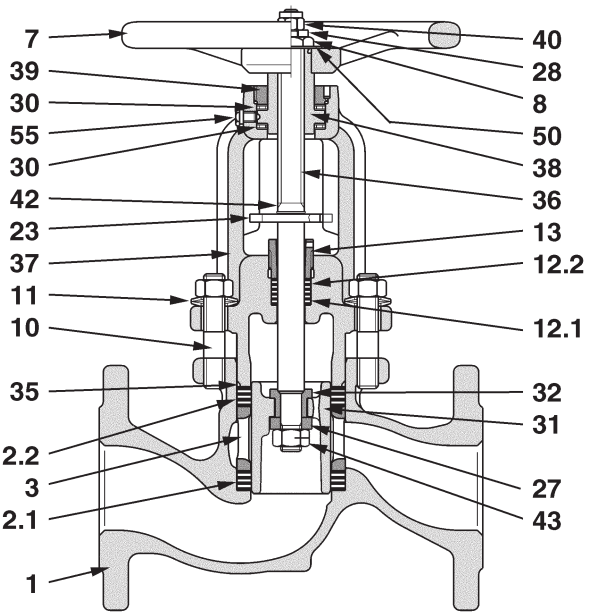


Fig. 1020

Type BVe

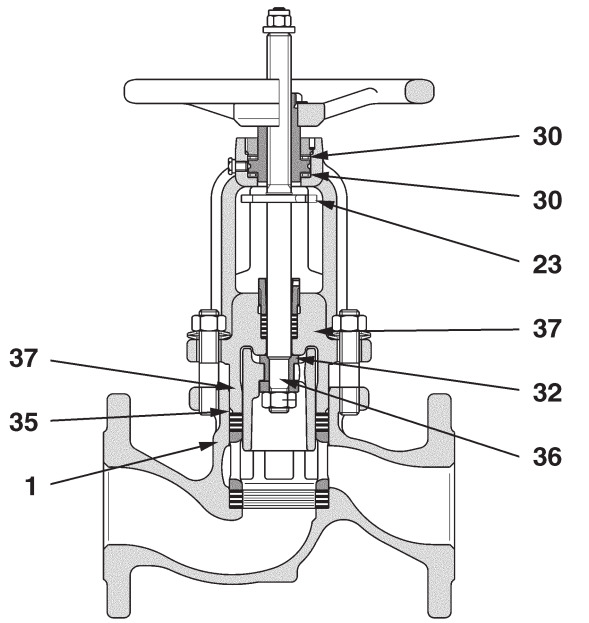


Fig. 1020.1

1	Body
2.1	Lower Valve Ring
2.2	Upper Valve Ring
3	Lantern Bush
7	Handwheel
8	Handwheel Nut
10	Stud Bolt and Nut
11	Belleville Washer
12.1	Stuffing-box Lower Ring
12.2	Stuffing-box Upper Ring
13	Gland Nut
23	Antirotating Device / Stroke Indicator
27	Nonrotating Disc
28	Locking Washer
30	Roller Bearing
31	Balanced Piston
32	Backseat
35	Autoseal Ring
36	Stem
37	Bonnet
38	Stem Bush
39	Retaining Nut
40	Nut
42	Retaining Ring
43	Notched Nut
50	Name Plate
55	Lubricator

BONETTI® Piston Valves – Cast Iron

Stop Valves
Flanged Ends to DIN 2533 - PN 16
Rating: DIN 2401 - PN 16
Size DN 10 to DN 150

1 **Full Bore - BV,**
Standard Bore - BVn
Reduced Bore - BVR

2 Standard Flanges are Raised Face, drilled.

3 Face-to-Face Dimension (A) to DIN 3202 - F1.

4 Standard Material Schedule: G - PN 16.

5 Pressure - Temperature Rating on page 2.

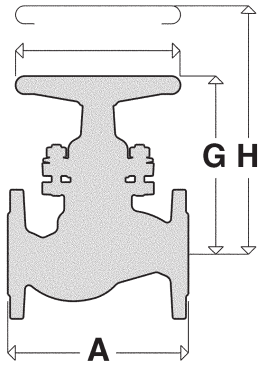


Fig. 1010 - 1075

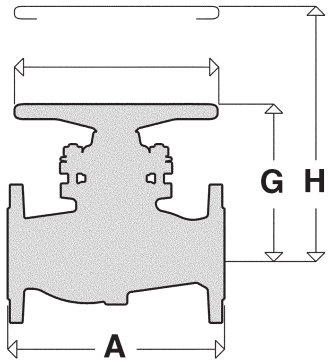


Fig. 1045

Type	DN	Fig.	Mater. Sched.	Dimensions				Flange Dimensions					Weight	Valve Rings (see page 17)		
				A	G	H	V	Outs. Dia.	Thick.	No. of Holes	Dia. of Holes	Dia. of Bolt Circle		d	D	h
	mm			mm	mm	mm	mm	mm	mm	No.	mm	mm	kg	mm	mm	mm
BV	10	1010	G	120	110	140	95	90	14	4	14	60	2,3	15	23,5	9
BV	15	1010	G	130	110	140	95	95	14	4	14	65	2,5	15	23,5	9
BV	20	1010	G	150	135	170	115	105	16	4	14	75	3,8	20	30,0	10
BV	25	1010	G	160	150	185	125	115	16	4	14	85	5,3	25	38,0	12
BV	32	1010	G	180	170	215	150	140	18	4	18	100	7,7	30	45,0	15
BV	40	1010	G	200	195	250	150	150	18	4	18	110	11,3	40	58,0	16
BV	50	1010	G	230	225	285	200	165	20	4	18	125	15,4	50	70,0	17
BVn	65	1045	G	290	210	260	300	185	20	4	18	145	21,0	60	82,0	16
BVn	80	1045	G	310	230	290	300	200	22	8	18	160	28,0	70	94,0	19
BVn	100	1045	G	350	275	350	300	220	24	8	18	180	41,0	90	112,0	20
BVn	125	1045	G	400	310	395	400	250	26	8	18	210	65,0	110	135,0	22
BVn	150	1045	G	480	340	440	400	285	26	8	22	240	92,0	130	155,0	23
BVR	15	1075	G	130	90	108	75	95	14	4	14	65	2,2	10	18,0	6
BVR	20	1075	G	150	110	140	95	105	16	4	14	75	3,2	15	23,5	9
BVR	25	1075	G	160	135	170	115	115	16	4	14	85	4,5	20	30,0	10
BVR	32	1075	G	180	150	185	125	140	18	4	18	100	6,8	25	38,0	12
BVR	40	1075	G	200	170	215	150	150	18	4	18	110	8,6	30	45,0	15
BVR	50	1075	G	230	195	250	150	165	20	4	18	125	12,2	40	58,0	16

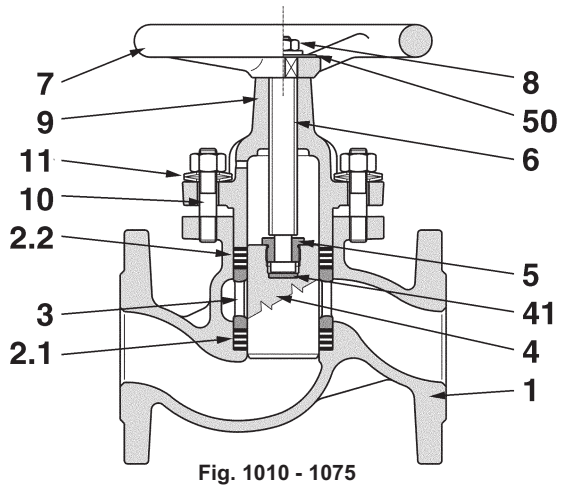


Fig. 1010 - 1075

	Part	Part Material for Material Schedule G
1	**Body**	JL 10401
2.1	**Lower Valve Ring**	Graphite T1
2.2	**Upper Valve Ring**	Graphite T4 / Graphite T1 ▲
3	**Lantern Bush**	Carbon Steel / Cast iron ★
4	**Piston**	ASTM A582 - XM 34 ★ G-X 70 Cr Mo 29 2 ★
5	**Split Nut** ●	Fe37 + H.T.
6	**Spindle**	C30
7	**Handwheel**	Cast iron
8	**Handwheel Nut**	5-2
9	**Bonnet**	JL 1040
10	**Stud Bolt and Nut**	5.6 - 5-2
11	**Belleville Washer**	50 Cr V4
16	**Threaded Bush** ▲	OT 58
17	**Pin** ▲	Carbon Steel
41	**Thrust Plate** ■	AISI 420 H.T.
50	**Name Plate**	Aluminium

● not existing for DN 10, 15, 20 mm
▲ for Size 65 and larger only
★ depending upon Size
■ for Size 32 and larger, only

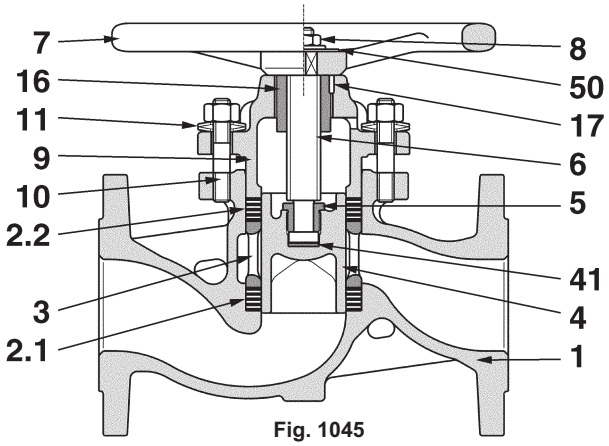


Fig. 1045