



**BONETTI**®



**Piston Valves**

# 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 1/2" (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
- Druckbehälterverordnung 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



# BONETTI® Piston Valves

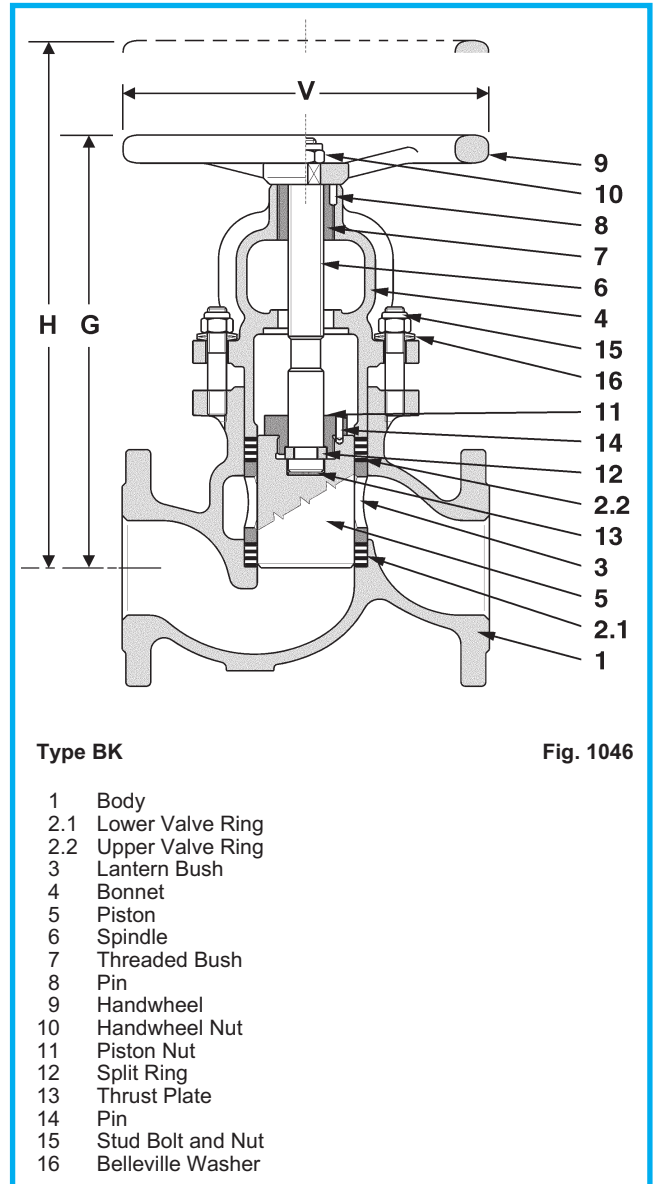
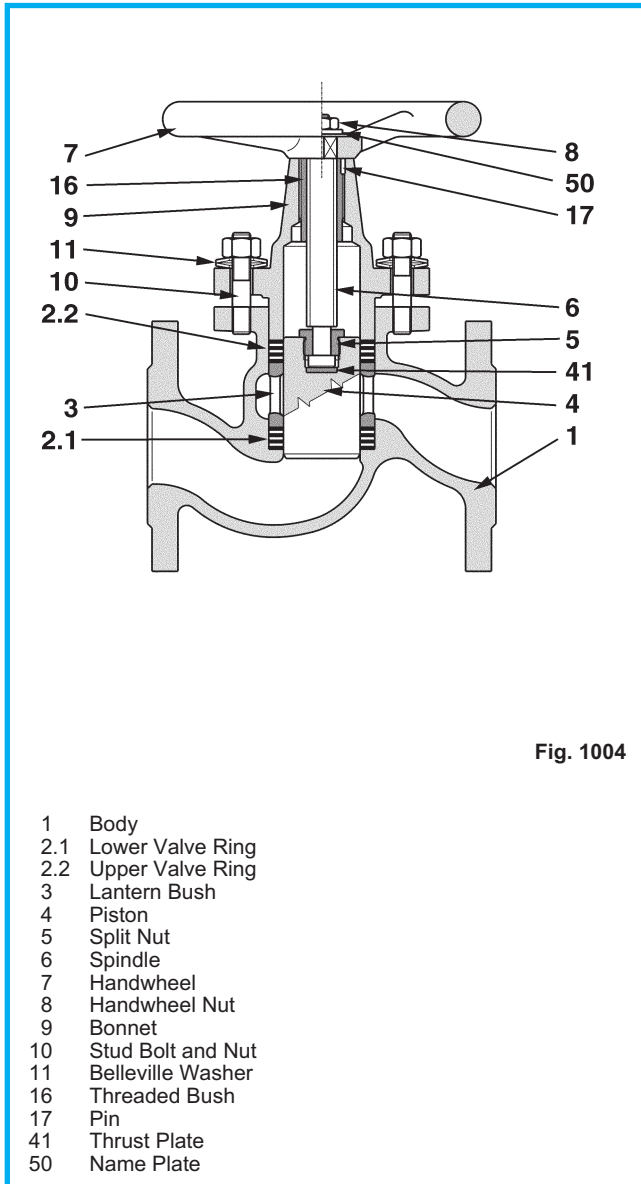


Figure 1004 shows the basic design of a BONETTI® Piston Valve. The valve consists of a body (1), which is internally fitted with two sealing rings. The lower valve ring (2.1) ensures upstream/downstream seat tightness. The lantern bushing (3) is the spacer between the valve rings. The upper valve ring (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 1/2") 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.

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 1/2") 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"
<b>G</b> (mm)	320	365	420	470	530
(in.)	12.598	14.370	16.535	18.504	20.86
<b>H</b> (mm)	390	445	515	575	655
(in.)	15.354	17.520	20.276	22.638	25.787
<b>V</b> (mm)	250	300	350	350	400
(in.)	9.843	11.811	13.780	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 TÜV.

# BONETTI® Piston Valves

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 accordance to figure 1020 BVe:

- Size from DN 65 (2. 1/2") to DN 200 (8") for:
- DIN PN 16 - PN 40 and ASME class 150 - 300

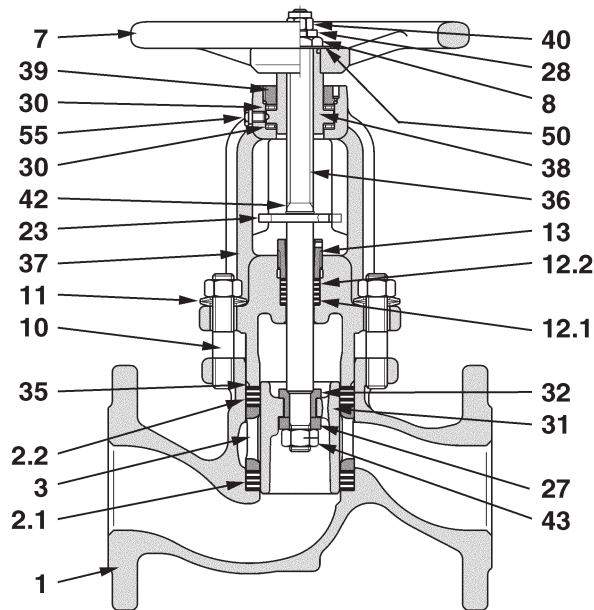


Fig. 1020

Type BVe

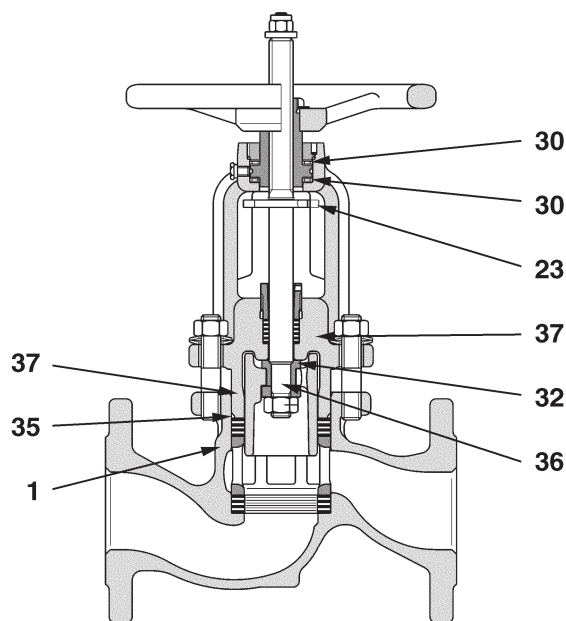


Fig. 1020.1

- |      |  |
|------|--|
| 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

### Female Screwed Ends

Rating: DIN 2401 - PN 16

Size 3/8" to 2"

- 1 Standard female screwed ends to B.S.P. (DIN 2999).
- 2 Length of body (A) to DIN 3202 - M9 - (except 1.1/2", 2" and type B V R).
- 3 Standard Material Schedule: G - PN 16.
- 4 Pressure - Temperature Rating on page 2.

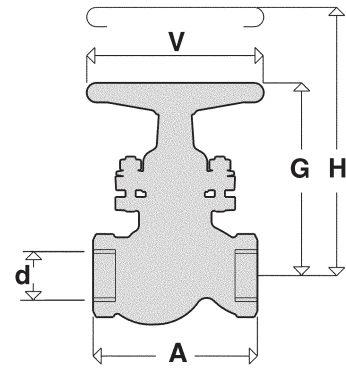


Fig. 1018

Type	DN inches	Fig.	Mater. Sched.	B.S.P. Thread d inches	Dimensions				Weight kg	Valve Rings (see page 17)		
					A mm	G mm	H mm	V mm		d mm	D mm	h mm
BV	3/8"	1018	G	3/8"	100	110	140	95	1,3	15	23,5	9
BV	1/2"	1018	G	1/2"	100	110	140	95	1,3	15	23,5	9
BV	3/4"	1018	G	3/4"	120	135	170	115	2,1	20	30,0	10
BV	1"	1018	G	1"	135	150	185	115	3,1	25	38,0	12
BV	1.1/4"	1018	G	1.1/4"	160	170	215	150	5,0	30	45,0	15
BV	1.1/2"	1018	G	1.1/2"	175	195	250	150	7,0	40	58,0	16
BV	2"	1018	G	2"	195	225	285	150	10,9	50	70,0	17
BVR	3/4"	1018	G	3/4"	100	110	140	95	1,4	15	23,5	9
BVR	1"	1018	G	1"	120	135	170	115	2,3	20	30,0	10

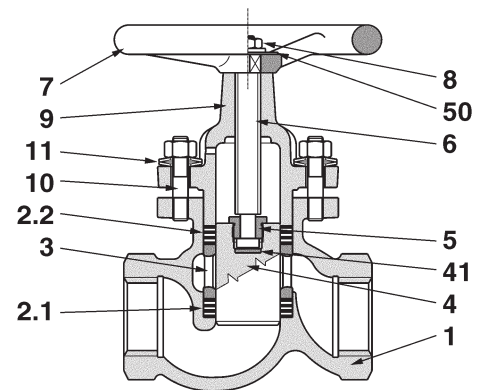


Fig. 1018

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

● not existing for d = 15 and 20 mm

★ depending upon Size  
■ for Size 1.1/4" and larger, only

# BONETTI® Piston Valves - Cast Iron, Nodular Iron

**Stop Valves – Type BVe**  
**Flanged Ends to DIN 2533 - PN 16**  
**Rating: DIN 2401 - PN 16**  
**Size DN 65 to DN 200**

- 1 Standard Flanges are Raised Face, drilled.
- 2 Face-to-Face Dimension (A) to DIN 3202 - F1.
- 3 Standard Material Schedule: G - PN 16, GS - PN 16.
- 4 Pressure - Temperature Rating on page 2.  
 These DN 200 valves are designed and suitable for PN 16.  
 Some Countries accept DN 200 and larger sized valves of cast iron for lower PN, only. We suggest to examine carefully the relevant standards in force.

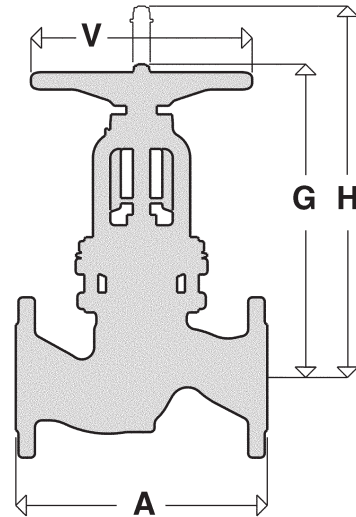


Fig. 1021

Type	DN	Fig.	Mater. Sched.	Dimensions				Flange Dimensions					Weight	Valve Rings (see page 17)			Stuffing-box Rings (see page 17)		
				A	G	H	V	Outs. Dia.	Thick.	No. of Holes	Dia. of Holes	Dia. of Bolt Circle		d	D	h	d	D	h
	mm			mm	mm	mm	mm	mm	mm	No.	mm	mm	kg	mm	mm	mm	mm	mm	mm
BVe	65	1021	G - GS	290	340	395	250	185	20	4	18	145	23,5	60	82	16	20	30	7
BVe	80	1021	G - GS	310	370	430	250	200	22	8	18	160	31,0	70	94	19	20	30	7
BVe	100	1021	G - GS	350	415	490	300	220	24	8	18	180	43,0	90	112	20	20	30	7
BVe	125	1021	G - GS	400	460	545	350	250	26	8	18	210	65,0	110	135	22	25	38	9
BVe	150	1021	G - GS	480	495	590	350	285	26	8	22	240	91,0	130	155	23	25	38	9
BVe	200	1021	G - GS	600	580	695	400	340	30	12	22	295	175,0	170	200	15	25	38	9

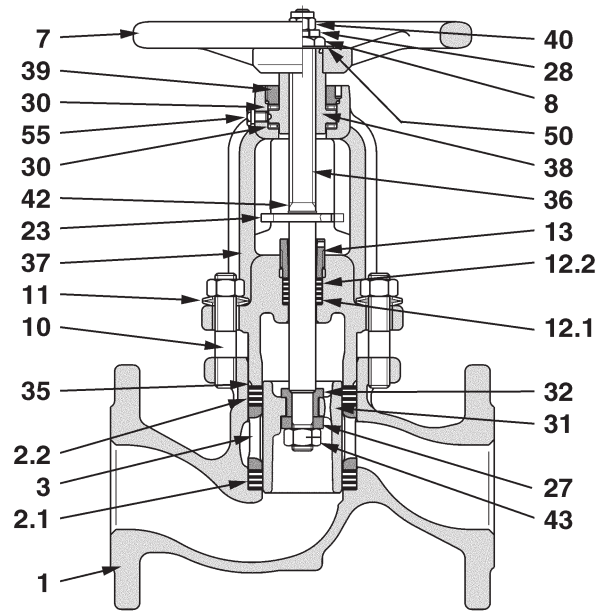


Fig. 1021

Part	Part Material for Material Schedule	
	G	GS
1 Body	JL 1040	JS 1049
2.1 Lower Valve Ring	Graphite T1	Graphite T1
2.2 Upper Valve Ring	Graphite T1	Graphite T1
3 Lantern Bush	Cast iron	Cast iron
7 Handwheel	Cast iron	Cast iron
8 Handwheel Nut	Carbon Steel	Carbon Steel
10 Stud Bolt and Nut	5,6 - 5-2	5,6 - 5-2
11 Belleville Washer	50 Cr V4	50 Cr V4
12.1 Stuff.-box Lower Ring	Graphite T1	Graphite T1
12.2 Stuff.-box Upper Ring	Graphite T1	Graphite T1
13 Gland Nut	Carbon Steel	Carbon Steel
23 Antirotating Device	Carbon Steel	Carbon Steel
Stroke Indicator	Carbon Steel	Carbon Steel
27 Nonrotating Disc	Carbon Steel	Carbon Steel
28 Locking Washer	ASTM A182 F6	ASTM A182 F6
30 Roller Bearing	Alloy Steel	Alloy Steel
31 Balanced Piston	ASTM A582 XM34	ASTM A582 XM34
32 Backseat	ASTM A182 F6	ASTM A182 F6
35 Autoseal Ring	Graphite T3	Graphite T3
36 Stem	ASTM A479 Tp.410 c.3	ASTM A479 Tp.410 c.3
37 Bonnet	JL 1040	JS 1049
38 Stem Bush	ASTM A439 D2 / GGG NiCr	ASTM A439 D2 / GGG NiCr
39 Retaining Nut	Carbon Steel	Carbon Steel
40 Nut	Carbon Steel	Carbon Steel
42 Retaining Ring	Stainless Steel	Stainless Steel
43 Notched Nut	Carbon Steel	Carbon Steel
50 Name Plate	Aluminium	Aluminium
55 Lubricator	1/8" BSP	1/8" BSP