Installation, Operating & Maintenance

Operating & Maintenance

Sizes included: ½" - 8" (DN15 - DN200)

Full Bore, Metal Seated, Flanged Ball Valve

Series included:

ANSI series:	Series Z73 - Class 150
	Series Z74 - Class 300
High temperatures ANSI series:	Series Z73T - Class 150
	Series Z74T - Class 300
DIN series:	Series Z77 - PN16
	Series Z78 - PN40
High temperatures DIN series:	Series Z77T - PN16
	Series Z78T - PN40

1. GENERAL

This Installation, Operating & Maintenance manual presents the instructions required for safe use of Habonim 2 pieces metal seated, flanged ball valve series. The manual relates to FULL BORE only, standard type (Z73, Z74, Z77, Z78) and extreme high temperature type (Z73T, Z74T, Z77T, Z78T). Before using any of these series valves, read the entire IOM carefully and make sure you understand everything. Where in doubt, please consult with Habonim engineering team.

WARNINGS & SAFETY INSTRUCTIONS

Habonim cannot anticipate all of the situations a user may encounter while installing and using Habonim valves. The user **MUST** know and follow all applicable industry specifications on the safe installation and use of these valves. Misapplication of the product may result in injuries or property damage. Refer to Habonim product catalogues, product brochures and installation, operating and maintenance manuals for additional product safety information or contact Habonim.

1. Keep hands and objects away from the valve ports at all times. Actuated valves could be accidentally operated, resulting in serious injury or valve damage.
2. 2. Before removing a valve from the line, always make sure the line has been depressurized and drained. Cycle the valve a few times to relieve any pressure that could be trapped in the body cavity.
3. 3. Utmost caution must be taken when handling a valve that has toxic, corrosive, flammable or a contaminant nature media flowing through its pipeline. The following safety precautions are recommended when dismantling valves with hazardous media:
   a. Wear eye shield, protective headgear, clothing, gloves and footwear.
   b. Have available running water.
   c. Have a suitable fire extinguisher when media is flammable.
4. Do not try to operate a valve that exhibits any sign of leakage. Isolate the valve and either repair or replace it.
5. Do not use or substitute non Habonim components or parts in Habonim valves and assemblies.

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2. SIL

Under normal operating conditions the Habonim valve should be inspected for proper functioning and signs of deterioration every 50,000 cycles or 6 months (whichever comes first). Under severe operating conditions inspection should be more frequently; detected defects should be repaired promptly.

Severe operating conditions can be defined as:

- Application temperature less than -20 deg C
- Application temperatures above 450°C, or up to 650°C with temperature limit on tag.
- Flow velocity higher than 5 m/sec for liquids, and 200 m/sec for gaseous
- Acidic media PH < 5 or alkaline media PH > 9

Habonim recommend a proof test interval of 12 months; in case of Fail to Open ESD system a partial stroke is acceptable to confirm that the installation is functioning properly.

For ESD systems with a Fail-To-Close demand, it is necessary to plan a system shut-down; de-energize the system and inspect the valve turning to its fully closed position.

It is essential to log-in the following parameters on site QA records as a proof for preserving SIL capabilities: date, hour, name and signature of the responsible engineer, air pressure on site, time to close the valve, time to open the valve.

Habonim recommend valve full maintenance operation every 500,000 cycles or 4 years, whichever comes first (refer to para. 9 in this IOM for maintenance instructions). The combined corrosion and erosion allowance for the valve body wall thickness is 1 mm. When this allowance has been eroded or corroded, mechanically removed or otherwise, the valve should no longer be used. Inspect the valve wall thickness every time the valve is maintained. Refer to Habonim Corrosion Data Chart T-614 to determine the corrosion rate for your application.

The estimated mean time to repair (MTTR) a valve, i.e. time net (line draining or cooling down time excluded from the valve MTTR) of replacing old valve with a new one is 60 minutes. Maintenance team must read and understand the Habonim product IOM before starting the operation. In case of a doubt please consult the Habonim engineering team.

When a valve has been repaired or any maintenance was performed, check the valve for proper function (proof testing). Any failures affecting functional safety should be reported to the Habonim factory. Client should consult the Habonim factory in order to obtain the product assessment, FMEDA report, and other associated statistical data to satisfy SIL level.

3. LIMITATIONS

The correct selection of materials of construction, seats and seals, internal valve components and pressure/temperature ratings determines the safe use of the valves and the particular performance requirements for the application. This information can be found on the nameplate welded to the valve body.

It is not possible to cover all installation and maintenance instructions for service of the valves, as the extent of applications that these valves can be used in, is large. It is the user's responsibility to use the valves as recommended and in accordance with the pressure and temperature limits as stated on this tag. Where in doubt, please consult with Habonim.

Unstable fluids or gases are prohibited for use in Habonim valves.

CAUTION:

The valves should be used in a well designed, adequately protected system to **ensure that external and internal pressure and temperature limits do not exceed the valve limits.**

The valve rating is defined as the lower rating of the seat and valve body.

Valve surface temperature may become extremely hot or cold due to operating conditions. Prevent any type of direct contact with the valve that may cause harm or injury .Avoid direct contact with the valve by wearing protective gloves.

The valves should be used in a well designed, adequately supported piping system such that it will not be subjected to undue forces, stresses or shock loads during service.

The valves are not designed to operate during or after earthquakes or under fatigue conditions. It is the responsibility of the owner to determine if fatigue conditions exist.

Do not allow dust layers to build up on the equipment.

The process fluid temperature shall not exceed the ignition temperature of the dust.

4. STORAGE

Prior to storage, inspect the valve for shipping damage. Keep all protective packaging, flange covers and end caps attached to the valves during storage. It is recommended to keep the valves in a clean and dry environment until ready for use.

Carbon Steel valves have a “black oxide” and oil dipped finish. This nontoxic process is performed to retard rusting during storage. It is not a substitute for paint or other means of protective coating to be applied to the valve once installed.

Stainless steel valves have their natural finish and do not need any additional protection once installed.

5. LONG TERM STOREAGE

5.1. It is advisable to store the valves in waterproof conditions.Ball valves should be protected to safeguard against humidity, Moisture, dust, dirt, sand, mud, salt spray, and sea water.

5.2. Manual ball valves must remain in the open position during the period of storage.

5.3. Actuated valves (fail to close position) remain in closed position during this time.

5.4. Valves may be stored as shipped, provided the above storage location and equipment orientation instructions are followed

5.5. In order to prevent damage, protective covers on valve ends should not be removed until immediately prior to installation.

5.6. Visual inspection should be performed on a semi-annual basis and results recorded.

6. OPERATING INSTRUCTIONS

Habonim Valves provide tight shut off when used under normal conditions and in accordance with Habonim’s published pressure/temperature chart. If these valves are used in a partially open (throttled) position, seat life may be reduced. Consult with Habonim

for the proper seat material selection.

On manual operated valves, the valve operation is done by turning the valve handle 90° clockwise to open (handle is parallel to flow line), and 90° counter clockwise to close (handle is perpendicular to flow line).

Metal seated valves are unidirectional designed; a flow arrow indicates the flow direction of the valve for proper installation.

A silicone-based lubricant is applied to assist valve break in. The lubricant, if unacceptable, may be removed by a solvent wash.

If a shut-off valve is installed for end of line service, it must be ensured that it is closed with a blind end connection and the valve is secured against being opened unintentionally.

WARNING: Never look into the valve bore while the valve is in a flow line. Pressure and fluids could escape from the valve causing harm or injury.

To prevent leakage, malfunctions resulting from internal wear or seal degradation, the user must establish a preventive maintenance and inspection program. This program must include:

a. Inspection of parts to detect loss of wall thickness which may result in decreased pressure capacity (see **Para. 2** for acceptable reduction of wall thickness).

b. Routine replacement of seals and inspection for proper operation (See **Para. 9** for maintenance instructions).

Valve operating torques, as published in the Habonim literature, are the normal expected maximum break-out torques. These torques have been confirmed by laboratory testing of each valve under controlled conditions. Highly viscous or abrasive media, frequency of operation and temperature fluctuations could cause an increase in valve torque.

7. INSTALLATION

The installation procedure for metal seated ball valves is critical to ensuring both long life and satisfying performance. Valves stored on site, awaiting installation, should be kept in their original packing, in dry conditions, where damage will not occur (See **Para. 4**). Before carrying out the installation, it is important to follow the basic procedures described below:

General

7.1. Carefully unpack the valve and check valve nameplate for identification of materials (see **Figure 3**).

7.2. Remove any special packing materials surrounding the valve.

7.3. Check the valve for the flow direction indication marks. Appropriate care must be taken, to install the valve for proper flow orientation.

7.4. Inspect the valve interior through the end ports to determine it is clean and free from foreign matter according to ASME G93-03E1.

7.5. Cycle the valve and inspect any functionally significant features.

7.6. Read all the literature and note any special warning tags or plates attached to the valve.

7.7. Before installation check to insure that the flow line balls are in the fully open position in order to prevent possible damage to the balls and seats. The valve performance depends on its original conditions. At any stage do not leave the valve in the partially open position on either of the lines.

8. Flanged Valves

8.1. Before installing the valve, make sure the flanges on the mating pipe are free from excessive grit, dirt or burrs, and that there is no mechanical damage to the flanges on the pipe.

8.2. The mating flanges must be aligned and parallel with the correct distance to allow the valve face-to-face dimension and gaskets to fit between.

8.3. Use standard piping practices.

8.4. Make sure to assemble the valve in the arrow flow direction

8.5. Insert the valve between the mating flanges. Avoid harming the sealing surfaces of the flanges.

8.6. Align the valve and mating flanges and insert at least 2 bolts at the lowest side of the flange to support the gaskets.

8.7. Insert the gaskets between the flanges. Insert the remaining bolts.

8.8. Before tightening the bolts, make sure the gaskets are aligned with the raised face of the mating flanges.

8.9. Tighten the flange bolts according to the gasket manufacturer's recommended instructions.

8.10. It is recommended to use ring spanners to tighten and support the bolts and nuts.

8.11. Before flushing the line, be sure the valves are in the fully open position. Fail-to-close actuated valves should be operated to the open position for flushing.

8.12. Before performing any pressure test in the valves, open the valves to half-aperture to ensure pressure reaches the stem seals and to avoid unnecessary seats loading.

9. MAINTENANCE

HABONIM valves have a long and reliable life, and maintenance is seldom required. When maintenance is necessary, valves can be refurbished on site.

To extend valve performance and reduce possible plant problems, the following procedures should be followed:

9.1. If leakage around the stem is noticed, check the stem nut torque according to value in **Table 1**. If the leak continues, tighten the gland nut about a 1/6-turn as a routine maintenance procedure. This will compensate for any wear or settling of the gland packing.

9.2. **Caution:** Excessive tightening of the stem nut can result in accelerated seal wear and high valve operating torque.

9.3. If the valve is removed from the line and disassembled, replacement of all seats and seals is recommended using the appropriate Habonim Repair kit. Examine all metallic sealing surfaces such as ball, stem, and the surfaces on the end connectors that contact the seats for wear, corrosion or damage.

9.4. Only Habonim authorized spare parts should be used. Repair kits series from Habonim consist of the following:

1 x ball
2 x seats set
2 x body seals
1 x seat seal
1 x spring
2 x stem thrust seal

1 x stem packing

1 X bonnet seal (for high temperatures series **Z73T, Z74T, Z77T,** and **Z78T** only)

9.5. 9.5 In addition to repair kits, other spare parts are available from Habonim, such as stem, glands, bolts, screws and nuts. Should additional parts be required, it is recommended that the complete valve be replaced.

9.6. 9.6 When ordering repair kits, please provide the valve size and full figure number code and series, engraved on the valve ID tag.

10. DISASSEMBLY

The following instructions are for off-line disassembly of valves sizes 1/2" (DN15) To 1 ½" (DN40)

10.1. Cycle the valve with the line pressure fully relieved before attempting to remove the valve from the pipeline, to insure pressure has also been discharged from the valve cavity.

10.2. Rotate the valve handle to the "open" position (see Para. 6 for valve handle position).

10.3. With the valve in the open position, loosen all the flange bolts.

10.4. Remove all flange bolts, so the valve can slide side-ways from its installed position and be brought out of the pipe line .

10.5. Clamp the valve in a vice or connect the valve back flange to a fixture to support it before removing the valve End.

10.6. Loosen the valve body nuts and remove the end cap. Lay the end cap on the flange side and remove the downstream metal seat from its place.

10.7. Support the ball to prevent it from falling out of body and turn handle to the "close" position for its removal (see para. 6 for valve handle position). Set the ball aside in a clean and secure area for reuse.

10.8. Remove and discard the body seal and the downstream seat seal from the body. Take care not to damage the sealing surfaces of the body or end cap.

10.9. Sections 8.10-8.11 refer to standard stem valve design Z73, Z74, Z77, and Z78 series. Sections 8.12-8.13 refer to High temperature stem valve design Z73T, Z74T, Z77T, and Z78T series

10.10. Remove the handle nut, serrated washer, and handle, locking clip, stem nut, disk springs and follower. Place all removed components, in a clean and secure area.

10.11. Push the stem down into the body cavity and remove it (do not damage the body core). Discard the stem thrust seal, bearing and packing, care taken not to scratch or nick the stem bore area of the body. Clean the stem and stem bore area.

10.12. Remove the handle nut, serrated washer and handle.

10.13. Remove the bonnets bolts. Slightly pull up the bonnet, and remove locking clip, stem nut, disc springs, location ring, stem packing, follower, stem thrust seals. Place all removed components, in a clean and secure area.

10.14. Remove the upstream seat and spring.

The following instructions are for off-line disassembly of valves sizes 2" (DN50) to 8" (DN200)

10.15. Cycle the valve with the line pressure fully relieved before attempting to remove the valve from the pipeline, to insure pressure has also been discharged from the valve cavity.

10.16. Rotate the valve handle to the "open" position (see Para. 6 for valve handle position).

10.17. With the valve in the open position, loosen all the flange bolts.

10.18. Remove all flange bolts, so the valve body can slide side-ways from its installed position and be brought out of the pipe line (see **figure 3**).

10.19. Clamp the valve in a vice or connect the valve back flange to a fixture to support it before removing the valve End.

10.20. Loosen the valve body nuts and remove the end cap. Lay the end cap on the flange side and remove the downstream metal seat from its place.

10.21. Support the ball to prevent it from falling out of body and turn handle to the "close" position for its removal (see para. 6 for valve handle position). Set the ball aside in a clean and secure area for reuse.

10.22. Remove and discard the body seal and the downstream seat seal from the body. Take care not to damage the sealing surfaces of the body or end cap.

10.23. Sections 10.24-10.25 refer to standard stem valve design Z73, Z74, Z77, and Z78 series. Sections 10.26-10.27 refers to High temperature stem valve design Z73T, Z74T, Z77T, and Z78T series

10.24. Remove the wrench bolt, wrench head and handle, stem nut, stop plate and follower. Place all removed components, in a clean and secure area.

10.25. Push the stem down into the body cavity and remove it (do not damage the body core). Discard the stem thrust seal, bearing and packing, care taken not to scratch or nick the stem bore area of the body. Clean the stem and stem bore area.

10.26. Remove the wrench bolt, wrench handle with wrench head,

10.27. Remove the bonnets bolts. Slightly pull up the bonnet, and remove the stem nut, tab washer, stop plate, follower, and stem packing, stem thrust seal, bonnet seal and bearing. Place all removed components, in a clean and secure area.

11. ASSEMBLY

The following instructions are for off-line assembly of valves sizes 1/2" (DN15) To 1 ½" (DN40)

11.1. Lubricate the new stem thrust seals, bearings and packing's, with appropriate lubricant (TURMOPAST - thin smear). Place the stem thrust seals on the stem. Place the two stem thrust bearings on the stem.

11.2. Sections 11.3-11.7 refer to standard stem valve design Z73, Z74, Z77, and Z78 series. Sections 11.8-11.18 refer to High temperature stem valve design Z73T, Z74T, Z77T, and Z78T series

11.3. Insert the stem in horizontal position into the body center section, with the threaded side first and carefully guide it up through the stem bore.

11.4. Holding the stem up, insert the new packing over the stem and into the stem bore. Place the bearing, follower and two disk springs onto the stem. The first spring's convex facing down, and the second spring convex facing up.

11.5. Thread the stem nut onto the stem. Tighten the stem nut to the torque figures (**Table 1**).

11.6. Place the locking clip on the stem nut by adjusting the orientation of the nut (in the clockwise direction).

11.7. If required, place the handle, serrated washer and thread the handle nut on the stem. Tighten the handle nut, while holding the handle.

11.8. Lubricate the new stem thrust seals, bearings and packing's, with appropriate lubricant (TURMOPAST - thin smear). Place the stem thrust seals on the stem.

11.9. Insert the stem inside the bonnet.

11.10. Insert the stem packing and follower into the bonnet.

11.11. Install the location rings.

11.12. Install the disc springs, facing each other. The first spring's convex facing down, and the second spring convex facing up.

11.13. Thread the stem nut onto the stem. Tighten the stem nut to the torque figures (**Table 1**).

11.14. Place the locking clip on the stem nut by adjusting the orientation of the nut (in the clockwise direction).

11.15. If required, place the handle, serrated washer and thread the handle nut on the stem. Tighten the handle nut, while holding the handle.

11.16. Insert the bonnet seal

11.17. Insert the body bearing to the stem cavity

11.18. Insert the bonnet and bonnet bolts (tighten bolts according to **Table 3**, tightening pattern according to **figure 2**).

11.19. Insert a new graphite body seal. Place the new graphite seal on the back face of the downstream seat.

11.20. To prevent galling of threads of bolts or nuts, lubricate threads with an anti-galling compound (Turmopast).

11.21. Place the downstream seat on the downstream seat seal and place the end connector on the body. Insert the body bolts (or stud + nuts) and tighten them evenly (according to **figure 1**) to the torque figures in (**table 2**) using a proper tool.

The following instructions are for off-line assembly of valves sizes 2" (DN50) to 8" (DN200)

11.22. Sections 11.23-11.26 refer to standard stem valve design Z73, Z74, Z77, and Z78 series. Sections 9.27-9.34 refer to High temperature stem valve design Z73T, Z74T, Z77T, and Z78T series

11.23. Lubricate the new stem thrust seals, bearings and packing's, with appropriate lubricant (TURMOPAST - thin smear). Place the stem thrust seals on the stem.

11.24. Insert the stem in horizontal position into the body center section, with the threaded side first and carefully guide it up through the stem bore.

11.25. Holding the stem up, insert the new packing over the stem and into the stem bore. Place the bearing, follower and two disk springs onto the stem. The first spring's convex facing down, and the second spring convex facing up.

11.26. Thread the stem nut onto the stem. Tighten the stem nut to the torque figures (**Table 1**).

11.27. Lubricate the new stem thrust seals, bearings and packing's, with appropriate lubricant (TURMOPAST - thin smear). Place the stem thrust seals on the stem.

11.28. Insert the stem inside the bonnet.

11.29. Insert the stem packing, follower.

11.30. Install the stop plate; note that the plate edge is pointing to the same direction of the arrow plate welded to the valve body.

11.31. Insert the tab washer, stem nut (tighten according to **Table 1**)

11.32. Insert the wrench handle and bolt, tighten to manual tightening.

11.33. Insert the bonnet seal

11.34. Insert the bonnet and bonnet bolts, tighten according to **Table 3,** tightening pattern according to **figure 2**

11.35. Insert a new graphite body seal. Place the new graphite seal on the back face of the downstream seat.

11.36. To prevent galling of threads of bolts or nuts, lubricate threads with an anti-galling compound.(Turmopast)

11.37. Place the downstream seat on the downstream seat seal and place the end connector on the body. Insert the body bolts (or stud + nuts) and tighten them evenly (according to **figure 1**) to the torque figures in (**table 2**) using a proper tool.

TABLE 1
Stem Nut Tightening Torque

Full Bore	Nut Thread	Graphite Seal	
		Nm	in.lb
½"	⅜"-24 UNF	6	53
¾"	7/16"-20 UNF	11	97
1"	7/16"-20 UNF	11	97
1½"	9/16"-18 UNF	16	140
2"	M20x2.5	36	320
3"	1"-14 UNS-2A	72	637
4"	1"-14 UNS-2A	72	637
6"	1½" 12UNF-2A	145	1280
8"	1½" 12UNF-2A	145	1280

IMPORTANT:
An excessively tightened stem nut can cause excessive packing wear and increase stem torque.

TABLE 2
Body Bolts Tightening Torque

Full Bore	Bolt thread	Tightening torque	
		Nm	in.lb
½"	M8	18	160
¾"	M10	39	345
1"	M10	39	345
1½"	M12	65	575
2"	M12	65	575
3"	M16	245	2170
4"	M16	245	2170
6"	M20	490	4340
8"	M24	560	4955

TABLE 3
Bonnet Bolt Tightening Torque

Full Bore	Bolt thread	Tightening torque	
		Nm	in.lb
½"	M5	8	71
¾"	M5	8	71
1"	M6	14	124
1½"	M6	14	124
2"	M8	18	160
3"	M10	39	345
4"	M12	65	575
6"	M20	490	4337
8"	M20	490	4337

FIGURE 1
Body Bolts Tightening Patte

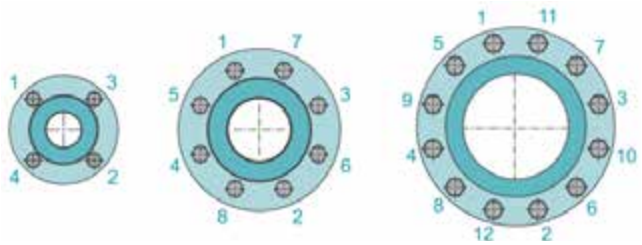
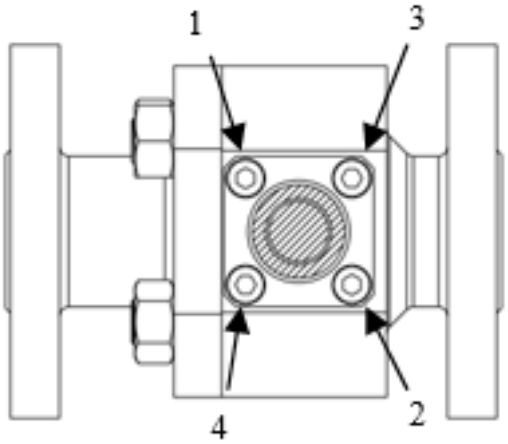


FIGURE 2
Bonnet bolts tightening pattern



Sizes 2"- 8"

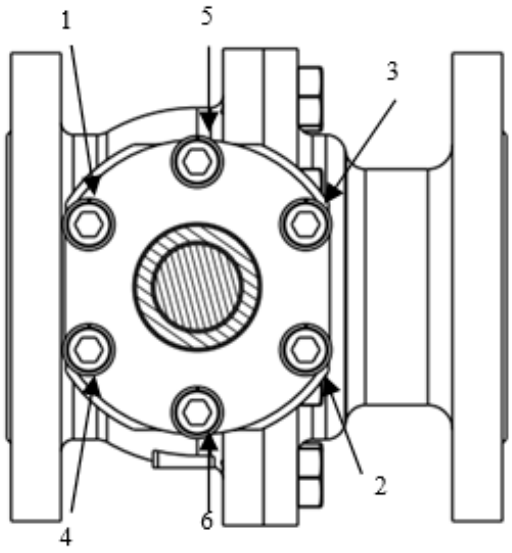
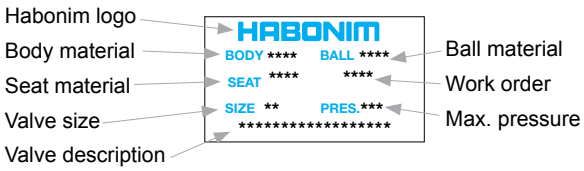


FIGURE 3
Valve Marking and Labeling



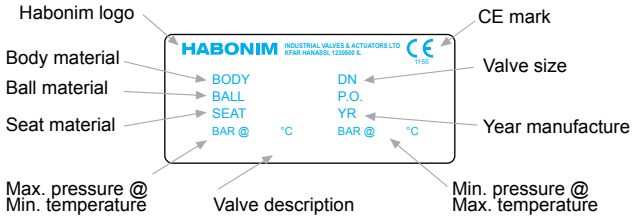
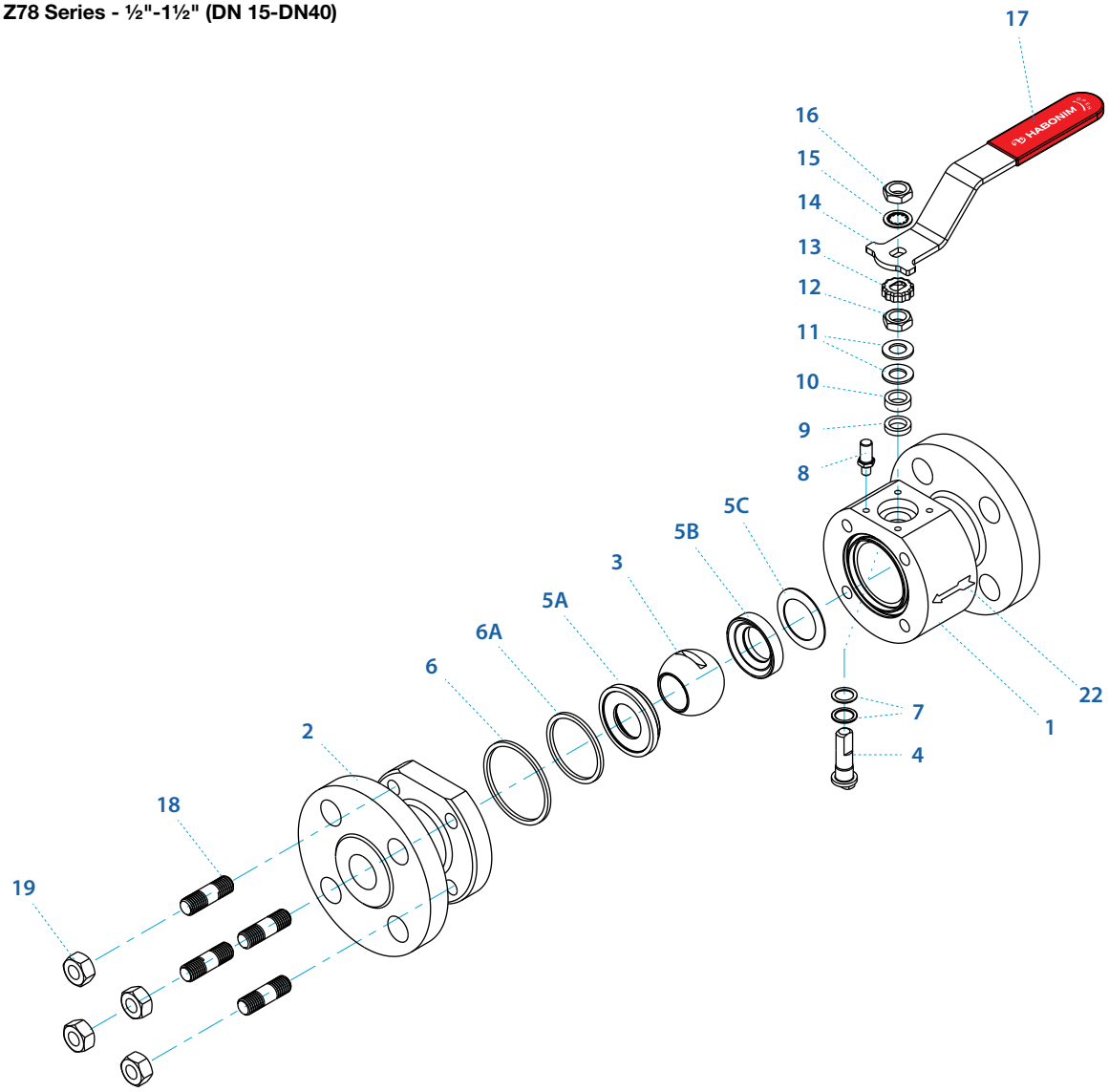


FIGURE 4

Valve slide out and maintenance

Z73, Z74, Z78 Series - ½"-1½" (DN 15-DN40)

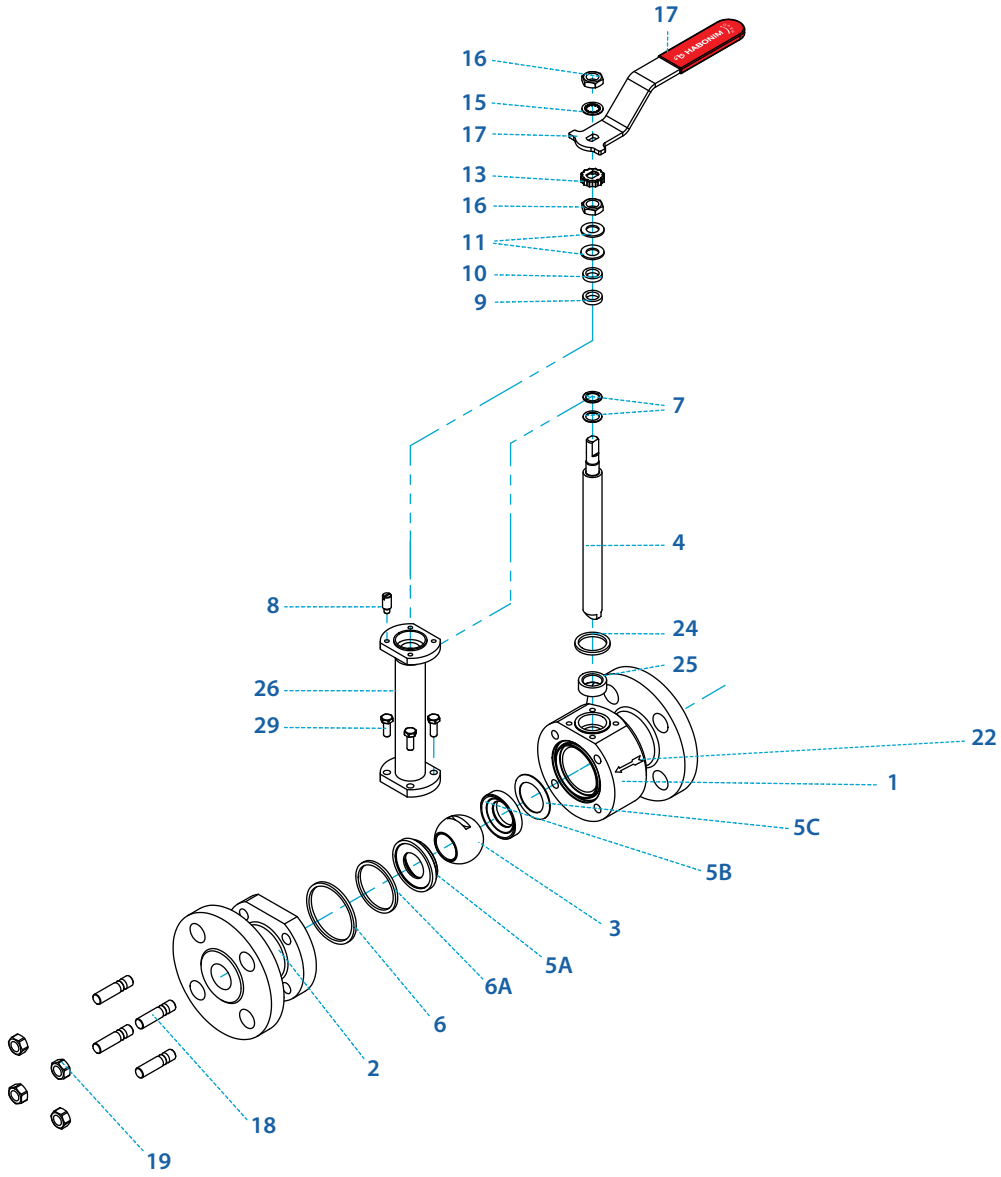


Item	Description	Material specification	Qty.
1	Body	A479 316L, A479 S31254, A479 S31803, A479 S32750, A350 LF2,	1
2	End	A479 316L, A479 S31254, A479 S31803, A479 S32750, A350 LF2	1
3	Ball	A351 CF8M, A351 CK3MCuN, A995 CD3MN 4A , A995 CE3MN 5A. Hardended with LTPN - Low Temperature Plasma carboNitriding technology	1
4	Stem	A564 Gr.630 H1150D 17-4PH, B637 N07718 Inconel 718	1
5A	Upstream seat	A479 316L, A479 S31254, A479 S31803, A479 S32750. Hardended with LTPN - Low Temperature Plasma carboNitriding technology	1
5B	Downstream seat	A479 316L, A479 S31254, A479 S31803, A479 S32750. Hardended with LTPN - Low Temperature Plasma carboNitriding technology	1
5C	Upatream disc spring	Inconel 718	1
6*	Body seal	Graphite	1
6A*	Seat seal	Graphite	1
7*	Stem thrust seal	A479 316L Hardended with LTPN - Low Temperature Plasma carboNitriding technology, B637 N07718 Inconel 718	2

Item	Description	Material specification	Qty.
8	Stop pin	A582 303	1
9*	Stem seal	Graphite	1
10	Follower	B783 316L	1
11	Disc spring	A693 631 17-7PH	2
12	Stem nut	A194 8M, EN3506-2 A4-80	1
13	Locking clip	A167 304	1
14	Handle	A659 G10200 Zinc plate, A240 430	1
15	Serrated washer	A240 410	1
16	Handle nut	A194 8M, EN3506-2 A4-80	1
17	Sleeve	PVC	1
18	Body bolts/studs	EN 3506-1 A4-80, A193 B8M, A193 B7 zinc plated	4
19	Body nut	EN 3506-2 A4-80, A194 B8, A194 7 zinc plated	4
22	Arrow flow	A167 304	1
23	Tag (not shown)	A167 304	1

* Repair kit components

Z73T, Z74T, Z78T Series - 1"-1½" (DN 25-DN40)

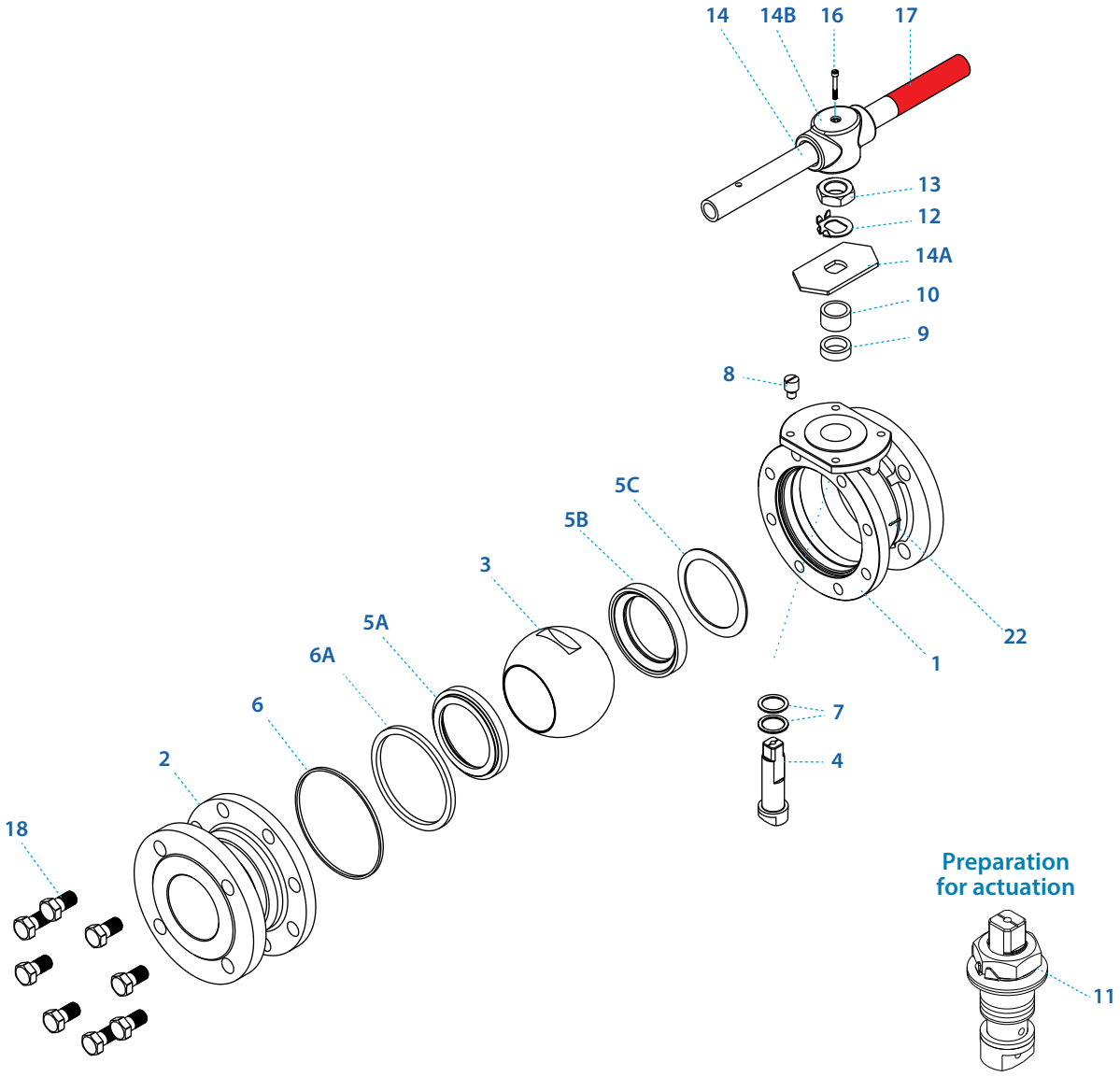


Item	Description	Material specification	Qty.
1	Body	A479, 316L, A479 321, A350 LF2, A351 CF8M, A216 WCB	1
2	end	A479, 316L, A479 321, A350 LF2, A351 CF8M, A216 WCB	1
3	Ball	Base material: A182 F316, A182 F316H, A182 F6A Coating**: Cr3C2 - Chromium Carbide with Nickel Chrome binder (HVOF).	1
4	Stem	B637 N07718 Inconel 718	1
5A	Downstream seat	Base material: A182 F316, A182 F316H, A182 F6A Coating**: Cr3C2 - Chromium Carbide with Nickel Chrome binder (HVOF).	1
5B	Upstream seat	Base material: A182 F316, A182 F316H, A182 F6A Coating**: Cr3C2 - Chromium Carbide with Nickel Chrome binder (HVOF).	1
5C	Upstream seat spring	Inconel 718	1
6*	Body seal	Graphite	2
6A*	Seat seal	Graphite	1
7*	Stem thrust seal	A479 316L, Hardended with LTPN - Low Temperature Plasma carboNitriding technology. B637 N07718 Inconel 718	2

Item	Description	Material specification	Qty.
8	Stop pin	A582 303	1
9*	Stem seal	Graphite	1
10	Follower	B783 316L	1
11	Disc spring	A693 631 17-7PH	2
12	Stem nut	A194 8M, EN3506-2 A4-80	1
13	Locking clip	A167 304	1
14	Handle	A659 G10200 Zinc plate, A240 430	1
15	Serrated washer	A240 410	1
16	Handle nut	A194 8M, EN3506-2 A4-80	1
17	Sleeve	PVC	1
18	Body bolts/studs	A193 B8M, A193 B7 zinc plated,A534 660	4
19	Body nuts	A194 B8, A194 7 zinc plated,A534 660	4
22	Arrow flow	A167 304	1
23	Tag (not shown)	A167 304	1
24	Bonnet seal	Graphite	1
25	Stem Bearing	B637 N07718 Inconel 718 , Bonze	1
26	Bonnet	A351 CF8M, A479 321, A479 316H	1
29	Bonnet bolts	A193 B8M, A534 660	4-6

* Repair kit components
** Other coatings avilable
WC-Co - Tungsten Carbide with Cobalt binder (HVOF), Stellite (PTA)

Z73, Z74, Z77, Z78 Series - 2"-8" (DN50-DN200)

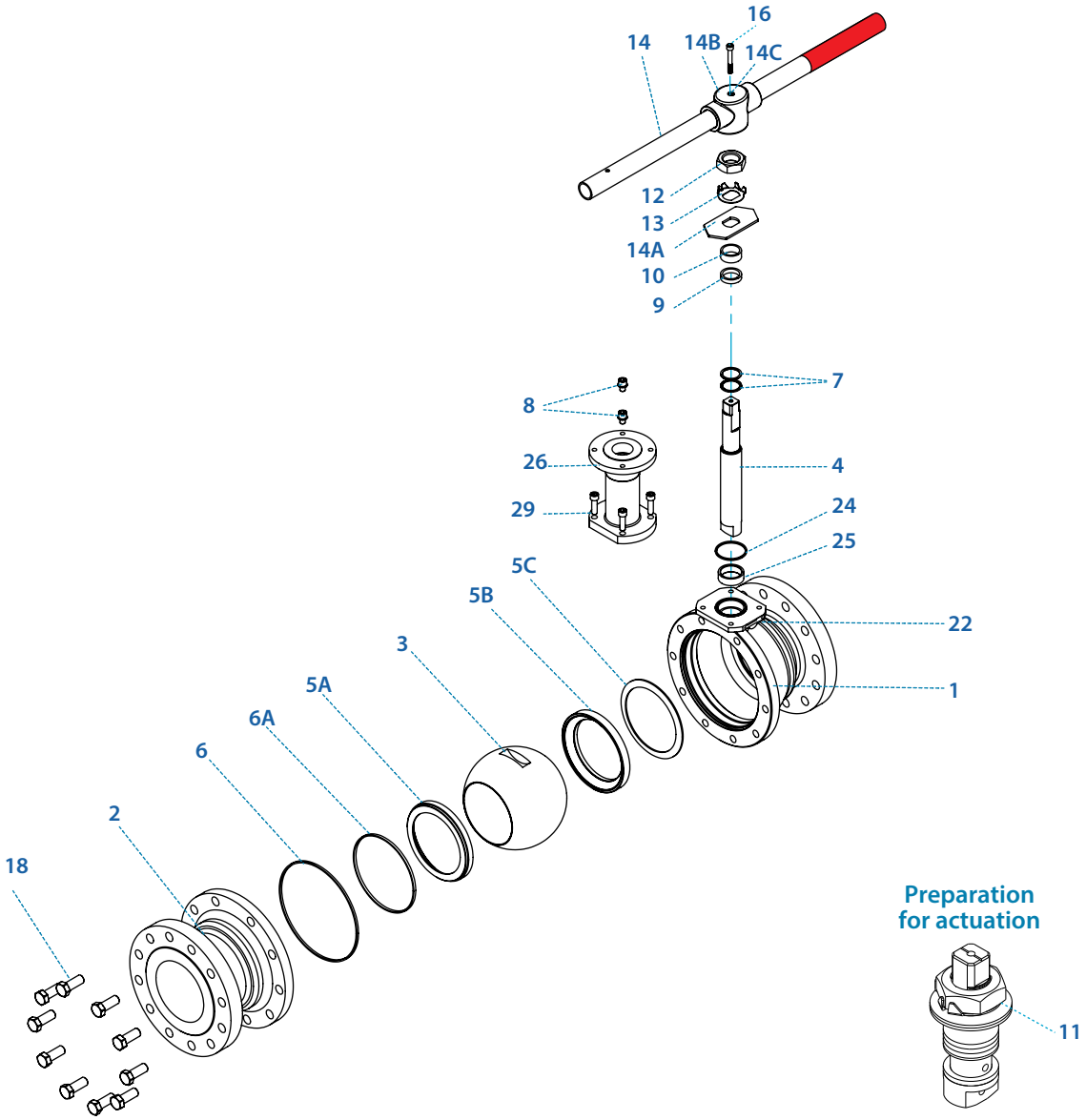


Item	Description	Material specification	Qty.
1	Body	A351 CF8M, A216 WCB, A351 CK3MCuN, A995 CD3MN 4A , A995 CE3MN 5A	1
2	End	A351 CF8M, A216 WCB, A351 CK3MCuN, A995 CD3MN 4A , A995 CE3MN 5A	1
3	Ball	A351 CF8M, A351 CK3MCuN, A995 CD3MN 4A , A995 CE3MN 5A. Hardended with LTPN - Low Temperature Plasma carboNitriding technology	1
4	Stem	A564 Gr.630 H1150D 17-4PH, B637 N07718 Inconel 718	1
5A	Downstream seat	A479 316L, A479 S31254, A479 S31803, A479 S32750. Hardended with LTPN - Low Temperature Plasma carboNitriding technology	1
5B	Upstream seat	A479 316L, A479 S31254, A479 S31803, A479 S32750. Hardended with LTPN - Low Temperature Plasma carboNitriding technology	1
5C	Upatream disc spring	Inconel 718	1
6*	Body seal	Graphite	1
6A*	Seat seal	Graphite	1
7*	Stem thrust seal	A479 316L Hardended with LTPN - Low Temperature Plasma carboNitriding technology, B637 N07718 Inconel 718	2

Item	Description	Material specification	Qty.
8	Stop pin	A582 303	1
9*	Stem seal	Graphite	1
10	Follower	B783 316L	1
11	Disc spring	A693 631 17-7PH	2
12	Stem nut	A194 8M, EN3506-2 A4-80	1
13	Tab lock washer	A240 304	1
14	Handle	C.St. A29 G10200 Zinc plate, A240 430	1
14A	Stop plate	C.St. 1.0402 Zinc plate, A240 430	1
14B	Wrench head	Ductile Iron A536 Gr. 65-45-12, A216 WCB, A351 CF8M	1
16	Wrench bolt	EN3506-1 A2-70/A4-80, A193 Gr B8/B8M	1
17	Sleeve	PVC	1
18	Body bolts	EN 3506-1 A4-80, A193 B8M, A193 B7 zinc plated	8-12
22	Arrow flow	A167 304	1
23	Tag (not shown)	A167 304	1

* Repair kit components

Z73T, Z74T, Z77T, Z78T Series - 2"-8" (DN50-DN200)



Item	Description	Material specification	Qty.
1	Body	A351 CF8M, A216 WCB	1
2	end	A351 CF8M, A216 WCB	1
3	Ball	Base material: A182 F316, A182 F316H, A182 F6A Coating**: Cr3C2 - Chromium Carbide with Nickel Chrome binder (HVOF).	1
4	Stem	B637 N07718 Inconel 718	1
5A	Downstream seat	Base material: A182 F316, A182 F316H, A182 F6A Coating**: Cr3C2 - Chromium Carbide with Nickel Chrome binder (HVOF).	1
5B	Upstream seat	Base material: A182 F316, A182 F316H, A182 F6A Coating**: Cr3C2 - Chromium Carbide with Nickel Chrome binder (HVOF).	1
5C	Upstream seat spring	Inconel 718	1
6*	Body seal	Graphite	2
6A*	Seat seal	Graphite	1
7*	Stem thrust seal	A479 316L, Hardended with LTPN - Low Temperature Plasma carboNitriding technology. B637 N07718 Inconel 718	2
8	Stop pin	A582 303	1

Item	Description	Material specification	Qty.
9*	Stem seal	Graphite	1
10	Follower	B783 316L	1
11	Disc spring	A693 631 17-7PH	2
12	Stem nut	A194 8M, EN3506-2 A4-80	1
13	Tab lock washer	A240 304	1
14	Handle	C.St. A29 G10200 Zinc plate, A240 430	1
14A	Stop plate	C.St. 1.0402 Zinc plate, A240 430	1
14B	Wrench head	Ductile Iron A536 Gr. 65-45-12, A216 WCB, A351 CF8M	1
16	Wrench bolt	EN3506-1 A2-70/A4-80, A193 Gr B8/B8M	1
17	Sleeve	PVC	1
18	Body bolts	A193 B8M, A193 B7 zinc plated, A534 660	8-12
22	Arrow flow	A167 304	1
23	Tag (not shown)	A167 304	1
24	Bonnet seal	Graphite	1
25	Stem Bearing	B637 N07718 Inconel 718 , Bonze	1
26	Bonnet	A351 CF8M, A479 321, A479 316H	1
29	Bonnet bolts	A193 B8M, A534 660	4-6

* Repair kit components

** Other coatings avilable

WC-Co - Tungsten Carbide with Cobalt binder (HVOF), Stellite (PTA)