

# Valves & Actuators

## Products Overview







## **Inspired By Challenge**

Established in 1949, with over 60 years of experience, Habonim is committed to engineering, manufacturing and supplying superior products and providing excellent personal service to our customers. We take pride in incorporating quality, innovation, reliability and safety into our products. We provide the best professional solutions for the most demanding industries, including oil and gas, chemical, petrochemical, pharmaceutical and mining. In addition to standard floating ball valves, we manufacture trunnion, cryogenic, high pressure and metal seated valves, as well as control and automation systems, pneumatic actuators and complex manifold assemblies for economical solutions to specialized tasks. Our dedicated staff focuses on developing new products while continually upgrading our existing lines. Our expertise is providing personalized solutions for each customer's unique requirements. Always keeping safety and environmental considerations in mind, Habonim products comply with the strictest industrial and international standards. Our products are highly durable under the most extreme conditions and undergo rigorous testing before being launched into the market. Habonim leads the industry with expertise based on decades of experience; we take special pride in our system-based solutions, which embody our strength and vision.

## Prelude

Ball valves play a fundamental and critical role in modern manufacturing around the world. Properly selected and well-maintained ball valves increase efficiency, safety, profitability, and safeguard the environment.

The Habonim Main Catalog is an aggregate of invaluable information for process and piping engineers. It not only describes Habonim's valves and actuators but also assists the engineer in his/her daily work with hydraulic and pneumatic information, insights into the chemical characteristics of metals, polymers and elastomers, dimensional tables, and torque graphs. This first edition is a complete revision covering the latest technologies supplied by Habonim, with vital information on ball valve performance, automation, and international standards.

### Chapter 1 | Product Overview

A thorough introduction to Habonim ball valves (floating and trunnion types) including the various valve component designs available. In this chapter we describe the key features incorporated into all of the various product lines such as the unique Habonim HermetiX™ stem seal, fire safe design, anti-static device and more. Chapter 1 also describes the cleaning, assembly and testing procedures that Habonim implements according to the requirements of different types of services. The last part of the chapter covers Habonim's automation packages including the unique COMPACT™ 4-piston actuator, as well as control systems based on quarter-turn ball valves, Habonim's exclusive low profile tubeless PNEULINK™, and tailor-made solutions built by and with engineers from around the globe.

### Chapter 2 | Floating Ball Valves

Describes in detail all of the various floating ball valve configurations up to Class 2500 pressure, including standard 3-piece valves, flanged valves, multiport valves, valves for cryogenic applications and high temperature applications

### Chapter 3 | Actuation

Describes Habonim's automation product lines including the COMPACT™ 4-piston actuator, Habonim's Emergency Shutdown (ESD) solution, and the unique tubeless PNEULINK™ package.

### Chapter 4 | Accessories

Covers valve and valve accessories such as locking devices, valve extensions, various handle types, the Breather Block and the patented IMPACT™ spring assist.

### Chapter 5 | Technical information

Provides useful technical information for piping and process engineering: torques for all valves and seat materials, chemical compatibility for hundreds of different media, seat material variations, flange dimensions and more.

**A live and up-to-date electronic document of the Habonim Main Catalog is also available on [www.habonim.com](http://www.habonim.com)**  
**In the case of discrepancies between the print and electronic versions, we recommend that you use the electronic version.**

**We are confident that you will find this catalog useful and we welcome your feedback so that we can improve future editions.**



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### Cryogenic valves

C47 series  
C31/C32 series  
C73/C74 series  
C78/C77 series  
C26 series  
C28 series

### Standard valves

3 piece 47/26 series  
TuBore™ 48 series  
Flanged 31/32, 73/74, 77/78 series  
Multiport - 61/62 series

### Metal seated valves

Z47/Z47T series  
Z73, Z74/ Z73T, Z74T series  
Z78/Z78T/ Z77/ Z77T series  
Z28/Z28T series

### High pressure valves

24 series  
27 series  
28 series

### Trunnion valves

2 piece Class 150 - 81 series  
2 piece Class 300 - 82 series  
2 piece Class 600 - 83 series  
3 piece Class 150 - 91 series  
3 piece Class 300 - 92 series  
3 piece Class 600 - 93 series  
3 piece Class 900 - 94 series  
3 piece Class 1500 - 95 series  
3 piece Class 2500 - 96 series



ANSI  
pressure  
class

2500

1500

900

600

300

150

Vacuum

Cryogenic temperature

-269° C  
-452° F

**C28 series**  
3 Piece  
Class 2500  
1/4" - 8"  
DN8-DN200  
[page 232](#)

**C47 series**  
3 Piece  
Class 600  
1/4" - 2"  
DN8-DN50  
[page 200](#)

**C26 series**  
3 Piece  
Class 600  
2" - 8"  
DN50-DN200  
[page 204](#)

**DC47 series**  
Class 600  
1/2" - 2"  
DN15-DN50  
[page 240](#)

**C32 series**  
1 Piece  
Class 300  
1/2" - 8"  
DN15-DN200  
[page 210](#)

**C47 series**  
3 Piece  
Class 300  
2 1/2" - 6"  
DN65-DN150  
[page 202](#)

**C74 series**  
1 or 2 Piece  
Class 300  
1/2" - 8"  
DN15-DN200  
[page 220](#)

**C61/C62 series**  
Multiport  
Class 300  
1/2" - 4"  
DN15-DN100  
[page 236](#)

**C78 series**  
1 or 2 Piece  
PN 40  
1/2" - 2"  
DN15-DN50  
[page 226](#)

**C31 series**  
1 Piece  
Class 150  
1/2" - 8"  
DN15-DN200  
[page 206](#)

**C73 series**  
1 or 2 Piece  
Class 150  
1/2" - 8"  
DN15-DN200  
[page 214](#)

**C77 series**  
2 Piece  
PN 16  
3" - 6"  
DN80-DN150  
[page 230](#)



## Standard temperature

## High temperature

-60° C  
-76° F

+260° C  
+500° F

+400° C  
+752° F

+538° C  
+1000° F

+650° C  
+1200° F


**28 series**  
3 Piece  
Class 2500  
1/4" - 8"  
DN8-DN200  
[page 256](#)

**96 series**  
3 Piece  
Class 2500  
2" - 8"  
DN50-DN200  
[page 396](#)

**24 series**  
2 Piece  
Class 2500  
1/4" - 1 1/2"  
DN8-DN40  
[page 248](#)

**27 series**  
3 Piece  
Class 2500  
1/4" - 2"  
DN8-DN50  
[page 250](#)

**27 series**  
3 Piece  
Class 1500  
2 1/2" - 8"  
DN65-DN200  
[page 252](#)

**95 series**  
3 Piece  
Class 1500  
2" - 12"  
DN50-DN300  
[page 396](#)

**94 series**  
3 Piece  
Class 900  
2" - 16"  
DN50-DN400  
[page 394](#)

**26X/W series**  
3 Piece  
Class 600  
2" - 8"  
DN50-DN200  
[page 180/184](#)

**61/62 series**  
Multiport  
Class 600  
1/2" - 1 1/2"  
DN15-DN40  
[page 152](#)

**93 series**  
3 Piece  
Class 600  
2" - 16"  
DN50-DN400  
[page 394](#)

**48X/G series**  
TuBore™  
Class 300  
1/2" - 6"  
DN15-DN150  
[page 60](#)

**83 series**  
3 Piece  
Class 600  
2" - 16"  
DN50-DN400  
[page 388](#)

**D31/S31/D32/S32 series**  
Diverter  
Class 150/300  
1/2" - 8"  
DN15-DN200  
[page 168](#)

**32X/W/G series**  
1 Piece  
Class 300  
1/2" - 8"  
DN15-DN200  
[page 90/106/122](#)

**47X/W/G series**  
3 Piece  
Class 400  
3" - 6"  
DN80-DN150  
[page 44/48/52](#)

**61/62 series**  
Multiport  
Class 300  
2" - 4"  
DN50-DN100  
[page 152](#)

**D47/S47 series**  
Diverter  
Class 600/300  
1/4" - 6"  
DN8-DN150  
[page 160](#)

**74X/W/G series**  
1 or 2 Piece  
Class 300  
1/2" - 8"  
DN15-DN200  
[page 94/110/126](#)

**78X/W/G series**  
1 or 2 Piece  
PN 40  
1/2" - 2"  
DN15-DN50  
[page 100/116/132](#)

**81/82 series**  
2 Piece  
Class 150/300  
2" - 16"  
DN50-DN400  
[page 386](#)

**91/92 series**  
3 Piece  
Class 150/300  
2" - 16"  
DN50-DN400  
[page 392](#)

**31X/W/G series**  
1 Piece  
Class 150  
1/2" - 8"  
DN15-DN200  
[page 90/106/122](#)

**73X/W/G series**  
2 Piece  
Class 150  
1/2" - 8"  
DN15-DN200  
[page 94/110/126](#)

**77X/W/G series**  
2 Piece  
PN 16  
3" - 8"  
DN80-DN200  
[page 104/120/136](#)

**Z28 series**  
3 Piece  
Class 2500  
1/4" - 1 1/4"  
DN8-DN32  
[page 290](#)

**Z28 series**  
3 Piece  
Class 2500  
1 1/2" - 6"  
DN40-DN150  
[page 292](#)

**Z47 series**  
3 Piece  
Class 600  
1/4" - 2"  
DN8-DN50  
[page 278](#)

**Z47 series**  
3 Piece  
Class 600  
2 1/2" - 8"  
DN65-DN200  
[page 280](#)

**Z78 series**  
2 Piece  
PN 40  
1/2" - 2"  
DN15-DN50  
[page 286](#)

**Z73 series**  
2 Piece  
Class 150  
1/2" - 8"  
DN15-DN200  
[page 282](#)

**Z74 series**  
2 Piece  
Class 300  
1/2" - 8"  
DN15-DN200  
[page 282](#)

**Z77 series**  
2 Piece  
PN 16  
3" - 6"  
DN80-DN150  
[page 288](#)

**Z47T series**  
3 Piece  
Class 600  
1/4" - 2"  
DN8-DN50  
[page 294](#)

**Z47T series**  
3 Piece  
Class 600  
2 1/2" - 8"  
DN65-DN200  
[page 296](#)

**Z74T series**  
2 Piece  
Class 300  
1" - 8"  
DN25-DN200  
[page 298](#)

**Z78T series**  
2 Piece  
PN 40  
1" - 1 1/2"  
DN25-DN40  
[page 302](#)

**Z73T series**  
2 Piece  
Class 150  
1" - 8"  
DN25-DN200  
[page 298](#)

**Z78T series**  
2 Piece  
PN 40  
2"  
DN50  
[page 304](#)

**Z77T series**  
2 Piece  
PN 16  
3" - 6"  
DN80-DN150  
[page 304](#)

**Z28T series**  
3 Piece  
Class 2500  
1/4" - 1 1/4"  
DN8-DN32  
[page 310](#)

**Z28T series**  
3 Piece  
Class 2500  
1 1/2" - 6"  
DN40-DN150  
[page 312](#)

**Z47T series**  
3 Piece  
Class 600  
1/4" - 1 1/4"  
DN8-DN32  
[page 306](#)

**Z47T series**  
3 Piece  
Class 600  
1 1/2" - 6"  
DN40-DN150  
[page 308](#)





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### Quarter-turn floating ball valve

#### One-piece design

The standard-port, one-piece, solid-cast body and flange design ensures minimum leak paths. The valve complies with ANSI B16.5 for flange dimension and ANSI B16.10 for Face-to-Face dimensions. In the standard design, the valve flange raised face is serrated per ANSI B16.11. The body includes an ISO 5211 integral mounting pad for easy automation. To facilitate easy assembly and maintenance, the valve is designed with one flange with a side entry that allows all inner parts to be positioned easily, and with a threaded plug that sets all parts under a precise preload with high repeatability. The result is optimum operating torque and bubble tight shut-off. It is possible to modify the ANSI-standard flange connections by drilling the flanges to the EN1092 PN16 and PN40 standard. It is also possible to change one flange to a weld-end connection. A thermal jacket (steam jacket) over a one-piece design is the most efficient solution in applications where heating up the valve's outer surface (and the media inside) is mandatory to maintain media flow.

#### 31 series

ANSI B16.34 class 150  
Size ½"-8" (DN15-DN200)

#### 32 series

ANSI B16.34 class 300  
Size ½"-8" (DN15-DN200)



#### Two-piece design

This unique full-port two-piece solid-cast body and flanged end design supports high flow capacity. The Habonim two-piece design is available in ANSI B16.10 for Face-to-Face dimensions and ANSI B16.5 class 150 and ANSI class 300 flange dimensions and also in EN 1092 PN16 and PN40. In the standard design, the valve flange raised face is serrated per ANSI B16.11. The body includes an ISO 5211 integral mounting pad for easy automation. The valve is designed as a split construction which facilitates easy assembly and maintenance with standard tools. Tightening the end connector to the valve body via the body bolts preloads the complete ball-seat set, ensuring low operating valve torque, repeatability, and bubble tight shut off.

#### 73 series

ANSI B16.34 class 150  
Size ½"-8" (DN15-DN200)

#### 74 series

ANSI B16.34 class 300  
Size ½"-8" (DN15-DN200)

#### 78 series

EN 1092 flanged PN40  
Size ½"-2" (DN15-DN50)

#### 77 series

EN 1092 flanged PN16  
Size 3"-8" (DN80-DN200)





## Three-piece design

The forged, cast, or rolled bar 3-piece design is comprised of a body (center section) and a variety of end connectors (thread, weld, flange) to facilitate a wide range of construction configurations. The swing-out design of the center section allows the end connector to remain a fixed part of the pipe work while the valve itself can be easily maintained by swinging out the center section only.

### 47 series

Standard or full port design, forged or cast  
ANSI B16.34 class 900 (wall thickness), size 1/4"-2" (DN8-DN50)  
ANSI B16.34 class 400 (wall thickness), size 2 1/2"-6" (DN65-DN150)



### 26 series

Full port, solid cast  
In full compliance with ANSI B16.34 class 600  
size 2"-8" (DN50-DN200)



### 27 series

Standard and full port, forged or rolled bar,  
ANSI B16.34 class 2500 (wall thickness), size 1/4"-2" (DN8-DN50)  
ANSI B16.34 class 1500 (wall thickness), size 2 1/2"-8" (DN65-DN200)  
Breakout torque to open under maximum Class 2500 differential pressure, for size up to and including 2" (DN50)  
Breakout torque to open under maximum differential pressure of 70 bar (1015 psi), for size 2 1/2" (DN65) and above



### 28 series

Standard and full port, forged or rolled bar, robust design, with Hybrid seats technology.  
ANSI B16.34 class 2500 (wall thickness), size 1/4"-8" (DN8-DN200)  
Breakout torque to open under maximum Class 2500 differential pressure, for size up to and including 2" (DN50)  
Breakout torque to open under maximum Class 1500 differential pressure for size 2 1/2" (DN65) and above.



### Multiport valves

Multiport valves are primarily used to simplify pipe and valve systems by replacing multiple two-way valves with a single multiport valve. They minimize dead legs, optimize drainability, simplify system validation and have a reduced envelope profile for easier installation.

Multiport valves allow piping and machine engineers to design a simpler system that saves space and has fewer flow elements and leak paths. One multiport valve can replace multiple two-way valves and automation devices, and provides safe and easy changeover and flow shutoff, all within a confined space. Reducing the quantity of piping and fittings also means faster and more cost-effective construction.

Available in a variety of flow patterns and directions and in both automatic and manual configurations, the design possibilities offered by the multiport valve are virtually unlimited.



### Diverter valves

Diverter valves are primarily used to split or combine process flows, or to switch medium among different pieces of process equipment such as pumps, filters, or whole pipelines.

Diverter valves provide reliable high flow rates in the most severe operating conditions, including vacuum conditions. They can also handle highly viscous media without the need for constant back-flushing.

The diverter valves are available with different ball designs to accommodate a wide range of flow patterns. These flexible flow combinations reduce the number of valves in a system, thereby saving costs and facilitating easier control. Because all of the diverter valves have the same body Face-to-Face dimensions, they can be used with all standard end connections.



## Fire safe design

Valves to be used in explosive or fire-hazard areas must be designed to prevent in-line leaks for at least 30 minutes when exposed to flames and/or temperatures between 900 - 1000°C. In addition, after cooling down, a fire-safe valve has to be able to be cycled once and seal at an acceptable level of in-line leakage.

The fire-safe valves available in the market today typically include stem and body seals fabricated from graphite, which is well-known as a fire-retardant material. In the event of fire, the valve's soft seats melt and the ball is pressed against a metallic fire lip on the downstream end connector thus preventing in-line leakage. The fire also burns off the stem's thrust seal, causing the stem, which has a machined chamfer at its root, to be pushed up and form a metal-to-metal seal with the valve body and prevent leakage. The fire-resistant graphite stem seal then functions as a base to hold the stem parts aligned and pre-loaded so that, after cool-down, the valve can be cycled once to the open position.

Habonim has developed HermetiX™, a unique polymer-based graphite-free stem seal that, even after its polymer materials have melted, allows the stem to stay aligned and fully operable after cool-down. During normal operation, our polymer-based stem seal allows 500,000 operation cycles without maintenance, making it remarkably more durable than porous graphite seals, which have to undergo maintenance every 5,000 cycles without refurbishment.

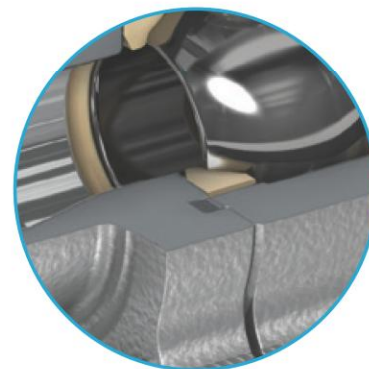
This revolutionary design has been tested and certified to API 607 and ISO 10497 standards and is default in all Habonim fire-safe valves.



## Tongue & groove body seal design

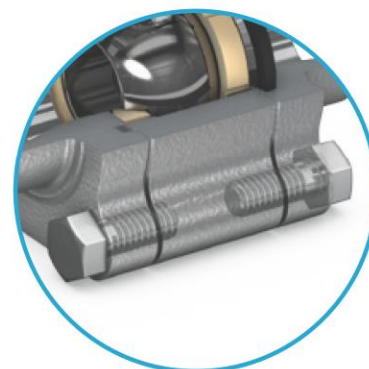
A 'tongue' machined on one side of the valve body and a matching 'groove' machined on the opposite side provides a perfect interlock system that precisely aligns the body and ends along the valve's center axis, thus increasing accuracy and repeatability during valve assembly and maintenance.

The tongue & groove design is used in all of our fire safe valves so that the expanded graphite body seal is fully encapsulated and compressed in the event of a fire. The tongue & groove design forces fluid emissions to flow in a labyrinth pattern, thus ensuring zero leakage into the atmosphere.



## Body bolts

Instead of long through-way bolts and nuts, all of our 3-piece fire-safe valves use double the number of one-size-up short bolts threaded into the body. In the event of fire these bolts minimize thermal expansion and prevent external leakage.





### Ball configurations

Our mirror-polished solid balls ensure tight shutoff and long service life. All balls come with specially rounded leading edges to eliminate excessive seat wear during rotation. Standard ball materials include Stainless Steel 316 (CF8M), Alloy-C276, Alloy-C22, Monel 400, 254SMO, Duplex, Super Duplex, Inconel 625, Titanium and more. All materials, except Stainless Steel 316 (CF8M), are marked for clear identification.

There are different styles related to the ball port itself:

- Standard port ball (also known as reduced port) - The flow through the ball is one size smaller than the pipe's size resulting in a flow area smaller than the pipe's area. The reduced flow area increases the flow velocity (assuming a constant flow discharge) and the head-loss over the valve.
- Full port ball - Has an over-sized ball so that the ball's port is larger than the pipe port, thus reducing friction loss. Flow is unrestricted but the valve is larger so full-port balls are typically used where free flow is particularly important such as in pipelines that require pigging.
- Tube bore ball (also known as true port) has a port which is identical to the tube's inside diameter. This configuration is used mainly in the pharmaceutical industry where dead legs and pockets of contamination are totally unacceptable.

### Pressure equalizing hole

Balls typically have a hole in the stem slot to equalize the pressure over the ball sphere. The pressure inside the ball port and the pressure in the valve cavity are identical and hence no stress is applied to the ball sphere. The pressure equalizing hole is eliminated in the following cases:

- High surface finish requirements, mechanically polished or electro-polished
- Diverter valves
- 
- 
- 



C  
T  
H  
S  
p  
r  
v  
b  
ir  
N  
n

U  
H  
m  
m

On baked ground cone: when a standard valve is in the closed position and a solid layer has adhered to the ball's upstream sphere, subsequent valve operation will erode the upstream soft seat, loosen the pre-load of the ball seats set, and rapidly degrade the valve's functionality. With a '159' ball media solidification is impossible as there is no surface area on which the media can accumulate. The upstream seat withstands the media unscratched; the pre-load of the ball seat set as well as the functionality of the valve remain intact for a longer period of time.

Upstream sphere  
completely machined in  
a '159' ball

### Multiport and diverter ball

Multiport and diverter ball designs are used primarily to split or combine process flows or to switch medium between alternative pieces of process equipment.

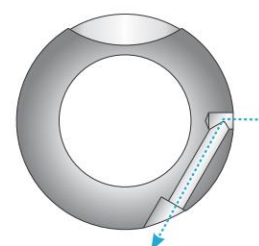
The diverter ball configuration can be either bottom entry or side entry. The diverter ball has the same sphere diameter as standard 2-way balls so the same soft parts can be used. Multiport balls have numerous flow configurations, which are described in detail in the Multiport chapter of this catalog. The multiport ball has a larger sphere diameter than a diverter ball, allowing a firm grip of four seats vs. two seats in the diverter configuration.



Diverter ball with isometric T port construction

### Downstream pressure relief ball

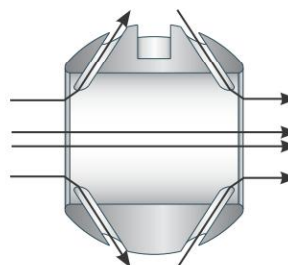
Habonim ball code BVT is designed with a diagonal hole in the downstream sphere toward the bottom of the ball. In the open position the flow runs smoothly through the valve. When the valve is closed the downstream pressure is vented through the diagonal tunnel and out via a third port incorporated into the valve body so that the relieved pressure can be diverted safely to a secured area. This feature is mainly used for pressure gauges and instrumentation service. The Habonim BVT design eliminates the need to install an additional downstream pressure vent valve.



Special diagonal tunnel vents downstream pressure when the valve is closed.

### CIP/SIP

Habonim 'CIP' ball code is mainly used in sanitary and biopharm applications. In clean applications the main ball valve problem is contamination caused by impurities trapped in the cavity between the ball's outer sphere and the valve body's inside diameter. To overcome this problem Habonim has designed a special ball that allows the stream to clean the valve cavity thoroughly during the CIP/SIP process, with the valve in the full open position. The bottom line: Bidirectional and streamlined flow with a high Cv, and self-cleaning of hidden cavities.



With the valve in the open position, special tunnels flush the valve cavity constantly



### V-Ball

The V ball is used in control valve solution for less demanding applications, such as clear liquid at a maximum pressure drop of 6 bar (87 psi), or clean gas at a maximum pressure drop of 10 bar (145 psi), and maximum temperatures of 120 °C (248 °F) for either.

The V ball design is comprised of a floating characterized ball, mounted between two seats, which maintain a trim preload and bubble-tight shut-off and low torque demand. V-Balls come in a variety of 'V' and 'slot' shapes, and can be custom designed to meet any control requirement. The V-Ball is available in a wide range of high-alloy materials and coatings for highly corrosive applications.



Characterized ball for flow control applications

### Seat configurations

#### Standard seat

A flexible, precision-machined seat that provides the highest seal capabilities (EN12567 Rate A) in high pressure and vacuum conditions. Its unique design reduces valve torque, facilitating a more compact, lower-weight automated package. The design also reduces wear, thus extending the life of the seat. The seat perimeter has pressure-equalizing slots to allow pressure to penetrate into the body cavity for better sealing and for avoiding upstream seat collapse into the valve cavity while turning the valve ball from the open to closed position under high differential pressure.



Standard seat

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#### Self-Relieving-Seat (SRS)

The Self Relieving Seat (SRS) is used mainly in syltherm and dowtherm services in the chemical and biopharm industries. Both syltherm and dowtherm have a high thermal expansion coefficient and in trapped cavities (such as when the valve ball is in its closed position) even a moderate temperature increase will cause dramatic pressure build-up that can cause cessation of valve operation, seat swelling, and even valve shell failure. The SRS is designed to flex and allow the trapped pressure to escape into the pipeline, while shutting off as soon as the peak pressure is relieved. The pressure relief is achieved by a special internal groove that is machined into the seat radii facing the ball. Additional radial grooves enable the pressure to bypass the ball and access the internal groove.

The seat sealing surface is in the central internal section and provides tight shutoff. The outer section of the seat above the internal groove gives the support needed to the ball when higher line pressure pushes the ball toward the downstream seat, thus preventing "crushing" of the seat.



Self-Relieving-Seat (SRS)

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#### Diverter seat

A diverter valve must seal the pressure at the upstream side, which contradicts the traditional floating ball mode of operation (where sealing is typically done on the downstream seat only). Habonim's solid one-piece seat-seal design blocks the flow through the back of the seat, generating an upstream seal.

Diverter seats can be used with differential pressure up to ANSI Class300. For higher differential pressures use either a diverter valve with hybrid seats, or a dual floating ball valve integrated into a one block or trunnion mounted valve.



Diverter seat

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### Hybrid seat

When a soft seated floating ball valve is held even momentarily at mid position, the upstream seat is only partially supported by the ball and can be pushed towards the valve cavity by the force of the stream.

This deformation is amplified with increased media density, high differential pressure and/or high velocity.

Under these extreme conditions the deformation can: cause the ball to grip the unsupported area of the soft seat and jam the valve; slice the seat by the port edge of the ball; or trigger stem twisting (caused by excessive torque applied by the operator trying to close the valve).

Habonim's line of Hybrid seats were developed especially to overcome the problems posed by high differential pressure applications.

The combination of a metallic housing and polymer insert offers the stiffness of a metal seat with the bubble tight shutoff leakage rate and operating torque of a soft seat. Different hybrid seat designs were developed to meet the needs of different applications, and are designated by the metallic housing design.



Hybrid seat

### Cavity filler seat

The cavity filler seat is used mainly in the biopharm and pharmaceutical industries. The design minimizes crevices and gaps between the ball and the valve body, thus reducing the risk of trapped contaminants. Because the valve body is specially machined with a larger bore diameter to fit the special cavity filler seat dimensions, they cannot be retrofit into a standard valve body. The cavity filler seat is a one piece seat-seal design and is therefore suitable for use with the Habonim 3-piece product line.

**Note:** A valve with a cavity filler seat cannot be used in fire-safe service.



Cavity filler seat

### Metal seat

Habonim metal seats are used for extreme service applications where high temperature, abrasion and/or corrosion restrict the use of soft seats. The metal seats are mated with the ball for enhanced engagement and sealing. A variety of surface treatments and coatings can be applied to the seat's outer surface to withstand corrosion, galling and other forms of wear.



Metal seat

### V-port seat

Superior control performance and accuracy is designed into the geometry of the downstream V-port. The precision wire cut 'V' shape of a metal seat, enables equal percentage flow characteristics, while S-port design ('Slot') provides linear flow characteristics. V-Port valve assembly, comprised of a ball and wire cut metal seat, lapped together into a single seamless component.

V-port design provides the high rangeability and precision throttling required for clean or dirty liquids and gases, as well as fibrous suspension applications.

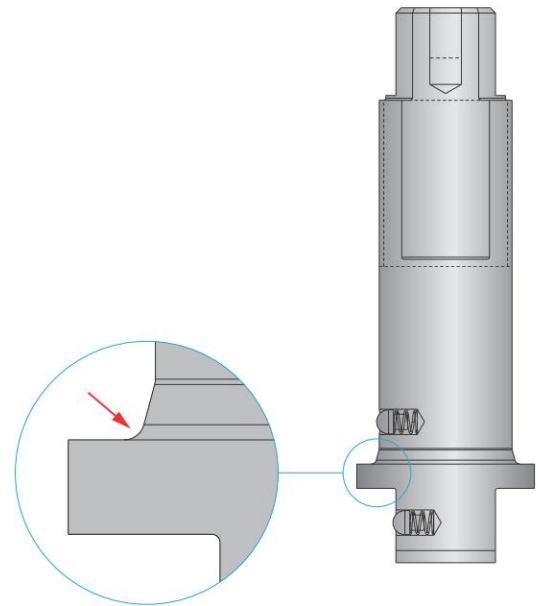
The streamlined flow passage allows for high recovery, maximum efficiency and excellent erosion resistance.



V-port seat

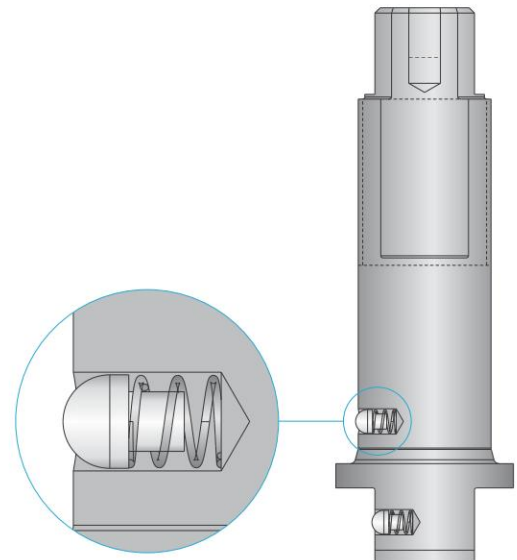
### Stem design

A crucial component in a quarter-turn ball valve is the stem, which transfers the torque from the operator to rotate the ball and control its movement. The stem geometry and surface finish is crucial to minimize stem leak and maximize ease of operation. The stem is a dynamic element and, in most cases, is the only element that protrudes from the pressure vessel and is thus subject to safety issues as well. Habonim's robust stem design complies with ASME B16.34 and API 6D and can endure at least twice the valve's nominal torque. To solve a major safety issue, the stem is designed to be "blowout-proof". Because it is inserted into the valve body from within, the stem will not release under pressure. All Habonim stems are, by default, fire-safe design. A special chamfer is machined at the root of the stem so that, in the event of fire, the stem is pushed upwards and seals against the valve body - metal to metal engagement. Various stem materials are available, from austenitic stainless steel to nickel alloys, to titanium. The most common materials are A479 316/316L for light and moderate torque requirements, and 17-4PH for high cycle applications or high torque demands. The stem top planes for valve sizes ½" (DN15) up to 2½" (DN65) are typically a Double-D shape, while 3" (DN80) stems and above typically have a square shaft (although a Double-D stem can be provided upon request by adding the 'WR' suffix to the valve description).



### Anti-static design

An anti-static device provides for electrical continuity between the body, ball and shaft of the valve and is used to discharge static electricity buildup on electrically isolated balls. According to the EN ISO 17292 standard, all valves with a size up to 2" (DN ≤ 50) require a stem/body contact, while larger valve sizes also require a ball/stem contact. The anti-static feature shall have electrical continuity across the discharge path with a resistance not exceeding 10 Ω from a power source not exceeding 12 VDC when type tested on a new, dry, as-built valve after pressure testing and cycling of the valve at least five times. The Habonim anti-static device, in which contact is made via a spring loaded stainless steel element, complies with EN ISO 17292 and is, in fact, built-in to all Habonim valve product lines, without exception.





## Stem seals

The valve trim - and the valve stem seal design in particular - determine the quality of a valve. The stem seal must perform two tasks: keep the media within the boundaries of the pressure vessel, and allow uninterrupted leak-free continuous open/closed quarter-turn rotation.

Unlike the valve body's static seal, the stem seal is subject to dynamic operation of the valve, as well as to side loads resulting from actuator misalignment or from the operator forcing the handle incorrectly. The valve trim typically comprises two Belleville springs assembled Face-to-Face, which preload the stem seal. This self-adjusting mechanism compensates for wear and pressure/temperature differentials - ensuring a leak-tight seal and extended service life. Habonim's trim design for heavy-duty service, such as high cycle applications, uses four or even six sets of Belleville springs so as to maintain preload over a longer operational cycle life. The Belleville springs are compressed by the stem nut, which is locked to prevent unintentional release during cycles.

Habonim's research, design, and testing program has resulted in a new valve designed to ANSI B16.34 specifications with advanced seal technology. This very strong, tough valve can handle pressure and unforeseen piping strains with a stem seal that extends the operational cycle life. The improved stem seal design, consisting of a live-loaded carbon-filled PEEK thrust bearing and anti-abrasion ring combined with a carbon filled-PTFE stem seal, significantly increases valve cycle life over conventional ball valves and extends the time between adjustments.

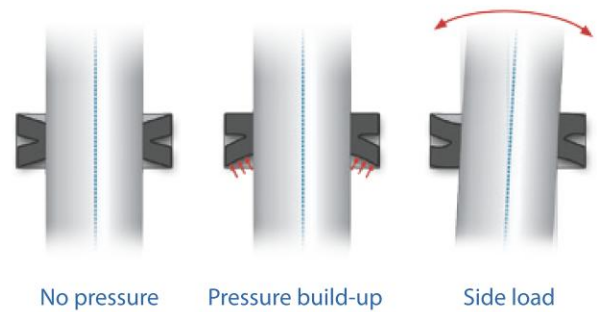




### Stem seal

#### HermetiX™ stem seal

The patented HermetiX™ stem seal is named for its distinctive "X"-shaped design. The flexible "X" shape creates a dynamic sealing arrangement so that, in the event of pressure buildup or side load, the HermetiX™ adjusts dynamically to prevent fugitive emissions. The result is a superior stem seal design compared with the conventional flat stem seals currently available on the market.



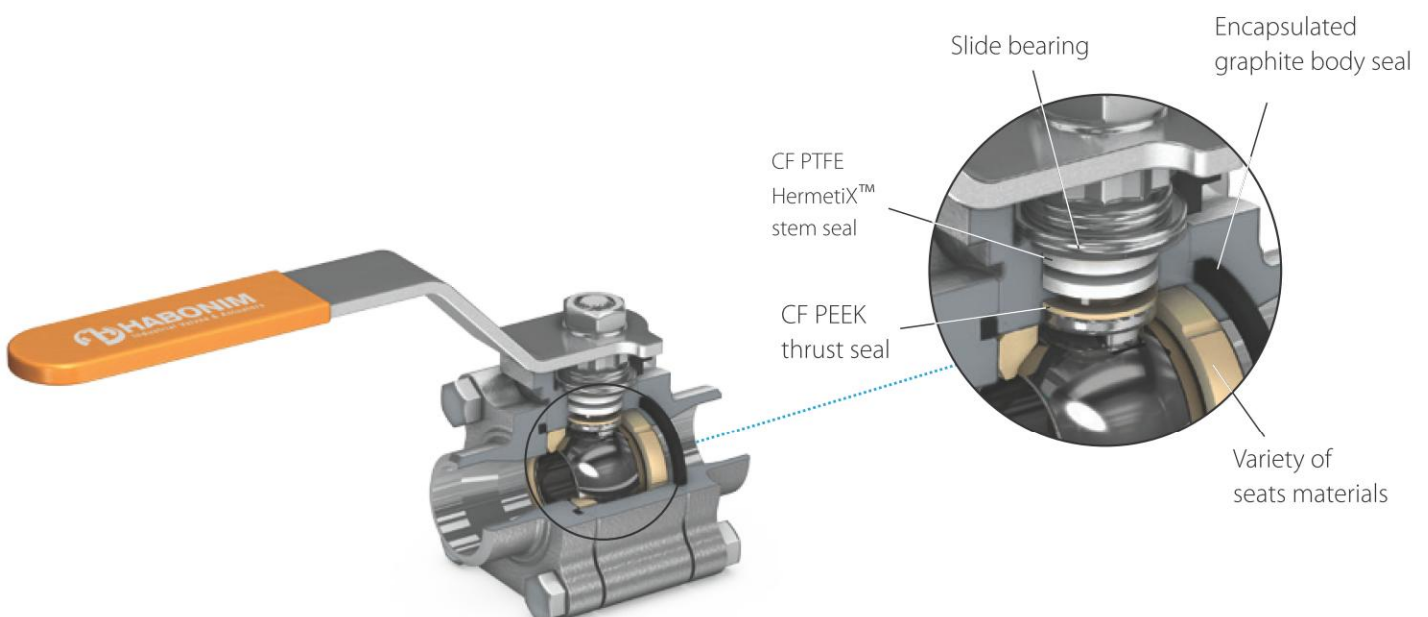
#### Features

- Fugitive emission certified to ISO 15848-1
- Habonim design Patent No. D598,988
- Designed to operate for 500,000 cycles without refurbishment
- Prevents media contamination from graphite particles
- Ensures uninterrupted production
- Increases site safety
- Anti-static as standard

#### Graphite-free fire safe HermetiX™ stem seal

Habonim has introduced a revolutionary stem seal, the HermetiX™ Fire-safe. This patented design includes a polymer based stem seal and a unique fire safe certified construction. The graphite-free stem seal, suitable for use in hazardous industries such as chemical, petrochemical and oil & gas, is designed to operate for 500,000 cycles without refurbishment – a dramatic improvement over porous graphite stem seals. The HermetiX™ fire safe valve offers the ultimate solution - an exclusive graphite free stem seal that eliminates the risk of graphite disintegration after prolonged valve cycles, protecting both line materials and air quality.

Today, there is an ever increasing demand for high-performance valves due to a number of factors including: rising insurance costs for liability from personnel injury or loss of life; property damage; tighter environmental and safety regulations; loss of materials through leakage; and the high cost of system shutdown, clean-up and replacement parts. The HermetiX™ fire safe valve meets the requirements of fire-safe API 607 / ISO 10497 standards, as well as the stringent ISO 15848-1 standard.

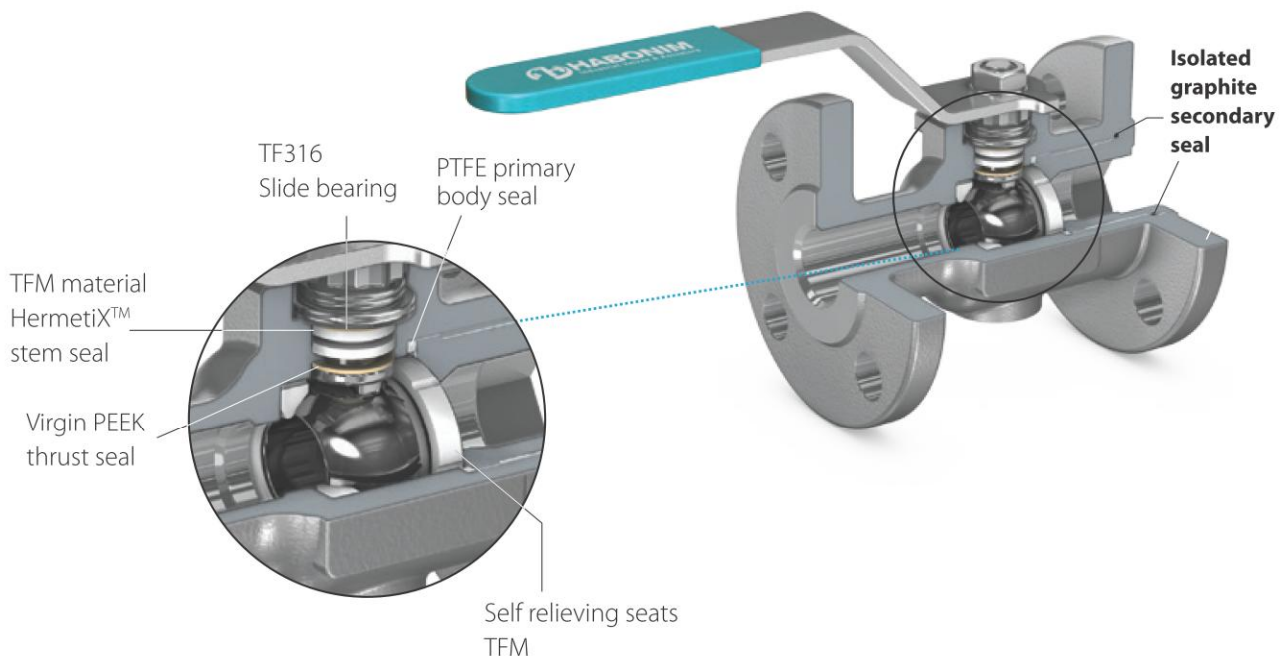


### HermetiX™ fire safe stem seal for BioPharm

The BioPharm industry faces contradictory needs when defining the piping equipment for engineering specifications. On the one hand there is a mandatory demand for fire safe design valves in an Ex-proof zone, which dictates the use of graphite material as the traditional fire-safe solution for stem and body seals. On the other hand there is the demand for only FDA approved materials to come into contact with the media, as well as strict cleanliness demands for parts used in high purity processes. Habonim's response to this challenge is a premium line of products based on the HermetiX™ fire safe technology.

This unique fire safe valve design includes a graphite-free HermetiX™ stem seal consisting of a Virgin PEEK thrust bearing and anti-abrasion ring, and a stem seal made of TFM material. Both virgin PEEK and TFM are FDA approved.

The double body seal set is comprised of an internal PTFE body seal facing the media, and an external graphite seal to withstand fire. This configuration effectively isolates the graphite seal in a dry cavity, preventing it from coming into contact with the media or otherwise contaminating high purity processes.



### Graphite-free stem seal

Habonim's proprietary graphite-free stem seal is suitable for use in Explosive or flammable zones in the BioPharm, pharmaceutical, and chemical industries. It eliminates possible contamination from graphite in the stem seal. The HermetiX™ stem seal for BioPharm is made solely from FDA approved materials, thus avoiding possible costly rejections due to batch contamination.

### Features

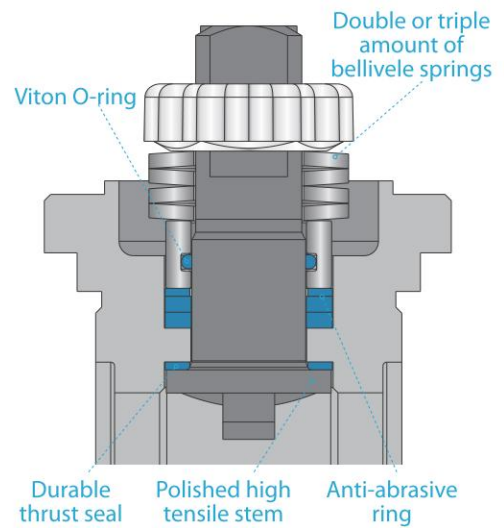
- Prevents media contamination from graphite particles
- FDA approved polymer materials
- Ensures uninterrupted production
- Fugitive emission certified to ISO 15848-1
- Fire safe design to API 607 and ISO 10497
- Cleaned, assembled and packed for Biopharma / API service
- Designed to operate for 500,000 cycles without refurbishment
- Increases site safety
- Self-relieving seats (SRS) as standard
- Habonim design Patent No. D598,988

### High Cycle (HC) Stem seal

The ISO 15848-1 certified HermetiX™ stem seal is Habonim's default for most applications. However, we do not specify the HermetiX™ stem seal for high cycle operations such as mixing or separating media by energy pulses, chemical injections, on-off step control, and rapid CIP/SIP processes. High cycle service is defined by Habonim engineering as continuous operation for more than one hour at a frequency greater than 1 cycle / 180 seconds.

When designing a valve for high cycle service parameters, such as heat dissipation due to friction of metallic and plastic parts, resistance to fatigue stress, and mean time between maintenance activities must be taken into consideration.

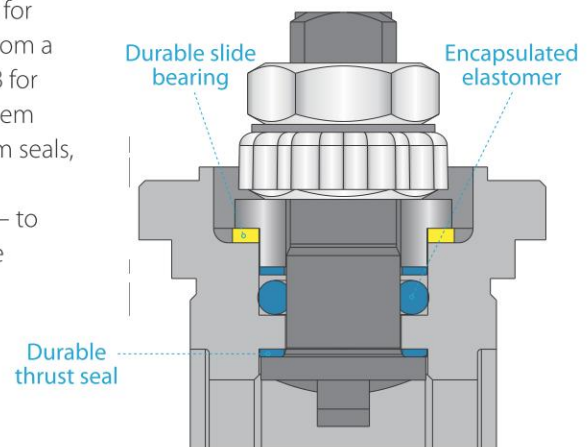
For high cycle applications Habonim recommends the use of valve stems made of high tensile material (stainless steel 17-4PH as a default, depending on its corrosion resistance). The stem will be polished for a high degree of surface roughness. The stem thrust seal will always be made from highly wear-resistant plastic material with CF PEEK being the Habonim default. A Viton O-ring is inserted into a customized follower. The complete trim assembly is preloaded by a double or even triple Belleville spring stack. All of these design features give the valve a particularly long service life.



### Spring-less stem seal

In a corrosive application where standard 17-7PH Belleville springs cannot be used, Habonim recommends a cost effective solution: an O-ring based stem seal with a unique L-shaped follower positioned on a durable polymer slide bearing. The special follower accurately aligns the stem in place for concentric rotation of all trim parts. An elastomer O-ring fabricated from a variety of materials (Habonim code ORE for EPDM, ORV for Viton, ORB for NBR) is compressed between the polished stem and the body. The stem nut is secured with a lower torque compared with spring loaded stem seals, resulting in a lower operational torque requirement.

NOTE: It is always advisable – and especially when using elastomers – to verify the materials temperature and corrosion compatibility with the application.





## End connections



### XBW

Extended butt weld end for various pipe schedule - one piece solid cast - special design for in-line welding save labor cost and keep the integrity of the product factory tested.

### XSW

Extended Socket-weld end one piece solid cast - special design for in-line welding save labor cost and keep the integrity of the product 'factory tested'



### LL / LM

Compression ends for metric (code LM followed by the tube OD in mm) or imperial (code LL) tube dimensions. mainly used in instrumentation services, with sizes up to 1" (DN25)



### LL / LM Exploded view

Compression end normally supplied as a set with a machined end, ferrule, backup ring and a nut. Habonim suffix 'W/O NF' exclude the extra parts from the product bill of material.



### BWO / BWI / BWD

Butt weld end for various tube standards - designed to ASME BPE (BWO), ISO 1127 (BWI) and DIN 11850 (BWD). The length of this end doesn't allow the use of orbital welding.



### ETO / ETI / ETD

Extended butt weld end for various tube standards - designed to ASME BPE (ETO), ISO 1127 (ETI) and DIN 11850 (ETD). One piece solid cast with sufficient length to allow the use of orbital welding.



### TC

Tri-Clamp end - designed to ASME BPE (TC) standard, allows fast connection or removal of the valve from the line. Mainly used in the pharmaceutical and food & beverage industries.

### Handles

A valve handle is the interface between the operator's hand and the valve trim. Habonim's handles are designed for safe operation, with a firm and comfortable grip. To facilitate ease of operation, the handle length ensures that the maximum force required at the handle-end to apply the breakaway torque will never exceed 360 N (80 lbf).

The handles are manufactured in a variety of technologies: casting, forging, punching, and laser cut and welding.

The standard materials are zinc plated carbon steel and stainless steel.

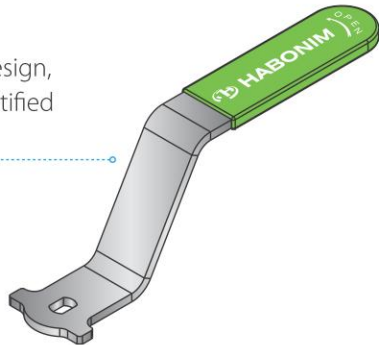
Habonim's range of handle designs addresses the diverse needs of multiple applications.

### Color coding

The color-coded PVC sleeve glued onto the metal handle provides a clear indication of the valve's construction, as follows:

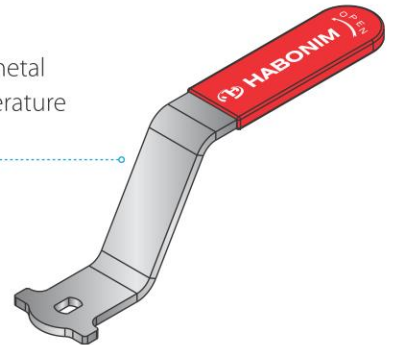
#### Green

The Habonim 'X' valve design, HermetiX™ stem seal, certified to ISO 15848-1



#### Red

Habonim 'Z' valve design, metal seated valve for high temperature and abrasive applications



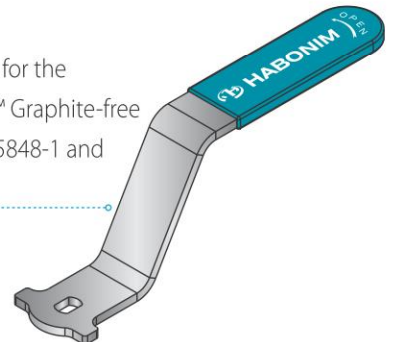
#### Orange<sup>(1)</sup>

The Habonim 'W' valve design, HermetiX™ Graphite-free fire safe stem seal design, certified to ISO 15848-1 and API 607 / ISO 10497



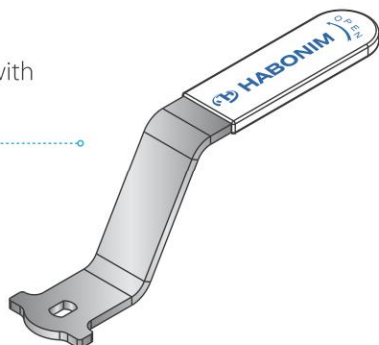
#### Turquoise<sup>(1)</sup>

The Habonim 'G' valve design for the Biopharm industry, HermetiX™ Graphite-free Fire safe valve design to ISO 15848-1 and API 607 / ISO 10497



#### White

Cryogenic valve design with basic<sup>(2)</sup> stem seal



#### Blue

Standard Habonim valve with basic<sup>(2)</sup> stem seal

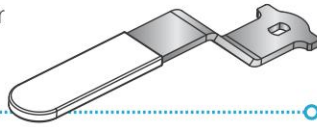


<sup>(1)</sup> Add the 'F' prefix to the valve series when coding a fire safe valve.

<sup>(2)</sup> Basic stem seal means a graphite stem seal or a flat polymer stem seal or, in general, a NON-HermetiX™ stem seal construction.

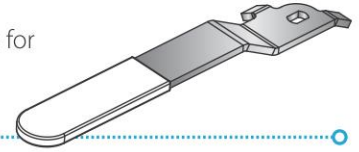
### The 'SHARK' handle

Habonim's standard handle for valves with an ISO 5211 top pad.



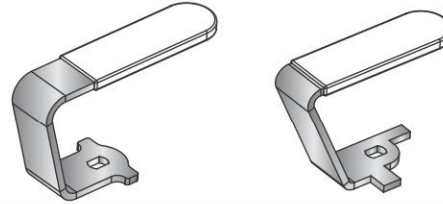
### The 'POINTER' handle

Habonim's standard handle for valves without an ISO5211 top pad.



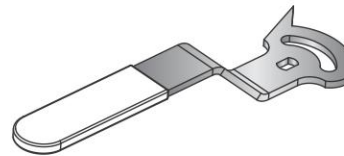
### The 'SCORPION' handle

Habonim's special handle for confined spaces. There are two types to accommodate valves with or without an ISO 5211 top pad. To specify a valve with the SCORPION handle add the '-SCR' suffix to the valve code.



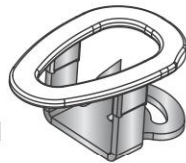
### The 'ADJUSTABLE' handle

Habonim's special handle for manually controlled valves. It is supplied as part of a kit that includes a lock-in-place mechanism and a mirror-polished scale for clear identification of the valve's angular position. To specify a valve with the ADJUSTABLE handle add the '-ADJ' suffix to the valve code.



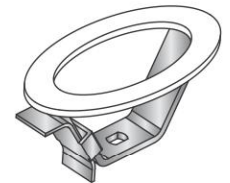
### The 'OVAL' handle

Habonim's special handle designed to avoid unintentional movement of the valve handle. It is also used in confined spaces where the handle must not protrude beyond the valve's Face-to-Face plate. To specify a valve with the OVAL handle add the '-OVL' suffix to the valve code.



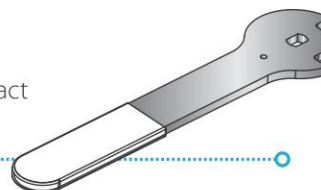
### The 'OVALD' handle

Habonim's OVAL handle design with a sliding plate locking device. To specify a valve with the OVALD handle add the '-OVL'D' suffix to the valve code.



### The Spring Return Handle (SRH)

An extra thick handle design to withstand the severe impact during valve closing. This handle is part of the SRH unit.

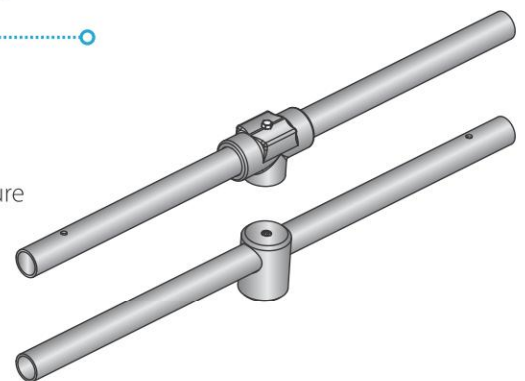


### Habonim's standard handle for large valves (2 1/2" and above)

Habonim's standard handle for large (2 1/2" and above) cryogenic, high pressure and metal-seated valves, and for large (3" and above) standard valves. It provides a firm grip and smooth operation. The maximum force required at the handle-end to apply the breakaway torque shall not exceed 360 N (80 lbf).

Habonim supplies valves with 2 1/2" standard port and above for manual operation with handles attached to or packed with the valve. (with the exemption of 47 series which is for 3" standard port and above).

If the valve is to be automatically actuated, Habonim removes the handle and prepares the valve stem seal accordingly. To specify a valve prepared for automated actuation, add the '-BS' (bare shaft) suffix to the valve code. The '-BS' suffix does not apply to valves size up to and including 2.





### Trunnion valves

In a trunnion-mounted valve the ball rotates only around its vertical axis while being mechanically anchored to the top and bottom of the valve body. The seats are compressed against the ball sphere by the force of the springs and by the line pressure. Trunnion-mounted ball valves are normally used for larger sizes and higher pressure ratings.

The 2-piece cast valve design, for pressure ratings up to ANSI Class 600, provides a cost effective solution while the robust 3-piece design, with forged body and ends, can handle pressure ratings up to ANSI Class 2500. A variety of end connectors allows for construction flexibility to meet customer-specific requirements.

#### 81 series

Two piece, Cast, Class 150, size 2"-16" (DN50-DN400)

#### 82 series

Two piece, Cast, Class 300, size 2"-16" (DN50-DN400)

#### 83 series

Two piece, Cast, Class 600, size 2"-16" (DN50-DN400)

#### 91 series

Three piece, Forged, Class 150, size 2"-16" (DN50-DN400)

#### 92 series

Three piece, Forged, Class 300, size 2"-16" (DN50-DN400)

#### 93 series

Three piece, Forged, Class 600, size 2"-16" (DN50-DN400)

#### 94 series

Three piece, Forged, Class 900, size 2"-16" (DN50-DN400)

#### 95 series

Three piece, Forged, Class 1500, size 2"-12" (DN50-DN300)

#### 96 series

Three piece, Forged, Class 2500, size 2"-8" (DN50-DN200)



### Features:

#### Design

- Double block & bleed
- Blowout proof stem design
- Seats preloaded by Inconel718 helical springs
- Injection fittings for emergency stem or seat sealant & lubrication maintenance for 8" (DN200) and above
- Antistatic grounding between ball, stem & body as standard
- 8" (DN200) and larger valves are equipped with lifting lugs
- Bi-directional
- Double Piston Effect (DPE) and Single Piston Effect (SPE) designs, are both available
- 8" (DN200) size and larger are manually operated via gearbox
- Buttweld ends valve may be supplied with extended spool pieces (PUPS) to avoid any risk of seat and seal damage during welding and post weld heat treatment operations
- Austenitic stainless steel valves are delivered in their natural finish, carbon steel valves are sandblasted and externally coated with a minimum of 180 micron epoxy paint. Other painting systems are available upon request

#### Standards of compliance

- API 6D certified
- Full compliance with ASME B16.34
- Fire safe designed to: API 6FA, API 607, ISO 10497
- NACE MR0175/ISO 15156 compliance
- ISO 5211 mounting pad permits easy adaptation to mount manual, electric, hydraulic or pneumatic actuators.





### Cleaning, assembly, testing, packaging and tagging

Habonim's wide variety of products serve numerous industrial sectors which require different levels of assembly and testing facilities as well as different levels of attention to cleaning and packaging. Habonim has different levels of assembly rooms, working procedures and tooling to cost-effectively meet the different levels of requirements. Our goal is to provide our customers with a cost-effective product that fully meets their requirements.



### Commercial service

Habonim valves for commercial service are assembled in a standard assembly room.

Excessive hydrocarbon films, water, rust or mill scale, shop dirt, filings, chips or loose weld spatter will be removed from the valve parts - with accessible surfaces inspected for cleanliness by the naked eye under bright white light and inaccessible surfaces inspected and cleaned indirectly by wiping.

The assembled valves are tested in full compliance with EN12266-1 and API 598. The duration of the strength test of the valve shell at 1.5 times the pressure rating will vary from 60 up to 180 sec depending on the valve size. After the shell test the functionality of the valve is verified, with every valve tested in-line at a 6 bar compressed gas, with Rate A result (bubble tight shutoff) for soft-seated valves and Rate B result for metal seated valves.

A torque test is conducted to make sure the valve torque falls between its minimum and maximum limits.

A statistically significant sampling of test results are recorded in the Habonim quality system.

Habonim valves are delivered in the open position and with capped ends. Actuated valves are delivered in their Fail-Safe position. The valves are packed in a firm, clean package surrounded by soft, clean, shock-absorbing material to protect it during transportation. A sticker on the valve package will indicate "cleaned for commercial service" as an indication of the quality level of the product inside.



### Oxygen / Cryogenic Service

Habonim's meticulous assembly procedure for valves intended for use in Oxygen or Cryogenic services eliminates the ignition hazards that can be caused by the presence of hydrocarbon oil, grease, and metal chips introduced by a poor deburring process or by shop dirt.

Habonim procedures for cleaning and inspecting valve parts used in Oxygen or Cryogenic services comply with all relevant international standards and corporate specifications:

**CGA G-4.1**

**ASTM A380/A380M**

**EIGA 33.06**

**Linde standard LS 141-47 part 1 and 2**

**Linde standard LS 031-6X7**

**Praxair standard GS-38**

Habonim uses a state of the art, environment friendly, alkaline based automatic degreasing system with multiple stages of cleaning, rinsing and drying chambers. Complete control over process parameters such as the cleaning agent PH and temperature, the temperature of the rinsing chambers, the temperature and humidity inside the drying chamber ensures optimal results and full repeatability of the cleanliness level of the cleaned parts.

Upon completion of the cleaning process the valves are assembled in an oil free restricted area by personnel who are specially trained to perform this task. The employees wear clean working clothes and latex gloves throughout the procedure. The equipment and tools are cleaned before use and the work surfaces are covered with clean polyethylene sheet before performing the valve assembly.



### High purity service

Habonim specializes in high purity ball valves for gas and water distribution, as well as chemical handling processes. all valves are cleaned in accordance with CGA G4.1 and NEPA 99. cleaning drying and packaging of valves takes place under Class 100,000 conditions. all the assembly of valves take place under Class 10,000 conditions.

All valves are 100% helium leak tested. Valves are assembled and tested without any lubricants. Helium leak tests are performed using a Helium leak detector machine with a sensitivity of  $1 \times 10^{-10}$  atm cc He/sec and a vacuum pump.

Valves are only removed from the cleanroom environment in sealed, non-shedding containers and with appropriately capped ends.

### Tagging

Each valve is tagged for traceability and material certification will be provided upon request. Valve identification is provided on a stainless steel nameplate according to MSS SP-25. Regarding documentation, B16.34 stipulates complete traceability of assembly and testing procedures, heat codes, and foundry identification. Full CMTRs (Certified Material Test Reports) on pressure vessel parts are available upon request.



### Control and automation

#### COMPACT™ pneumatic actuator

The COMPACT™ actuator is a quarter-turn rack & pinion pneumatic actuator that doubles the torque of standard pneumatic actuators. The superior performance is achieved by Habonim's patented four-piston design, which generates torque around a centrally located piston. This translates into double the power for the same size actuator - or half the size for the same amount of power.

#### Space saving, fast acting

The COMPACT™ has four small cylinders, one located on each of the four sides of the cube. The smaller pinion and shorter travel distance of the pistons in the COMPACT™ require less air pressure than a larger double-piston actuator to produce the same torque output. The end result is faster response times for emergency shutdown, lower air pressure for operation and reduced maintenance.



#### Technical summary

<b>Pressure range</b>	1.5 - 8 bar (20-120 psi) for DA actuators		
	2- 8 bar (30-120 psi) for SR actuators		
<b>Size range</b>	C15, C20, C25, C30, C30M, C35, C35M		
	C45, C45M, C60, C60M, C75, C75M		
<b>Ambient temperature</b>	NBR	-20 °C to 80 °C	(-4 °F to 176 °F)
	Viton	-20 °C to 120 °C	(-4 °F to 250 °F)
	EPDM	-40 °C to 80 °C	(-40 °F to 176 °F)
	LT NBR FX428	-53 °C to 100 °C	(-63 °F to 213 °F)
<b>Compressed gas</b>	Air, Nitrogen, CO <sub>2</sub> , Natural gas (sweet)		

#### Features

- Light weight, small size
- Balanced forces
- Less wear
- Superior corrosion resistance
- Less air consumption
- Fast action
- Single acting (spring return) and double acting configurations
- High efficiency

## Breather Block

In applications that use a fail-safe actuator, the spring chambers are exposed to the surrounding environment. Every stroke generated by the force of the springs introduces air from the surroundings into the actuator's inner parts. In the case of corrosive and/or abrasive working environments, the springs and the interior of the spring chamber become prone to damage that could cause the product to malfunction.

The Breather Block isolates the actuator's internal parts from the corrosive/abrasive surroundings by allowing only dry and filtered instrument air to flow into the spring chamber during the actuator's spring stroke. The Breather Block's exhaust port only allows air to flow out of the spring chamber and prevents outside air from flowing in.



### Features

- Fits directly onto any actuator with a Namur interface
- Interface for direct mounting of Namur solenoids
- When using remote solenoids, air supply tubes can be connected to the inlet port with a 1/4" NPT connector
- Aluminum anodized coating and external paint layer for extreme protection
- Optional metallic construction materials are available. The O-ring and membrane are made from Buna-N
- Operating limits: pressures up to 10 bar (150 psi) and temperature range of -20° C to +85° C (-4°F to +185°F)
- One unit fits all actuator sizes

## IMPACT™ spring assist

In a failsafe actuator compressed air inside the actuator preloads the springs. During normal operation, each time the solenoid valve is tripped the compressed air is released into the atmosphere through the solenoid valve's exhaust port.

The patented IMPACT™ unit diverts part of this energy to the spring chamber in order to boost the torque of the actuator by at least 50%.

The IMPACT™ also functions as a Breather Block that isolates the spring chamber from the atmosphere, and as a check valve that ensures that the temporary reduction of the compressed air pressure does not trigger movement of the valve and actuator to the mid-position.



### Features

- Boosts the torque of any spring return actuator
- One size down actuator for the same functionality
- Increases system reliability
- Internal Breather Block
- No external energy required
- NAMUR interface
- Single mechanical unit



### Control valves

Habonim's control valves provide an accurate, flexible, cost-efficient and easily maintained solution for industrial flow control systems. These compact, lightweight valves provide excellent performance even in the harshest environments, and are easy to maintain.

Their step-less pressure and flow control ensure fast response times, wide rangeability, zero backlash and bubble-tight shutoff. Other critical features include: high pressure drop capacity with straight through flow and high Cv.

### Features:

#### Fire safety

- Reduced stem seal wear
- Small size, light weight
- Less cavitation damage
- High recovery
- Various surface treatments and coatings
- Wide rangeability
- High repeatability
- Zero backlash
- Easy to maintain



## Pneu-link

The Habonim Pneu-link modulating system is the first quarter-turn rack & pinion control unit to successfully pass the Black Diamond Test several times.

The Pneu-link replaces the traditional mounting kit, tubing and fittings with a rigid manifold connection using O-ring sealing and a firm bolting connection. This results in a low profile compact package, minimum leak path, zero air leaks, and a unit impervious to harsh surroundings.

The Pneu-link valve actuator mounting kit includes a zero backlash coupler and an on/off position locking mechanism to meet the latest OSHA requirements.

The Pneu-link includes an advanced air manifold linkage specifically engineered for the Habonim 4-piston pneumatic actuator and compatible with a variety of limit switch boxes as well as pneumatic and electro-pneumatic positioners. Its corrosion resistant design makes it ideal for harsh wash down environments such as pharmaceuticals, food and beverage.

### Features:

#### Fire safety

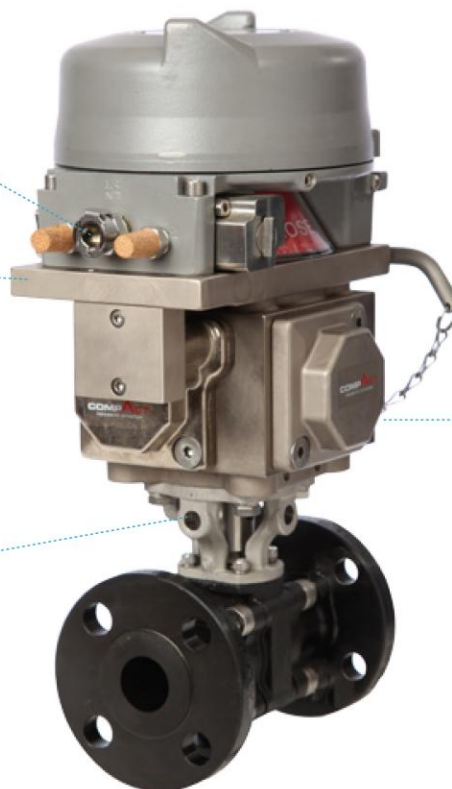
- Fusible plug
- Exhaust in case of fire
- Fail-safe

#### Direct mounting kit

- Internal air porting
- No external hose connections
- Increased rigidity and durability
- Low profile
- Small footprint
- Minimum leak path
- Zero air leak

#### Lockable mounting kit

- Maintenance safe
- High repeatability
- One piece rigid cast bracket



#### 4 - Piston COMPACT Pneumatic actuator

- Minimum hysteresis
- Zero backlash

### Special services

#### Valves for Ammonia services - "M" series

Habonim's ammonia service ball valves are ideally suited to provide optimal protection and functionality for use in severe ammonia service applications. All valves designated for ammonia service are expertly prepared and cleaned to standards required for the safe operation of ammonia service equipment and product purity.

#### Ammonia

Ammonia is a compound of nitrogen and hydrogen with the formula  $\text{NH}_3$ , at atmospheric conditions, ammonia is a colorless gas lighter than air with a pungent, suffocating odor. It is a highly caustic irritant that is both toxic and flammable. Ammonia is soluble in water to provide an alkaline solution.

Ammonia is lighter than air, its density 0.73 kg/m<sup>3</sup> (1.013 bar at 15 °C).

- Ammonia boiling point -33 °C (-28 °F) at a pressure of 1 atmosphere, the liquid must be stored under high pressure or at low temperature.
- Ammonia melting point -78 °C (-108 °F).

#### Ammonia Uses

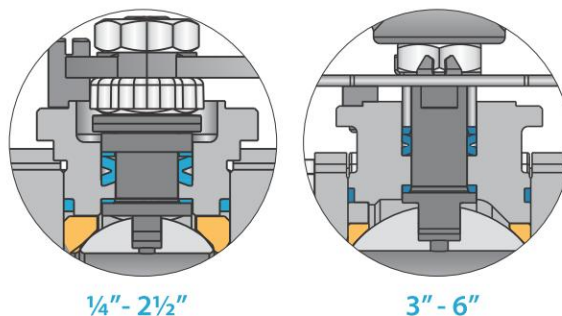
Manufactured by synthesis from nitrogen and hydrogen, ammonia has many uses in the production of fertilizers, plastics, explosives, pharmaceuticals, metal treating operations, refrigerant, cleaning agent and more.

#### Ammonia Hazards

Never permit oil, grease or other combustible substances to come in contact with ammonia service valves or components. Ammonia combined with these substances can result in explosions.

#### Design

Habonim ammonia service valves are available with screwed, socket weld, butt-weld, ANSI Class 150 and ANSI Class 300, EN 1092 PN16 and PN40 flanged ends. Flanged valves range from ½" to 8", and three piece valves from ¼" to 8". Body materials include 316 stainless steel or carbon steel. Standard ball and stem material is 316/316L stainless steel.



#### Valve Component Materials

Due to the extreme noxious nature of ammonia, it is crucial that all valve components are constructed with appropriate materials. Carbon steel is suitable for anhydrous ammonia applications, however if moisture is present, Stainless steel should be used.

TFM (code A), CF PTFE (code P) or glass filled PTFE (code R) seat material, and PTFE (code T) seal material, are used for anhydrous ammonia applications. The default stem seal include the Habonim unique HermetiX™ with CF PEEK thrust seal, CF PTFE stem seal, and anti-abrasion ring on top. The HermetiX™ stem seal assembly carries leak free warrantee of 500,000 cycles as a minimum condition.

Bill of Materials	Wet Ammonia	Dry Ammonia
Body, ends, ball, stem	Stainless steel 316/316L CF8M/CF3M	Carbon Steel WCB (min. temp. -29 °C LCB min. -46 °C LF2, LC1 min. -60 °C
Seats	TFM (A), PTFE (T), CF PTFE (P), Glass filled PTFE (R), PEEK (K), CF PEEK	TFM (A), PTFE (T), CF PTFE (P), Glass filled PTFE (R), PEEK (K)
Seals	PTFE (T)	PTFE (T)



Valves designed for ammonia in a liquid state come equipped with an upstream pressure relief hole in the ball (Suffix - P250). The relief hole avoids trapped cavities in the valve closed position and pressure buildup due to thermal expansion during liquid ammonia boil off. A valve with P250 relief hole is uni-directional, the relief hole must be positioned at the upstream, and otherwise an in-line leak will be evident.

For Bi-directional valve design in liquid ammonia a self-relief seats (SRS) should be used the seats material of construction in this case should be TFM or CF PTFE, a flex seat design dynamically release cavity pressure buildup and return to shutoff position once the over pressure is relieved.

Valves designed for ammonia in the gaseous state do not require an upstream pressure relief hole. Order code example:

10	M47X-4466AT/NPT	C.st valve code for gaseous ammonia.
10	M47X-6666AT/NPT-P250	Uni-directional S.st. valve for liquid ammonia.
10	M47X-6666AT/NPT-SRS	Bi-directional S.st. valve for liquid ammonia.

### Cavity pressure relief (P250 Ball)



### Preparation

All valve components used for ammonia service, in gaseous or liquid state, are de-burred to a high standard and specifically cleaned to remove any traces of oil, grease or hydrocarbon materials prior to assembly. Ammonia service Valve assembly is carried out in a high quality 'clean room' by technicians using lint free gloves, to assure no ingress of grease or dust. Only lubricants compatible with ammonia are used. Valve seat and external leakage pressure tests are conducted in a 'clean room' environment, using pure Nitrogen. Only special 'clean tools' are used in the valve assembly.

### Packing

After successful testing, valves are once again restored to the "open" position. Each valve is packed with a 'Silica-gel pack'. The valve is clearly labeled 'Prepared for Ammonia Service', and sealed in a polyethylene bag.

### Accessories

**Fugitive emission (FE) Bonnet** - An important safety mechanism that Habonim offers for ammonia service is the Fugitive Emission (FE) bonnet. A stainless steel pressure chamber bolted on and sealed against the valve ISO 5211 top platform. The FE bonnet will accumulate ammonia leak, if occurred, and contain it in a confined space until a maintenance operation is scheduled. A readily made purge ports at the FE bonnet top allow the site technician to connect pressure gauge, pressure transducer or ammonia sniffer to alert for ammonia leak through the valve stem seal. The FE bonnet allows stem seal redundancy, a simple design, yet crucial to enhance site safety in terms of ammonia leak through the atmosphere.

**Locking Device (LD)** - As a matter of safety, it is advisable that valve for ammonia service should be equipped with spring loaded locking device to avoid unauthorized or unintentional valve operation. The Habonim locking device match a 6 mm pad lock, which effectively holds the LD cap down and locks the handle in the open or in the closed position.



### Special services

#### Valves for Chlorine services - "K" series

HABONIM ball valves "K" Series for chlorine service are ideally suited for use with chlorine according to guidelines established in the Chlorine Institute Pamphlet 6: "Piping Systems for Dry Chlorine". These valves are specially designed to meet the most demanding requirements for high quality and meticulous material selection for chlorine applications. All valves designated for chlorine service are expertly prepared and cleaned to standards required for the safe operation of chlorine service equipment and product purity.

#### Chlorine

Chlorine is a hazardous and toxic material that irritates the respiratory, with a distinctive pungent odor. Chlorine, chemical element symbol Cl, is nonflammable in both gaseous and liquid states however; chlorine gas is a strong oxidizer, which may react with flammable materials, and can support combustion when combined with other substances.

The gas has an irritating odor that many people can detect with as little as 3.5ppm (parts per million) chlorine present. Breathing air containing more than 1000 ppm of chlorine can be fatal.

Chlorine density is 3.2 kg/m<sup>3</sup> (1.013 bar at 0 °C), because it is heavier than air, it tends to accumulate at the bottom of poorly ventilated spaces.

Chlorine boiling point -34.04 °C (-29.27 °F) at a pressure of 1 atmosphere, the liquid must be stored under high pressure or at low temperature.

Chlorine melting point -101.5 °C (-150.7 °F).

#### Chlorine Uses

Chlorine is mainly used in manufacturing chemicals; including solvents, pesticides and herbicides, plastics and fibers, refrigerants and propellants. It is also an ingredient in bleach, deodorizer and disinfectant. In addition, chlorine is widely used in bleaching pulp, paper and textiles; disinfecting drinking water and swimming pool purification; plus in sanitation of industrial and sewage wastes.

'Chlorine' term can be misunderstanding; is it gas or liquid; dry or wet?

Gas and liquid refer to the physical state of chlorine itself; dry and wet refer to the content of moisture within the gas or liquid.

Dry chlorine is either gaseous or liquid chlorine with less than 150 ppm of water by weight.

Chlorine containing more than 150 ppm is considered as wet chlorine, gas or liquid.

**HABONIM offers metallic valves only for dry chlorine.**

#### Design

Habonim ammonia service valves are available with screwed, socket weld, butt-weld, ANSI Class 150 and ANSI Class 300, EN 1092 PN16 and PN40 flanged ends. Flanged valves range from ½" to 8", and three piece valves from ¼" to 8". Body materials include 316 stainless steel or carbon steel. Standard ball and stem material is 316/316L stainless steel.

#### Valve Materials for dry chlorine

Valves for dry Chlorine Systems are used with chlorine in dry or liquid state, at temperatures between -101 °C (-150 °F) and +149 °C (+300 °F). Steel piping is generally recommended for handling dry chlorine, defined as containing no more than 150 PPM of water by weight. Stainless steels Type 300 series can fail due to chloride stress cracking, particularly in presence of moisture at ambient and elevated temperatures.

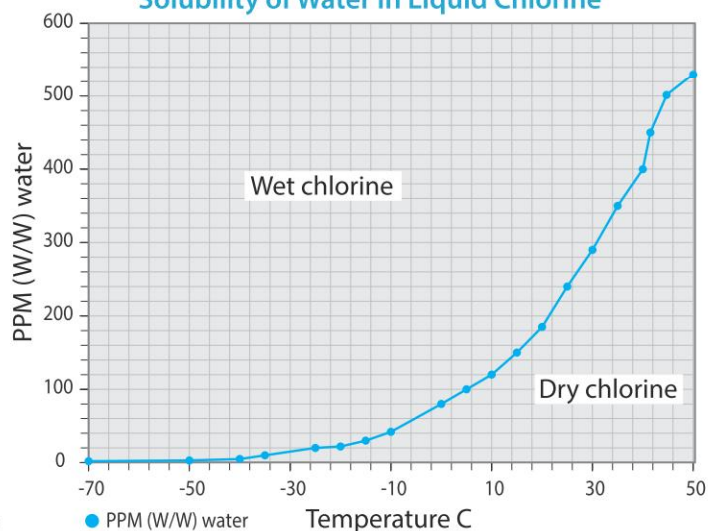
Monel 400 and Alloy C22, or Alloy C276 are the recommended materials for ball and stem, with TFM or CF PTFE seats.

Body and stem seals can be PTFE, CF PTFE or graphite for fire-safe valves.

Moisture Level	Material
0 - 20 PPM	Alloy C22 ball and Monel 400 stem
20 - 50 PPM	Alloy C22 ball and stem
0 - 50 PPM	Alloy C22 ball and stem (for end of line service)

Note: For higher moisture levels up to 150 PPM, Alloy C22 is the recommended material of construction for all metal parts.

Solubility of Water in Liquid Chlorine





The following material of construction are recommended for dry chlorine service by the Chlorine Institute, Pamphlet #6:

Temperature	-29 °C (-20 °F) to 149 °C (300 °F)	-46 °C (-50 °F) to 149 °C (300 °F)	-60 °C (-76 °F) to 149 °C (300 °F)
Fluid State	Gas or Liquid (<150ppm water)	Gas or Liquid (<150ppm water)	Gas or Liquid (<150ppm water)
Ends	Threaded, Welded, Flanged	Threaded, Welded, Flanged	Threaded, Welded, Flanged
Body/Ends	A216 WCB, Alloy C22, Alloy C276	A352 LCB, Alloy C22, Alloy C276	A352 LC1, A350 LF2, Alloy C22, Alloy C276
Ball/Stem	Alloy C22, Alloy C276	Alloy C22, Alloy C276	Alloy C22, Alloy C276
Bolts	ASTM A193 Grade B7, B7M (Ferritic Steels)	ASTM A320 Grade L7	ASTM A320 Grade L7
Nuts	ASTM A194 Grade 2H, 2HM (Carbon Steel)	ASTM A194 Grade 4 (Carbon-Molybdenum steel)	ASTM A194 Grade 4 (Carbon-Molybdenum steel)
Seats	PTFE, TFM	PTFE, TFM	PTFE, TFM
Seals	PTFE, Graphite	PTFE, Graphite	PTFE, Graphite

**Warning - The HermetiX™ stem seal valve for chlorine service include different material than PEEK.**

### Sample valve description for chlorine service

Valves designed for chlorine in a liquid state come equipped with an upstream pressure relief hole in the ball (Suffix - P250). The relief hole avoids trapped cavities in the valve closed position and pressure buildup due to thermal expansion during liquid chlorine boil off. A valve with P250 relief hole is uni-directional, the relief hole must positioned at the upstream, and otherwise an in-line leak will be evident.

For Bi-directional valve design in liquid chlorine a self-relief seats (SRS) should be used the seats material of construction in this case should be TFM or CF PTFE, a flex seat design dynamically release cavity pressure buildup and return to shutoff position once the over pressure is relieved.

Valves designed for chlorine in the gaseous state do not require an upstream pressure relief hole.

Order code example:

10 K47P-44WWTT/BW-AAX C.st valve code for gaseous dry chlorine.

10 K47P-44WWTT/BW-P250-AAX C.st valve code for liquid chlorine.

10 K47P-WWWTT/BW-SRS-AAX Bi-directional Alloy C22 valve code for liquid chlorine and high moist concentration (<150 PPM)

### Self-Relieving-Seat (SRS)



### Preparation

All valve components used for chlorine service, are de-burred to a high standard and specifically cleaned to remove any traces of oil, grease or hydrocarbon materials prior to assembly. Chlorine service valve assembly is carried out in a high quality 'clean room' by technicians using lint free gloves, to assure no ingress of grease or dust. Only lubricants compatible with chlorine are used. Valve seat and external leakage pressure tests are conducted in a 'clean room' environment, using pure Nitrogen. Only special 'clean tools' are used in the valve assembly.

### Packing

After successful testing, valves are once again restored to the "open" position. Each valve is packed with a 'Silica-gel pack'. The valve is clearly labeled 'Prepared for Chlorine Service', and sealed in a polyethylene bag.

### Accessories

**Locking Device (LD)** - As a matter of safety, it is advisable that valve for chlorine service should be equipped with spring loaded locking device to avoid unauthorized or unintentional valve operation. The Habonim locking device match a 6 mm pad lock, which effectively holds the LD cap down and locks the handle in the open or in the closed position.



### Special services

#### Valves for Oxygen services - "O" series

Habonim's "O" Series oxygen service ball valves are ideally suited for use with both liquid and gaseous oxygen. All valves designated for oxygen service are expertly prepared and cleaned to standards required for the safe operation of oxygen service equipment and product purity.

#### Oxygen

Oxygen, chemical element with symbol  $O_2$ , content in air is approximately 21% by volume. Oxygen is an odorless, colorless gas, with many industrial uses, mainly in the manufacture of steel and chemicals. Oxygen itself is nonflammable, however materials that are flammable in air, burn far more vigorously mixed with oxygen. Oxygen is shipped as a non-liquefied gas at pressures of 2000 psig (138 bar) and above, also as a cryogenic liquid at pressures and temperatures below 13.8 bar (200 psi) and  $-146.5\text{ }^{\circ}\text{C}$  ( $-232\text{ }^{\circ}\text{F}$ ). Air separation plants produce pure oxygen via liquefaction of atmospheric air and separation of the oxygen by fractionation.

Also minute quantities of Oxygen can be produced by electrolysis of water.

Oxygen density is  $1.429\text{ kg/m}^3$  (1.013 bar at  $0\text{ }^{\circ}\text{C}$ )

Oxygen boiling point  $-182.95\text{ }^{\circ}\text{C}$  ( $-297.31\text{ }^{\circ}\text{F}$ ) at a pressure of 1 atmosphere, the liquid must be stored under high pressure or at cryogenic temperature.

Oxygen melting point  $-218.79\text{ }^{\circ}\text{C}$  ( $-361.82\text{ }^{\circ}\text{F}$ ).

#### Oxygen Uses

Oxygen is used extensively in medicine, high altitude flying, deep sea diving and as rocket fuel. Industrial applications include utilization with acetylene, propane, hydrogen and other fuel gases for metal cutting, welding, hardening and scarfing. In steel and iron manufacturing, oxygen helps increase the capacity and efficiency of furnaces. Another major use of oxygen is in the making of 'Synthesis Gas' for production of gasoline, methanol and ammonia. Oxygen is also used in the manufacture of nitric acid, ethylene and other compounds.

#### Valve Component Materials

Gaseous oxygen is non corrosive and may be contained in systems constructed of any common metal. Stainless steel, Monel, Bronze and Brass are the preferred materials for all metal components coming into contact with gaseous Oxygen. In the extreme low temperatures of cryogenic liquid oxygen, stainless steel 300 series is mainly the preferred material.

#### Oxygen Hazards

Never permit oil, grease or other combustible substances to come in contact with oxygen service valves or components. Oxygen combined with these substances can result in explosions.

#### Design

Habonim carries a wide selection of valves suitable for oxygen service. Valves are available with screwed, socket weld, butt-weld, ANSI Class 150 and ANSI Class 300, DIN PN16 and DIN PN40 flanged ends. Flanged valves range from  $\frac{1}{2}$ " to 8", and three piece valves from  $\frac{1}{4}$ " to 6". Body materials include 316 Stainless Steel, Monel 400 and Bronze. Standard ball and stem material is 316 stainless steel. TFM, PTFE or glass filled PTFE are inert in oxygen and are considered standard seat and seal materials for oxygen service.

**Warning! Delrin (Acetal resin) seats and Nylatron stem thrust seals MUST NOT BE USED IN OXYGEN SERVICE.**

All Habonim oxygen service valves may be used with both liquid and gaseous oxygen. For temperatures below  $-60\text{ }^{\circ}\text{C}$  ( $-76\text{ }^{\circ}\text{F}$ ), we recommend using Habonim's Cryogenic valves series.

### Cleaning

Habonim procedures for cleaning and inspecting valve parts used in oxygen or cryogenic services comply with all relevant international standards and corporate specifications: CGA G-4.1, ASTM A380/A380M, EIGA 33.06, Linde standard LS 141-47 part 1 and 2, Linde standard LS 031-6X7, and Praxair standard GS-38

### Assembly

Habonim's assembly procedure for valves intended for use in oxygen or cryogenic services eliminates the ignition hazards that can be caused by the presence of hydrocarbon oil, grease, and metal chips introduced by a poor deburring process or by shop dirt.

Oxygen service valve assembly is carried out in a high quality 'clean room' by technicians using lint free gloves, to assure no ingress of grease or dust. Only lubricants compatible with oxygen are used. Valve seat and external leakage pressure tests are conducted in a 'clean room' environment, using pure Nitrogen. Only special 'clean tools' are used in the valve assembly.

### Packing

After successful testing, valves are once again restored to the "open" position. Each valve is packed with a 'Silica-gel pack'. The valve is clearly labeled 'Prepared for Oxygen Service', and sealed in a polyethylene bag. Valves for oxygen service are identified by a letter "O" before the series number.

### Accessories

Locking devices are available, including the unique design for "Locked in Last Position" (LLP). Valves with a stem extension are provided for insulated pipelines. Valves can be used with the Habonim Compact II Actuator for automation and remote control.

### Tailor made solutions

Habonim excels when no commercial product can satisfy your requirements. Habonim's experienced engineering and R&D team frequently creates special solutions that meet the needs of special customer requests. To name a few:

- Complex skids and automated manifold designs, which fully comply with your P&ID
- Lower weight and reduced volume of existing systems for off-shore applications
- Minimizing leak paths and introduction of fail-safe assemblies in hazardous applications.
- Fast closing (<0.5 sec) automated mechanism for ESD systems
- Safety shut-off device for gas feeding systems

We create custom valves, manifolds and special solutions to meet the most stringent demands of extreme temperature, high pressure, corrosive and abrasive application, because at Habonim we are **"Inspired by Challenge"**.



#### Gas Valve Unit (GVU)

Special manifold for dual fuel (diesel / LNG) ships reduces the amount of pollution generated by ship engines. Improves air quality in harbor cities.



#### Cost-Effective Replacement Solutions

This custom valve, used to divert flow from a single source to multiple lines, was designed to replace larger globe valves for the same application.





### Cryogenic double block & bleed valve

Habonim's cryogenic DBB valve maximizes safety when handling high-pressure cryogenic liquids at the most critical stages of LNG and CNG processing that require a furnace feed (boiler, gas turbine, LNG or CNG feeder). The Habonim cryogenic DBB valve solution is comprised of a single body, which saves space and reduces the number of body seals, thereby reducing the potential for leakage.



### Multi-valve ensemble (MVE)

Habonim designed the revolutionary Multi-Valve-Ensemble (MVE) as an innovative alternative to large, heavy skid-mounted valve assemblies that take up a lot of space and are loaded down with complex piping; vulnerable to leakage. The MVE eliminates up to 90% of the piping required on conventional skids, and weighs 30% less.

### Safety, quality and environmental policy

**Quality** - Habonim strives to deliver quality products that meet customer expectations and provide complete and total satisfaction, thus maintaining the Company's position at the forefront of the global ball valve and actuator markets.

**Health & Safety** - Habonim aspires to zero work accidents. Management and the entire workforce comply with all the relevant laws and regulations necessary to achieve this goal.

**Environment** - Habonim management pledges to comply with all relevant laws, standards, and regulations to preserve the environment — at the Company's site as well as at the customer site.

Habonim management and employees are committed to the following principles:

- The Company is fully committed to the customer
- Management regards quality, safety in general — and the functional safety of its products in particular — as key success factors
- Management will take all steps and assign all resources required in order to meet these targets
- The Company's procedures, products, quality systems, and safety and environment practices will meet the requirements of all relevant national and international standards, as well as the standards of our customers

Habonim implements its policies by:

- Allocating resources
- Educating management and employees in order to raise awareness regarding safety, quality, and the environment
- Continuous improvement of processes and products and enforcing compliance in all areas








The Company works hard to strengthen the partnership between management and employees in order to increase awareness of and commitment to the safety and quality of the Company's products and processes. The Company instructs and trains employees as required by standards such as: API 6D, Directive 94/9/EC, ISO 9001, IEC 80079-34, PED 97/23/EC PED 2014/68/EU, EN 13980, ISO 14001, OHSAS 18001, IEC 61508-1,2 and others.

Habonim management diligently monitors these goals and objectives and continually enhances processes and products as well as safety and environment practices in order to ensure that they are met.



## Habonim's certifications list

Habonim Industrial Valves and Actuators Ltd. constantly and proactively maintains and updates its wide range of certifications and approvals in response to the latest market requirements. The following list presents most of the certifications Habonim holds at the date of publication of this catalog. For a complete and up-to-date list of certifications, please refer to the Habonim website.

Name	Description	Scope	Notified body
<b>ISO 9001-2008</b>	Quality Management System Certificate No. 49030	Habonim Industrial Valves & Actuators Ltd.	
<b>API-6D</b>	American Petroleum Institute Habonim Monogram 6D-1278	Ball valves	
<b>PED 97/23/EC 2014/68/EU Module H</b>	Pressure Equipment Directive Certificate No. 1155	Valves size > 1" DN25	
<b>ATEX 94/9/EC Category II</b>	Equipment and protective systems intended for use in potentially explosive atmospheres (optional for actuated unit only)	Valves and Actuators	
<b>API 607 / ISO 10497</b>	Testing of valves - fire type-testing requirements	Valves	
<b>CRN</b>	Canadian Registration Number	Valves and Actuators	
<b>ISO 15848-1</b>	Industrial valves - measurement, test and qualification procedures for fugitive emissions	Floating ball valves	
<b>DNV</b>	Det Norske Veritas	Floating ball valve, High pressure valve, Manifolds & Actuators	
<b>CSA</b>	Canadian Standards Association Certificate No. 2701467	Manual and Automated valves for gas appliance	

Continued on next page



## Product Overview

Name	Description	Scope	Notified body
IEC 61508-2 SIL 2/3	Safety Integrity Level - functional safety of electrical/electronic/ programmable electronic safety-related systems (optional for actuated unit only)	Valve-Adaptor-Actuator Products	 <b>sira</b> CSA Group
TSG D7002-2006	Manufacturer license of pressure piping components – Republic of China	Pressure piping components	
ABS	American Bureau of Shipping	Valve, Manifold	
BV	Bureau Veritas Marine division	Valve Manifold, Valves for Liquefied Gases,	
CCS	China Classification Society	Valve Manifold, Valves for Liquefied Gases,	
DNV-GL	Det Norske Veritas - GL	High pressure valves	<b>DNV-GL</b>
LR	Lloyd's Register	Fire tested soft seated flanged and 3-piece ball valves.  Pneumatic Quarter turn, Spring and air closing actuators	