

Technical Manual

Quality Assurance

Sep-25

BROEN BALLOMAX® -45C API 6D CERTIFIED BALL VALVES (TRQ2)

Double Block & Bleed, with Injection Ports



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I. INTRODUCTION

Technical Manual Release Date

BROEN

BALLOMAX®

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Initial Release: June, 2024

Latest Revision: September 29, 2025. Prepared by: James Posenjak

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BROEN ApS and BROEN Inc.

BROEN ApS was founded in 1948 in Denmark. Today it is part of the Aalberts Industries Group of the Netherlands. BROEN ApS is a global leader manufacturer of valves for District Heating and for the Natural Gas Industry. Recently BROEN ApS acquired Clorius, a manufacturer of products for temperature and pressure control.

BROEN Inc, Birmingham, Alabama was created in 1995 to provide the North American market production of Ball Valves to better serve our customers. We moved to **Houston, Texas** in 2016 to a new and larger facility, with greater capacity, to continue to provide fast deliveries, broader product range, and technical assistance when needed.

The Product

The Flagship products for BROEN Inc. are the **BALLOMAX®** Ball Valves for Natural Gas Industry. Our **-45C API 6D Certified Valves** represent the state of the art for ball valve technology. The valves are Double Block and Bleed, ANSI 150, ANSI 300, and ANSI 600.

Scope

This Technical Manual applies to **BROEN Inc. -45C API 6D Certified Valves** manufactured after January 2024. Valves manufactured after this date are made to comply with the 25th edition of API 6D.

Code and Compliance

BROEN Inc. BALLOMAX® -45C API 6D Certified Ball Valves are produced in accordance with API 6D, ASME B16.34, and CSA Z245.15 and strictly adheres to API Monogrammed requirements. Conforming to requirements of API Q1 and ISO 9001 Quality Management Systems. All BALLOMAX® API 6D valves are fully traceable, Fire Tested to ISO FT (10497), and DOT Title 49, part 192. Compliant with NACE MR0175. CRN approval in every Province and Territory of Canada. Each valve produced is Hydrostatically Tested per API 6D with a supplementary air test. Test Certificates are available for every valve. We operate under the API license # 6D-0378.

Applicable Standards and Specifications

The latest edition of the following specifications and standards will be used to establish the basic requirements referenced throughout this pre-qualification for the specific type of valves being inspected and tested.

Unless specifically designated by date, the latest edition of each publication shall be used together with any amendments, supplements, or revisions.

API Spec. Q1	Specification for Quality Programs.
API Spec. 6D	Specification for Pipeline Valves.
ASME B 16.5	Pipe Flange and Flanged Fittings.
ASME B 16.10	Face-to-Face and End -to-End Dimensions of Valves.
ASME B 16.25	Butt Welding Ends.
ASME B 16.34	Valves-Flanged, Threaded and Welding Ends.- Pressure rating
EN ISO 12516-2-2015	Design code for steel valve calculations
EN ISO 10497 2010	Specification for Fire Test for Valves (comparable with API 607 and API 6FA).
CSA Z245.15	Specification for Steel Valves in Oil or Gas Pipelines.
NACE MR0175	Specification for Materials for Use in H2S-Containing Environments

II. QUALITY ASSURANCE AND CONTROL

The BROEN Quality Management System

BROEN VALVE GROUP was originally certified according to EN 29001/ ISO 9001 on September 9, 1994. Audits are periodically performed to ensure certification validity.

BROEN VALVE Group's Quality Management System is now described by an electronic document, accessible to all relevant employees, continuously updated and improved, and used for both internal and external audit purposes.

ISO 9001 Certificate



Bureau Veritas Certification



BROEN A/S

Skovvej 30, 5610 Assens, Denmark

This is a multi-site certificate, additional site(s) are listed on the next page(s)

Bureau Veritas Certification Holding SAS - UK Branch certifies that the Management System of the above organisation has been audited and found to be in accordance with the requirements of the management system standards detailed below

ISO 9001:2015

Scope of certification

Development, manufacturing, engineering and delivery of valves to District Energy & Gas, Building Installations & Control, Industrial Installations & Control, & Control valve solutions to Marine, Power & Energy.

Original cycle start date:	10-07-1991
Expiry date of previous cycle:	NA
Certification / Recertification Audit date:	05-07-2024
Certification / Recertification cycle start date:	16-09-2024
Subject to the continued satisfactory operation of the organisation's Management System, this certificate expires on:	15-09-2027

Certificate No.: **DK018330**

Version: **1**

Issue date: **23-08-2024**

Phil Absalonsen



0008

Signed on behalf of BVCH SAS UK Branch

Certification Body Address: 5th Floor, 66 Prescott Street, London, E1 8HG, United Kingdom

Local Office: Bureau Veritas Certification Denmark A/S, Oldenborggade 25-31, 7000 Fredericia

Further clarifications regarding the scope and validity of this certificate, and the applicability of the management system requirements, please call: (+45) 77 311 000.

UKAS Certificate Template Multi Site Rev4.1

1/2

28 Aug 2023



BUREAU
VERITAS

Bureau Veritas Certification



BROEN A/S

ISO 9001:2015

Scope of certification

Site Name	Site Address	Site Scope
BROEN A/S (Head Office)	Skovvej 30, 5610 Assens, Denmark	Development, manufacturing, engineering and delivery of valves to District Energy & Gas, Building Installations & Control, Industrial Installations & Control, & Control valve solutions to Marine, Power & Energy.
BROEN Poland Sp. z o.o. (Pieszycza)	ul. Pieszycza 10, 58-200 Dzierżonów, Poland	
BROEN Clorius (Clorius Controls)	ul. Strefowa 19, 58-200 Dzierżonów, Poland	Manufacturing, engineering, and delivery of control valve solutions to Marine, Power & Energy. Manufacturing and assembly of valves to Building Installations & Control.
BROEN Inc. (USA)	6421 Lozano Drive, Houston, 77041 Texas, USA	Development, manufacturing, engineering, delivery and service of valves actuators and controllers to District Energy & Gas, Building Installations & Control and Industrial Power & Energy.
BROEN Poland Sp. z o.o. (Strefowa)	ul. Strefowa 15, 58-200 Dzierżonów, Poland	Storage and assembling of valves to District Energy & Gas, Building Installations & Control and Industrial Installations & Control.

Certificate No.: DK018330

Version: 1

Issue date: 23-08-2024

Phil Absalonsen



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Signed on behalf of BVCH SAS UK Branch

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UKAS Certificate Template Multi Site Rev.4.1


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28 Aug 2023

API 6D CERTIFICATE



American Petroleum Institute



2019-155

Certificate of Authority to use the Official API Monogram
License Number: 6D-0378 **ORIGINAL**

The American Petroleum Institute hereby grants to

BROEN POLAND SP. Z O.O.
Ul. Wojska Polskiego 4
Rogozno
Republic of Poland

the right to use the Official API Monogram[®] on manufactured products under the conditions in the official publications of the American Petroleum Institute entitled API Spec Q1[®] and **API-6D** and in accordance with the provisions of the License Agreement.

In all cases where the Official API Monogram is applied, the API Monogram shall be used in conjunction with this certificate number: **6D-0378**


The American Petroleum Institute reserves the right to revoke this authorization to use the Official API Monogram for any reason satisfactory to the Board of Directors of the American Petroleum Institute.

The scope of this license includes the following: Ball Valves

QMS Exclusions: No Exclusions Identified as Applicable

Effective Date: APRIL 23, 2025
Expiration Date: APRIL 23, 2028

To verify the authenticity of this license, go to www.api.org/compositelist


Senior Vice President of Global Industry Services

III. ENGINEERING DETAILS

Valve Data Sheet

Valve Size: 2 inch – 24 inch

Port: Full Port

Traceability: All valves with individual Serial Numbers

Service: Natural Gas Distribution and Compliance Pipeline, Bypass lines, Hot Tapping for Natural Gas Service.
Transmission Service

Flow direction: bi-directional

Location: Above Ground and Below Grade for direct burial.

Maximum Operating Pressure @20° C: 285 PSI (ANSI 150), 740 PSI (ANSI 300), 1480 PSI (ANSI 600)

Maximum Field Test Pressures: 1.5 times MAOP with valve in Fully Open position, 1.1 times MAOP with valve in full closed position.

Pressure Class: ANSI 150, ANSI 300 and ANSI 600

Maximum Service Temperature: 250° F (121° C)

Minimum Service Temperature: -49° F (-45° C)

Service: Natural Gas

Type of Valve: Double Block and Bleed Ball Valves (DIB options available)

Torque information, Pressure Loss information (Cv), weight data, and any other additional technical information is either included on the drawing for each individual valve or will be provided upon request.

Valve Components and Materials

Body

The BALLOMAX® -45C API Certified Ball Valves is manufactured in an all welded construction, designed and built to attain maximum strength and minimum weight, minimizing the potential leak paths.

The body is manufactured of A350 LF2 material. The valve is suitable for both above ground and direct buried applications.

Ball

The ball is full port (API 6D), made of High strength Carbon Steel A-350 LF2, ground to specific tolerances, with Electroless Nickel Plating (ENP – 3mils). Additional special materials available upon request.

Trunnion Mounted Ball Design

All BROEN BALLOMAX® -45C API 6D certified valves 2" and larger are Trunnion Mounted type.

The sealing principle is that the trunnion supported ball surface mates with the piston spring loaded HNBR/FKM seats on both sides of the Ball creating a double blocking design. This is especially desirable in High Differential pressure applications to eliminate high torque in the operations of the valve.

Vent and Drain

- Valves 6" and Above Include:
 - A vent port on the upper quadrant to vent the cavity in the valve body, in the full open or full close position.
 - A vent/drain port at the bottom of the trunnion which can vent or drain the valve cavity in the open or closed position. This port can be used to check the tightness of the seats in the open or closed position.
- 4" Valves Include:
 - A vent port on the upper quadrant to vent the cavity in the valve body, for use in the closed position.
 - A vent/drain port at the bottom of the trunnion which can vent or drain the valve cavity in the closed position. This port can be used to check the tightness of the seats in the closed position.
- Valves 3" to 2" Include:
 - A vent/drain port at the bottom of the trunnion which can vent or drain the valve cavity in the closed position. This port can be used to check the tightness of the seats in the closed position.

Seat

We offer two seat designs:

- SPE, single piston effect, with self-relieving seats: an over-pressure in the body cavity is released across the seat on the side of lower pressure (typically downstream).
- DPE, double piston effect: an over-pressure in the body cavity is trapped and not released. The installation of a pressure relief system is to be evaluated and specified by the purchaser.

Both seats are PMSS (Primary Metal and Secondary Soft Seats), where the primary metal seats protects the soft materials from external materials in the fluid, thus ensuring extended valve lifespan. The soft HNBR/FKM O-ring ensures bubble tight operations, even at cold temperature (-49°F/-45°C).

Metal-to-metal seats are available upon request.

All seats are spring loaded.

Fire safe design is ensured by a graphite ring and the metal to metal primary seal.

Emergency Sealant/Lubricant System

The BALLOMAX -45C API 6D certified valves are provided with Emergency Sealant/Lubricant Injection ports as follows:

- Valves 2" and below do not have injection ports.
- Valves 3" and above have injection ports on both seats. All injection ports include two independent check valves. One located after the Injection fittings to ensure no leakage even after removal of the Injection fitting, and one additional check valve included in the Injection fitting.
- Valves 6" and above, in addition to the injection ports on both seats, also have an injection port on the stem.

The seat injection system is designed to accomplish three goals:

- I. Flushing: remove any external materials from the interstice between the ball and the seat;
- II. Lubrication: reduce the friction between ball and seat, minimizing the torque required to operate the valve;
- III. Emergency sealing: allow for sealants to be pumped into the seating area to stop leaks.

The stem injection system is designed **only for emergency sealing**.

End Connections

Weld Ends are in A350 LF2 machined per ANSI B16.25, machined to industry standards wall thicknesses. At the customer's request the ends can be counter bored to match piping.

Flanged Ends are made from A350 LF2 Forged Steel per ANSI B16.5.

Anti-static Device

All BROEN BALLOMAX -45C API 6D valves come with an anti-static device on their stem in order to avoid sparks and prevent problems when handling flammable fluid, in compliance with API 6D requirements.

Stem Material and Sealing Design

The Stem is made of 25CrMo4/ AISI4130 High strength steel, Electroless Nickel Plating (ENP).

The Stem sealing for all BROEN BALLOMAX -45C API 6D valves have a minimum of 2 O-rings (HNBR or FKM Viton®) and a graphite ring for fire-safe protection. The stem sealing design on sizes 6" and higher also include a PTFE+C stem packing.

The stem assembly is designed including an anti-blow out system in compliance with API 6D requirements.

Paint

Standard paint is a Non-Toxic water based prime. BROEN can provide specialty coatings in house such as 3M 323+, or Coal Tar Epoxy. Contact us for any special coating requirement you may have.

Gear Operators

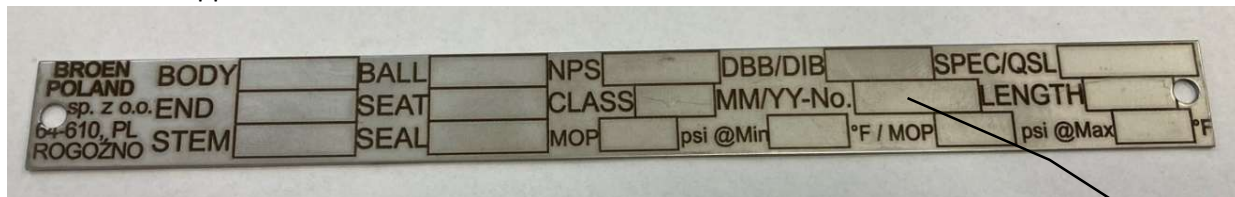
Valves can be supplied with Horizontal Gear or Vertical Gear, both with 2" Operating Ductile Iron nut or Handwheel. All gears are sized to optimize performance. Suitable for above ground or Direct Burial. Gears are attached to the valve using standard ISO mounting plates.

Actuators

Valves can be supplied with any type of actuator. Please provide all relevant actuator specs and controls requirements when requesting an automated valve package.

The API 6D Nameplate

Every BALLOMAX API Certified valve has a permanently affixed API licensed Label per API 6D code. It provides you with critical information permanently stamped to insure no misapplication of correct valve pressure rating is used for the application that it is intended:



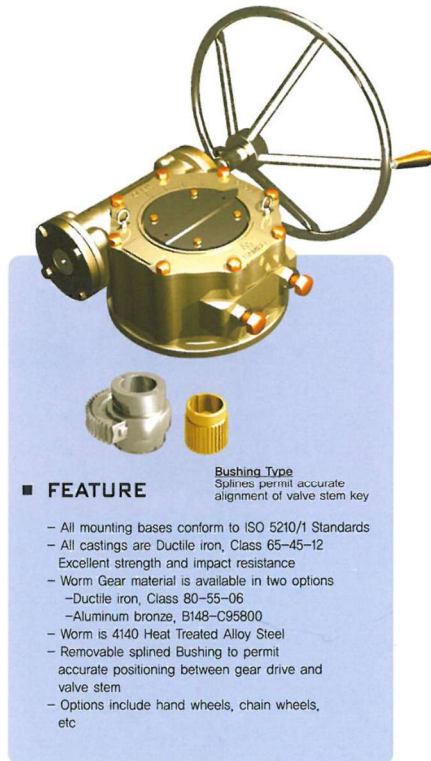
This is the unique Serial Number used by BROEN to ensure valve identification and traceability

A separate nameplate includes the API monogram, the unique API number assigned to BROEN and the manufacturing date:



Extract from Catalog

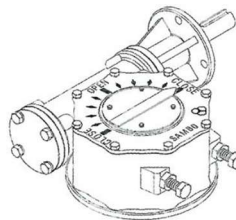
HORIZONTAL INPUT



■ FEATURE

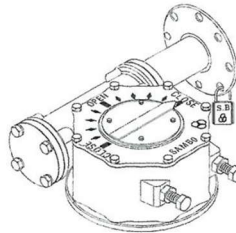
- All mounting bases conform to ISO 5210/1 Standards
- All castings are Ductile iron, Class 65-45-12
Excellent strength and impact resistance
- Worm Gear material is available in two options
 - Ductile iron, Class 80-55-06
 - Aluminum bronze, B148-C95800
- Worm is 4140 Heat Treated Alloy Steel
- Removable splined Bushing to permit accurate positioning between gear drive and valve stem
- Options include hand wheels, chain wheels, etc

M. O. V option



Worm Gear can be provided with Motor actuator Input flanges to accept standard ISO Mounting Base

Locking Device option



Input can be equipped with a Hand wheel locking Device for Manually operated units

SELECTION CHART FOR MANUAL OPERATORS

MODEL	SIZE	GEAR RATIO	MAX. Stem Acceptance	Mounting option & Standard	MAX. Torque Capacity		WEIGHT
					N · m	Ft·lbf	
SBWG-BF		32 : 1	20 (6x6)	F-07	310	229	4
SBWG-0		36 : 1	28 (8x7)	F-07, F-10	600	443	6
SBWG-00		38 : 1	36 (10x8)	F-10, F-12	1000	738	9
SBWG-01		42 : 1	46 (14x9)	F-12, F-14	1550	1143	13
SBWG-02		48 : 1	60 (18x11)	F-14, F-16	2400	1770	21
SBWG-03		52 : 1	75 (20x12)	F-16, (F-20)	4300	3172	30
SBWG-04		56 : 1	95 (25x14)	(F-20), F-25	7700	5680	62
SBWG-05		60 : 1	115 (32x18)	F-25, F-30	14800	10916	88
SBWG-06		64 : 1	140 (36x20)	F-30, F-35	26700	19693	162
SBWG-07		68 : 1	180 (45x25)	F-35, F-40	51100	37690	268
SBWG-08		58 : 1	225 (50x28)	F-40, F-48	106000	78182	510
SBWG-09		62 : 1	280 (63x32)	F-48, F-60	167000	123173	930
SBWG-10		64 : 1	320 (70x36)	F-60	250000	184390	1515
SBWG-11		68 : 1	360 (80x40)	F-60	370000	272897	2145
SBWG-12		72 : 1	400 (90x45)	F-60, (F-80)	540000	398283	3130

SINGLE REDUCTION

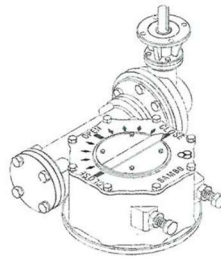


■ FEATURE

- All mounting bases conform to ISO 5210/1 Standards
- All castings are Ductile iron, Class 65-45-12
- Excellent strength and impact resistance
- Worm Gear material is available in two options
 - Ductile iron, Class 80-55-06
 - Aluminum bronze, B148-C95800
- Worm is 4140 Heat Treated Alloy Steel
- Removable Splined Bushing to permit accurate positioning between gear drive and valve stem
- Options include hand wheels, chain wheels, etc

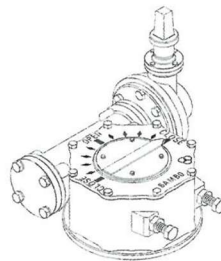
Bushing Type
Splines permit accurate alignment of valve stem key

M. O. V option



Worm Gear can be provided with Motor actuator input flanges to accept standard ISO Mounting Base

Square Nut option



Should state that Optional Square nut can be provided on input shaft

SELECTION CHART FOR MANUAL OPERATORS

MODEL	SIZE	GEAR RATIO	MAX. Stem Acceptance	Mounting option & Standard	MAX. Torque Capacity		WEIGHT
					N • m	Ft lbf	
SBWG-00-2B		76 : 1	36 (10x8)	F-10, F-12	1000	738	15
SBWG-01-2B		84 : 1	46 (14x9)	F-12, F-14	1550	1143	19
SBWG-02-2B		120 : 1	60 (18x11)	F-14, F-16	2400	1770	29
SBWG-03-2B		130 : 1	75 (20x12)	F-16, (F-20)	4300	3172	38
SBWG-04-2B		182 : 1	95 (25x14)	(F-20), F-25	7700	5680	78
SBWG-05-2B		195 : 1	115 (32x18)	F-25, F-30	14800	10916	104
SBWG-06-2B		256 : 1	140 (36x20)	F-30, F-35	26700	19693	195
SBWG-07-2B		272 : 1	180 (45x25)	F-35, F-40	51100	37690	301
SBWG-08-2B		319 : 1	225 (50x28)	F-40, F-48	106000	78182	598
SBWG-09-2B		372 : 1	280 (63x32)	F-48, F-60	167000	123173	1048
SBWG-10-2B		416 : 1	320 (70x36)	F-60	250000	184390	1693
SBWG-11-2B		442 : 1	360 (80x40)	F-60	370000	272897	2323
SBWG-12-2B		504 : 1	400 (90x45)	F-60, (F-80)	540000	398283	3397

IV. TESTING CODE AND COMPLIANCE

Test Procedure According to API-6D Section 10

We hereby detail our test procedures according to API-6D section 10. **These tests are performed and certified prior to leaving our manufacturing facility. Each valve is documented and has a test certificate which is available upon request.**

No test procedure will be started until the valve is at room temperature.

All **BROEN BALLOMAX®** Valves are tested in accordance with the procedures described below.

Any additional customer specified test will be evaluated, performed and certified in accordance with provided written requirements. BROEN Inc. reserves the right to review same for additional charges.

Hydrostatic Shell Test

1. The BROEN BALLOMAX® valve is placed in the testing bench.
2. The valve is opened half way and water (or other test media) at ambient temperature is pumped into it.
Pressure is built up to 1.5 times MAOP.
3. At the test pressure the operator is observing the valve in the specified testing time.

Testing time for 4" and smaller:	2 Minutes
Testing time for 6" thru 10":	5 Minutes
Testing time for 12" thru 18":	15 Minutes
Testing time for 20" and larger:	30 Minutes

4. No visible leakage is permitted: the valve is rejected if any leakage is detected.

Hydrostatic Seat Test

1. The BROEN BALLOMAX® valve is placed in the testing bench.
2. The valve is opened half way and water (or other test media) at ambient temperature is pumped into it. Pressure is built up to 1.1 times MAOP.
3. The valve is closed, and the test machine valve is closed between the valve and the machine pump. A manometer is observed while one side of the valve is drained and vented. After 15 seconds, the pressure is registered, and with any pressure loss the valve is rejected. The specified testing time is as follows:

Testing time 4" and smaller:	2 minutes
Testing time 6" to 18":	5 Minutes
Testing time 20" and larger:	10 minutes

- Paragraph 3 is now repeated for the other connection end of the valve.
- The test media is evacuated from the valve.

Supplementary Air Seat Test According to API 6D L.19 Type I and II (ISO 5208 Rate A)

Low-pressure Gas Seat Testing-Type I

- The **BROEN BALLOMAX®** valve is placed in the testing bench.
- The valve is opened half way, the closure member and leakage measurement connection port shall be purged with air, and air at ambient temperature is pumped into it at 10 psi.
- The valve is closed, and the test machine valve is closed between the valve and the machine pump. A manometer is observed while one side of the valve is drained and vented. After a period of 2 minutes of constant pressure, the stabilization period begins. The stabilization period can be extended in case stabilization is not achieved. The stabilization period is as follows:

Stabilization time 4" and smaller:	5 minutes
Stabilization time 6" to 10":	10 Minutes
Stabilization time 12" to 18":	15 Minutes
Stabilization time 20" and larger:	30 minutes

- Following stabilization, the test begins. The pressure is registered, and with any pressure loss the valve is rejected. The specified testing time is as follows:

Testing time 4" and smaller:	2 minutes
Testing time 6" to 18":	5 Minutes
Testing time 20" and larger:	10 minutes

- Paragraphs 3 & 4 are now repeated for the other connection end of the valve.
- The test media is evacuated from the valve.

The test benches are calibrated four times per year according to procedures described in the quality control system of BROEN Inc.

Low-pressure Gas Seat Testing-Type II

- The **BROEN BALLOMAX®** valve is placed in the testing bench.
- The valve is opened half way, the closure member and leakage measurement connection port shall be purged with air, and air at ambient temperature is pumped into it at 90 psi.
- The valve is closed, and the test machine valve is closed between the valve and the machine pump. A manometer is observed while one side of the valve is drained and vented. Pressure shall be identified

as stabilized when the rate of change is no more than 5% of the test pressure within 5 minutes. (87.75-92.25 psi range).

4. Following stabilization, the test begins. The pressure is registered, and with any pressure loss the valve is rejected. The specified testing time is as follows:

Testing time 4" and smaller:	2 minutes
Testing time 6" to 18":	5 Minutes
Testing time 20" and larger:	10 minutes

5. Paragraphs 3 & 4 are now repeated for the other connection end of the valve.
6. The test media is evacuated from the valve.

The test benches are calibrated four times per year according to procedures described in the quality control system of BROEN Inc.

Valve Documentation

All BROEN -45C API 6D valves are supplied with a test certificate related to the pressure test (hydrotest and air test).

Additional MTRs (including chemical compositions and mechanical properties of the materials, etc.) are available upon request.

Test Certificate Example

Test Certificate		BROEN VALVE TECHNOLOGIES	
Customer:	[Customer Name]	Order No.:	[Order Number]
Serial No.:	[seven digit unique number]		
Test article:	Ball valve		
Port size:	Full Port		
End connections:	Welding - Welding		
Size:	12"	Quantity:	1
MAOP:	1480 PSI	Drawing no.:	3/B300WWA52
Materials			
Valve Component	Material Type, Material Grade or P-number per ASME BPVC IX		
Welding end:	Carbon steel, P1 group per ASME BPVC IX		
Welding end:	Carbon steel, P1 group per ASME BPVC IX		
Valve body:	Carbon steel, P1 group per ASME BPVC IX		
Stem:	Stainless steel, AISI 420		
Ball:	Low Temp Carbon steel, A350LF2 + ENP		
Seat:	HNBR		
Operation Means:	Gear Operator	Hand-Wheel	Gear Orientation: Horizontal # of Turns: 15.5
Pressure Test			
Testing ball valve according to API specification 6D, Sec.10 25th Edition, November 2021			
Hydrostatic Test	Test Pressure (Psig)	Test Time (Minutes)	Test Result (Pass/Fail)
Section 10.3, Shell Test	2220	15	Pass: No visible leakage
Section 10.4, Seat Test - Seat A	1630	15	Pass: No visible leakage
Section 10.4, Seat Test - Seat B	1630	15	Pass: No visible leakage
Supplementary Test according to API 6D, Annex L			
Low-Pressure Gas Seat Test With Air			
Acceptable Criteria: ISO 5208, Rate A, No Visible Leakage.	Test Pressure (Psig)	Test Time (Minutes)	Test Result (Pass/Fail)
- L.19.1 Type I - Seat A	10	5	Pass: No visible leakage
- L.19.1 Type I - Seat B	10	5	Pass: No visible leakage
- L.19.2 Type II - Seat A	90	5	Pass: No visible leakage
- L.19.2 Type II - Seat B	90	5	Pass: No visible leakage
Label:	API 6D		
Houston, TX	Date:	5/26/2023	Inspector: Gustavo Perez
BROEN, Inc. 6421 Lozano Dr. Houston TX, 77041		Telephone: (713) 300-0480 Email: info@broen.com	

V. STANDARD VALVE PROCEDURES

Valve Preservation and Storage

The internal surfaces of the valve are protected against corrosion with a protection film. This protects the valve for a period of 6 months.

We recommend to store the valve on a flat surface in a dry, clean area, protected against weather conditions and corrosive agents.

The valves should always be stored in their full open position to prevent damage to the balls.

The valves are supplied with end caps to protect the beveled ends or the flange surface. These protection caps are to be kept until valve installation.

If the valves are stored for an extended time, we recommend to periodically (every 6 months) flush, clean, lubricate, and operate the valve, before re-storing it in fully open position.

Valves are shipped in a durable environmentally-friendly packaging. Disposal of valve packaging is under responsibility of BROEN's customers.

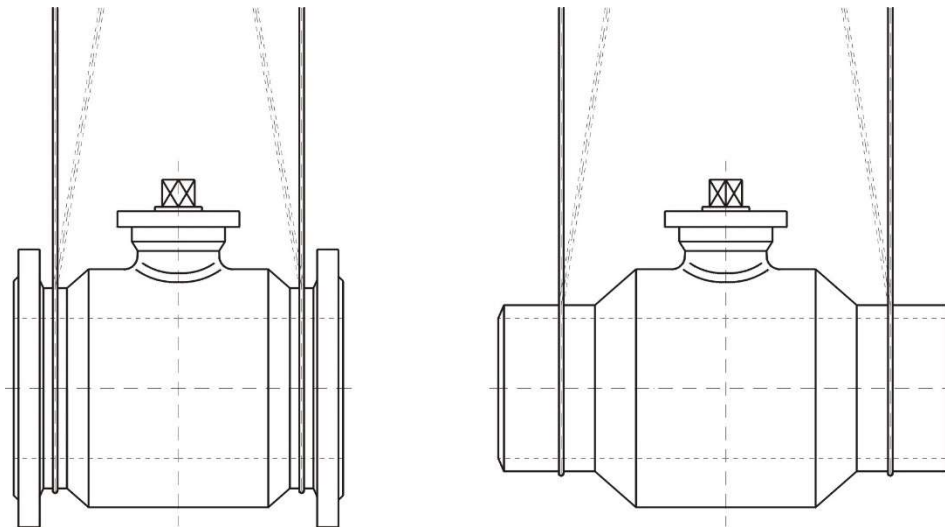
Valve Handling, Transportation, and Shipment

All BROEN BALLOMAX® Valves are to be shipped in the FULL OPEN position.

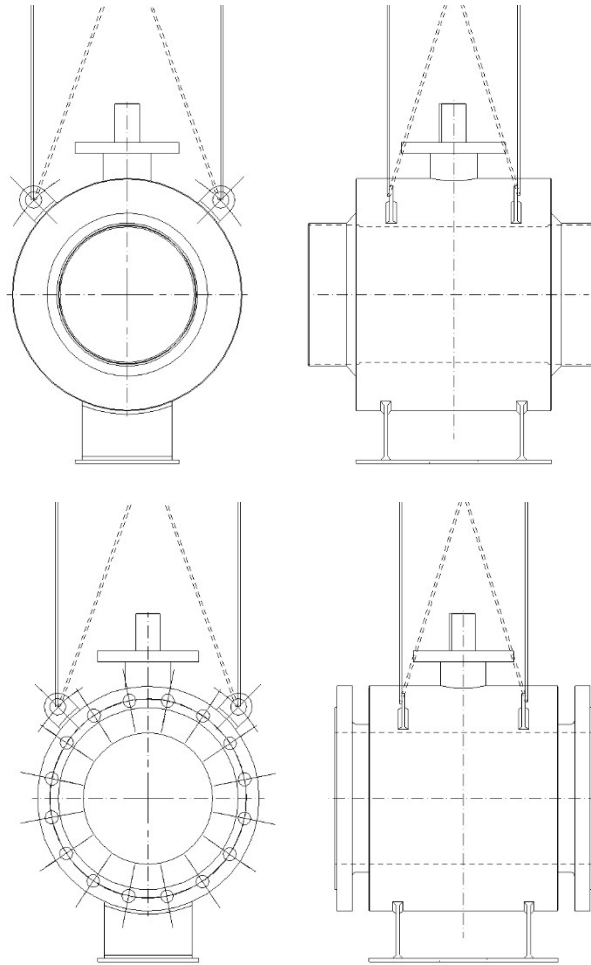
Gear Operators are factory set and should not be removed or adjusted before or during construction without consulting a factory representative.

Valves are to be handled with extreme caution.

Valves without lifting lugs are to be lifted as shown in the following illustration:



Valves with lifting lugs are to be lifted as shown in the following illustrations:



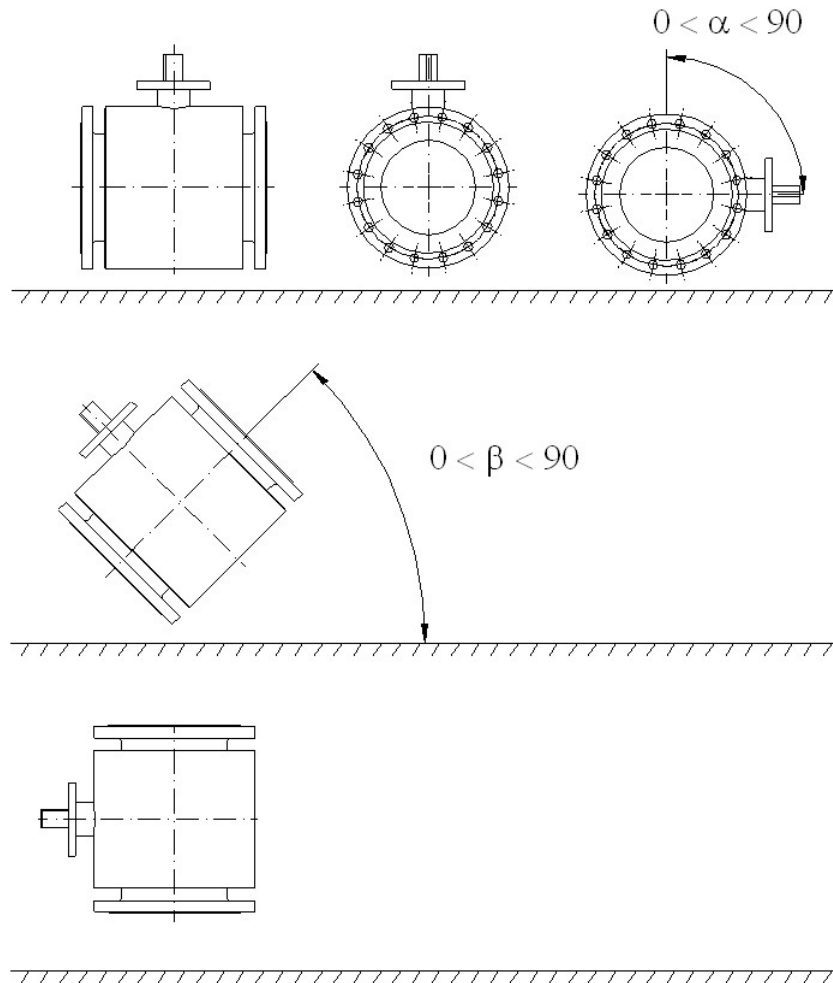
Standard Installation Procedures

Keep the -45C API 6D Certified Ball Valve in the Fully OPEN position During Installation. The Fully Open position best protects the soft seats from potential high heat and weld spatter. We suggest protecting the area where the ball and seat seals join to prevent weld spatter or weld beads attaching and possibly scratching the ball.

Do Not leave the Valve in any Partial Open or Closed Position. This would allow for the edge of the ball to rest on the soft seat which may temporarily cause an indentation until it has time to cold flow back into proper position. It also exposes the seats to heat and potential weld spatter. Leaving the valve in the partially open position may permanently damage the seat.

A Closed Ball Valve exposes the surface of the Ball Valve which can be damaged by weld spatter. The exposed surface is especially vulnerable when welding in the vertical position.

Installation Position: The API 6D Certified Ball Valve operates in any position, with either vertical or horizontal stem, as shown in the pictures below.



Valves with stem extensions (high end extensions) must be installed with vertical stem only. Please note that stem extensions must not be exposed to bending forces or torques.

Field Welding:

The welding ends of the valve are ANSI B 16.25 prepared for API 1104 standard arc welding procedures and are of a length to allow for arc welding without any unusual precautions. Gas welding is not recommended because it may cause excessive heat to build up that can burn the seats.

The valve should be welded in the Fully Open position, and the inside sealing surface area should be protected against weld spatter or weld beads in the sealing area

For valves with weld ends, please follow the proper WPS. Monitor the valve body temperature while welding, at a distance X from the welding point. Do not exceed 120°C (248°F).

Valve size	X [mm/inch]
Up to 4"	50/2
6" and above	100/4

Pups: Valves with pups prepared in a valve shop prior to installation may be preferable in some applications. The pups allow for a longer distance between the weld location and the soft seats, decreasing the likelihood of damage. The pups allow the site welds to weld the same pipe as the rest of the pipeline, following the same welding procedure. The increased length can also help with alignment during installation.

On Gear Operated Valves it is advisable to fully cycle operator before installation, while observing operation and the proper set points of the travel stops in Fully Open and Fully Closed positions. The travel stops are measured and set at the factory and marked.

Testing of welds can be performed by Hydrostatic testing or Nitrogen testing as is normal construction practice. The valve has already undergone API Hydrostatic Shell Testing at the factory. To check the integrity of your welds, review the dedicated section "Testing of Field Welds".

Testing of Field Welds

After welding, you may desire to test the welds hydrostatically or with nitrogen as is common practice in the Industry. Below are our procedures.

a) Hydro Testing:

The valve has already undergone API certification at the factory and the test certificates if requested from the factory show the results of these tests. Never Test Against a Closed Ball Valve.

Field Hydrostatic testing should be as follows:

1. Fill the Pipeline with clean water, with the Valves in the FULLY OPEN position. Filling the pipeline with valves in the partial open position allows for rust scale and trash to enter the valve body.
2. Once filled, you can move the ball to ½ open position to allow the cavity of the valve to fill with water.

3. Pressurize the line and perform test. (A recommended test operation can be found below.)
4. Valves should be returned to Fully Open position before draining the Pipeline. This prevents rust scale and trash entering the valve body and building up in the soft seat area which may cause damage to seats.
5. Upon draining the Pipeline, it is necessary to drain the valves using the drain in the bottom of the trunnion to remove all water from the cavity of the valve.
6. Note: if the valve has been left in the partial open position for an extended period, the valve should be exercised several times and left in the Full Open or Fully Closed position for the Soft Seat material to cold flow back into position for 100% shut off.
7. It is important not to use this newly installed valve for a blowdown valve or throttling valve. A sacrificial valve should be installed downstream for blowing down your line.
8. After the test has been concluded, flush the seats according to the Recommended Valve Lubrication Procedure section.

b) Nitrogen Testing

We understand that Nitrogen Testing is a common construction practice. This testing should be performed under careful practices that include heating of the nitrogen to prevent the valves plasticized components from freezing and damage.

This valve is for Natural Gas Service. We do not perform Nitrogen testing on our valves. We test to API-6D standards. When testing with Nitrogen you must respect that you are testing your welds, not the sealing ability of the soft seated valve. The molecules of Nitrogen, which are dry and very cold, are many times smaller than that of Natural Gas, which has natural lubricating properties. If your Nitrogen is not preheated, you can destroy the seats of the valve. Never test with unheated Nitrogen with the valve in the partial open position and never where the test media is lower than -40F. Leaving the valve in the partially open position may permanently damage the seat.

Be sure to thoroughly drain and dry the valve after test.

PS – Maximum allowable valve pressure

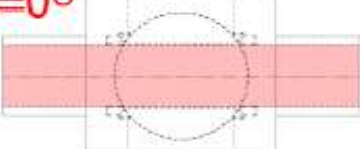
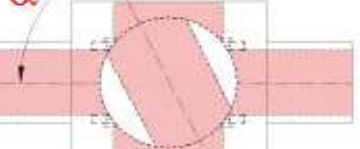
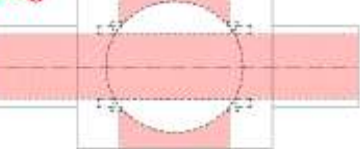
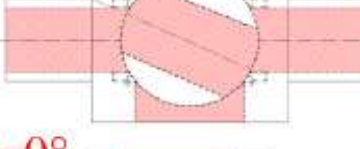
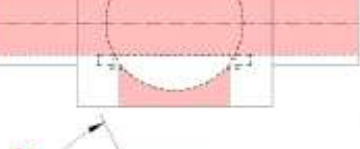

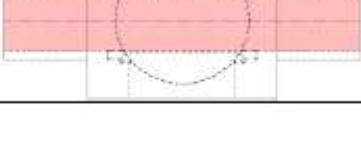
PT_{inst.} – pipeline system test pressure

Permissible Duration of the pressure test of the piping system:

	$PT_{inst.} \leq PS$	$PS \leq PT_{inst.} \leq 1.1xPS$	$1.1xPS \leq PT_{inst.} \leq 1.5xPS$
Time [h]	Without limits	Max. 48 h	Max. 2 h

The test pressure must not be greater than 1.5xPS.

Recommended Field Test Operation:

Operations sequence	Description of the operation	Placement of the valve ball
1	Put the valve to the "fully open" position ($\alpha=0^\circ$)	$\alpha=0^\circ$ 
2	Fill the system with liquid (pure water or water with a corrosion inhibitor)	
3	Open the valve by an angle $\alpha=75^\circ$ in relation to the open position - for max. 2 h	α 
4	Top up the system with liquid	
5	Apply the strength test pressure of the system PT_{inst}	$\alpha=0^\circ$ 
6	Put the valve to the "fully open" position ($\alpha=0^\circ$)	
7	Test the strength - for time see the table "Permissible duration of the test pressure of the pipeline system"	α 
8	Open the valve by an angle $\alpha=15^\circ$ in relation to the open position - for max. 30 min.	
9	Reduce the pressure to the system required for the tightness test	$\alpha=0^\circ$ 
10	Put the valve to the "open" position ($\alpha=0^\circ$)	
11	Perform the tightness test - for time see the table "Permissible duration of the test pressure of the pipeline system"	α 
12	Open the valve by an angle $\alpha=75^\circ$ in relation to the open position - for max. 2 h	
13	Relieve fluid pressure	$\alpha=0^\circ$ 
14	Put the valve to the "fully open" position ($\alpha=0^\circ$)	
15	Drain the piping of liquids	
16	Drain and dry the valve (see point 7.2)	

Hot Tapping

BALLOMAX® -45C API 6D Certified Ball Weld X Flange Valves are Full Port Open Valves and are suitable for Hot Tapping Operations. Always Tap through the valve in the Fully Open position. It is very important to remove all metal chips from the Tapping Operation prior to closing the Valve. This is a soft seated valve and the seats can be damaged from the metal tapping chips.

If pressure testing the valve after installation but before the coupon is cut, ensure that the test pressure does not exceed the current operating pressure of the line to prevent damage to the pipeline.

We recommend you refer to the Tapping Equipment Manufacturers procedure for the Tapping operation and procedure. Ensure the proper drilling tool is selected based on the port size, valve nest dimension, and overall length of the valve. As a general rule, the cutter size should be at least 0.5" smaller than the valve port size.

Valve Operations

Your BROEN BALLOMAX® -45C API 6D Certified Ball Valve is designed for On / Off service. The valve should never be used as a Throttling Valve or Blowdown Valve.

Standard BROEN BALLOMAX® -45C API 6D Certified Ball Valves 3" and below use a lock plate and 2" nut. The nut has an extrusion that serves as the indicator showing the valve's position. The valve is open when the extrusion is in-line with the direction of the pipeline. If the extrusion is perpendicular to the pipeline direction, the valve is closed. The lock plate includes mechanical stops to ensure the fully closed/open position is achieved.

Standard BROEN BALLOMAX® -45C API 6D Certified Ball Valves 4" and above are Gear Operated Valves and have a Rotating position indicator. The indicator clearly shows Open and Closed positions and provides you visually the travel direction of the valve stem.

The valve OPENS counter-clockwise and CLOSES clockwise. The valve is a quarter-turn operation. The Gear Operator is multi-turn to slowly move the ball into the desired position. The number of turns is marked on the Gear.

The Gear Operator has positive stops incorporated into the unit for full open and full closed positions. The positions are set at the factory and determined by measurements based on the ball position. If you need to reposition in the field, please call your representative on the procedure.

Valve Maintenance

BROEN BALLOMAX® -45C API 6D Certified Valves are designed to be maintained and lubricated on a routine basis. The Valve requires lubricant to operate smoothly. After injecting lubricant, the valve must be operated to uniformly coat the surface of the ball. Venting the valve allows you to check for seat tightness. (See Recommended Valve Lubrication Procedure).

BROEN recommends **Sealweld Valve Cleaner Plus** or **ISOFLOW Valve Scrub** for flushing our valves. This will help to remove construction particles left from loose rust or welding procedures. For lubricant, we recommend **Sealweld Equa Lube 80**, **Sealweld 7030**, or **ISOFLOW Valve Lube 365** for smooth operations. If necessary, **Sealweld 5050**, **Sealweld Total Lube #911**, or **ISOFLOW Valve Secure Seal** sealant for sealing leaking seats. For stem leakage, we recommend **ISOFLOW Valve Pak-N-Seal** to seal stem leaks.

Note: Flushing is recommended after each instance of pigging.

Recommended Valve Lubrication or Flushing Procedure

As it becomes necessary to maintenance your valve, the following items will be necessary to perform this task:

- 10,000 PSI High Pressure Hydraulic Valve Lubrication Gun
- A recommended Valve Lubricant

BROEN recommends **Sealweld Valve Cleaner Plus**, **ISOFLOW Valve Scrub** or equal be used for flushing. If the valve requires lubrication, **Sealweld 7030**, **Sealweld Equa Lube 80**, **ISOFLOW Valve Lube 365** or equal would be recommended.

Note: There is a difference in Lubricating a valve and Sealing a Valve. A Valve Sealant should only be used in case Natural Gas is blowing by the Seat Seals, and 100% shut of is necessary. This normally means there is Seat Damage to the valve. Follow the instructions provided by the Lubrication Gun Manufacturer.

Follow the steps below for lubricating or flushing the valve:

- STEP 1 Valve should be placed in the CLOSED position. If you cannot close the valve because of disruption of service, you can lubricate the valve, but not as effectively.
- STEP 2 The Valve will have 2 or 4 Big Button Head Lubrication Fittings on the Body. Maximum injection pressure should not exceed 2.5*Maximum Operating Pressure. Inject the recommended amount of lubricant according to the list below. Refer to the Lubricant Manufacturer's recommended pressures. At this point the valve is full. This procedure should be performed on both or all 4 fittings.

Note: If the valve has been lubricated before, we assume there is some lubricant in the valve. If the valve is completely void of lubricant the following amounts of lubricant are needed to replenish.

The amount of Cleaner, Lubricant per valve is as follows:

4" Valve	2 ounces each side of valve
6" Valve	3 ounces each side of valve
8" Valve	4 ounces each side of valve
12" Valve	6 ounces each side of valve
16" Valve	8 ounces each side of valve
20" Valve	10 ounces each side of valve
24" Valve	12 ounces each side of valve
30" Valve	15 ounces each side of valve
36" Valve	20 ounces each side of valve

STEP 3 This is the most important STEP. The Ball of the Valve should be rotated to the Open Position to evenly spread the lubricant over the surface of the Ball. If the valve is very dry or the line has a lot of rust scale. Rotating the ball multiple times may be necessary to obtain full shut off, and you must re-lubricate.

Note: If the Valve is dry and hard to turn at the start, you will notice quickly that the newly lubricated ball is easier to turn. As you rotate the ball you are using or replacing the missing lubricant. It is recommended that you re-lubricate the valve again after this initial procedure. This is regarded as Topping Off the reserve lubricant.

Note: **Do not inject lubricant or flush through the stem port. The stem port is for emergency sealing only (covered in Recommended Valve Sealing Procedure).**

Recommended Valve Sealing Procedure

If a stem or seat leak has been detected and it has been determined that the valve seat or stem must be sealed for 100% shutoff, the following procedure should be performed:

- 10,000 PSI High Pressure Hydraulic Valve Lubrication Gun
- A recommended Valve Lubricant

BROEN recommends **Sealweld 5050**, **Sealweld Total Lube #911**, or **ISOFLOW Valve Secure Seal** sealant for sealing leaking seats. For stem leakage, we recommend **ISOFLOW Valve Pak-N-Seal** to seal stem leaks.

Note: There is a difference in lubricating a valve and sealing a valve. A Valve Sealant should only be used in case Natural Gas is blowing by the Seat Seals, and 100% shut of is necessary. This normally means there is Seat Damage to the valve. Follow the instructions provided by the Lubrication Gun Manufacturer.

The procedure for applying sealant is below:

STEP 1 Valve should be placed in the CLOSED position. If you cannot close the valve because of disruption of service, follow the procedure for flushing and lubrication.

STEP 2 We recommend **Sealweld 5050** or **Sealweld Total Lube #911**, or **ISOFLOW Valve Secure Seal Sealant** to seal off leaking seats. The Valve will have 2 or 4 Big Button Head Lubrication Fittings on the Body. Maximum injection pressure should not exceed 2.5*Maximum Operating Pressure. Inject the recommended amount of sealant according to the list below. Refer to the sealant Manufacturer's recommended pressures. At this point the valve is full. This procedure should be performed on both or all 4 fittings to seal the seats.

The amount of Sealant per valve is as follows:

4" Valve	2 ounces each side of valve
6" Valve	3 ounces each side of valve
8" Valve	4 ounces each side of valve
12" Valve	6 ounces each side of valve
16" Valve	8 ounces each side of valve
20" Valve	10 ounces each side of valve
24" Valve	12 ounces each side of valve
30" Valve	15 ounces each side of valve
36" Valve	20 ounces each side of valve

STEP 3 For Valves with Stem Sealant Injectors, we recommend **ISOFLOW Valve Pak-N-Seal** to seal stem leaks. Only 1-2 pumps of the gun are required to seal the stem due to the small sealing area.
This fitting only be used if there is a detectable Stem Leak!

Gearboxes provided with BROEN BALLOMAX® -45C API 6D Certified Valves are lubricated for life. Under normal operating conditions, the gearbox lubrication requires no maintenance.

Troubleshooting

BROEN BALLOMAX -45C API 6D Certified Valves are designed such that there are very few problems that can be experienced. If you do have issues, please call you Representative or our Office for assistance.

Few remarks:

- If the seats are SPE (self-relieving), allow for any over-pressure within the body cavity time to be released before checking for leaks.
- If the valve is not sealing, make sure that the valve is in fully closed position.
- If the torque to operate valve is high (especially if the valve was not operated for a long period), please flush and lubricate the valve using the lubrication ports and the proper fluids (see section on Recommended Valve Lubrication procedure).