Severe Service Ball Valve

Technical brochure

AMPO
POYAM VALVES

Commitment made of steel

INDEX

1. COMPANY PROFILE

AMPO is an **international leader** in highly engineered valves and Integrated Smart Solutions for the most severe applications and industries as well as in stainless steel and high alloy castings.

Through our AMPO SERVICE team **we guarantee a prompt response** to customer needs wherever they are throughout the world: technical support in start-up stages, equipment selection, predictive and preventive maintenance, training, etc.

Fully inhouse manufacturing process

Worldwide references

Project based on people

Innovative spirit

700+ people

In more than 60 countries

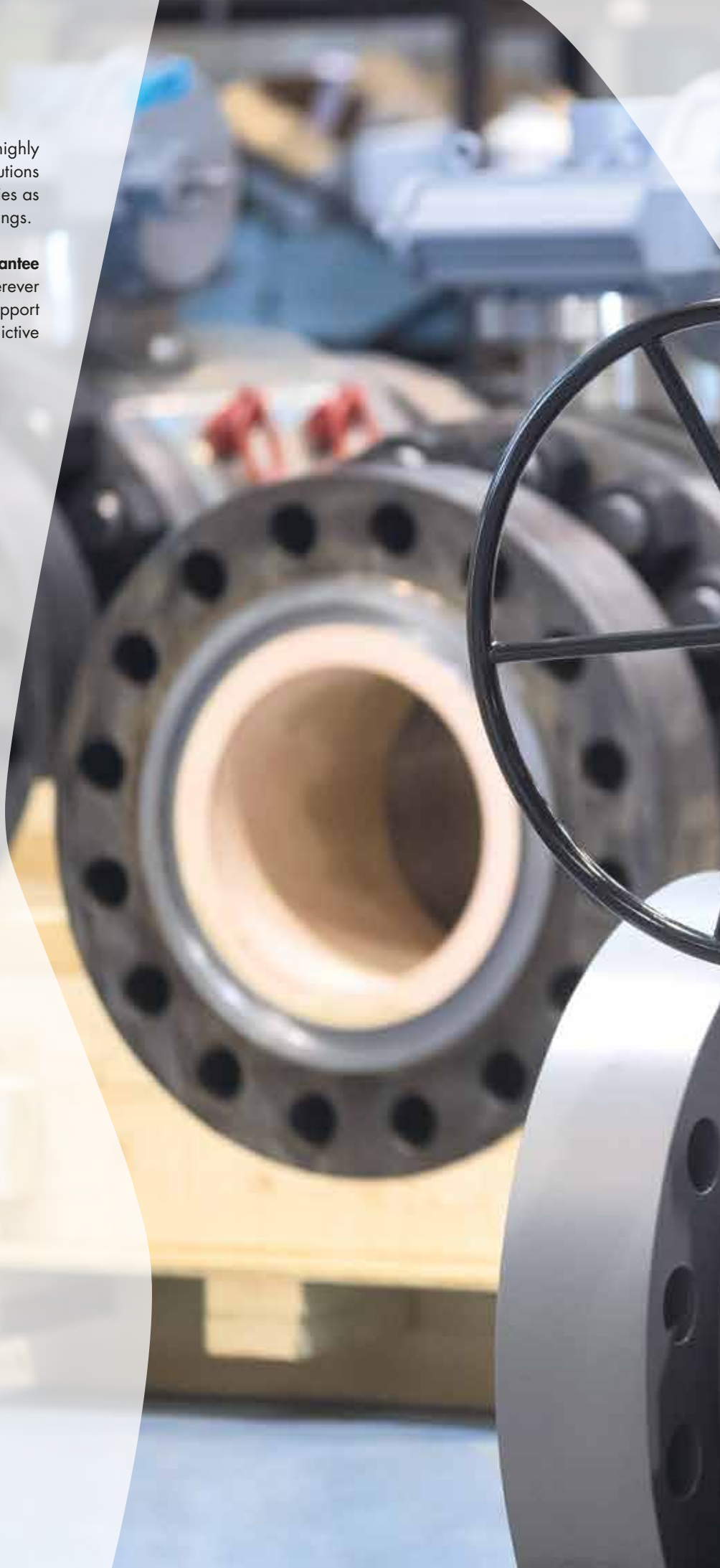
Most important partners in the industry

Cutting edge technologies

Our commitment: the best service

Customer focus

Since 1964



2. APPLICATION

AMPO POYAM VALVES offer a highly engineered range of **Severe Service Floating Ball Valves** for the hydrocarbon processing industry, which are designed for high temperature and high-pressure severe service applications where reliability and safety are both ours and our clients primary concern. Our customized solutions and robust designs create complete reliability due to their optimum performance.

Reliable Floating Ball Valves are the ideal solution for severe services containing heavy crude feedstocks subject to high temperature and coke formation such as:

- Catalytic Cracking (FCC, RFCC, DCC)
- Visbreaking
- Hydrocracking
- Slurry Hydrocracking
- Hydrotreating
- Hydro processing
- Solvent DeAspahlting
- CDU / VDU
- CCR, Aromatics
- Steam / Thermal Cracking
- Gasification
- Delayed coking
- Sulphur recovery
- Ethylene cracker
- Fossil Fuel (Power Generation)
- Fly Ash Handling
- Coal Gasification
- Propane De – Hydrogenation
- Hydrogen production
- Mineral ore refining / Autoclaves
- Polysilicon
- Special industries

2. APPLICATION

The processing of heavy oil (Residuum) results in coke formation and deterioration of a valve operation if the proper valve is not chosen. The AMPO POYAM isolation ball valve has been specifically designed for the severe service conditions of these applications.

This severe service isolation ball valves brochure defines the following categories as a minimum for the hydrocarbon industry:

- Critical service with coking media, High Temperature and High Pressure.
- Severe service with coking media, High Temperature and Low Pressure.
- Severe service with non-coking, High Temperature and High or Low Pressure.
- Severe service with slurry, High Temperature and High Pressure.
- Severe service with slurry, Low Temperature and High Pressure.

Severe service category:

- Coking service
- Non coking service
- High temperature and gradient thermol/shock
- High pressure, erosive, slurry
- Low pressure, solids, viscous, sticky
- Gas, hazardous
- High cycling
- Positive isolation (zero leakage internal and external to atmosphere)
- System depressurization, over pressure protection systems

- Chopper valves (back flow Preventer), Emergency shut down.
- Solids, particulates, sticky, high viscosity, sediments, coking
- Multiphase flow medium
- Corrosive
- Abrasive
- Lethal
- Quick opening and closing, High cycle
- Tight shut off or no leakage or leak paths in all operating conditions
- Low emission per ISO 15848-1 min Class B
- Complex control to protect downstream assets and people safety.
- Fire safe & certified
- High operational reliability
- Minimum spare part dependent. "mttr*" (total cost of ownership) ** mttr - Mean time to repair*

If three or more conditions above prevail it is highly recommended to categorize as severe service metal seated valves.

3. SEVERE SERVICE BALL VALVES

Design standards:
- API: 608, 6D, 598, 641
- ASME: B16.34, B16.10, B16.5, B16.47 A or B, B16.25, VIII Div 1 & 2…
- OTHERS: FCI 70-2, NACE MR0175, NACE MR0103, ISO 17495-1…

Classes: 150 lbs up to 2500 lbs

Sizes: 1/2" up to 24" (higher sizes upon request)

Materials: AMPO POYAM VALVES manufactures valves following any material (forging or casting equivalent) specified on ASME B16.34, such as:

- CARBON STEEL
- CARBON STEEL FOR LOW TEMPERATURE
- AUSTENITIC STAINLESS STEEL
- ALLOY STEEL
- DUPLEX STAINLESS STEEL
- NICKEL BASE ALLOYS
- INCOLOY for high temperature applications

A patented material is recommended for applications with polythionic acid corrosion stress cracking, ammonium bisulfide stress cracking, chloride stress cracking at elevated temperatures.

Ball materials shall be in series 300 of austenitic stainless steel or nickel base alloys with HVOF Chromium Carbide Coating (to minimize corrosion and erosion) with mechanical and/or metallurgical bonding depending on applications.

Seat materials: Same as above Ball materials with Chrome carbide coating as specified / required in individual data sheet, ensuring an identic thermal expansion between sealing components.

NACE MR0103 compliance is a common requirement in sour water applications. AMPO POYAM VALVES' Severe Service Ball Valve is commonly used in these applications and is compliant to NACE. Materials shall meet NACE MR0103 where required.

For special process fluids where the material selection must be performed with a specific concentration in or out of the standards, AMPO POYAM VALVES is able to customize the concentration of each component such as Ni, Mb, C… etc. to follow the most severe corrosion conditions and enlarge the lifetime of the valve.

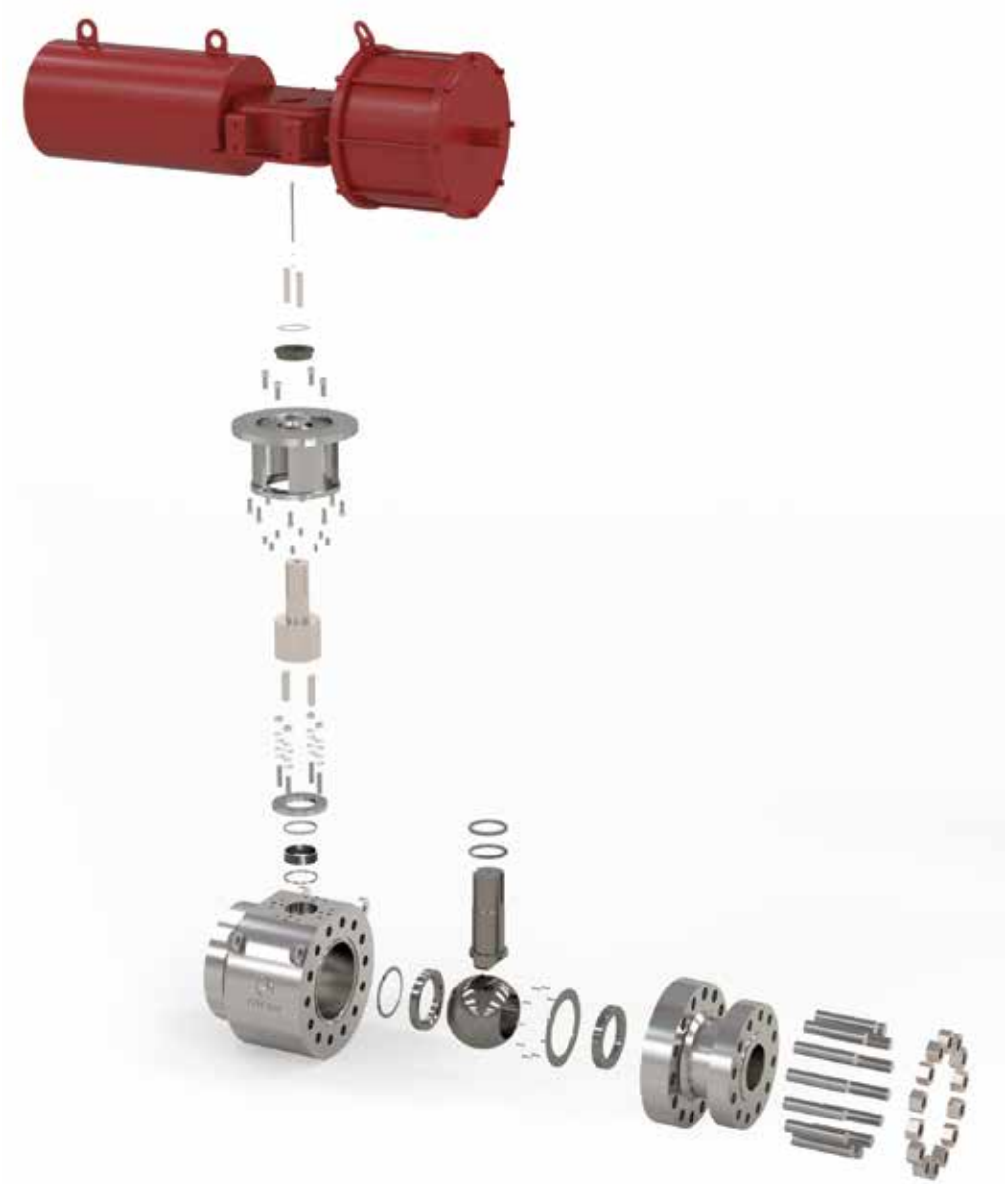
Moreover, one of our main advantages is that we have our own foundry. Consequently, AMPO FOUNDRY provides the best quality castings and service as it works hand in hand with our manufacturing processes. At our foundry, which is expert in stainless steel and high alloy castings, cast materials are produced and machined under strict quality controls and this ongoing monitoring is the key to our quality and success. On the valve manufacturing process, we are in a privileged position, since at AMPO, we control the whole manufacturing process, from the very beginning to the end, from the receipt of the scrap material to cast and to end solution ready to ship to the customer, as our castings start from one of the world's leading valve foundries, and continue through to a product which is finished and tested to any specification all within our own facilities.

End connections: RF, RTJ, HUBS, BW, etc. are fabricated integral to the valve body.

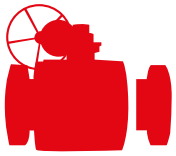
Actuation:
- Manual gearbox
- Electric, hydraulic or pneumatic actuator
- Local control panels and integrated instrumented systems are available per request.

Temperature: -46°C up to +850°C (-51° F up to +1562° F)

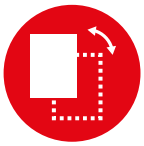
Design features:
- Available in full or reduced port designs.
- 2 or 3 pieces, Split Body, Side entry, Floating type, with unidirectional or bidirectional sealing with as required in individual data sheet.
- True anti-blow out type design.
- Advanced metal to metal (fire safe tested) sealing solutions for long life cycle.
- Pressure energized body gaskets available to meet application requirements.



4. WHY CHOOSE OUR SEVERE SERVICE BALL VALVES

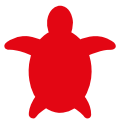


SPLIT BODY / SIDE ENTRY DESIGN
for a robust valve solution.

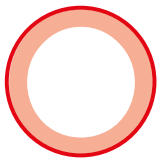


METAL SEATED DESIGN permits the valve to be installed vertically or horizontally and for high pressure differentials.

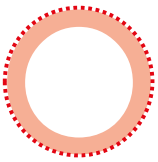
HIGH ACCURACY OF THE DRIVE TRAIN COMPONENT which makes a stronger and a more robust design avoiding misalignments found in similar designs.



LONGER LIFE thanks to highly engineered protected sealing areas between the seat and the ball which significantly reduces the wear between the ball and the seats. Besides, seats are **PROTECTED** from erosion in the open and close positions (whole cycle).



WIDE SEAT SEALING SURFACE
to reduce scratches and abrasion.

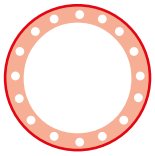


HIGH PERFORMANCE COATINGS
to increase the durability of the key parts in harsh environment of erosion and corrosion, and high temperatures and pressures.

Belleville springs allow **EFFECTIVE PERFORMANCE** maintaining pressure energized sealing of the ball and seat at all thermal gradients providing constant mechanical force.

MINIMAL MAINTENANCE:
AMPO POYAM VALVES' Ball Valve is designed to provide maintenance free operation between turnarounds. Minimum spares and long reliability (MTTR.)

OPTIMIZED FLUSHING SYSTEMS
are designed to ensure the best performance.



HIGHLY SEALING SOLUTION
to maintain integrity and reduce leak paths to the atmosphere.

Purge/Flushing system **KEEPS SEATING SURFACES CLEAN** of debris thus avoiding seating surface erosion and ensuring positive sealing.

SELF ALIGNING GLAND. Minimal wear on stem and LOW EMISSION PACKING SEALING SYSTEM to maintain high resolution to thermal cycles.

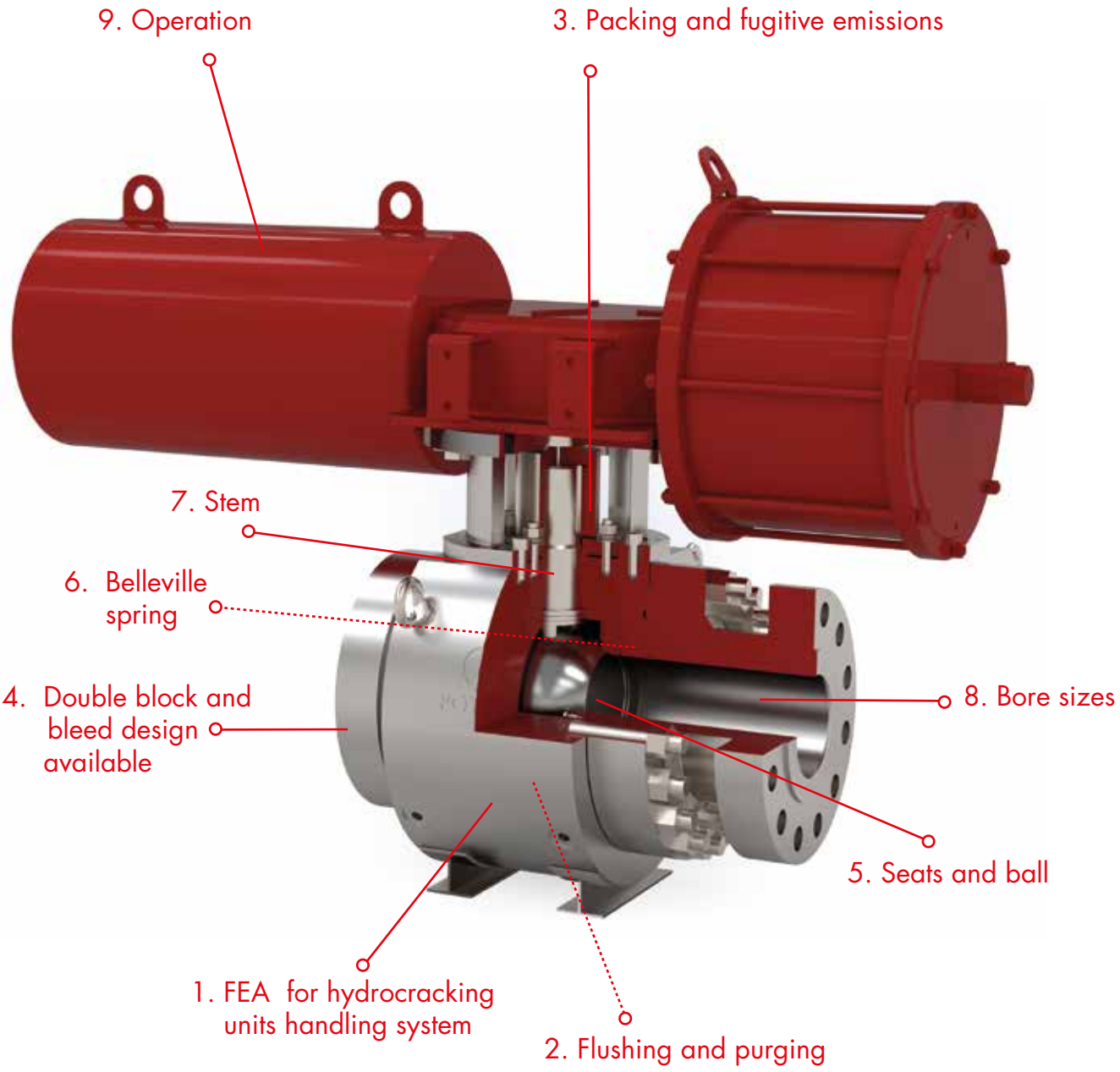
ACTUATION UNIT IS INLINE SERVICEABLE.

SIMPLICITY, fewer parts than any other comparable valves leading to greater reliability.

IN-HOUSE TESTING CAPABILITIES:
erosion test rig, customized testing programs, etc.

OPTIMIZED DESIGN due to mechanical and fluid dynamic simulations and due to in service valve design check.

5. TECHNICAL FEATURES



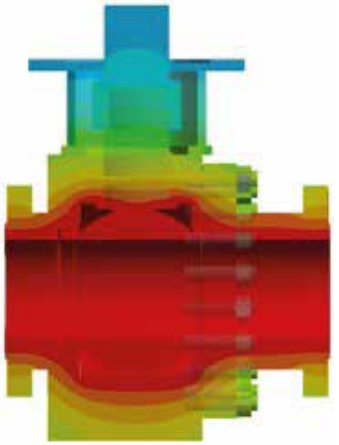
5.1. FEA FOR HYDROCRACKING UNITS HANDLING SYSTEM:

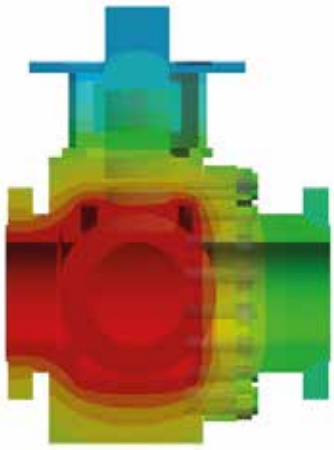
AMPO POYAM VALVES has a continuous improvement plan which includes performing analyses to verify our calculations and meeting our customer's needs.

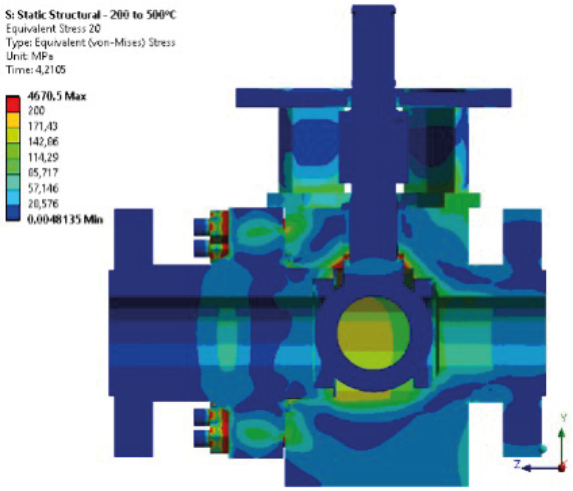
Assessments have been carried out in compliance with ASME VIII or EN 12952-3 code and EN-13445 code for design by analysis and fatigue assessment. Material properties and stress limits are accordingly following the ASME codes.

For the FEA, the worst possible high temperature scenarios have been evaluated: +850°C (+1562° F).

*For temperatures of +1000°C and above, please contact factory.







5.2. FLUSHING AND PURGING:

FLUSHING

Flushing is the supply of a clean fluid via the cavity surrounding the ball and seats in the valve. The flushing fluid being at a higher pressure than the line media passes between the body and the ball and seats into the line during the operation of opening or closing the valve. Furthermore, flushing fluid pressure must be notified as it affects the actuator sizing. This flushing fluid thus enters the main line and being of a clean nature ensures that the ball contact against the seats is on clean metal to metal surfaces.

AMPO's flushing parts are manufactured according to ASME B.16.34.

- **Parameters:**
  - Line pressure
  - Steam T°
  - Steam pressure
  - Schedule

PURGING

Purging is the supply of an inert and safe fluid into the cavity surrounding the ball and seats and spring in the valve. The purge is maintained at a higher pressure than the media. Purging fluid pressure must be notified as it affects the actuator sizing. The purge operations maybe continuously operating to ensure a clean and debris free environment for the valve sealing mechanisms. Purge operations and cyclical duties can be determined during the detail engineering stages depending on the need and process operations.

The objective of this point is to determine the type of purging system required for each isolation valve design in critical service coking valve applications. The correct purge system selection for individual critical service applications benefits plant operations smooth and safely, avoiding costly unexpected valve related shutdowns, increasing the overall plant reliability and availability.

Typical objectives of a purging system:

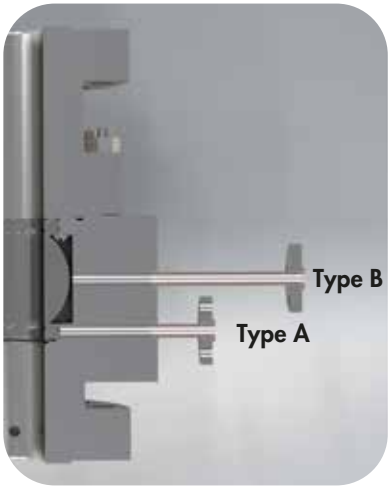
- To maintain acceptable valve torque of critical service isolation ball valves subject to heavy Resid and coking.
- To prevent ball coating damage from high torque turning with the presence of coke particles in ball, seat, or cavities.
- To maintain tight shutoff condition of critical service isolation ball valves.
- To provide hot standby and prevent isolation and control valve trim damage during start up, operation and bypass. Fluid shall be non-flashing.
- To prevent coking in control valve vent and drain valves and provide safe de-pressurizing and drain ability of trapped HHP liquids from the control valve.
- Purge connections shall be determined to be continuous low rate or intermittent high rate during the detail engineering stages depending on the valve location and process operations. Vendor shall be able to perform by FEA and provide proper justification on the purge design.
- Source of high-pressure purge oil with non-coking properties and non-solidifying properties due to temperature fluctuations shall be customer scope of supply.
- Purging media commonly used has been heavy or light gas oil, heavy or light diesel depending on the availability. Steam or clean gas such as air or nitrogen maybe used as substitute depending on unit operation and availability.
- Valve cycling and purge functions shall be determined during detailed engineering stages depending on the process conditions.
- Detailed design contractor, end user to include in their scope of supply for other pieces of equipment's along with specifications for orifices, block valves, flow control valves and make sure all piping are safely connected and operational.

Purging/Flushing Systems are recommended to use of continuous body & seat purging to ensure against operating torque increases or valve lock-up due to heavy Resid or coke formation. The residual build up could occur in a state change during operating temperatures range from 270°C (518° F) to 700°C (1292° F) and the fundamental concept of purging is to displace the volume of the valve cavity every 2~3 minutes with purging/flushing media removing the heavy hydrocarbon before the light ends flash and deposition occurs.

Flushing or Purging can be accomplished with steam, nitrogen gas or liquid such as heavy or light VGO, etc. AMPO POYAM VALVES engineering team always needs to know the intended flush/purge fluid for designing the right solution for the desired purposes.

These systems' designs and locations could vary depending on the specific data of the application, but these are our standards:

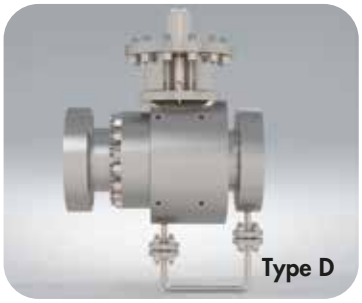
- **Type A:**
  - Purging zone: Dynamic Seat Purge
  - Continuous Inlet Connection
  - Consumption Level: Very Low
- **Type B:**
  - Purging zone: Body Cavity Purge
  - Continuous Inlet Connection
  - Consumption Level: Very Low (when valve is in fully open or closed position). High (during operation)

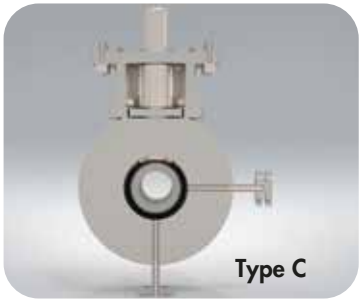


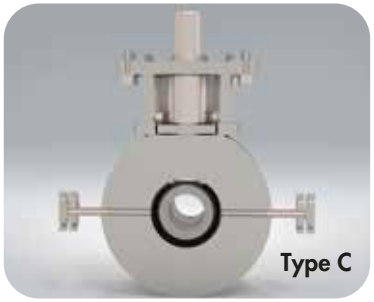
- **Type C:**
  - Purging zone: Body Cavity Drain
  - Continuous or Intermittent Outlet Connection
  - Consumption Level: Increases the consumption of the Type B when it is "ON"
- **Type D:**
  - Purging zone: Draining Return to Line
  - Continuous Inlet Connection
  - Consumption Level: High

Type D
DRAINING
RETURN-TO-LINE

Type C
BODY CAVITY
DRAINING







VERTICAL

HORIZONTAL

The factors to take into account for optimum purge systems are: purge design type (the types may be used independently or in combinations), connection type and location, media type and pressure, temperature, etc.

However, Flushing/Purge connections can be configured to customer request. When requesting non-standard configurations merely indicate the location desired and specify the size. The proposed connection is a mechanically reinforced one to avoid load transmission to the welding.

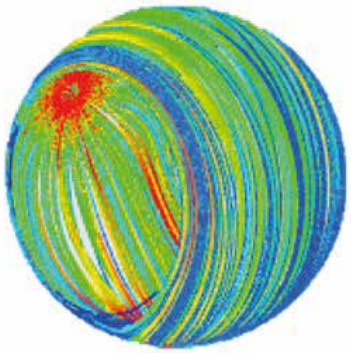
Purge Conditions: VALVE PURGING ZONES

Welded standard connection
mechanically reinforced connection
to avoid load transmision to welding

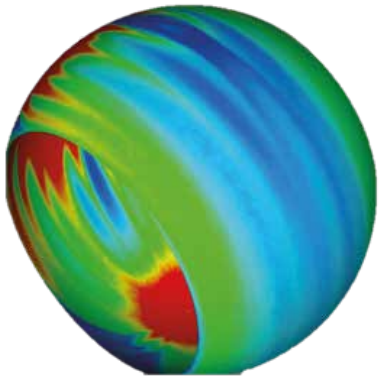
AMPO POYAM VALVES can also perform a fluid-dynamic analysis, in order to design the correct system of flushing to facilitate the flow value. In case of an accidental overflow or human error, ball and seats could have serious damage and consequently have unexpected plant shutdowns and repair issues.

With our optimized purge design, there is an efficient flow around the ball. A stable velocity and shear stress avoids the risk of having erosion at the ball and a cleaning effect around the ball, specially near seat to ball contact areas, is obtained.

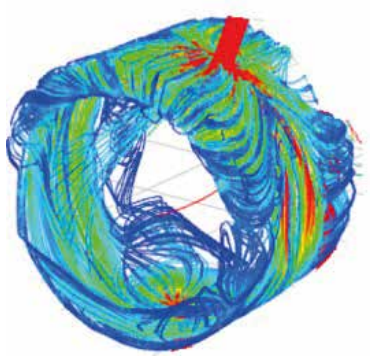
An inefficient fluid distribution would generate a turbulent flow with a poor cleaning around the ball. Furthermore, in areas with a high peak velocity, the risk of erosion in the ball is there. Meanwhile at the low velocity areas cleaning of the valve is not guaranteed.



Velocity distribution



Ball shear stress



Velocity distribution of a turbulent flow

With an optimized port and internal design, we get a more stable velocity and shear stress avoiding the risk of having erosion at the ball and a better cleaning.

- **Connection:**
  All purged valves as required in individual data sheet shall be supplied with specified connection such as RF (raised face flange), RTJ (ring type joint), hub/ clamp connector, butt welded ends.
  Purges are welded on to the valve body locations as a default standard with liquid penetrant examination and a hydrostatic test at 150% of Maximum Allowable Working Pressure (MAWP). Other NDE such as 100% radiography may not be possible practically. If compact flanges or any other integrally machined connections are required, please consult our expert.

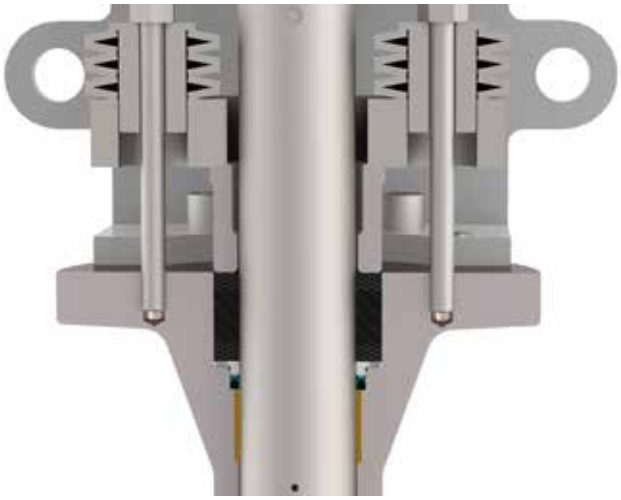
- **Purge pressure and volume:**
  Purge pressure (MOP) shall not be more than 500 psig (34.5 barg) of line pressure and shall not exceed the MAWP of the valve body material.
  Purge volume is calculated on the volume of displacement required between the valve body and the ball. A volumetric flow rate may be applied to calculate.

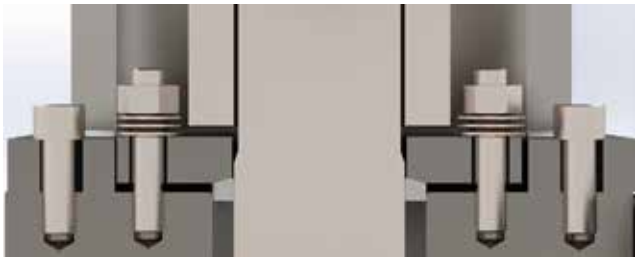
- **Purge temperature:**
  The purging temperature should maintain a temperature that does not exceed a differential of 200°C (392° F) to the operating temperature and should not exceed the maximum allowable design temperature of the valve body material.

5.3. PACKING AND FUGITIVE EMISSIONS:

AMPO POYAM severe service floating ball valve designs for all ratings, from 150 to 2500 class, comply with ISO 15848-1 Class B (Class A as per requirement) and ANSI FCI 70-2 Class VI. API 641 standard has also been followed in order to get API certification. Moreover, the design has been checked with other testing procedures that involve the toughest requirements such as thermal variations of more than 500°C (932° F) variations, and operation cycles of more than 500 opening-closing events.

The optimization of the design on the packing area, is one of the most important aspects while designing the AMPO POYAM severe service floating ball valve, since it is the key location for a possible external leakage a valve in this service may suffer.



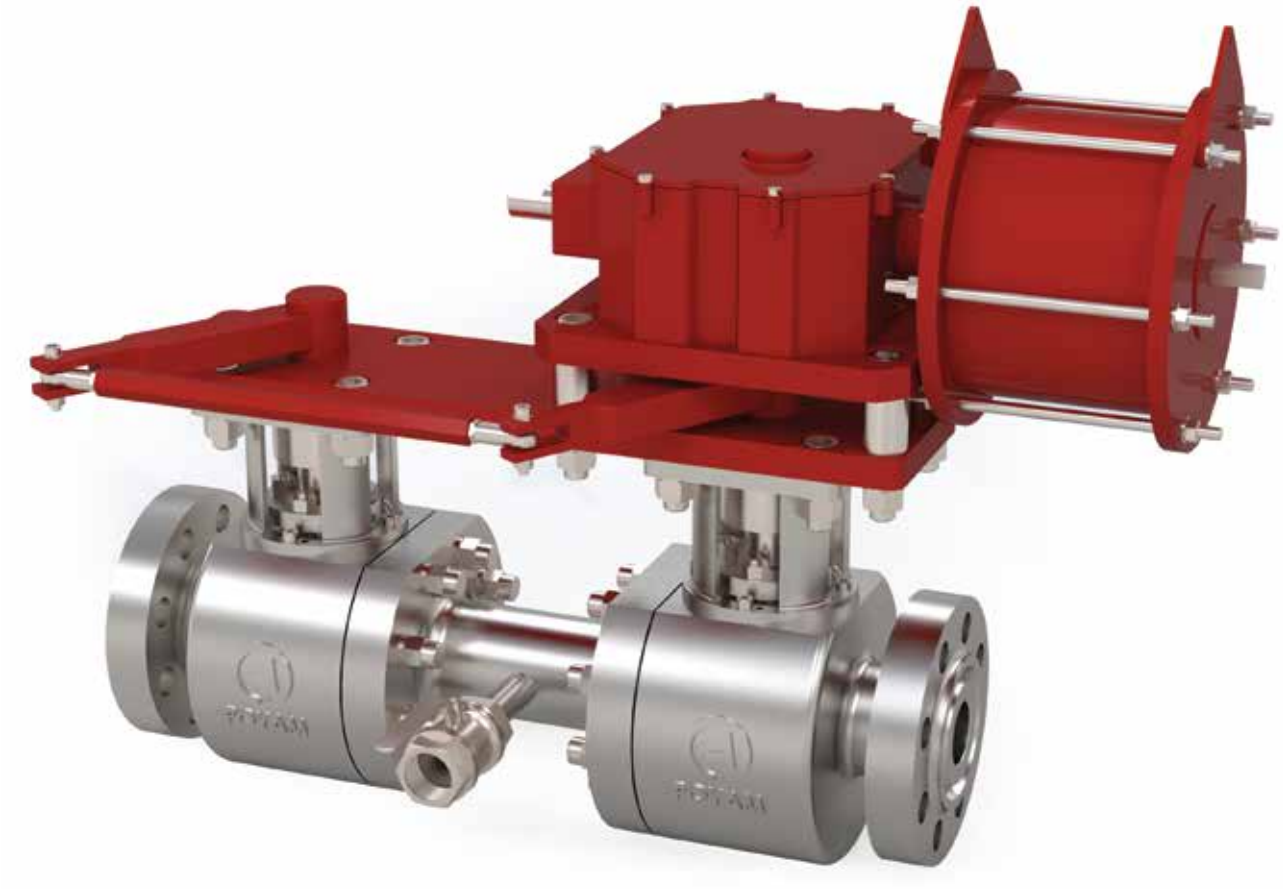


The design concepts that are taken into account are:

- FLUSHING/PURGING connection to the packing area to be able to clean any coke impurity is able to build up close to the area of the packing and the stem.

5.4. DOUBLE BLOCK AND BLEED DESIGN AVAILABLE:

AMPO POYAM VALVES is able to provide Double Block and Bleed concept with a double ball or tandem valve.



5.5. SEATS AND BALL:

Normally seats' materials are with Chrome carbide coating as specified / required in Individual data sheet. Sealing seat shall be internal to end adaption or locked in seat for eliminating buildup of solids and mate lapped to pass vacuum test. There shall not be any loose seat / sealing area to avoid leak path, potential area for buildup of solids. Seat leakage Testing Helium to be used for seat tightness and shall meet standards of FCI 70-2 and API 598 and when required valve must meet TSO (Tight Shut off). Seat springs shall be machined of Inconel 718 to prevent deformation and damage during the reverse pressure applications. Lapping shall be carried on back of the respective seats if the flow is bidirectional for effective sealing in both directions.

Coating: (Cr2C3), Application – minimum finished thickness shall be greater than or equal to 0.003" (76µm). Finished roughness shall be lower than RMS5 in sealing areas. 1/10" coating Uniformity to withstand Thermal Expansion eliminating coating cracks, excellent Bond strength, <0.1% porosity for corrosion resistance and compressive reducing forces for longer operational reliability. All sealing surfaces shall have a minimum Rc Hardness of 62 at ambient temperature and Rc 55 at operating Temperature. (Note: Catalyst applications should have a minimum Rc 68 at ambient).

Particular fluid challenges and deterioration of the sealing surfaces are evaluated to provide the best tailor-made valve design, best choice of materials and coatings.

For an effective sealing lapping is carried out a both manually and automated lapping process to ensure leak tightness. Sealing is guaranteed thanks to a seat to Body End lapped flat face.

Catalyst loading and Withdrawal Valves: shall be of single or double ball type* (contact our Engineering team), with end connections flanged or hub connectors, specialty coatings on ball and seats for high thermal cycling application. There shall not be any loose seats and inserts that can cause potential failure during daily operation leading to costly (unplanned) plant shut down. Vendor to provide further information during detail engineering stage to contractor / licensor / end user.

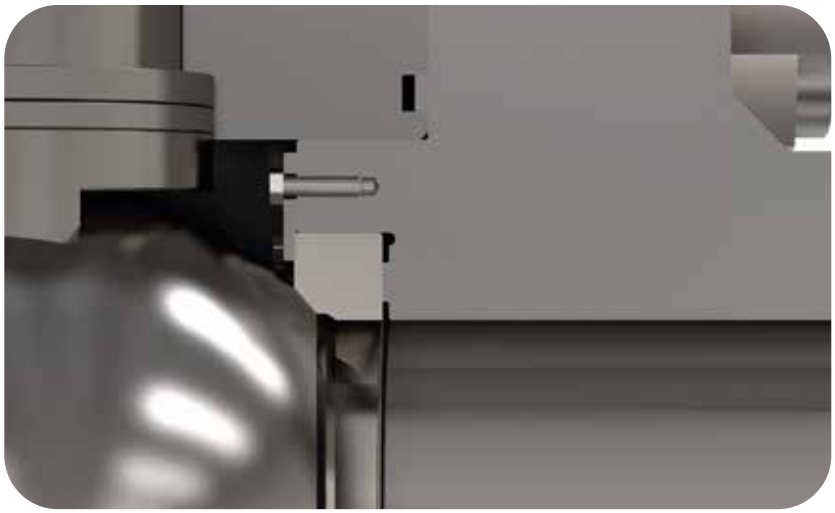
Our severe service ball valves are floating type. Some manufacturers choose the seat supported type, and we also have the technology to follow it. But our standard is the floating design because independent seats allow for easy maintenance and a material matching for identical thermal grow up in the most critical thermal conditions.

The purpose is to have two seats without any bellows (Belleville spring design of Inconel 718 is used to keep the ball and seat in position maintaining sealing with zero Leakage at all operating conditions even in harsh media conditions such as solids, slurry, viscous, resid, coking, catalyst medium with very high tensile strength). Stellite based weld hard facing is applied on the backseat contact for an improved load strength. Welded surface provides for enough thickness to be grinded and lapped many times in service without re-coating.

A key factor on the sealing is the thermal expansion. Material selection and proper design with minimal parts is critical to ensuring net thermal expansion at high temperatures is kept at a minimum.

Additional materials for the hard facing are available as per request to obtain the perfect performance of the valve and assure to long lifetime of the valve following different conditions of the process. Materials of construction are matched and selected to meet thermal shocks, thermal gradients and coefficient of thermal expansion in individual applications. The goal is to avoid corrosion, abrasion, adhesion or erosion situations.

There is no single "one size fits all" approach when selecting a hard coating solution. Particular testing programs are carried out in an in-house developed erosion test-rig to select best solution for each valve service. These tests are complemented by additional validation essays to ensure surface lifetime in terms of debonding, fatigue damage or load capacity.



Technology	Material	Description	Hardness	Erosion	Corrosion
CVD	Hardide™	Tungsten Carbide	1100-1500 HV	Excellent	Very Good
HVOF	WC-CoCr	Tungsten Carbide with Cobalt and Chromium binder	750-1450 HV	Excellent	Good in NaCl Fair in HCl-H2SO4-NaOH
	WC-CoCrNi	Tungsten Carbide with Cobalt, Chromium and Niquel binder	1050-1400 HV	Very Good	Excellent in NaCl Good in HCl-H2SO4-NaOH
	Cr3C2-NiCr	Chromium Carbide with Niquel and Chromium binder	850-1200 HV	Very Good	Excellent in NaOH and NaCl Good in H2SO4 Fair in HCl
	Colmonoy 88	Ni-W-B-Si	710-840 HV	Very Good	Very Good
Spray & Fuse	Ni-Bo	Niquel-Boron self fluxing alloy	60 HRC	Good	Limited
Welding	Stellite 6	Co-Cr-W hardfacing	39-43 HRC	Acceptable	Fair in NaCl Fair in H2SO4, HCl,
	Stellite 21	Co-Cr-Mo hardfacing	25-30 HRC	Acceptable	Fair in NaCl Moderate in H2SO4, HCl
	Ultimet	Co-Cr-Ni-Mo hardfacing	<25 HRC	Acceptable	Excellent in NaCl
	Colmonoy 6	Ni-Cr-B-Si hardfacing	56-61 HRC	Good	Excellent in NaCl

An optimized valve trim design is essential to extend the valve lifetime. Based on advanced coating performance evaluation valve critical locations can be identified and preventive design actions can be taken.

5.6. BELLEVILLE SPRING:

The Belleville spring is a cone-shaped washer which provides a constant mechanical force on seat against ball to maintain the sealing (assisted by line pressure) at all operating conditions. Their ability to handle high stresses in small area of movement makes them well suited for use in a metal seated ball valves to create high mechanical preload and position for the ball and seats.

The material of the spring is UNS N07718 (in compliance with NACE when specified) and its properties ensure the correct seat position (prevent ball misalignment or vibration in high pressure conditions) for absolute sealing (prevent particles from entering and damaging the ball and seat sealing area):

- High tensile strength
- High yield strength
- High creep strength

5.7. STEM:

The stem shall be introduced into the valve body through the ball opening and is retained by an integrally machined shoulder.

Gland design shall be live loaded to accommodate temperatures fluctuations with minimum four stud system.

The valve stem shall be one single piece and not connected with pins or any other methods from the ball slot to the top of actuator mounting adaptation. Besides, surface hardened with smooth finish shall be taken into account to eliminate galling effects.

For the stem guiding purpose, there are three different guiding points to prevent the misalignment of the stem: the pressure energized stem packing and anti-blowout pieces work as lower stem guide; stem bushing works as upper stem guide and mounting flange to body is the third one.

Same ball to seat coating and lapping process is applied to anti blow-out metallic rings for long life design and high bearing load withstanding capabilities.

5.8. BORE SIZES:

Bore sizes options are:

- Full Port.
- Reduced Port.
- Special bores based on customer needs.

As per our standard, the bore size would be acc. to ASME B16.34. (Non-Mandatory Appendix A, Table A1 shall be upon request).

5.9. OPERATION:

AMPO POYAM VALVES severe service ball valves can be provided with the following actuation systems:

- Hand lever
- Gearbox
- Electric Actuator
- Hydraulic Actuator
- Pneumatic actuator

For these severe service applications, most of the valves are pneumatic actuated. However, in case of non-availability of size and space limitations hydraulic actuators may be considered.

But AMPO POYAM VALVES offer more than just valves. We offer tailored INTEGRATED SMART SOLUTIONS to fulfill severe service applications in the oil and gas, chemical and petrochemical, mining and power industries, where reliability and safety are both ours and our clients primary concern. We provide tailored smart solutions for:

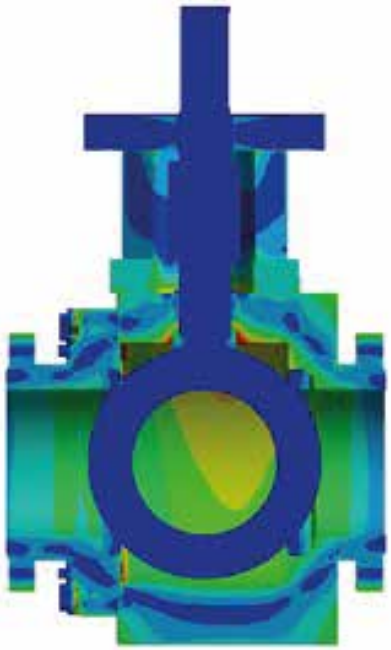
- SYSTEM INTEGRATION
- VALVE ACTUATION CONTROL SYSTEMS
- AMPO RCM: REMOTE VALVE CONDITION MONITORING SYSTEM

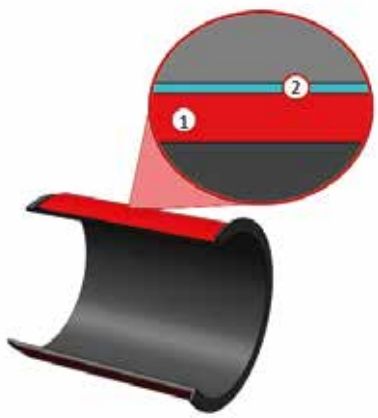
INTEGRATED SMART SOLUTIONS BY AMPO POYAM VALVES Commitment made of steel

Thanks to our In-house capabilities and capacities, AMPO POYAM VALVES is continuously improving and developing valve designs' to collaborate with end users and operators to provide customized upgrading, overhaul, repair and replacement of valves, actuators and control systems. The aim is to ensure that the final element remains effective and fit-for-purpose as requirements and operating conditions change.

5.10. ADDITIONAL FEATURES TO BE ADDED:

- Fire proofing: As required in the individual data sheet. (intumescent coating, flexible mattress / jacket and/or stainless steel enclosure) certified in accordance to UL1709 or others.
- Position indicator
- Extended bonnet (upon request)
- Limit Switches, proximity or mechanical
- Interlock
- Legs / Feet
- Coatings
- Corrosion allowance
- Jacket
- Thermal sleeves option for a better temperature and stress distribution on a sleeve protected valve.





6. QUALITY

AMPO values quality and therefore our operating and production processes are implemented and controlled by a quality assurance system, certified since 1991 under the ISO 9001 Standard, API Spec Q1&6D and SIL 3 and accredited by the most important external organizations in the market, such as Lloyd's Register, Bureau Veritas (BV), Det Norske Veritas (DNV) and American Bureau (ABS).

All valves are designed and built from Forgings and castings inhouse, as well as the coating, machining, and all the rest operations for valves' manufacturing. 100% made in AMPO.

We are equipped with the most modern testing facilities and highly qualified Internal Quality Control Personnel to ensure the reliability of our valves. We carry out Non Destructive Testing such as X-ray, Dye Penetrant, Ultrasonic Test, Magnetic Particle and PMI (Positive Material Identification), Impact Tests, Visual inspections, Hydrostatic Tests, Pneumatic Tests, Cryogenic or Low Temperature Tests, Fugitive Emission Tests, Vacuum Tests, High Temperature Tests, High Pressure Tests, etc.

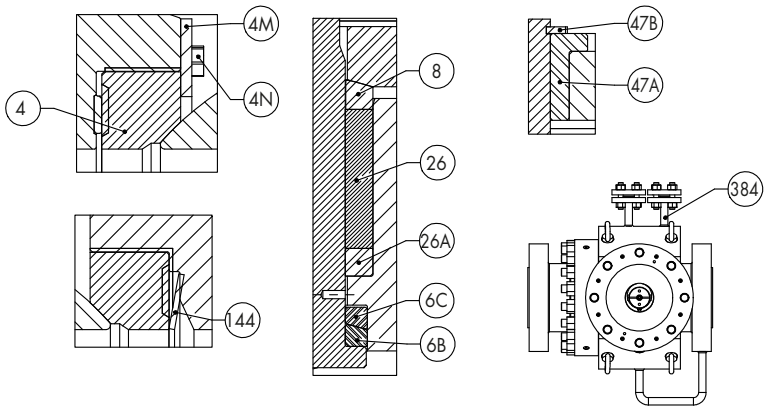
Our management is completely based on the strictest quality standards, which is the foundation to enable AMPO to develop the product which best satisfies our customer.

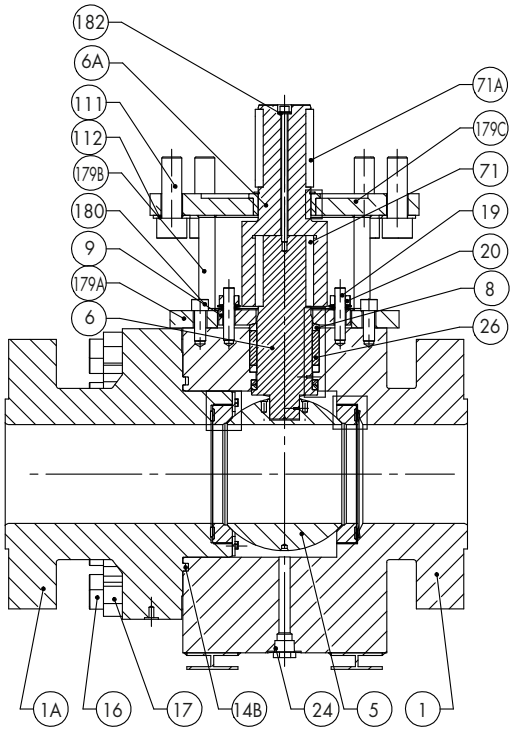
The standard testing procedure of our severe service ball valves is based on the API 598. (Other standards like API 607, API 6FA, API 641 and ISO 15848 upon request).

To assure the AMPO POYAM VALVES quality, all tests specified on the standard are performed as mandatory, even the optional ones such as High Pressure Closure test.

All the painting works are performed fully in house, special requirements for high temperatures or adhesions test are available for the special processes.

7. MATERIAL SELECTION



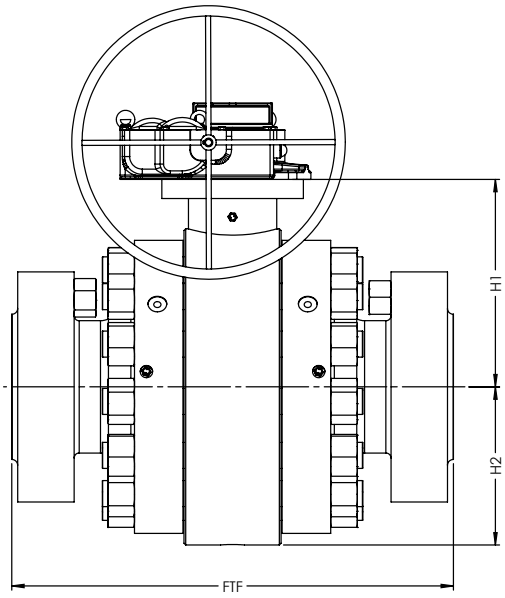


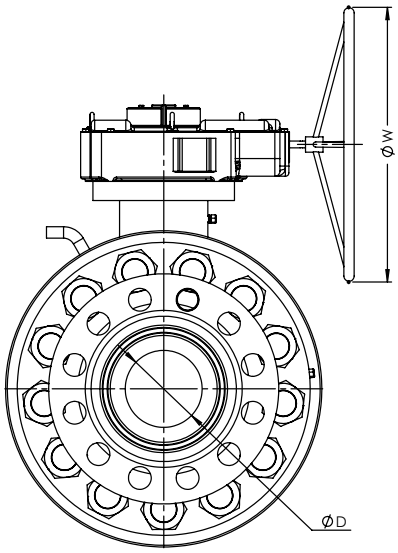
		CARBON STEEL / LOW T° CARBON STEEL		STAINLESS STEEL (HT)	NICKEL ALLOY	LOW ALLOY STEEL
		CS TRIM	SS TRIM	SS TRIM	INC TRIM	LOW ALLOY STEEL TRIM
1 1A	BODY BODY-END / ADAPTER	ASTM A216 WCB / ASTM A105 / ASTM A352 LCB / ASTM A350 LF2		ASTM A351 CF8C / ASTM A182 F347	ASTM A494 CU5MCUC / ASTM B564 (UNS N08825)	ASTM A217 C12 / ASTM A182 F9 / ASTM A217 C12A / ASTM A182 F91
4	SEAT	SS 410 + CC Coating	SS + CC Coating	SS + CC Coating	INCONEL + CC Coating	LOW ALLOY STEEL + CC Coating
4M	RETENTION RING	CS	SS	SS	INCONEL	LOW ALLOY STEEL
4N	HEXAGONAL SCREW	ASTM A193 Gr.B7	ASTM A193 Gr. B8M CLASS 2			ASTM A193 B16
5	BALL	SS 410 + CC Coating	SS + CC Coating		INCONEL + CC Coating	LOW ALLOY STEEL + CC Coating
6 6A	STEM STEM EXTENSION(*)	ASTM A638 Gr.660	ASTM A479 XM-19 S (NITRONIC 50 SHS)	ASTM A638 Gr.660	INCONEL 718	ASTM A182 F6A CLASS 2
6B 6C	STEM BACK-UP WASHER STEM BACK-UP WASHER	CS + CCC	SS + CCC			MARTENSITIC STEEL + CCC
8	STUFFING BOX WASHER	CS	SS		INCONEL	MARTENSITIC STEEL
9	STUFFING BOX	CS	SS		INCONEL	MARTENSITIC STEEL
14B	GASKET	SPIRAL WOUND 316 + GRAPHITE / METALLIC			SPIRAL WOUND INC + GRAPHITE / METALLIC	SPIRAL WOUND 316 + GRAPHITE / METALLIC
16	STUD BOLT	ASTM A193 Gr.B7	ASTM A193 Gr. B8M CLASS 2 / ASTM A453 Gr.660			ASTM A193 B16
17	NUT	ASTM A194 Gr.2H	ASTM A194 Gr.8M / ASTM A453 Gr.660			ASTM A194 Gr7
19	STUD BOLT	ASTM A193 Gr.B7	ASTM A193 Gr. B8M CLASS 2 / ASTM A453 Gr.660			ASTM A193 B16
20	HEAVY NUT	ASTM A194 Gr.2H	ASTM A194 Gr.8M / ASTM A453 Gr.660			ASTM A194 Gr7
24	NPT CAP (if applicable)	CS	SS		INCONEL	MARTENSITIC STEEL
26	STEM PACKING	THERMALLY EXPANDED GRAPHITE				
26A	STEM GUIDE RING	ASTM A638 Gr.660	ASTM A479 XM-19 S (NITRONIC 50 SHS)	ASTM A638 Gr.660	INCONEL 718	ASTM A182 F6A CLASS 2
47A 47B	STEM CASING SEEGER RING	CS	SS		INCONEL	MARTENSITIC STEEL
71 71A	STEM KEY EXTENSION KEY (*)	ASTM A638 Gr.660				
111	ALLEN SCREW	ASTM A193 Gr.B7	ASTM A193 Gr. B8M CLASS 2 / ASTM A453 Gr.660			ASTM A193 B16
112	WASHER	CS	SS			CS
144	SPRING	UNS N07718				
179A 179B 179C	SUPLEMENT LOWER PLATE SUPLEMENT COLUMN SUPLEMENT UPPER PLATE	ASTM A36		ASTM A182 F316		ASTM A36
180	ALLEN SCREW	ASTM A193 Gr.B7	ASTM A193 Gr. B8M CLASS 2 / ASTM A453 Gr.660			ASTM A193 B16
182	WASHER	CS		SS		CS
384	PURGE PIPING (if applicable)	ASTM A106 Gr.B	ASTM A333 Gr.6	ASTM A312 TP347	INCONEL	ASTM A335 P9 / ASTM A335 P91

** For 538°C or higher*

8. DIMENSIONAL TABLES

TWO/THREE FORGED PIECES FLOATING DESIGN BALL VALVES (Bolted & from -46 ˚C/-51 F up to +327 ˚C/+620 F)





150 LBS						
SIZE	FTF-RF	Ø D	H-1	H-2	W	WEIGHT (KG)
2	178	49	180	88	800	27
3	203	74	202	109	800	49
4	229	100	244	131	800	72
6	394	150	311	183	800	195
8	457	201	351	224	800	315
10	533	252	397	242	800	439
12	610	303	453	280	800	645
14	686	334	478	304	800	832
16	762	385	566	350	800	1170
18	864	436	605	389	900	1561
20	914	487	596	430	900	1984
22	1010	538	646	474	900	2613
24	1067	589	684	513	900	3192
26	1143	633	723	552	1000	3778
28	1245	684	815	596	1000	4717
30	1295	735	854	635	1000	5623
32	1372	779	888	670	1000	6684
34	1473	830	962	709	1000	7808
36	1524	874	1001	748	1000	9077
38	1667	925	1040	787	1000	10675
40	1749	976	1074	821	1000	11892
42	1831	1020	1113	855	1000	13483
44	1914	1069	1137	893	1000	15226
46	1996	1118	1180	935	1000	17348
48	2078	1166	1216	972	1000	19348
50	2160	1208	1279	1004	1000	21151
52	2242	1250	1323	1036	1000	22900
54	2324	1312	1375	1089	1000	26146
56	2407	1360	1428	1121	1000	28766
58	2489	1415	1480	1159	1000	31804
60	2571	1458	1531	1197	1000	35446

300 LBS						
SIZE	FTF-RF	Ø D	H-1	H-2	W	WEIGHT (KG)
2	216	49	180	87	800	39
3	282	74	227	117	800	75
4	305	100	274	147	800	111
6	403	150	317	187	800	217
8	502	201	372	232	800	388
10	568	252	418	245	800	519
12	648	303	505	290	800	751
14	762	334	535	319	800	1057
16	838	385	535	368	800	1507
18	914	436	588	412	900	1986
20	991	487	639	451	900	2612
22	1092	538	717	495	900	3394
24	1143	589	759	534	900	4071
26	1245	633	826	573	1000	5009
28	1346	684	870	617	1000	6143
30	1397	735	914	656	1000	7132
32	1524	779	940	695	1000	8662
34	1626	830	984	740	1000	10299
36	1727	874	1021	773	1000	12007
38	1777	925	1093	818	1000	12566
40	1863	976	1138	852	1000	14097
42	1949	1020	1177	891	1000	16132
44	2035	1069	1215	928	1000	18205
46	2121	1118	1321	975	1000	20297
48	2207	1166	1360	1012	1000	22913
50	2293	1208	1404	1053	1000	24785
52	2378	1250	1448	1093	1000	27548
54	2464	1312	1492	1134	1000	30872
56	2550	1360	1536	1175	1000	33731
58	2636	1415	1580	1215	1000	38620
60	2722	1458	1624	1256	1000	41665

** In case of higher or lower temperature range, H 1, H 2, W and weight may be subject to change.*
*** Dimensions are in mm.*

600 LBS						
SIZE	FTF-RF	Ø D	H-1	H-2	W	WEIGHT (KG)
2	292	49	211	104	800	57
3	356	74	254	126	800	111
4	432	100	284	148	800	163
6	559	150	347	194	800	331
8	660	201	436	248	800	580
10	787	252	420	273	800	895
12	838	303	489	317	800	1214
14	889	334	535	346	800	1480
16	991	385	615	391	800	2084
18	1092	436	669	440	900	2786
20	1194	487	734	481	900	3739
22	1295	538	788	530	900	4704
24	1397	589	827	579	900	5706
26	1448	633	874	623	1000	6841
28	1549	684	937	662	1000	8223
30	1651	735	988	711	1000	9886
32	1778	779	1120	745	1000	11847
34	1930	830	1186	794	1000	14387
36	2083	874	1193	838	1000	16572
38	2101	925	1246	887	1000	18111
40	2200	976	1284	921	1000	20628
42	2300	1020	1321	955	1000	23691
44	2400	1069	1376	996	1000	26322
46	2500	1118	1430	1037	1000	30528
48	2600	1166	1485	1078	1000	33793
50	2700	1208	1539	1119	1000	37012
52	2800	1250	1602	1178	1000	40126
54	2900	1312	1665	1238	1000	46523
56	2999	1360	1724	1288	1000	50942
58	3099	1415	1785	1342	1000	55422
60	3199	1458	1845	1396	1000	61253

900 LBS						
SIZE	FTF-RF	Ø D	H-1	H-2	W	WEIGHT (KG)
2	368	49	232	110	800	83
3	381	74	316	133	800	160
4	457	100	315	161	800	236
6	610	150	407	224	800	479
8	737	201	399	248	800	813
10	838	252	477	300	800	1293
12	965	303	582	350	800	1767
14	1029	322	609	371	800	2086
16	1130	373	685	427	800	3003
18	1219	423	746	478	900	3901
20	1321	471	792	531	900	5137
22	1462	522	864	580	1000	6756
24	1549	570	1004	626	900	8287
26	1682	617	1071	674	1000	10154
28	1792	665	1028	710	1000	12556
30	1903	712	1126	757	1000	14682
32	2013	760	1178	806	1000	17667
34	2124	808	1217	841	1000	19972
36	2234	855	1291	910	1000	23881
38	2344	904	1429	1044	1000	26927
40	2455	956	1539	1111	1000	31345
42	2565	1006	1812	1245	1000	36903
44	2675	1048	1880	1313	1000	43880
46	2786	1096	1947	1380	1000	59728
48	2896	1149	2014	1447	1000	68333

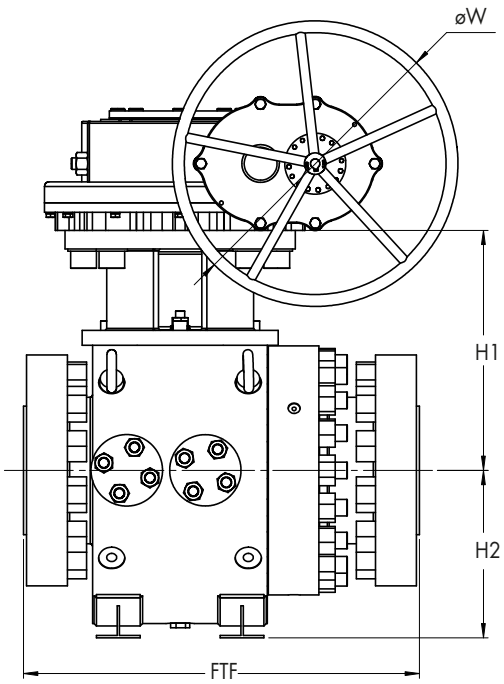
1500 LBS						
SIZE	FTF-RF	Ø D	H-1	H-2	W	WEIGHT (KG)
2	368	49	247	116	800	104
3	470	74	305	149	800	210
4	546	100	376	186	800	316
6	705	144	391	230	800	655
8	832	192	488	286	800	1231
10	991	239	663	341	800	1802
12	1130	287	753	294	800	2646
14	1257	315	779	416	800	3799
16	1384	360	862	481	900	4953
18	1550	406	932	522	900	7081
20	1694	454	1033	586	900	9209
22	1838	500	1101	645	900	11584
24	1982	546	1174	777	900	16318
26	2126	594	1254	845	1000	19961
28	2270	641	1556	977	1000	24737
30	2414	686	1690	1111	1000	36717
32	2558	730	1888	1245	1000	44367
34	2703	775	2087	1380	1000	56679
36	2847	819	2285	1514	1000	59903

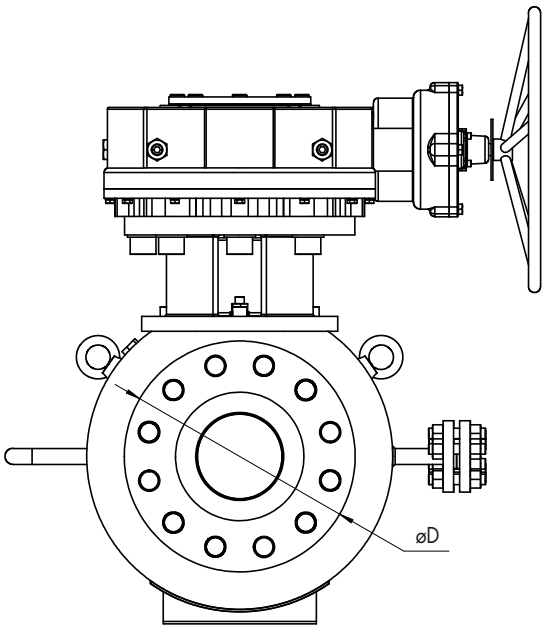
2500 LBS						
SIZE	FTF-RF	Ø D	H-1	H-2	W	WEIGHT (KG)
2	451	42	323	168	800	264
3	578	62	400	219	800	472
4	673	87	491	271	800	712
6	914	131	589	292	800	1477
8	1022	179	746	361	800	3493
10	1270	223	826	408	800	5397
12	1422	265	924	469	900	7447
14	1634	292	1026	531	800	9441
16	1826	333	1193	661	800	11436
18	2019	374	1294	731	900	15527
20	2212	419	1565	927	900	23341
22	2404	458	1658	997	900	33301
24	2597	500	1751	1068	900	41280
26	2789	544	1844	1138	1000	46740
28	2982	587	1937	1208	1000	54249
30	3175	628	2030	1279	1000	61758
32	3367	668	2123	1349	1000	69266
34	3560	709	2216	1419	1000	76776
36	3753	749	2309	1490	1000	84285

** In case of higher or lower temperature range, H 1, H 2, W and weight may be subject to change.*

*** Dimensions are in mm.*

TWO/THREE FORGED PIECES FLOATING DESIGN BALL VALVES (Bolted & from -46 ˚C/-51 F up to +850 ˚C/+1562 F)





150 LBS						
SIZE	FTF-RF	Ø D	H-1	H-2	W	WEIGHT (KG)
2	178	49	380	88	800	30
3	203	74	402	109	800	55
4	229	100	444	131	800	81
6	394	150	511	183	800	218
8	457	201	551	224	800	353
10	533	252	597	242	800	492
12	610	303	703	280	800	726
14	686	334	728	304	800	936
16	762	385	816	350	800	1316
18	864	436	855	389	900	1756
20	914	487	846	430	900	2232
22	1010	538	946	474	900	2953
24	1067	589	984	513	900	3607
26	1143	633	1023	552	1000	4269
28	1245	684	1115	596	1000	5330
30	1295	735	1154	635	1000	6354
32	1372	779	1238	670	1000	7586
34	1473	830	1312	709	1000	8862
36	1524	874	1351	748	1000	10302
38	1667	925	1390	787	1000	12116
40	1749	976	1424	821	1000	13497
42	1831	1020	1513	855	1000	15371
44	1914	1069	1537	893	1000	17358
46	1996	1118	1580	935	1000	19777
48	2078	1166	1616	972	1000	22057
50	2160	1208	1679	1004	1000	24112
52	2242	1250	1773	1036	1000	26221
54	2324	1312	1825	1089	1000	29937
56	2407	1360	1878	1121	1000	32937
58	2489	1415	1930	1159	1000	36416
60	2571	1458	1981	1197	1000	40586

300 LBS						
SIZE	FTF-RF	Ø D	H-1	H-2	W	WEIGHT (KG)
2	216	49	380	87	800	44
3	282	74	427	117	800	84
4	305	100	474	147	800	124
6	403	150	517	187	800	243
8	502	201	572	232	800	435
10	568	252	618	245	800	581
12	648	303	755	290	800	845
14	762	334	785	319	800	1189
16	838	385	785	368	800	1695
18	914	436	838	412	900	2234
20	991	487	889	451	900	2939
22	1092	538	1017	495	900	3835
24	1143	589	1059	534	900	4600
26	1245	633	1126	573	1000	5660
28	1346	684	1170	617	1000	6942
30	1397	735	1214	656	1000	8059
32	1524	779	1290	695	1000	9831
34	1626	830	1334	740	1000	11689
36	1727	874	1371	773	1000	13628
38	1777	925	1443	818	1000	14262
40	1863	976	1488	852	1000	16000
42	1949	1020	1577	891	1000	18390
44	2035	1069	1615	928	1000	20754
46	2121	1118	1721	975	1000	23139
48	2207	1166	1760	1012	1000	26121
50	2293	1208	1804	1053	1000	28255
52	2378	1250	1898	1093	1000	31542
54	2464	1312	1942	1134	1000	35348
56	2550	1360	1986	1175	1000	38622
58	2636	1415	2030	1215	1000	44220
60	2722	1458	2074	1256	1000	47706

600 LBS						
SIZE	FTF-RF	Ø D	H-1	H-2	W	WEIGHT (KG)
2	292	49	411	104	800	64
3	356	74	454	126	800	124
4	432	100	484	148	800	183
6	559	150	547	194	800	371
8	660	201	636	248	800	650
10	787	252	620	273	800	1002
12	838	303	739	317	800	1366
14	889	334	785	346	800	1665
16	991	385	865	391	800	2345
18	1092	436	919	440	900	3134
20	1194	487	984	481	900	4206
22	1295	538	1088	530	900	5316
24	1397	589	1127	579	900	6448
26	1448	633	1174	623	1000	7730
28	1549	684	1237	662	1000	9292
30	1651	735	1288	711	1000	11171
32	1778	779	1470	745	1000	13446
34	1930	830	1536	794	1000	16329
36	2083	874	1543	838	1000	18809
38	2101	925	1596	887	1000	20556
40	2200	976	1634	921	1000	23413
42	2300	1020	1721	955	1000	27008
44	2400	1069	1776	996	1000	30007
46	2500	1118	1830	1037	1000	34802
48	2600	1166	1885	1078	1000	38524
50	2700	1208	1939	1119	1000	42194
52	2800	1250	2052	1178	1000	45944
54	2900	1312	2115	1238	1000	53269
56	2999	1360	2174	1288	1000	58329
58	3099	1415	2235	1342	1000	63458
60	3199	1458	2295	1396	1000	70135

900 LBS						
SIZE	FTF-RF	Ø D	H-1	H-2	W	WEIGHT (KG)
2	368	49	432	110	800	93
3	381	74	516	133	800	179
4	457	100	515	161	800	264
6	610	150	607	224	800	536
8	737	201	599	248	800	911
10	838	252	677	300	800	1448
12	965	303	832	350	800	1988
14	1029	322	859	371	800	2347
16	1130	373	935	427	800	3378
18	1219	423	996	478	900	4389
20	1321	471	1042	531	900	5779
22	1462	522	1164	580	1000	7634
24	1549	570	1304	626	900	9364
26	1682	617	1371	674	1000	11474
28	1792	665	1328	710	1000	14188
30	1903	712	1426	757	1000	16591
32	2013	760	1528	806	1000	20052
34	2124	808	1567	841	1000	22668
36	2234	855	1641	910	1000	27105
38	2344	904	1779	1044	1000	30562
40	2455	956	1889	1111	1000	35577
42	2565	1006	2212	1245	1000	42069
44	2675	1048	2280	1313	1000	50023
46	2786	1096	2347	1380	1000	68090
48	2896	1149	2414	1447	1000	77900

1500 LBS						
SIZE	FTF-RF	Ø D	H-1	H-2	W	WEIGHT (KG)
2	368	49	447	116	800	116
3	470	74	505	149	800	235
4	546	100	576	186	800	354
6	705	144	591	230	800	734
8	832	192	688	286	800	1379
10	991	239	863	341	800	2018
12	1130	287	1003	294	800	2977
14	1257	315	1029	416	800	4274
16	1384	360	1112	481	900	5572
18	1550	406	1182	522	900	7966
20	1694	454	1283	586	900	10360
22	1838	500	1401	645	900	13090
24	1982	546	1474	777	900	18439
26	2126	594	1554	845	1000	22556
28	2270	641	1856	977	1000	27953
30	2414	686	1990	1111	1000	41490
32	2558	730	2238	1245	1000	50357
34	2703	775	2437	1380	1000	64331
36	2847	819	2635	1514	1000	67990

2500 LBS						
SIZE	FTF-RF	Ø D	H-1	H-2	W	WEIGHT (KG)
2	451	42	523	168	800	296
3	578	62	600	219	800	529
4	673	87	691	271	800	797
6	914	131	789	292	800	1654
8	1022	179	946	361	800	3912
10	1270	223	1026	408	800	6045
12	1422	265	1174	469	900	8378
14	1634	292	1276	531	800	10621
16	1826	333	1443	661	800	12866
18	2019	374	1544	731	900	17468
20	2212	419	1815	927	900	26259
22	2404	458	1958	997	900	37630
24	2597	500	2051	1068	900	46646
26	2789	544	2144	1138	1000	52816
28	2982	587	2237	1208	1000	61301
30	3175	628	2330	1279	1000	69787
32	3367	668	2473	1349	1000	78617
34	3560	709	2566	1419	1000	87141
36	3753	749	2659	1490	1000	95663

9. MORE AMPO POYAM VALVES SOLUTIONS

Other products applicable for severe service AMPO POYAM VALVES is able to offer:

LIFT PLUG AND SWITCH PLUG VALVES

THROTTLING BALL valves:

- Up to 36" & 900#
- High Temperatures

Slurry GATE & ANGLE valves:

- Solid Wedge
- Up to 60" & 2500#

10. CUSTOMERS

These are some of the main customers who trust on AMPO POYAM VALVES:

11. AMPO SERVICE

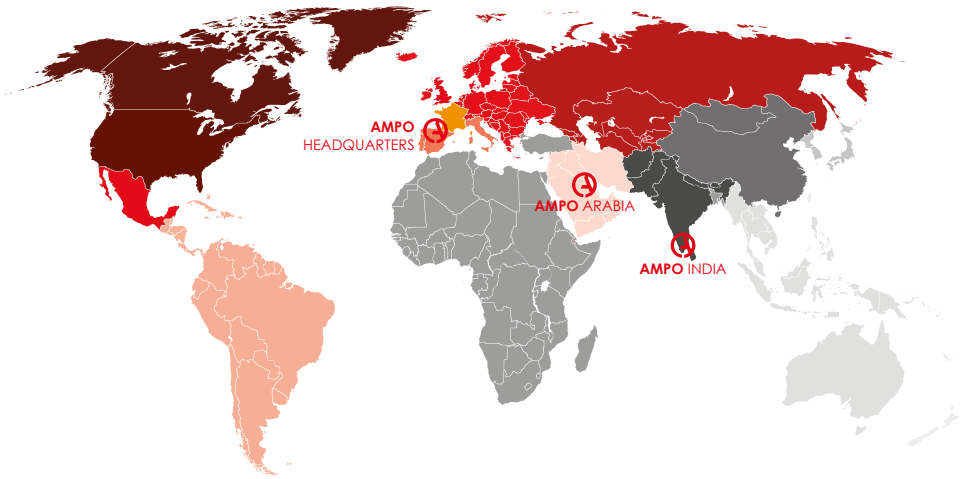
AMPO SERVICE has a wide experience in guaranteeing a **prompt response** (72 hours at site if needed) to customer needs **all over the world** with a highly experienced, customer oriented and specialized team. It provides a wide range of **ad-hoc and high added value services:**

- **MRO SERVICES**. Plug and play valves. Fast track.
- **SPARE PARTS**. Optimized Management Program. Fast track services.
- **TRAINING SERVICES**
- **FIELD ENGINEERING SERVICES (FES):** Consulting services during plant construction. Commissioning and start-up services. Planned shut-down services. Troubleshooting.
- **PREDICTIVE MAINTENANCE SERVICE:** Patented AMPO RCM system (Remote Valve Condition Monitoring Service)
- **PREVENTIVE MAINTENANCE SERVICE:** Maintenance Plan developments.
- **WORLDWIDE REPAIR AND MAINTENANCE CENTERS**
- **TAILORED ENGINEERING SOLUTIONS**
- **MASTER SERVICE AGREEMENTS WITH END USERS**

Our main aim is to fufill customer needs worldwide with the following key premises: **reliability, safety, trust and efficiency.**

12. WORLDWIDE SALES AND MANUFACTURING NETWORK

AMPO
POYAM VALVES
Commitment made of steel



AMPO Manufacturing plants
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Coimbatore - India
Dammam - Saudi Arabia

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AMPO is just 1 hour drive away from BILBAO (International Airport) and at the following distances from other important places:
65 km west of Pamplona/45 km south of San Sebastian/ 70 km south of the French border.

www.ampo.com