PETROLVALVES GROUP
enabling your energy flow

INNOVATING SUBSEA SOLUTIONS: ENGINEERING EXCELLENCE BENEATH THE SURFACE

Driving reliability, innovation, and sustainability in **Subsea** operations

SUMMARY

01 WE ARE PETROLVALVES GROUP

At the forefront of subsea engineering for over 60 years, we are a trusted partner in providing advanced flow solutions for critical operations.

Our mission is to revolutionize the energy sector by delivering reliable, sustainable, and innovative subsea systems.

CORE COMPETENCIES:

- **VALVE SOLUTIONS**
- **ACTUATION SYSTEMS**
- **SUBSEA CONTROL TECHNOLOGIES**

30 Years Plus of LEADERSHIP and INNOVATION in **Subsea Valves**

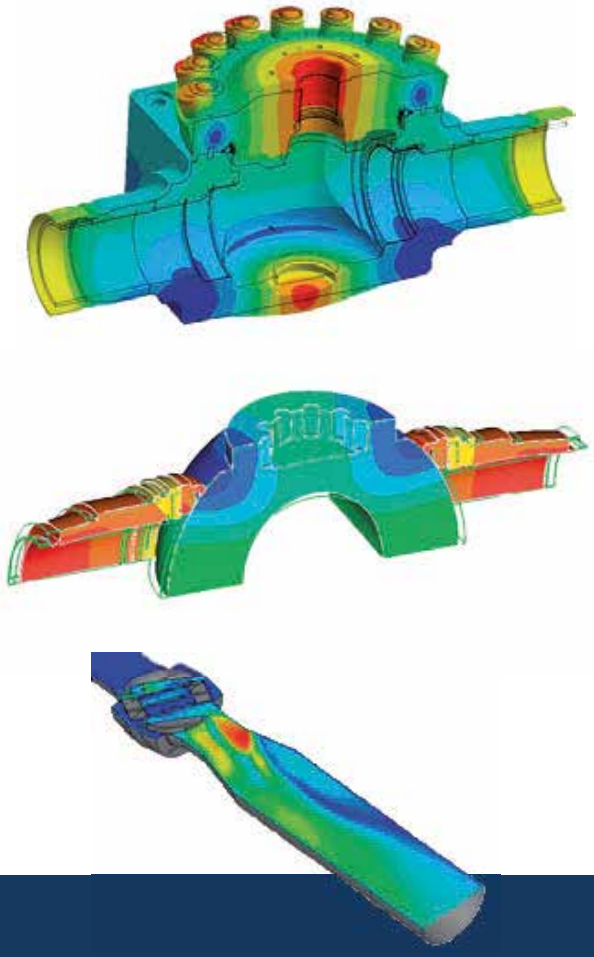
PetrolValves has been a leader in the manufacture of Subsea valves since the early 1970s, with our first installations in the North Sea.

Today, the Company's valves and actuators are installed worldwide in a very large number of Subsea pipelines and production modules. This is a testament to the level of confidence that major End Users and EPCs have in PetrolValves.

As line pressures continue to rise and the water depths extend beyond 10,000ft /3000 meters, PetrolValves continues to improve product reliability to provide customized solution for each unique operational requirement.

DESIGN FE&CFD

PetrolValves Engineering uses the most sophisticated and advanced Numerical Simulation Tools.
Both Elastic and Elastic-Plastic FE simulations are utilized to optimize performances and improve reliability in operation under any predictable loading conditions including internal & external pressure, mechanical loads and thermal gradients.
Extensive use of CFD is made to verify valve fluid-dynamic performance.
The experienced PetrolValves Engineering Team can develop customized solutions to suit any specific operational requirement up through API 20 K.



02 COMPREHENSIVE SUBSEA SOLUTIONS

VALVE SOLUTIONS:

Engineered to endure extreme pressures and temperatures, providing long-lasting performance.

ACTUATION SYSTEMS:

Designed for both subsea and topside environments, these actuators deliver high performance, reliability, and safety over a long operational life.

CONTROL SYSTEMS:

Cutting-edge technology for seamless integration and remote monitoring.

03 VALVE TECHNOLOGY: RELIABILITY IN EXTREME ENVIRONMENTS

OVER THREE DECADES OF EXPERTISE IN SUBSEA VALVE ENGINEERING.

PRODUCT RANGE:

TRUNNION-SUPPORTED BALL VALVES

FLOATING BALL VALVES

GATE VALVES AND

CHECK VALVES.

ADVANCED FEATURES:

METAL-TO-METAL SEALING AND COMPLIANCE WITH API AND ISO STANDARDS.

HP METAL FLOATING BALL (TRIFORCE)
SUBSEA

- No internal valve part can become stuck: valve provides tight seal and full operability even with fluids that can solidify or crystallize
- The valve and all the components, including gaskets, are designed for deep subsea installation&operation
- Seat and ball sealing surfaces match under low contact stress and self-cleaning operation
- Superior resistance to abrasion and wear

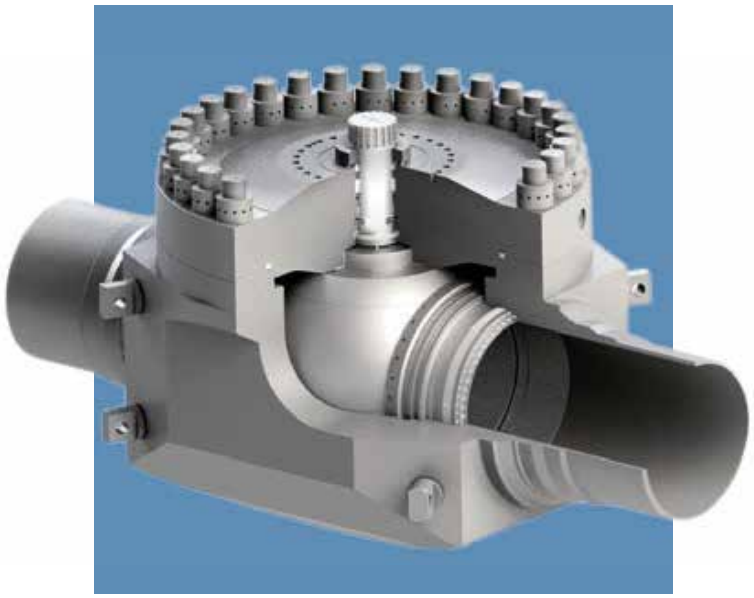
HEAVY **DUTY SERVICE**

AVAILABLE **RANGE***				
API 6DSS		**API** 6A / 17D		
150 to 1500	2500	2K to 5K	10K	15K
2" to 24"	up to 18"	$1^{13/16}$" to 20"	$1^{13/16}$" to 16"	$1^{13/16}$" to 6"

(*) For non-listed dimensions contact PV's staff

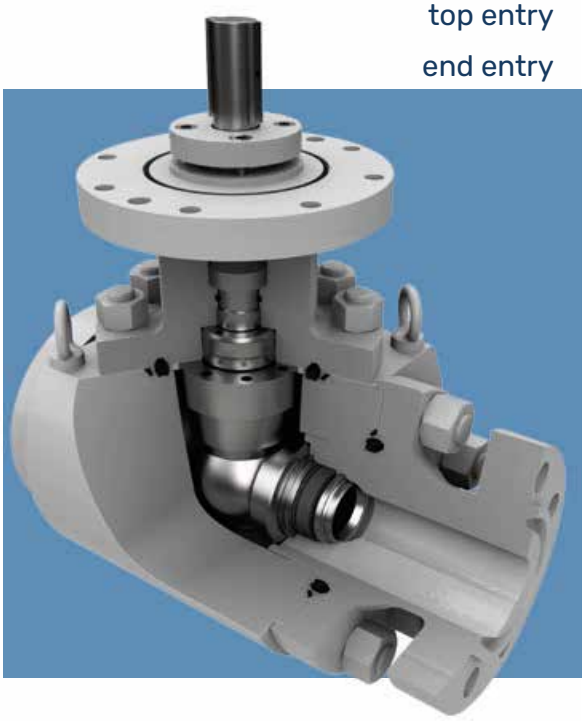
TRUNNION SUPPORTED BALL VALVES
SUBSEA

- PetrolValves trunnion mounted, full or reduced bore, metal seated.
- The valve and all the components, including gaskets, are the result of extensive Design and R&D programs aimed to verify their suitability for deep Subsea installation & operation
- The valve internal profile is shaped to minimize turbulence and to avoid any potential obstacle for the passage of pigs
- The valve body is designed to accommodate all predictable loads, including induced loads during installation
- Seat & ball flexibility/rigidity is designed to accommodate mutual elastic displacements
- Standard construction includes primary metal-to-metal, bi-directional body-to-environment seal
- Large variety of stem seal options available, including Infinity metal stem seal (PetrolValves patent)
- Both Self-Relieving (SPE) and Double Piston Effect(DPE) seat designs are available
- Double isolation construction (two trims in one unique body) is also available



top entry

end entry



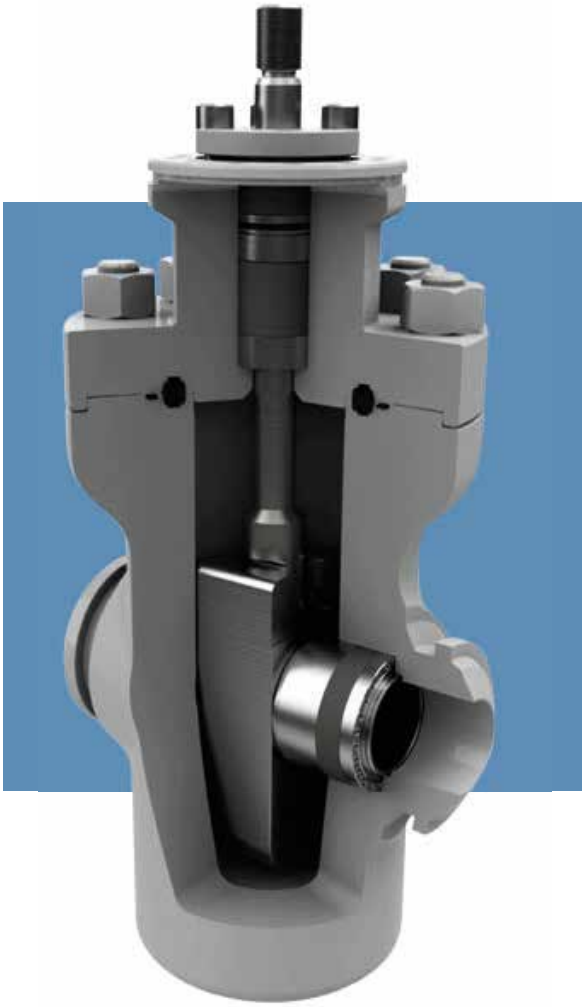
LOW **OPERATING** TORQUE

AVAILABLE **RANGE***				
API 6DSS		**API** 6A / 17D		
150 to 1500	2500	2K to 5K	10K	15K
2" to 48"	up to 32"	$1^{13/16}$" to 34"	$1^{13/16}$" to 24"	$1^{13/16}$" to 8"

(*) For non-listed dimensions contact PV's staff

SLAB GATE VALVES
SUBSEA

- Metal-to-metal seat seal
- Primary metal seat-to-body seal
- Standard construction includes metal-to-metal, bi - directional body-to-environment seal
- Large variety of stem seals available, including Infinity© metal stem seal (PetrolValves patent)
- Proven design for extreme deepwater installation
- Slab & seat rings match on fully hard-faced surfaces
- Both upstream and downstream seat seal designs are available
- Double isolation construction (two gate trims in one body also available)
- Twin seats design available for subsea pipeline installation



LOW CONTACT **STRESS METAL SEAL**

AVAILABLE **RANGE***				
API 6DSS		**API** 6A / 17D		
150 to 1500	2500	2K to 5K	10K	15K
2" to 42"	up to 30"	$1^{13/16}$" to 30"	$1^{13/16}$" to 24"	$1^{13/16}$" to 12"

(*) For non-listed dimensions contact PV's staff

DOUBLE EXPANDING GATE VALVES
SUBSEA

Double Expanding Gate Valves seal via mechanical means, stem thrust achieves bubble-tight seal simultaneously and independently at both upstream and downstream seat.

Thus the valve creates a true and intrinsic double barrier.

- Proven design for extreme deep subsea installation
- Fully metal-metal seal (both seat-body and seat-gate)
- Double block & bleed, double barrier
- Extremely highly reliable in severe service, including deep subsea installations
- Large variety of stem seals available, including Infinity metal stem seal (PetrolValves patent)
- Flexible seat design guarantees low contact stresses for an extended cyclic life
- Any valve end connection is available

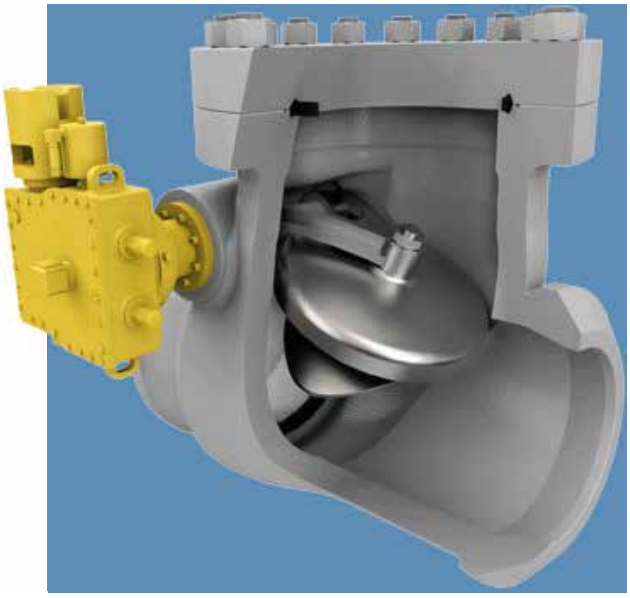
INTRINSICALLY **DOUBLE ISOLATION**

AVAILABLE **RANGE***				
API 6DSS		**API** 6A / 17D		
150 to 1500	2500	2K to 5K	10K	15K
2" to 48"	up to 30"	$1^{13/16}$" to 30"	$1^{13/16}$" to 24"	$1^{13/16}$" to 12"

(*) For non-listed dimensions contact PV's staff

SWING CHECK VALVES
SUBSEA

- Designed for deep subsea installation and operations
- Standard seat seal: metal-to-metal
- Lock open via ROV engagement
- Smooth transition of internal conduit for safe pigging operations
- Pig guide, integral with clapper, permits safe pigging in either direction
- Different clapper-locking mechanism design are available to allow safe 'reverse' pigging operations
- Large variety of stem seals available, including Infinity metal stem seal



SAFE **PIGGING**

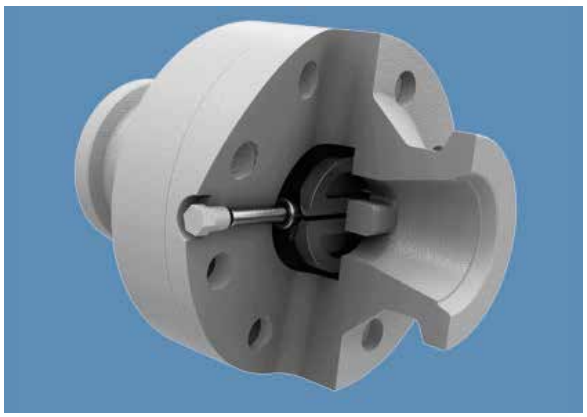
AVAILABLE **RANGE***				
API 6DSS		**API** 6A / 17D		
150 to 1500	2500	2K to 5K	10K	15K
2" to 48"	up to 30"	$1^{13/16}$" to 30"	$1^{13/16}$" to 20"	$1^{13/16}$" to 8"

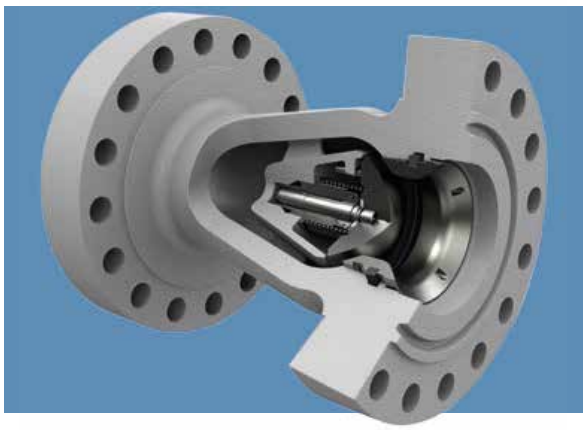
(*) For non-listed dimensions contact PV's staff

NON SLAM CHECK VALVES
SUBSEA

- » Suitable for deep subsea installation and operations
- » Non-Slam; quick (spring assisted)closure
- » Standard seat seal: metal-to-metal

QUICK **CLOSING**





AVAILABLE **RANGE***				
API 6DSS		**API** 6A / 17D		
150 to 1500	2500	2K to 5K	10K	15K
2" to 48"	up to 30"	$1^{13/16}$" to 30"	$1^{13/16}$" to 20"	$1^{13/16}$" to 12"

HIGH INTEGRITY PIPELINE PROTECTION SYSTEM (HIPPS)
SUBSEA

Our HIPP System scope includes PetrolValves' proprietary design and manufacture of valves and actuators.

SIL figures are evaluated on PetrolValves' own data base of reliability records constructed from feedback from field operators using our products over many years of service.

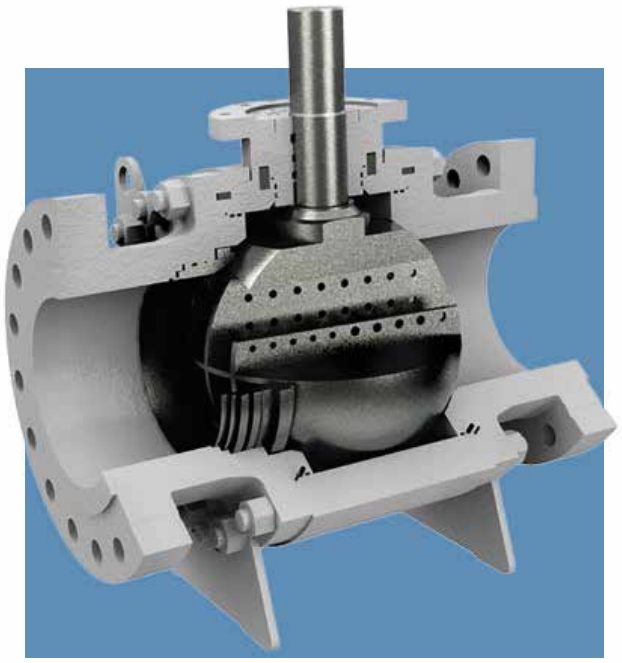
(*) For non-listed dimensions contact PV's staff

CONTROL VALVES
SUBSEA

PetrolValves production range includes a large variety of control valve types specifically designed for deep subsea installation and operations.

Control valve designs available include:
Globe, Cage Ball (both top entry and end entry construction) and Axial Flow valve.

- Different trim selections are available to suit the client's required CV curve.
- Large variety of stem seals available, including Infinity metal stem seal
- PetrolValves technical department can develop designs suitable to meet specific operating performance, including dynamic response.



04 PRECISION AND PERFORMANCE: SUBSEA ACTUATION SYSTEMS

COMPACT AND EFFICIENT:
Our actuators feature a helical spline design, saving space without compromising functionality.

ROBUST MATERIALS:
Built to withstand high pressure and corrosive environments.

OPERATIONAL VERSATILITY:
Suitable for remote operation via ROVs or divers.
Applications: Ideal for offshore oil and gas pipelines, ensuring operational efficiency.

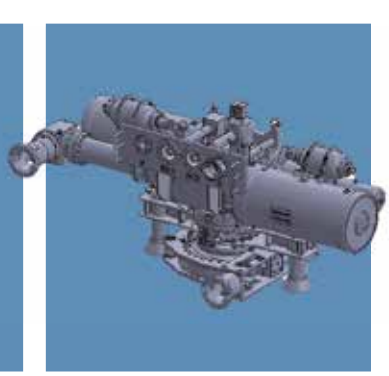
PetrolValves offers a complete single-source integrated solution for manual or actuated high integrity ball, check, slab gate, double expanding gate and axial flow valves, in both Subsea and Topside environments.

Subsea actuators are suitable for installation at any water depth, in both deep and shallow water.
Topside actuators are manufactured for special applications such as very reliable ESD & HIPPS Systems, quick-closing operations, high-torque requirements and compact platform installations.

Both Subsea and Special Topside actuated valves employ advanced technology to guarantee high performance, reliability, availability and safety over a long-term operational life.

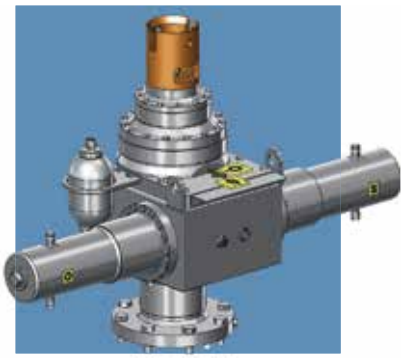
BALL AND CHECK VALVES
HYDRAULIC ACTUATORS

HELICAL SPLINE®
SPRING RETURN



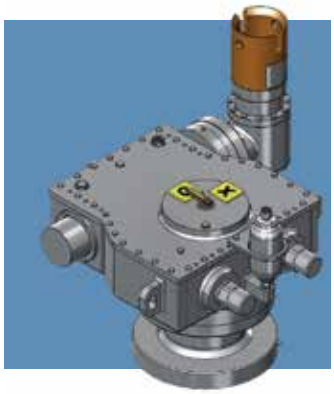
RACK&PINION
SPRING RETURN

HELICAL SPLINE®
DOUBLE ACTING

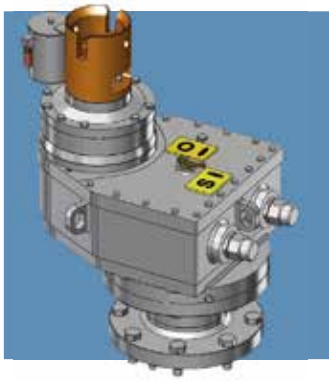


RACK&PINION
DOUBLE ACTING

GEARBOXES



WORM
SCREW



PARALLEL
AXIS

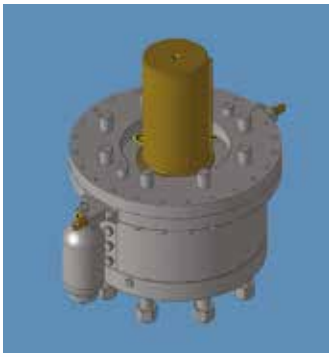
PLANETARY
GEAR

NORMAL
AXIS

DIVER HAND
WHEEL INTERFACE

DIRECT ROV
INTERFACE

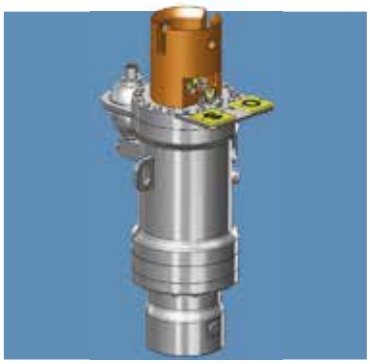
MANUAL TORQUE
TOOL



HYDRAULIC
DAMPER

GATE AND AXIAL
FLOW VALVES

LINEAR HYDRAULIC ACTUATOR SPRING RETURN AND DOUBLE ACTING



LINEAR GEARBOX

WORM MULTITURN GEARBOX

SUBSEA ACTUATORS
GENERAL FEATURES

- Tailor made sizing according to customer requirements related to safety factors, operating pressures and operating curves.
- Fully customized material selection in accordance with Client requirements and applications.
- High strength materials for internals and torque transmitting parts.
- Seawater resistant materials for all exposed parts.
- Fully compensated design for installation at any water depth.
- Designed for extended operational life.
- Fail-safe or Fail-as-is solutions according to plant design.
- Redundant dynamic sealing on piston and external moving parts.
- Clearly visible local position indicator.
- Compact design available for PLEM and manifold installation.
- Special features to allow fast valve operation (less than 2 sec.).
- Fully designed and qualified according to API 6A, API 17D, API 6D, API 6DSS, ISO 13628, ISO 10423, ISO 14723.
- API 17D, ISO 13628-8 or tailor made diver/ROV interfaces.

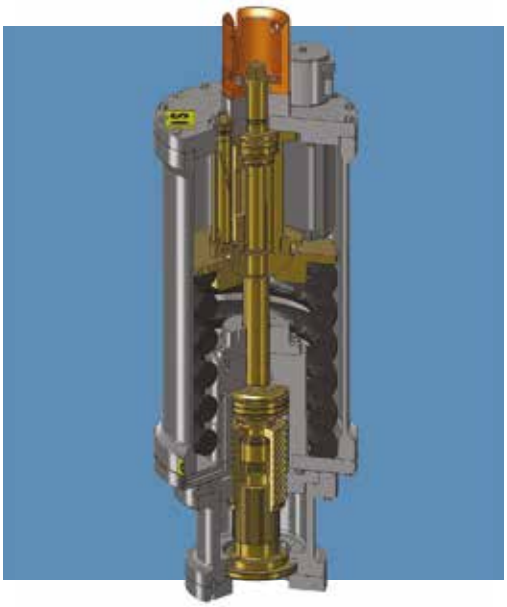
SUBSEA ACTUATORS
OPTIONAL FEATURES

- Hydraulic and electric connectors according to customer requirements.
- Umbilical system including SUTU and TUTU terminations and Hydraulic Power Units.
- Full diver/ROV retrievability of actuators and mechanical operators.
- Self-clutching system or diver/ROV retrievable actuators designed to match
- Client specifications.
- Guiding systems to ease subsea removal and installation operations of retrievable operators.
- Remote position indication to Control Room by means of limit switches or position transmitters.
- Stem and spool extensions to meet Client requirements in terms of distance from valve center line and field structure layout.
- Protection or pressure retaining caps engineered to protect valve stem and prevent any leakage to the environment after operator removal.
- Docking tools for removal and installation of operators and stem cap (ROV or diver operation).
- Tailor made position indicators according to Client requirements

ACTUATORS AND GEARBOXES
FOR QUARTER TURN VALVES

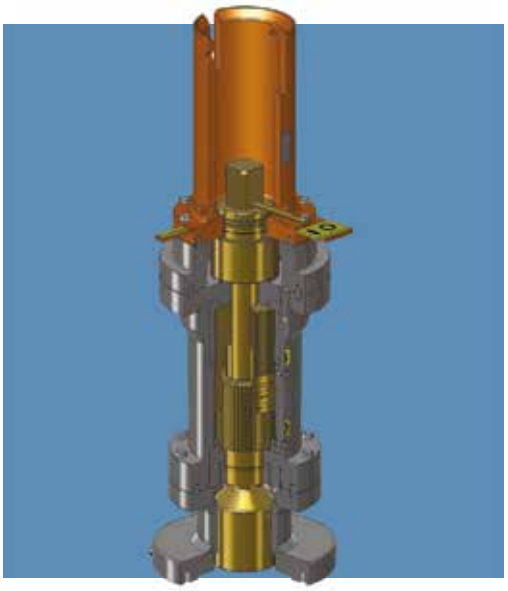
HYDRAULIC SPRING RETURN HELICAL SPLINE ACTUATORS
MAIN FEATURES

- Compact ergonomic design for manifold application.
- Piston with linear movement only instead of rotary to guarantee a linear output torque.
- High spline profile contact surface with low specific stress values preventing wear and deformation.
- Suitable and reliable for high number of strokes and fast operation.
- Factory set end stops for perfect valve stroke and alignment.



HYDRAULIC DOUBLE ACTING HELICAL SPLINE ACTUATORS
MAIN FEATURES

- Compact ergonomic design for side by side and manifold application.
- Piston with linear movement only instead of rotary to guarantee a linear output torque.
- High spline profile contact surface with low specific stress values preventing wear and deformation.
- Suitable and reliable for high number of strokes and fast operation.
- Factory set end stops for perfect valve stroke and alignment.

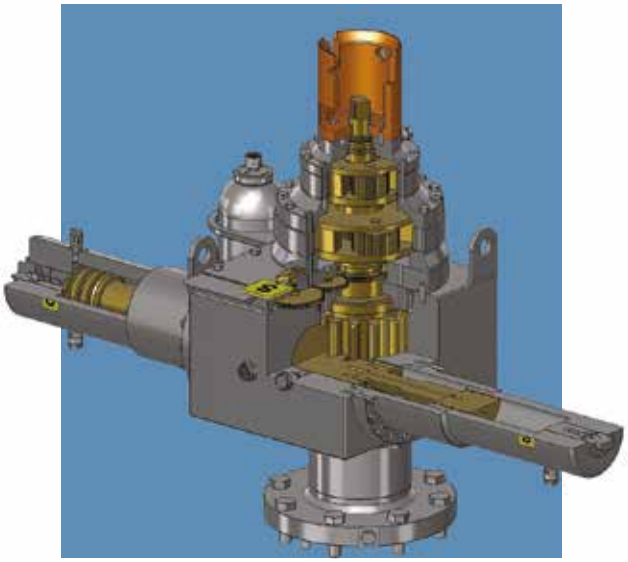


HYDRAULIC SPRING RETURN RACK AND PINION ACTUATORS
MAIN FEATURES

- Simple and reliable design for minimum vertical dimensions.
- Modular execution.
- Easily externally adjustable stops for perfect valve stroke and alignment.
- Weight balanced design.

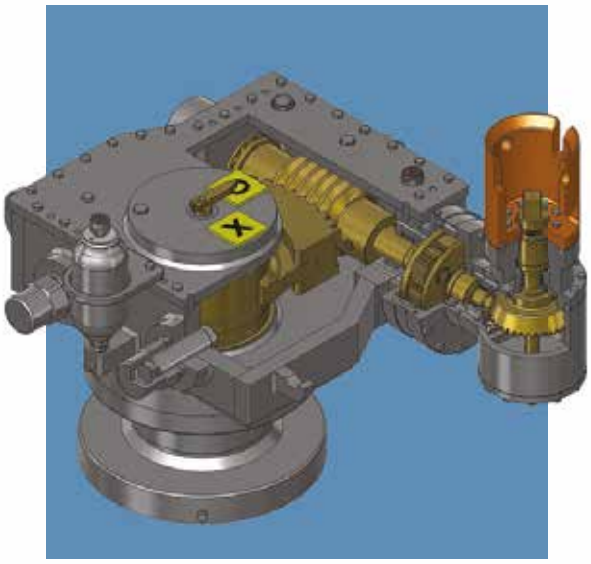
HYDRAULIC DOUBLE ACTING RACK AND PINION ACTUATORS
MAIN FEATURES

- Simple and reliable design for minimum vertical dimensions.
- Modular execution.
- Easily externally adjustable stops for perfect valve stroke and alignment.
- Weight balanced design.



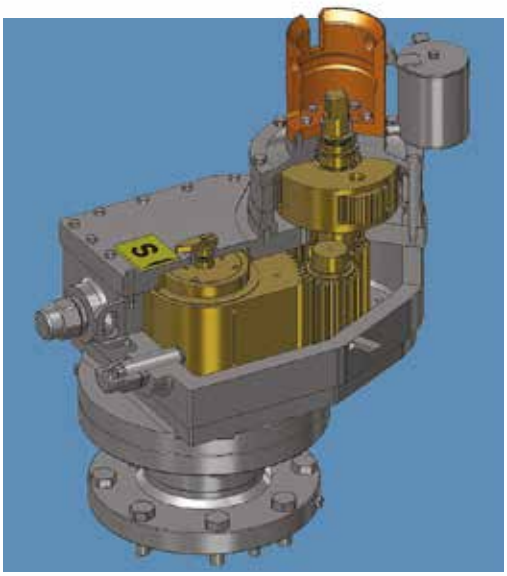
WORM SCREW GEARBOXES
MAIN FEATURES

- High output torque, suitable for any ball and check valve operation.
- Factory set end stops for perfect valve stroke and alignment.
- Non reversible mechanism to lock the valve in position during pigging operation.
- Horizontal or vertical diver/ROV interface as per customer requirements.
- Suitable for lifting the check valve clapper without in-line pressure.
- Designed to allow normal check valve functionality if not operated by diver/ROV.



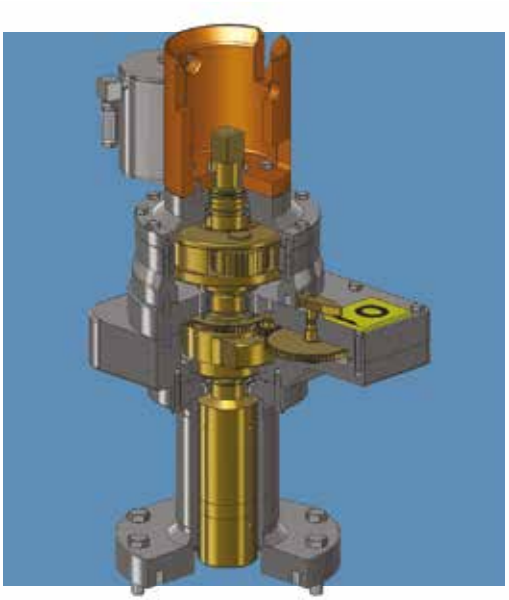
PARALLEL AXIS GEARBOXES
MAIN FEATURES

- Simple and compact design for minimum overall dimensions.
- Factory set end stops for perfect valve stroke and alignment.



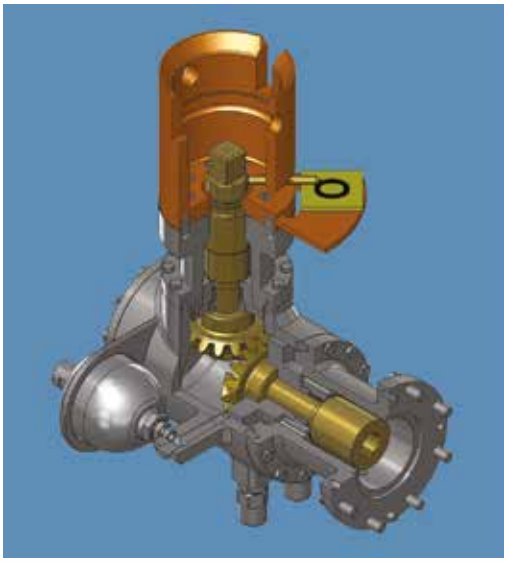
PLANETARY GEARBOXES
MAIN FEATURES

- Integrated valve and operator design, compact size and reduced weight.
- Long term reliable service life.
- Factory set end stops for perfect valve stroke and alignment.



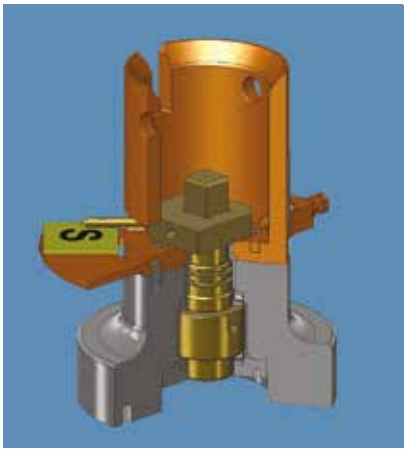
NORMAL AXIS GEARBOXES
MAIN FEATURES

- Integrated valve and operator design, compact size and reduced weight.
- Long term reliable service life.
- Factory set end stops for perfect valve stroke and alignment.



DIRECT ROV INTERFACES
MAIN FEATURES

- Integrated valve and operator design, compact size and reduced weight.
- Long term reliable service life.
- Factory set end stops for perfect valve stroke and alignment.

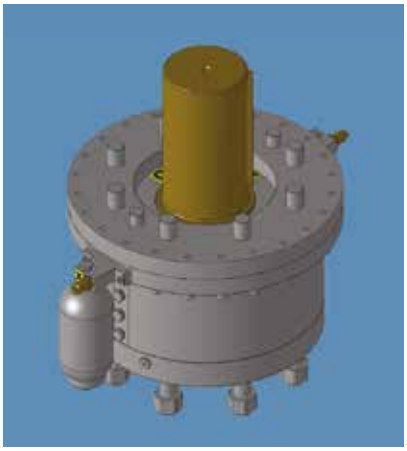


DIVER HANDWHEEL INTERFACES
MAIN FEATURES

- Integrated valve and operator design, compact size and reduced weight.
- High torque multiplication for an easy diver operation (diver max torque 75 Nm).
- Handwheel diameter 500 mm (other diameters available upon request).
- Long term reliable service life.
- Factory set end stops for perfect valve stroke and alignment.

HYDRAULIC DAMPERS
MAIN FEATURES

- Reduced impact of swing check valves closure member.
- Flow regulator to set operating time.



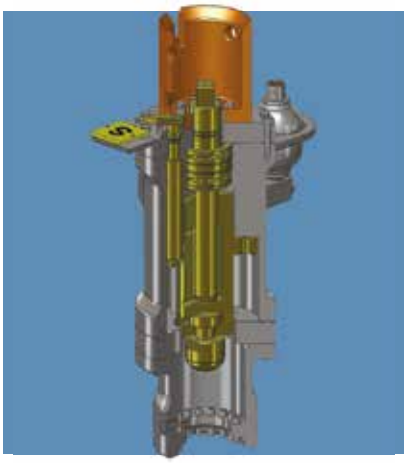
ACTUATORS AND GEARBOXES
FOR LINEAR VALVES

HYDRAULIC SPRING RETURN AND DOUBLE ACTING LINEAR ACTUATORS
MAIN FEATURES

- Spring Return and Double Acting execution available.
- Compact size and reduced weight.

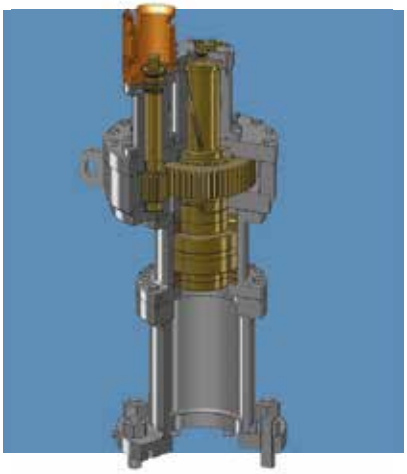
LINEAR GEARBOXES
MAIN FEATURES

- Compact size and reduced weight.
- High output thrust.



WORM MULTITURN GEARBOXES
MAIN FEATURES

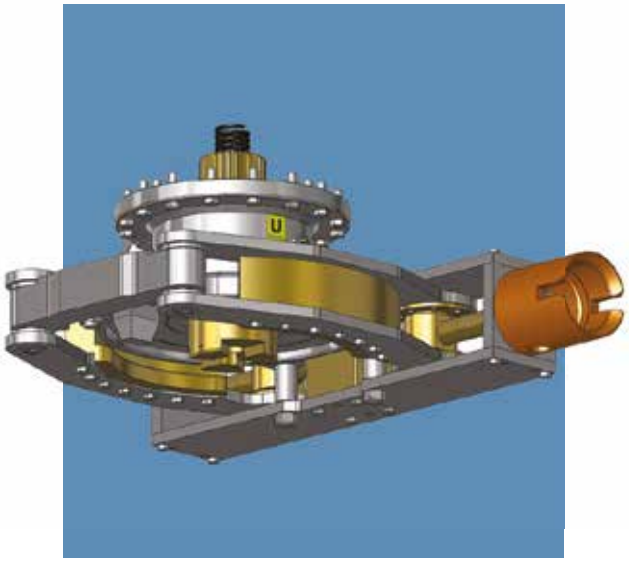
- High output torque, suitable for non-rising stem gate and axial flow valve operation.
- Compact size and reduced weight.



ACTUATORS AND GEARBOXES
REMOVAL SYSTEMS

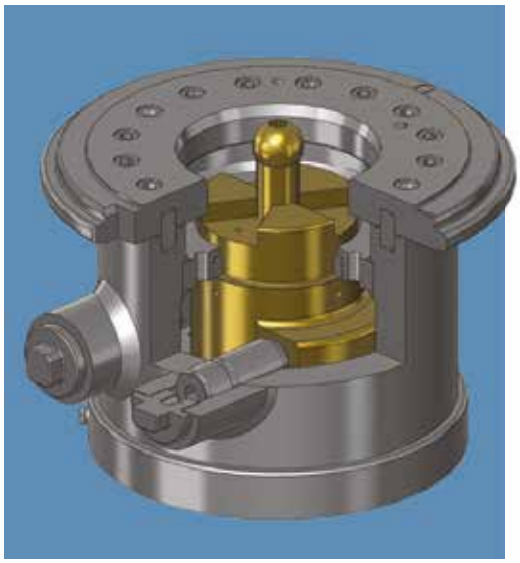
ROV CLAMP RETRIEVAL SYSTEM
CLAMP MAIN FEATURES

- Coupling between spool piece and operator guaranteed by a clamp system.
- Clamp arms operated from unlocked to locked position and vice versa by ROV override.
- Misalignment prevention between operator and spool piece guaranteed by a reference key or clamp system.
- Automatic clutch for removal and reinstallation on the valve apart from valve position.
- Clutch spool equipped with relief valve acting as overpressure venting device and accumulator acting as pressure compensation device.
- Seawater resistant materials for all exposed parts.



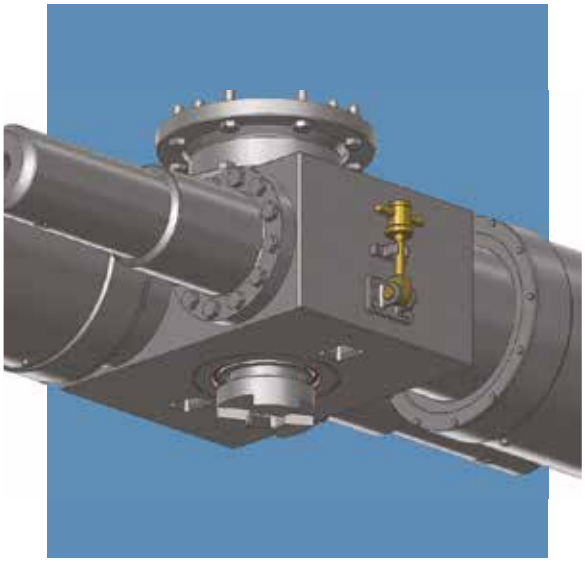
ROV CLAMP RETRIEVAL SYSTEM
PERMANENT SPOOL MAIN FEATURES

- Easily externally adjustable stops for perfect valve bore alignment.
- Misalignment prevention guaranteed by reference groove.
- Centering pin for easy alignment with clamp clutch.
- Stem teeth design including lateral slope angle to ease smoothly the disengagement operation.
- Seawater resistant materials for all exposed parts.
- Additional port for spool cavity flushing and filling with compensation oil.



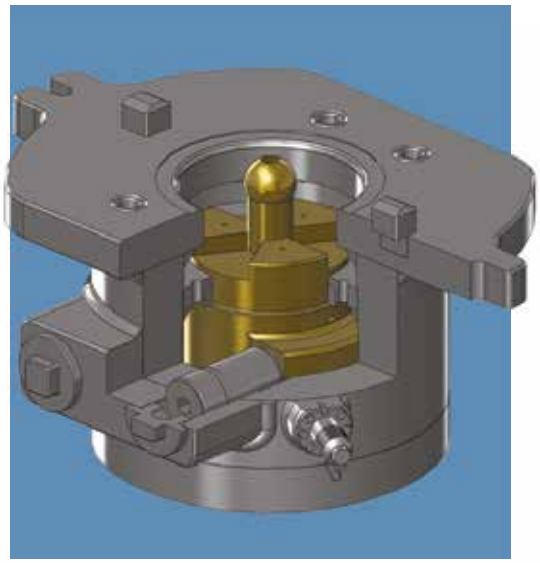
FAST BOLTING DIVER RETRIEVAL SYSTEM
CLAMP MAIN FEATURES

- Coupling between spool piece and operator guaranteed by diver operated fast bolts.
- Actuator locked and kept in position on the valve by easily rotating two levers placed on valve/actuator interface.
- Fast bolting operated from unlocked to locked position and vice versa by diver.
- Misalignment prevention between operator and spool piece guaranteed by a system of asymmetric dowels and anti-rotation pins.
- Automatic clutch for removal and reinstallation on the valve independently from valve position.
- Seawater resistant materials for all exposed parts.



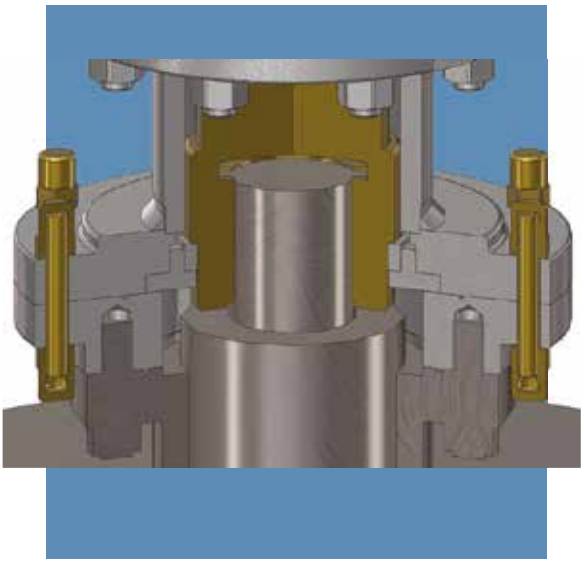
FAST BOLTING DIVER RETRIEVAL SYSTEM
PERMANENT SPOOL MAIN FEATURES

- Easily externally adjustable stops for perfect valve bore alignment.
- Centering pin for easy alignment with operator clutch.
- Stem teeth design including lateral slope angle to ease smoothly the disengagement operation.
- Equipped with relief valve acting as overpressure venting device and accumulator acting as pressure compensation design.
- Seawater resistant materials for all exposed parts.
- Additional port for spool cavity flushing and filling with compensation oil.



ENCLOSED NUTS DIVER REMOVABLE SYSTEM
CLAMP MAIN FEATURES

- Engagement/disengagement between operator and intermediate spool performed by means of diver removable enclosed nuts.
- Design limiting bolt and nut threads corrosion, permitting an easy unscrewing activity after long subsea installation periods.
- Separation of actuator and spool cavity by means of additional seals on actuator stem.
- Additional bearing on output stem to avoid any possible damage due to eventual impacts during installation.
- Additional adapter flange on valve top mounting to increase the diameter of location of the bolting.
- Additional port for spool cavity filling, outlet and inlet safety valves for seawater draining after installation.
- Seawater resistant material for exposed enclosed nuts.



ACTUATORS AND GEARBOXES
ACCESSORIES

CLOSED TYPE
COMPENSATION SYSTEM

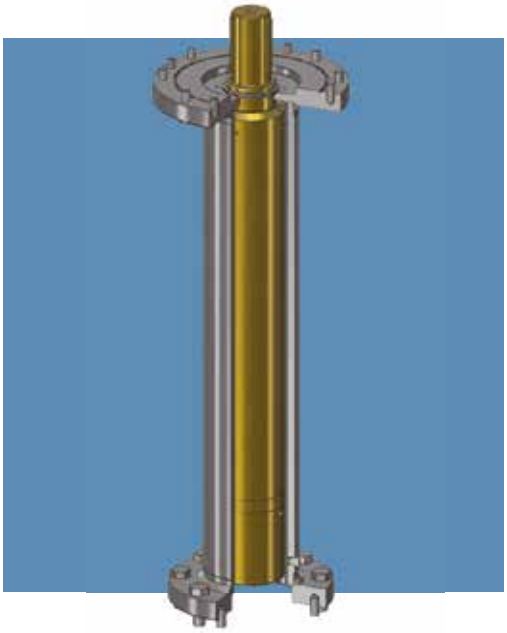
- Independent pressure balancing device connected to the operator main casing in order to avoid any spring chamber/casing over pressurization.
- Internal rubber diaphragm to avoid seawater and compensation oil direct contact.
- Safety relief to avoid pressurization of compensated cavity in case of stem leakage.
- Copper washer to avoid marine growth.
- PTFE nipple to protect copper pipe from cathodic corrosion protection system.

OPEN TYPE
COMPENSATION SYSTEM

- Independent pressure balancing device connected to the operator main casing in order to avoid any spring chamber/casing over pressurization.
- Compensation fluid is heavier than seawater and immiscible with it, both for actuators and gearboxes.
- Super Duplex tank in order to prevent any compensation system corrosion.
- Copper pipe to avoid marine growth.
- PTFE nipple to protect copper pipe from cathodic corrosion protection system.

SELF SUPPORTING SPOOL
EXTENSIONS

- Self supporting intermediate spool extensions.
- Capable of being installed between valves' bonnet and operator housing or below override interface in order to extend operating interfaces to the required height.
- Fixing to an external structure not needed.

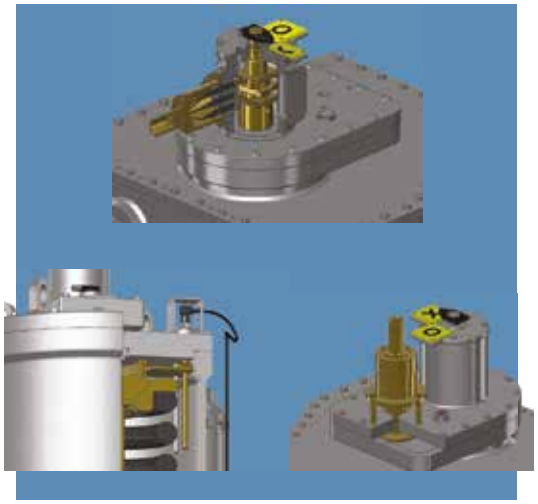


NON SELF SUPPORTING
EXTENSIONS

- Telescopic extensions available for both ROV interface and local position indicator.
- Adjustable final length of +/- 100 mm. Tailor made design for increase of adjustability.
- Available with universal joint to allow lateral misalignment of the ROV bucket.
- Seawater resistant material.

REMOTE POSITION
INDICATORS AND TRANSMITTERS

- Proximity switches for open, close and intermediate remote position indicator.
- 4-20 mA position transducer for continuous remote position indication; other communication protocol available upon request to meet Client requirements.
- Available up to triple redundant configuration.
- Both for linear and rotary equipment.
- Optional multiple pins subsea electric connectors, complete with protection caps.
- Optional diver removable limit switches and position transmitter assembly.

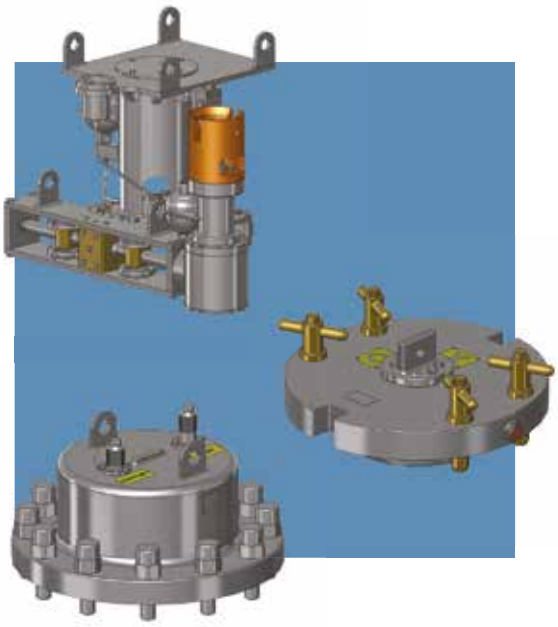


TORQUE TOOL
MULTIPLIER

- Light portable tool for diver intervention.
- Suitable for ISO 13628-8 ROV buckets or other types of buckets upon request.
- Diver torque multiplier up to 20 times.
- Max diver torque 75 Nm or 100 Nm.
- Handwheel diameter 500 mm (other diameters available upon request).

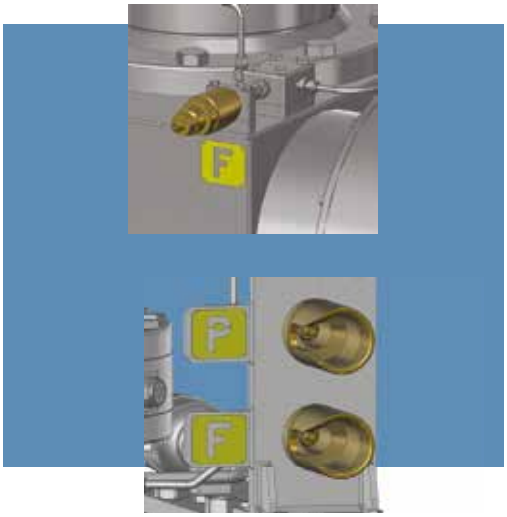
PROTECTION AND PRESSURE
CAPS

- Caps to protect valve stem after actuator removal.
- Clamp, fast bolting or enclosed nuts removal and installation system.
- Pressure containing design to contain any potential valve stem leakage.
- Relief valves for cap integrity protection in case of non pressure containing design.
- Valves and tools to enable flushing after installation.
- Tailor made caps to meet Client and field requirements.



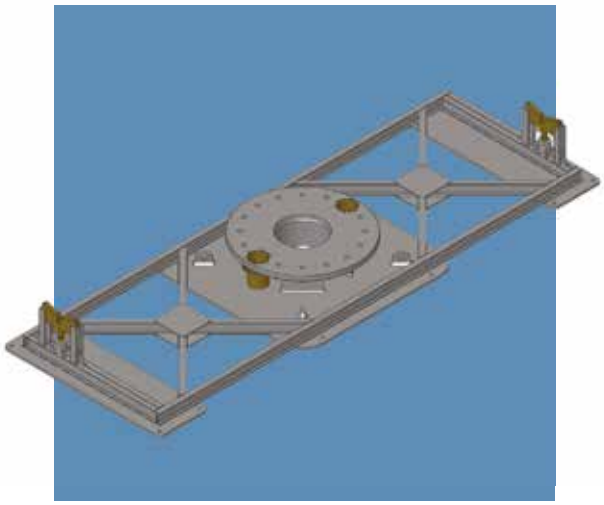
HYDRAULIC
CONNECTORS

- Female thread port on actuators' cylinders as standard connection; tailor made hydraulic connections provided upon request.
- Anti-vibration fittings feature.
- Hot stabs complete with protection caps.
- Both for ROV and diver intervention.



STORAGE AND TRANSPORTATION
STRUCTURES

- High strength materials.
- Tailor made structures on purchased actuators and gearboxes equipped with removal system.
- Suitable for operators' parking and transportation activities.



GUIDING
SYSTEM

- High strength pins to ease subsea removal and reinstallation activities by ART tool.
- Available for all type of removal systems.
- Tailor made in accordance with Client and field requirements.

05 ELECTRIFICATION
INNOVATION IN SUBSEA ACTUATION

- Modular and customizable for diverse operational needs.
- Features advanced monitoring systems for real-time control and diagnostics.
- Reduces downtime and enhances performance in critical subsea environments.

PETRONIC
100% ELECTRIC

SUBSEA ELECTRIC ACTUATORS
BENEFITS

- ENVIRONMENTALLY FRIENDLY
  no leaks, zero discharge
- ADVANCED DIAGNOSTIC
  continuous monitoring - partial stroking test - torque limiting
- RELIABILITY
  25 years of operational life - SIL 2 certified in High Demand Mode
- SAFETY FIRST
  overall risk mitigation of the plant
- PROJECT COST SAVINGS
  no hydraulic umbilicals and no HPU
- POWER EFFICIENCY
  avoiding hydraulic pressure drops and providing power consumption optimization

PETRONIC
MAIN FEATURES

SMART CONTROL CHARACTERISTICS
» Start/Stop torque control
» Continuous positioning
» Speed setting and control
» Max output torque limiting device
» Feed-back control position
» Speed control shaping to power consumption optimization

INTERCONNECTIONS UTILITIES
» Serial connection for test bench interface
» Different communication protocols available:
Canbus (SIIS Level 2 - Fault tolerant) , CANopen, MODBUS, TCP/IP, ETERNETH

DIAGNOSTIC CHARACTERISTICS
» Continuous voltage and current supply monitoring and control
» Partial stroking test
» Motor high temperature self-protection

MECHANICAL CHARACTERISTICS
» Nominal torque: 2.700 Nm ISO 13628-8 class 4 (different setting upon request)
» Nominal motor torque: 10 Nm
» Nominal motor speed: 1000 rpm

ELECTRIC CHARACTERISTICS
» Nominal voltage 24 VDC (range 12-36 VDC)
» Stand-by power consumption: 16W
» Different output torque on request

EXECUTION
» Stand-alone
» Back-up battery

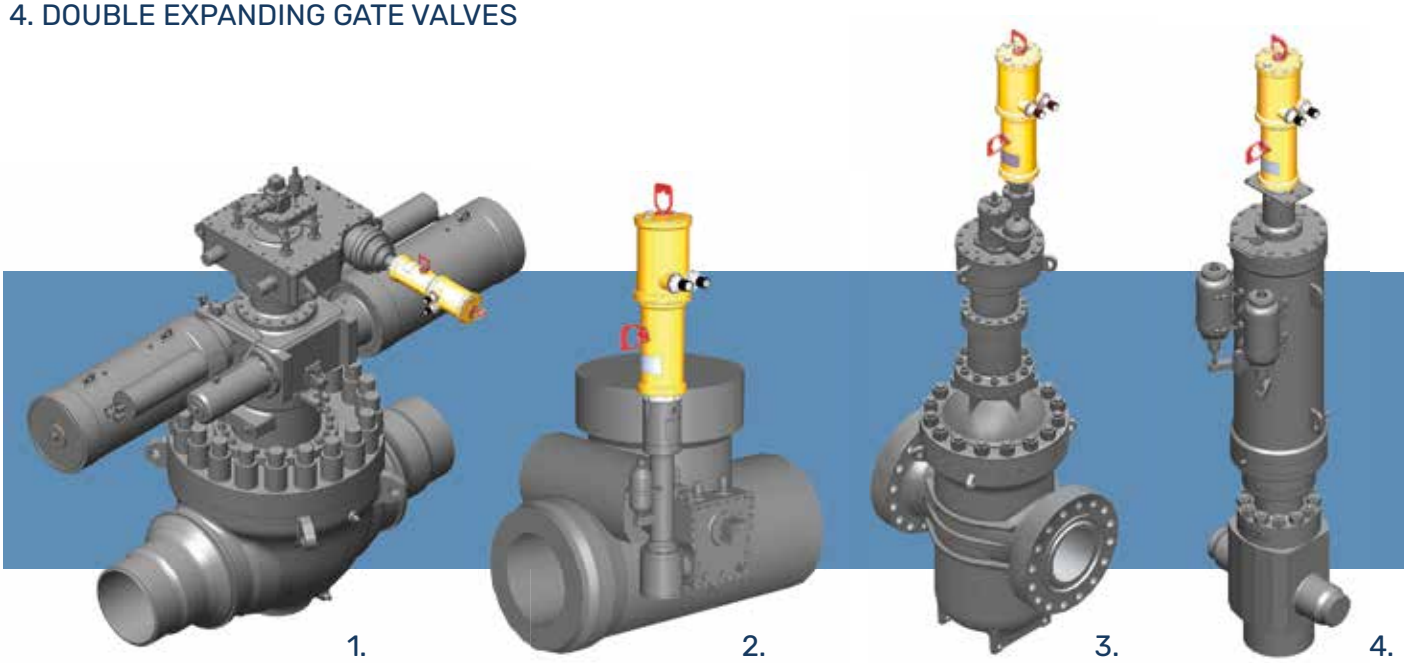
ENVIRONMENTAL CONDITION
» Pressure compensated electronic design: 300 bar (tested up to 450 bar) for 12.000 cycles
» Working temperature from -10°C to +65°C

QUALIFICATION TESTS
PERFORMED

- Functional test - ISO 13628
- Endurance Test (10.000 cycles) - ISO 13628
- Hyperbaric and Endurance Test (12.000 cycles@450 bar) - ISO 13628
- Motor Driver Board Test
- Mother Board Test
- Power Board Test
- Controller Board Test
- Electronic-Motor System Test
- Thermal Analysis Test
- PR2 Qualification Test (-10°C to +65°C) API 6A and API 17D
- Environmental Compatibility Test
- Vibration and Shock Test
- Electromagnetic Compatibility Test
- PETRONIC EROV Reliability Analysis

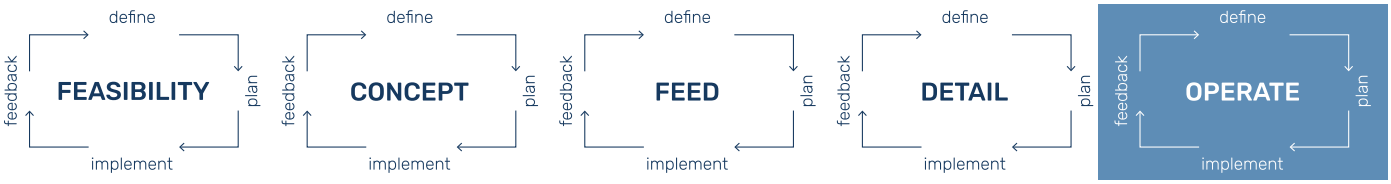
PETRONIC
ADAPTABILITY

1. BALL VALVES
2. CHECK VALVES
3. SLAB GATE VALVES
4. DOUBLE EXPANDING GATE VALVES



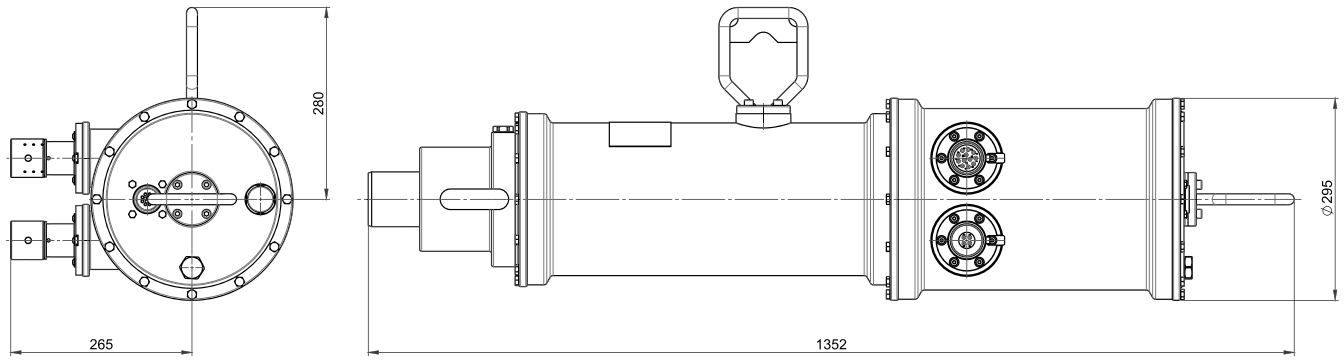
PETRONIC DEVELOPMENT APPROACH
API RP 17N/ISO 13628-13

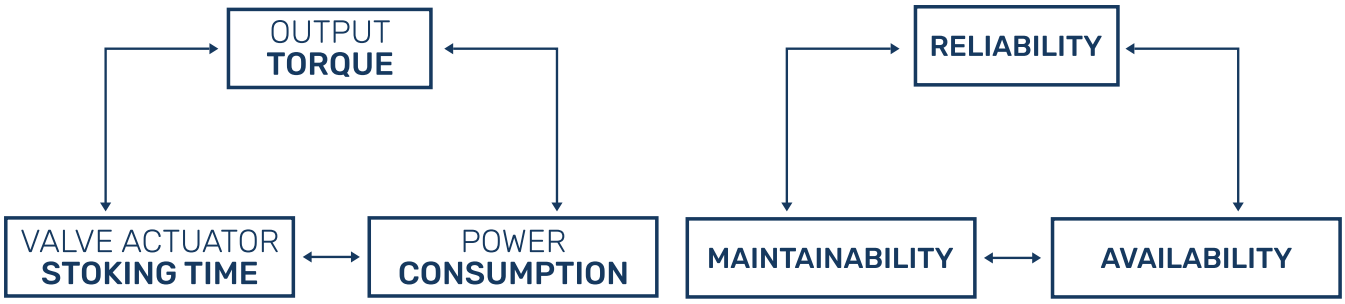
Recommended practice for subsea production system reliability and technical risk management



SIZES AND PERFORMANCES
TO MEET EVERY REQUIREMENT

Petronic subsea electric actuator is ergonomic, modular designed and fully customizable.
Different model sizes are available to meet project specifications and Client's requirements





PETRONIC
ADVANTAGES

SUBSEA ELECTRIC ACTUATION OFFERS SEVERAL ADVANTAGES:

- Environmentally friendly
- Overall project cost reduction
- Real-time feedback
- Power efficient
- Pollution emission free
- Certified SIL in accordance with IEC 61508: 2000

SIL CALCULATION
AND RELIABILITY ANALYSIS

SAFETY INTEGRITY LEVEL	
safety integrity levels for high demand mode of operation (IEC 61508-1 table 3)	
safety integrity level	probability of a dangerous failure per hour
SIL 4	>= 10 - 9 TO < 10 - 8
SIL 3	>= 10 - 8 TO < 10 - 7
SIL 2	>= 10 - 7 TO < 10 - 6
SIL 1	>= 10 - 6 TO < 10 - 5
table 3 “safety integrity levels for high demand mode of operation”	

HARDWARE FAULT TOLERANCE			
architectural constraints on type A* safety-related subsystems (IEC 61508-2 table 2)			
SAFE FAIL FRACTION	HTF		
	0	1	2
< 60%	SIL 1	SIL 2	SIL 3
60% ÷ 90%	SIL 2	SIL 3	SIL 4
90% ÷ 99%	SIL 3	SIL 4	SIL 4
> 99 %	SIL 3	SIL 4	SIL 4
table 2 “architectural constraints on type A* safety-related subsystems”			

HYBRID
WITH BOSCH

rexroth
Bosch Company

Rexroth eSEA Drive Smart Electrification of PetrolValves Large Valves

SCALING YOUR ENERGY TRANSITION PROJECT

Efficiently reducing the cost of subsea installations to scale up green hydrogen and carbon storage (CCUS): To fully electrify subsea factories, Bosch Rexroth has developed a retrievable and easy-to-use Subsea Intelligent Drive (eSEA Drive) for driving large process valves with operating torques much higher than 35.000 Nm. This innovative solution offers lower CAPEX and lower OPEX, while increasing safety and efficiency. eSEA Drive provides more protection to the sensitive subsea environment for greenfield or brownfield subsea production systems (SPS).

If you still have hydraulic functions and you thought you could not electrify them, it is time to get to know the eSEA Drive!

ONE STANDARD ELECTRIC SOLUTION FITS ALL

eSEA Drive enables a simple electrification of subsea applications with high loads and high safety requirements, such as Subsea Safety Isolation Valves (SSIV), Emergency Shutdown Valves (ESDV), or High Integrity Protection Systems (HIPPS). With its standardized interfaces and intelligent drive unit in combination with field-proven springs, eSEA Drive not only electrifies the safety operations subsea, but also improves them to reach up to SIL 3 by adding monitoring capabilities (Diagnostic Coverage) without disturbing the fast-acting safety return. These features are demonstrated with full-scale prototypes undergoing Technology Readiness Level 4 (TRL 4) qualification tests according to API 17N & API 17Q for water depth up to 4,000 m.

DO MORE WITH LESS POWER

eSEA Drive needs no external hydraulic connection, removing the need for a topside Hydraulic Power Unit, the hydraulic lines of the umbilical, and all additional components required by the hydraulically driven subsea control system. Its power-on-demand approach reduces the power consumption needed to operate large ball valves to a range between 96 W and 480 W. In the basic configuration, the eSEA Drive acts against a fail-safe spring by pressurizing the hydraulic control line with a standby power less than 20 W. If the electric power is shut down, the hydraulic pressure is released with the SIL 3 redundant safety control system, and the process valves return automatically to the safe state in a short time with the force provided by the field-proven springs integrated into the process valve.

ROBUST AUTOMOTIVE CONTROL UNIT

The centerpiece of eSEA Drive is a robust automotive electronic control unit. By varying the available electric power and motor speed, different hydraulic flow rates and pressures can be provided to drive a specific function, such as large subsea valves. Utilizing the integrated, embedded digital twin, downtimes can be minimized, increasing the overall system productivity. In addition, further smart functions under development will be deployed, such as a partial-stroke test, using the embedded digital twin without demanding direct monitoring of the valve position.

Field-proven safety valves (Source: PetrolVavles)

eSEA Electrified (Source: Bosch Rexroth)

FIELD-PROVEN SAFETY UP TO SIL 3

With the embedded control system and sensors, different control strategies can be implemented, considering not only pressure limits, but also (external) position indicators or limited power consumption. Even though it is qualified according to the SIL2 with 24 V DC and Fault-Tolerant CANopen, the eSEA Drive offers flexibility to operate between the power range of 96 to 480 W, depending on the electric power available, without compromising the safety function, especially the time-to-return. By integrating condition monitoring functionalities such as partial-stroke tests, the Diagnostic Coverage of the safety functions is increased, enabling them to reach up to SIL 3 without disturbing the production with shutdown test sequences.

MINIMIZED RISK OF CONTAMINATION

The eSEA Drive follows a novel and disruptive approach by providing an intelligent and retrievable subsea Hydraulic Power Unit (HPU). With its closed-circuit hydraulic control system, the risk of contamination for the sensitive subsea environment through hydraulic fluid is minimized, while being simple to exchange by any subsea intervention robots such as Remote Operated Vehicles (ROV). Furthermore, the response time of the overall system is improved with the fast-acting embedded control system.

ONE STANDARD SOLUTION FOR DIFFERENT FUNCTIONS

Actuation of large valves is usually driven by a pressurized control fluid provided via a hydraulic supply line. With the eSEA Drive, such valves can still be driven by the incoming pressure, but with the hydraulic power generated locally, on demand. This approach ensures that the field-proven design standards, mechanical integrity, and dimensioning principles of this type of hydraulically operated valve remain valid for the electrification systems, reducing the engineering and qualification efforts as well as the project risks.

The solution provides a simple electrical interface to electrify the subsea valves with a single electrical connector using 4 pins for the 24 V DC power supply and for the fault-tolerant CANopen communication interface as with any other subsea instrument.

22'' Ball Valve: Conventional Hydraulics (Source: PetrolVavles).

22'' Ball Valve: eSEA Electric Conventional Hydraulics (Source: PetrolVavles).

06 COMMITMENT TO QUALITY AND THE ENVIRONMENT

SUSTAINABILITY INITIATIVES:
Use of eco-friendly materials and processes.

CERTIFICATIONS:
Compliance with ISO 14001 and other global standards.

QUALITY ASSURANCE:
Rigorous testing ensures reliability and durability.

PRODUCT
QUALIFICATION

PETROLVALVES HAS AN EXTREMELY LARGE RECORD OF PREVIOUS QUALIFICATIONS SUCCESSFULLY PERFORMED :

- PR2 Design Validation Test according to API 6A /ISO 10423 Annex F
- Endurance Test According to API 17D
- Sand slurry test according to API 6A/ISO 10423 ANNEX I Class II
- Sand slurry test according to API 6AV1
- Hyperbaric Test according to API 17D Annex L
- A number of customized qualification Procedures

MATERIALS

VALVE TYPE	**AVAILABLE BODY** MATERIAL SELECTION	**AVAILABLE OBTURATOR** MATERIAL SELECTION	**AVAILABLE SEAT** MATERIAL SELECTION
BALL **GATE** **CHECK**	**Cast or Forged**: LTCS; Inconel Cladded **Forged**: Low Alloy Steel; Inconel Cladded **Cast or Forged**: Duplex, SuperDuplex, Ni Alloy	**Forged**: LTCS or Low Alloy Steel; Inconel Cladded **Cast or Forged**: Duplex, Super Duplex, Ni Alloy **HardFacing**: TCC	**Forged**: Duplex, Super Duplex, Ni Alloy **HardFacing**: TCC
		Cast or Forged: LTCS; Inconel cladded **Forged**: Low Alloy Steel; Inconel cladded **Cast or Forged**: Duplex, SuperDuplex, Ni Alloy HardFacing: Stellite	**Forged**: Duplex, Super Duplex, Ni Alloy **HardFacing**: Stellite

SEALS

BODY SEALS

All primary body gaskets are bi directional metal-to-metal to provide tight seal both toward and from environment.

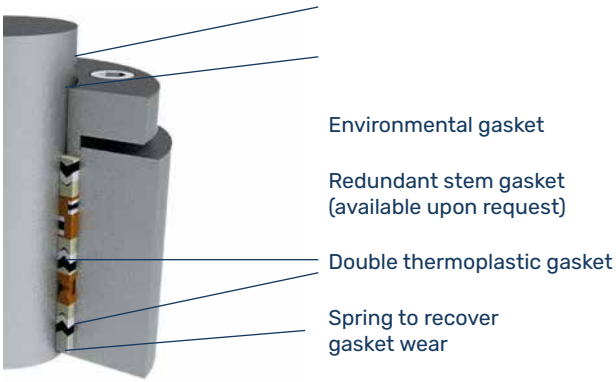
Typical arrangement also include a secondary environmental soft seal which provides an additional barrier to seawater ingress into the valve.

Optional: Lip seal additional barrier

STEM SEALS

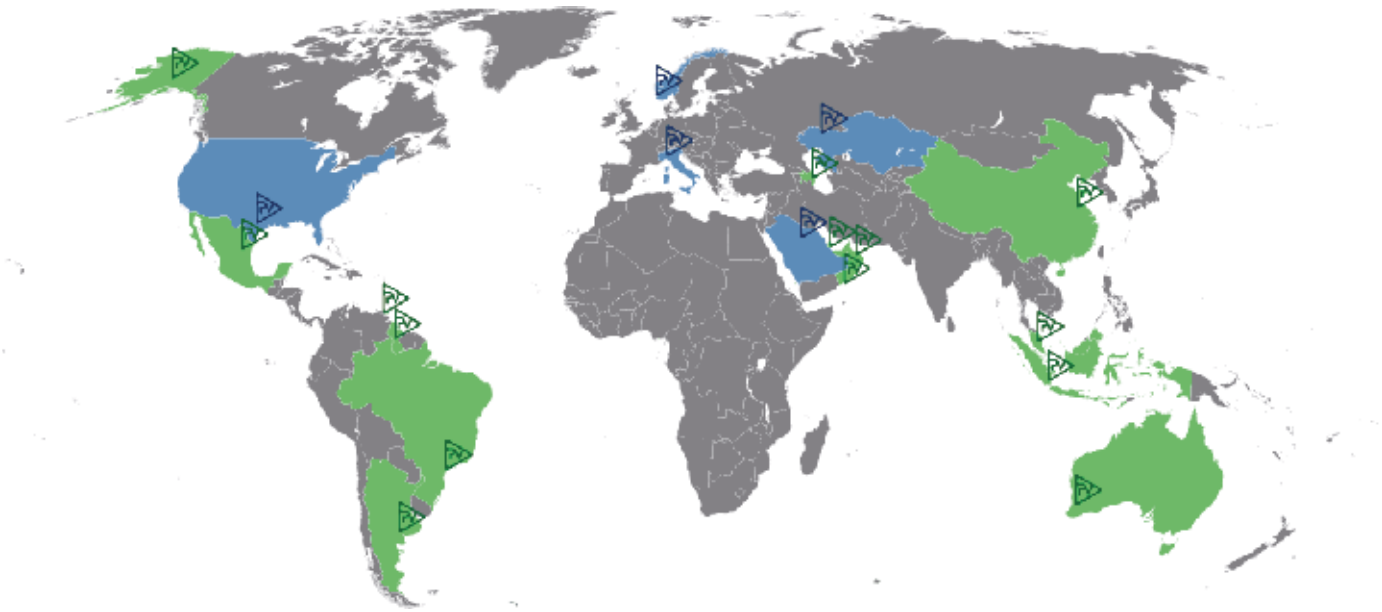
PetrolValves (proprietary design) subsea stem gasket is qualified up to 15,000 psi internal pressure and 4000 m water depth.

In addition, PV's patented Infinity Seal is available as an option. Through the employment of this metal to metal stem gasket, the guaranteed operational life can be extended.



07 GLOBAL EXPERTISE, LOCAL SUPPORT

PETROLVALVES GROUP GRANTS TO ITS CUSTOMER ACCESS TO ITS OWNED SHOPS NETWORK AND TO ITS AUTHORIZED REPAIR CENTERS TO COVER ALMOST ALL WORLD GEOGRAPHIES:



PETROLVALVES FACILITIES AND SERVICE SHOPS

- **Italy** – Milan (headquarter)
- **Italy** – Piacenza
- **USA** – Houston (Texas)
- **Norway** - Stavanger
- **Kazakhstan** – Aksai
- **Saudi Arabia** – Dammam

AUTHORIZED SERVICE SHOPS

- **Malaysia – Kuala Lumpur**
- **Indonesia – Jakarta**
- **China – Qingdao and Tianjin**
- **Arzebaijan - Baku**
- **Guyana - Georgetown**
- **USA – Alaska**
- **Argentina – Buenos Aires**
- **UAE – Abu Dhabi**
- **Qatar – Doha**
- **Oman – Muscat**
- **Australia – Perth**
- **Brazil – Itapema**
- **Mexico – Nuevo Leon**
- **Trinidad & Tobago**

PETROLVALVES GROUP GRANTS DIRECT ACCESS TO THE RECIPROCAL GLOBAL NETWORK OF HIGHLY QUALIFIED SISTER COMPANIES AND SELECTED PARTNERS WITH A WORLDWIDE PRESENCE.

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