


# Naval Marine Solutions

 IMI TRUFLO MARINE™

 IMI ORTON™

 IMI PBM™

 IMI THOMPSON VALVES™

 IMI REMOSA™

 IMI BOPP & REUTHER™

**Breakthrough  
Engineering**

We have over **140,000 valves** in service across **36 navies** worldwide.

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# Breakthrough Engineering

IMI Critical Engineering's family of specialist companies design, manufacture and service custom-designed valves and actuators that precisely control the flow of steam, gas and liquids under extremes of pressure and temperature, as well as intensely abrasive or corrosive operating conditions.

Our products are widely deployed on ships and submarines throughout the world.

In addition, our valves can be found in a myriad of industrial plants and processes, enabling the production of oil and gas, power, petrochemicals, metals, pharmaceuticals, cosmetics, food and

beverages, water and sanitation, pulp and paper, and ethanol and sugar.

Our engineering expertise means that we can make hazardous processes safer, cleaner, and greener. That is why we describe our purpose as 'breakthrough engineering for a better world'.

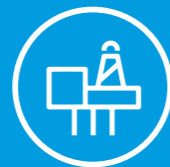
## The Markets We Serve:



Marine



Nuclear



Oil & Gas



Process



Water



Petrochemicals



Metals



Sanitary



Power

**IMI** IMI Critical Engineering is a division of IMI plc

FTSE  
250  
company

IMI plc have 3 divisions:



- > IMI Critical Engineering
- > IMI Precision Engineering
- > IMI Hydronic Engineering



Manufacturing operations in 20 countries

c. 10,000 people employed around the world in > 50 countries



# Why Partner With Us

## Naval Marine

Failure at sea is not an option, and with thousands of valves on a naval submarine or surface ship, defence customers require extreme confidence in their suppliers. This is why over 36 navies worldwide trust and choose IMI Critical Engineering. Our products have been created to withstand the harshest of environments to avoid potentially catastrophic events. We support all submarine propulsion systems, including diesel electric, air independent propulsion (AIP) and nuclear.

### 50+ Years Naval Marine Legacy

IMI Critical Engineering have been a trusted partner to key Maritime programmes since 1962. We lead the world in the design, manufacture, supply and through-life support of high integrity valves, actuators, and pressure regulators and manifolds, for nuclear and naval marine applications.

### A Global Through-Life Engineering Partner

At IMI Critical Engineering, customer collaboration is at the heart of all that we do. We listen to our partners to understand their specific requirements; embedding ourselves at every stage of a new submarine or surface ship build.

### Highest Defence Standards

Our product portfolio is unparalleled, harnessing the expertise and engineering excellence of our workforce. Our products are meticulously designed and manufactured to the highest of defence & military industry standards, and fully qualified for naval use.

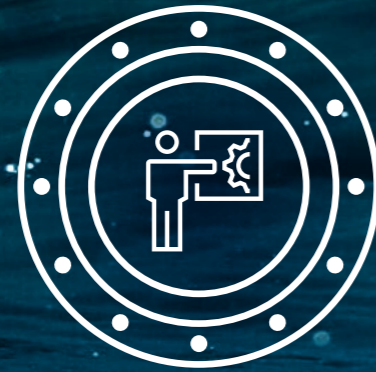
### Deep Domain Understanding

IMI Critical Engineering's continued commitment and investment into research and development allows our highly knowledgeable and qualified engineers to innovate new solutions. Our capability to provide mission critical products and through-life support is proven by our long-standing involvement in current and future naval marine programmes.

## Our Naval Marine Brands

- IMI TRUFLO MARINE
- IMI ORTON
- IMI PBM
- IMI THOMPSON VALVES
- IMI REMOSA
- IMI BOPP & REUTHER





### Consultancy

With decades of experience throughout submarine warship programs around the world, IMI Critical Engineering have established a substantial network of partners and experts; no matter the subject or complexity of the challenge, IMI is well equipped to provide the best solution.



### Design

IMI Critical Engineering employs a proven design process. This includes seconding engineers into customer technical teams, FEA / CFD simulation services, and environmental qualification design. We draw on lessons learned from navies globally, ensuring that we always offer best-in-class products.



### Qualification

IMI Critical Engineering valves are used in critical applications and therefore undergo stringent validation and quality assurance through prototype testing followed by factory acceptance testing on each valve produced.



### Manufacture

With ongoing investment in the latest machining and test technologies to keep our cutting-edge designs manufacturable at the highest efficiencies and quality standards, we stand ready to deliver on the promises we make to our customers.



### Through-life Support

By choosing parts and spares from IMI Critical Engineering, installed and tested by our own field service engineers, operators can be confident that they are made to the same high specification and quality standards as our original parts.

## The Trusted Partner

### Valve Doctors®

Our Valve Doctors™ are IMI Critical Engineering's top technical experts who can help our customers solve the most demanding engineering challenges - from diagnosis of problems to evaluating process requirements, and optimising configurations.

Our Valve Doctors™ operate on-site wherever they are needed to solve customers' process flow problems. They optimise plant performance, in power, nuclear, oil & gas, and petrochemical plants around the world.

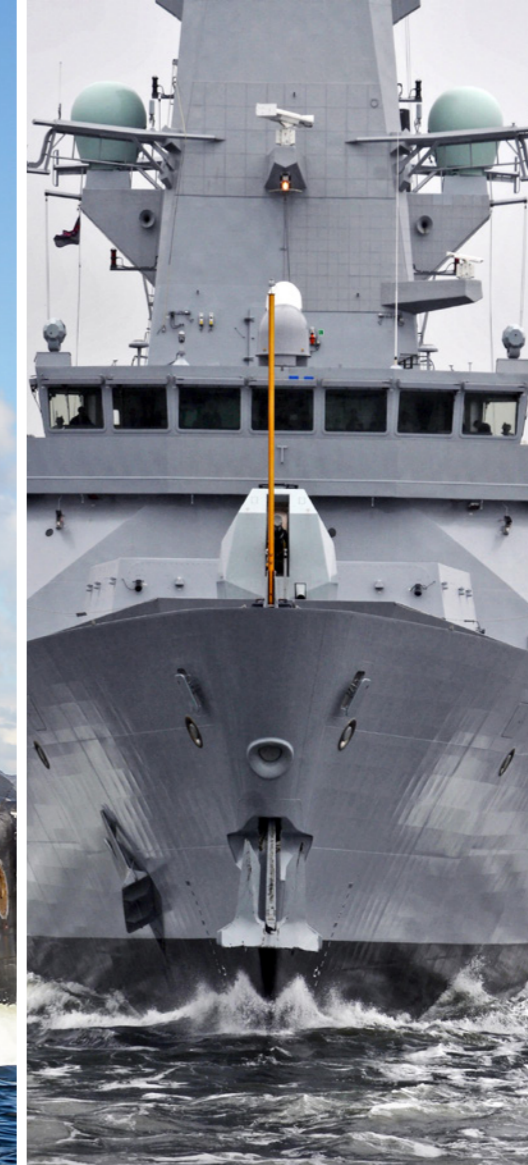


### Information Security

IMI Truflo Marine holds Cyber Essentials Plus, a Government backed scheme designed to help businesses protect themselves against cyber-attacks.

The scheme provides guidance to organisations and is focussed on 5 critical security controls with the aim of protecting UK businesses from the latest external threats and vulnerabilities and is now a requirement for many UK government contracts.





### IMI TRUFLO MARINE

IMI Truflo Marine meticulously design and manufacture to the highest of industry standards. **All valves are fully qualified for naval use.** This includes physical underwater explosion (UNDEX) testing where applicable, and high flow capability and quick shut off - vital to the functioning of critical systems during high intensity combat.

### IMI THOMPSON VALVES

IMI Thompson Valves have over 50 years' experience supplying naval equipment to a global client base. **Pressure reduction and fluid control solutions,** which include regulators, solenoid valves, and bellows sealed valves, are designed for reliable performance and meet the customer's most challenging operating conditions.

### IMI ORTON

IMI Orton produces specialist **isolation and control butterfly valves** for use on surface ships for sea water, fresh water and cooling systems, and for use on surface ships and submarines for heating, ventilation and air conditioning (HVAC) applications with firesafe specifications. IMI Orton's dedicated aftermarket department, supplies spare parts and field service to clients.

### IMI BOPP & REUTHER

IMI Bopp & Reuther have been providing **safety valves** for submarines for 40 years, and they can be used to control all the vital systems on board - fresh water, sewage, oxygen, sea cooling water, battery cooling, fuel, and weapons. All valves are designed and extensively tested in-house, and field service engineers are available to service installed valves.

### IMI REMOSA

IMI Remosa provides highly specialised **diesel exhaust valves** for submarines and actuation control systems for both submarines and surface ships. All products are custom-designed to meet a customer's specific requirements, manufactured and tested in-house and meet the necessary industry certifications and standards.

### IMI PBM

IMI PBM's seawater valves are available in a **vast array of alloys to prevent corrosion,** are ABS Type approved, and are in use in both commercial and naval vessels. Applications include: bilge, ballast, fuel (traditional and LNG), black and grey water, sea-chest, injection, NSF drinking water and more.

Our Brand Portfolio

# Localisation



## In-country Support

We work with countries around the world and are committed to having a presence in the country in which we are operating, to offer support and to ensure responsiveness.

Any company with which we party is fully vetted and inspected to ensure that they maintain the same standards to which we operate.



## Global Reach

IMI plc have 20 manufacturing facilities across the globe. These manufacturing facilities are located in Europe, America, and Asia.

IMI plc operate in over 50 countries and employ over 10,000 people.



## Technology Transfer

We will work with local IMI sites or third parties to transfer the full value chain of design, manufacture, and strip and survey capability.

This will allow full local capability to achieve sovereignty and self-sustainment.



## Knowledge Transfer

Our customers have full access to our experienced team of engineers, technicians, and assembly specialists for their local workers.

There is also access to a broad range of training and educational processes at our facilities and on-site at customer locations.

Engineering support is available via email, video conferencing and local in-market support.

## Connect

### Connect: Worldwide, Fast, Remote Assistance

IMI Critical Engineering Connect uses a wearable augmented reality (AR) audio-visual headset which connects your field technicians with one or multiple experts across our global knowledge network.

By offering remote guidance equipment to the customer as part of the service agreement, Connect can provide maintenance and troubleshooting for any valve technology without any delay.



- Australia**
  - > Anzac Class Frigate
  - > Huon Class MHC
  - > Collins Class (SSK)
- Argentina**
  - > Type 209 (SSK)
- Brazil**
  - > NAM Atlantico LPH
  - > Niterói Class Frigate
  - > Inhaúma Class Corvette
  - > Barroso Class Corvette
  - > Type 209 (SSK)

- Canada**
  - > Halifax Class Frigate
  - > Victoria Class (SSK)
- Chile**
  - > Type 209 (SSK)
- Columbia**
  - > Type 209 (SSK)
- Denmark**
  - > Absalon Class MSS

- Ecuador**
  - > Type 209 (SSK)
- Egypt**
  - > Type 209 (SSK)
- France**
  - > Scorpène (SSK)
  - > Barracuda (SSN)
- Germany**
  - > Brandenburg Class Frigate
  - > Type 212 (SSK)
  - > Type 214 (SSK)

- Greece**
  - > Super Vita Class
  - > Hydra Class Frigate
  - > Glavkos Class (SSK)
  - > Papanikolis Class (SSK)
- India**
  - > Talwar Class Frigate (P17)
  - > Type 209 (SSK)
- Indonesia**
  - > Bung Tomo Class Corvette
  - > Type 209 (SSK)

- Israel**
  - > Dolphin Class (SSK)
- Italy**
  - > Type 212A (SSK)
- Malaysia**
  - > Lekiu Class Frigate
  - > Kedah Class Corvette (MEKO A100)
- Netherlands**
  - > Walrus Class (SSK)

- New Zealand**
  - > Anzac Class Frigate
- Norway**
  - > Ula Class (SSK)
- Oman**
  - > Qahir Class Corvette
- Pakistan**
  - > Tariq Class Frigate (T21)



We have over **140,000 valves** in service across **36 navies** worldwide.

**Global Footprint**

- Peru**
  - > Type 209 (SSK)
- Portugal**
  - > Type 214 (SSK)
- Qatar**
  - > Barzan (Vita) Class

- Republic of Korea**
  - > KDX-2 Class Destroyer
  - > KSS-2 Class (SSK)
  - > Type 209 (SSK)
  - > Type 214 (SSK)
- Saudi Arabia**
  - > Al Jawf Class Minehunter
- Singapore**
  - > Type 218SG (SSK)

- South Africa**
  - > Valour Class Frigate (MEKO A-200)
  - > Type 209 (SSK)
- Spain**
  - > Álvaro de Bazán Class Frigate (F100)
  - > Segura Class Minehunter
  - > S-80 (SSK)

- Taiwan**
  - > Hai Lung Class (SSK)
- Thailand**
  - > Chakri Naruebet Class Aircraft Carrier
- Turkey**
  - > Aydin Class MHV (Type MHV 54-014)
  - > Yavuz Class Frigate
  - > Type 209 (SSK)

- United Kingdom**
  - > Type 23 Frigate
  - > Type 45 Destroyer
  - > Sandown Class Minehunter
  - > Queen Elizabeth Class Aircraft Carrier
  - > Hunt Class Minesweepers/Minehunter
  - > Wave Class Large Fleet Tanker (A)
  - > Albion Class Assault Ship (LPD)
  - > Vanguard Class (SSBN)
  - > Trafalgar Class (SSN)
  - > Astute Class (SSN)

- USA**
  - > ESB-3 Support Vessel
  - > Littoral Combat Ship (LCS)
  - > Island Class Patrol Boat
  - > Cyclone Class Patrol Boat
  - > Sentinel Class Cutter
  - > Heritage Class Cutter
  - > Response Boat - Medium
  - > Inland Construction Tender
  - > Polar Class Icebreaker
- Venezuela**
  - > Type 209 (SSK)

# Surface Ship Systems Support

- Black Water
- Brown Water
- Cryogenic
- Diesel Cooling
- Drinking Water
- Fire Suppression
- Fresh Water
- Fuel Oil
- Fuel System
- Grey Water
- High Pressure Air
- Hull Isolation
- HVAC
- Hydraulic
- Lubricating Oil
- Sea Water

# Submarine Systems Support

- Air Intake
- Battery Cooling
- Black Water
- Brown Water
- Cryogenic
- Diesel Cooling
- Diesel Exhaust
- Drinking Water
- Fire Suppression
- Fresh Water
- Fuel Oil
- Fuel System
- Garbage Disposal Unit
- Grey Water
- High Pressure Air
- Hull Isolation
- HVAC
- Hydraulic
- Hydrogen System
- Lubricating Oil
- Nitrogen System
- Nuclear Containment
- Nuclear Steam Supply
- Oxygen System
- Sea Water
- Sewage
- Weapons Handling



# Environmental Testing

Our valves can be designed and tested in accordance with **multiple international standards** upon request.

IMI have deep experience in the design, and quantification of critical products to the following standards:

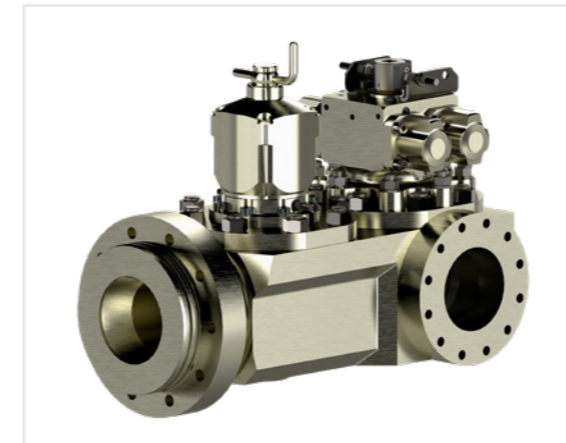
- > DEF-STAN 00-35
- > DEF-STAN 08-123
- > DEF STAN 59-411
- > DEF STAN 02-375
- > DEF STAN 08-120
- > STANAG 4141
- > MAP 01-470
- > BR 3021
- > MIL-STD-810
- > MIL-V-24509
- > MIL-S-901
- > MIL-STD-167-1A
- > MIL-STD-740-2
- > MIL-STD-1474E

Our valves can be designed and tested in accordance with multiple international standards upon request.

- > Shock testing - underwater explosion (UNDEX)
- > Shock testing - impact testing
- > Vibration testing
- > Accelerated corrosion
- > Thermal shock
- > Airborne noise
- > Fluidborne noise
- > Cyclic fatigue
- > Flow testing
- > Ingress Protection testing
- > Fire testing
- > Leach testing

Embedded within a submarine or surface ship's ecosystem, our products **protect, enable and empower** the life of service men and women worldwide.

# Core Technologies










## Double Ball Hull Valve

### Key Benefits

- > **Shock qualified for extreme service conditions** - strong mechanical properties
- > **High marine biofouling and corrosion resistance** - due to choice of materials
- > **Easy inline maintenance** - top entry access option available so no need to remove pipe flanges during repair saving time and money
- > **Redundancy safety back up** - two trunnion mounted balls for enhanced safety
- > **Manual override option** - quick acting operation in case of loss of actuator supply

### Systems Support

- 
-  Diesel Cooling
  -  Hull Isolation
  -  Hydrogen System
  -  Sea Water
  -  Sewage
  -  Weapons Handling



## Diesel Exhaust Valve

### Key Benefits

- > **Zero leakage** - prevents flooding of the engine
- > **Integrated cooling system** - decreases exhaust gas temperature
- > **Seal protection** - mechanism to avoid fouling buildup
- > **Compact and customisable design** - fitting tight space constraints
- > **Fast and silent** - actuation mechanism design

### Systems Support

- 
-  Air Intake
  -  Diesel Exhaust



























## Inline Ball Valve

### Key Benefits

- > **Easy to maintain** - top entry or end entry access to suit any application
- > **Highly shock resistant** - qualified for extreme service conditions
- > **Withstands extreme pressure** - designed to pressure vessel standard PD5500
- > **Multiple options for actuation** - manual handle/lever/torque multiplier, gearbox, hydraulic, electric or pneumatic
- > **Manual override option** - quick acting operations in case of failure

### Systems Support

	 Battery Cooling	 Black Water	 Brown Water	 Fresh Water	 Fuel Oil
	 Garbage Disposal Unit	 Grey Water	 HVAC	 Hydrogen System	 Lubricating Oil
	 Nitrogen System	 Nuclear Containment	 Sea Water	 Sewage	 Weapons Handling
	 Black Water	 Fresh Water	 Fuel Oil	 Grey Water	
	 HVAC	 Lubricating Oil	 Sea Water		











## 3-Piece Ball Valve

### Key Benefits

- > **Body design** - three-piece "swing out" and "non-swing out" design
- > **Drinking water** - available in NSF-61 versions
- > **Stem assembly** - accommodates IMI PBM Direct Mount Actuation for accurate alignment and increased cycling life
- > **Upstream / downstream bubble-tight sealing** - allows valve body cleaning, purging, and draining
- > **Live loaded stem packings** - robust live loaded stem packing ensures reliable positive seal engagement throughout operating the thermal cycle and pressure range
- > **High temperature valve version** - consists of carbide coating on the ball and seats

### Systems Support

	 Black Water	 Brown Water	 Drinking Water	 Fire Suppression
	 Fresh Water	 Grey Water	 High Pressure Air	






















## Floating Ball Valve

### Key Benefits

- > **End connection design and fabrication flexibility** - multiple standard and customisable end connections available
- > **Full and reduced port designs** - full thru bore and reduced bores available
- > **Quarter turn operation** - 90° from fully open to fully closed
- > **Compact and customisable design** - fitting tight space constraints
- > **Easy to operate** - low torque

### Systems Support

	 Battery Cooling	 Cryogenic	 Fresh Water	 Fuel Oil	 Fuel System
	 High Pressure Air	 HVAC	 Hydraulic	 Lubricating Oil	 Oxygen System
	 Cryogenic	 Fresh Water	 Fuel Oil	 Fuel System	
	 High Pressure Air	 HVAC	 Hydraulic	 Lubricating Oil	



## ANSI Ball Valve

### Key Benefits

- > **End connection design and fabrication flexibility** - multiple standard and customisable end connections available
- > **Full and reduced port designs** - full thru bore and reduced bores available
- > **Quarter turn operation** - 90° from fully open to fully closed
- > **Bleed or gauge ports available** - many options for measuring and cleaning
- > **Bolted body** - allows for complete internal rebuild without having to replace entire valve
- > **High temperature valve version** - consists of carbide coating on the ball and seats

### Systems Support

	 Black Water	 Brown Water	 Cryogenic	 Drinking Water	 Fire Suppression
	 Fresh Water	 Fuel System	 Grey Water	 High Pressure Air	




## Globe Valve

### Key Benefits

- > **Robust** - metal to metal seated shut off valve, proven in service life of 40 years
- > **Actuator options** - remote and manually actuated options available
- > **Versatile** - designed to work in a range of harsh environments with a range of liquids/gases
- > **Configurable** - a range of connections and seat options ensure easy integration into the system
- > **High temperature service** - elastomer free enable high service temperatures
- > **Inline maintenance** - all service parts are top loaded

### Systems Support

	 Air Intake	 Black Water	 Cryogenic	 Fresh Water	 Fuel Oil
	 Grey Water	 High Pressure Air	 Hydraulic	 Lubricating Oil	 Nuclear Containment
	 Nuclear Steam Supply	 Sea Water	 Weapons Handling		

	 Black Water	 Fresh Water	 Fuel Oil	 Grey Water	
	 High Pressure Air	 Hydraulic	 Lubricating Oil	 Sea Water	





## Solenoid Valve

### Key Benefits

- > **Robust** - proven in service highly reliable electrically actuated shut off valve
- > **Fast acting** - fast acting shut off with zero leakage, override optional
- > **Configurable** - a range of connections and seat options ensure easy integration into the system
- > **Versatile** - designed to work in a range of harsh environments with a range of liquids/gases
- > **Shock proof** - qualified for extreme service

### Systems Support

	 Fire Suppression	 High Pressure Air	 Hull Isolation	 Hydraulic
	 Oxygen System	 Weapons Handling		

	 Fire Suppression	 High Pressure Air	 HVAC	 Hydraulic
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## Gate Valve










### Key Benefits

- > **Robust** - metal to metal seated shut off valve, proven in service life of 40 years
- > **High flow rate** - optimised for high flow applications
- > **Versatile** - designed to work in a range of harsh environments with a range of liquids/gases
- > **Configurable** - a range of connections and seat options ensure easy integration into the system
- > **High temperature service** - elastomer free enable high service temperatures
- > **Inline maintenance** - all service parts are top loaded

### Systems Support

	 Air Intake	 Black Water	 Cryogenic	 Fresh Water
	 Fuel Oil	 Grey Water	 High Pressure Air	 Hydraulic
	 Lubricating Oil	 Sea Water	 Weapons Handling	

	 Black Water	 Fresh Water	 Fuel Oil	 Grey Water
	 High Pressure Air	 Hydraulic	 Lubricating Oil	 Sea Water



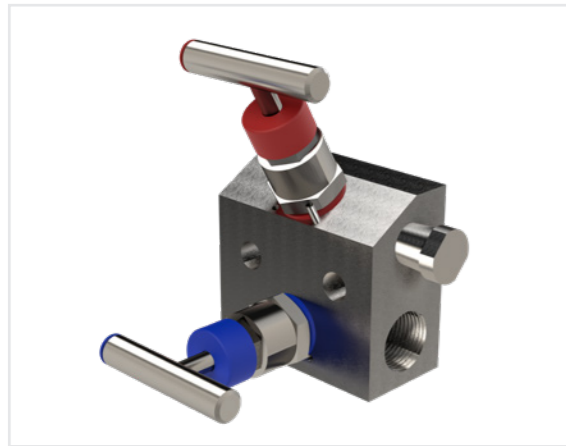
## Garbage Disposal Unit

### Key Benefits

- > **Submarine stays submerged longer** - storage chamber with a hatch to allow for garbage to be safely stored during longer patrols
- > **Highly shock resistant** - shock resistant hull valve qualified for extreme service conditions
- > **Watertight up to full drive pressure** - interlock safety feature to ensure watertight boundary is maintained at all times
- > **Various control mechanisms** - operated via handwheel and can be actuated if required

### Systems Support

	 Garbage Disposal Unit
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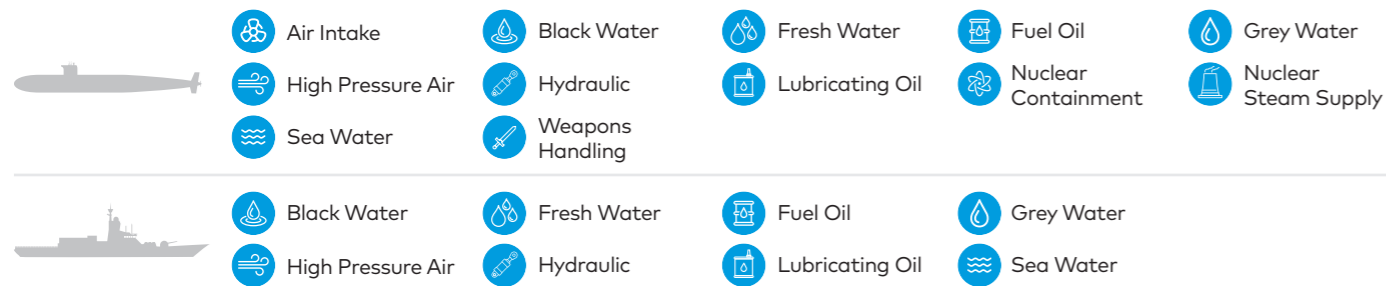


## Block and Bleed Valve

### Key Benefits

- > **Compact solution** - isolate and vent valve built into one body
- > **Versatile** - designed to work in a range of harsh environments with a range of liquids/gases
- > **Configurable** - a range of connections and coloured valve identifiers available
- > **Inline maintenance** - all service parts are top loaded
- > **High temperature service** - elastomer free options enable high service temperatures

### Systems Support

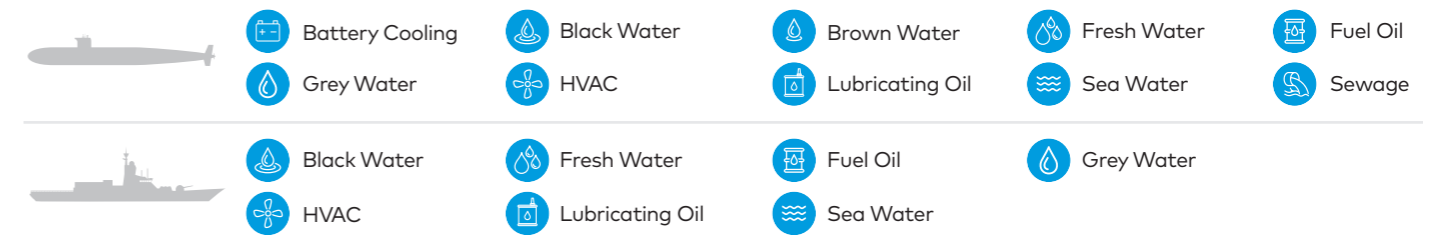


## Multiport Valve

### Key Benefits

- > **Space saving** - 3 or 4 port design; helps to reduce the number of valves required in a system, allows for a change in direction of flow
- > **Enhanced control / flow control systems** - it allows for the flow to be controlled and diverted to different areas
- > **Versatile design** - for a wide range of operating pressures, temperatures, mediums and connections
- > **Various control mechanisms** - operated manually via handwheel / lever, or can be actuated if greater levels of control are required

### Systems Support

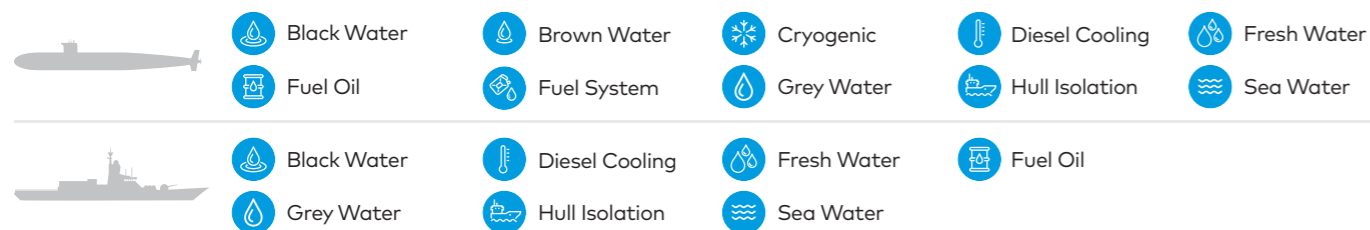


## Butterfly Valve

### Key Benefits

- > **Fast acting shut off** - protecting turbine from overspeed and to allow emergency shut down
- > **Reduced torque** - eccentric disc (with double and triple offset options)
- > **Shock qualified** - for extreme service conditions - it will not split increasing survivability under intense shock conditions
- > **SIL3 certified** - highest reliability over time
- > **Zero leakage** - bidirectional tight shut off
- > **Space saving** - small and light weight design

### Systems Support



## Weapons Handling Valve

### Key Benefits

- > **Fail safe spring return actuator** - mechanical spring pack ensures rapid isolation of the torpedo tube if hydraulic supply is lost
- > **Highly shock resistant** - qualified for extreme service conditions
- > **Full bore top entry design** - ease of maintenance without removing downstream pipework
- > **Space saving** - can be directly mounted onto the torpedo tube
- > **Near silent running** - anti-cavitation features

### Systems Support



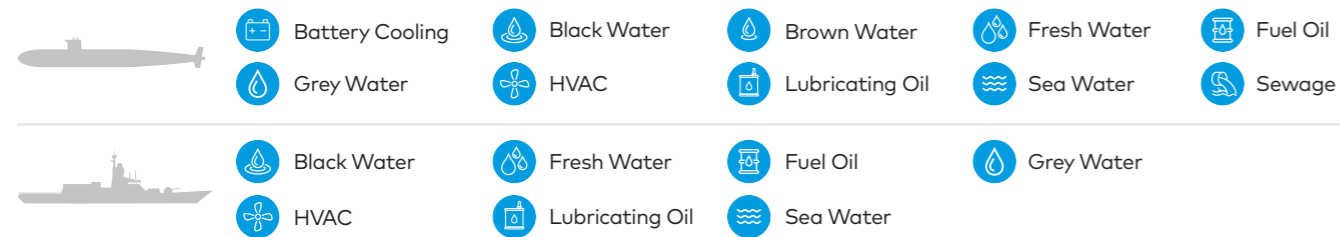


## Non Return Valve

### Key Benefits

- > **Prevents reverse flow** - reliable non-return sealing, ensuring the flow is one way only, preventing backflow
- > **Robust** - optional spring load hinge design returns valve to closed position
- > **Easy inline maintenance** - top entry access option available, removing the need to remove pipes during repair saving time and money
- > **Long product life** - protects pipes, pumps and other equipment from damage which is caused by the backflow of mediums

### Systems Support

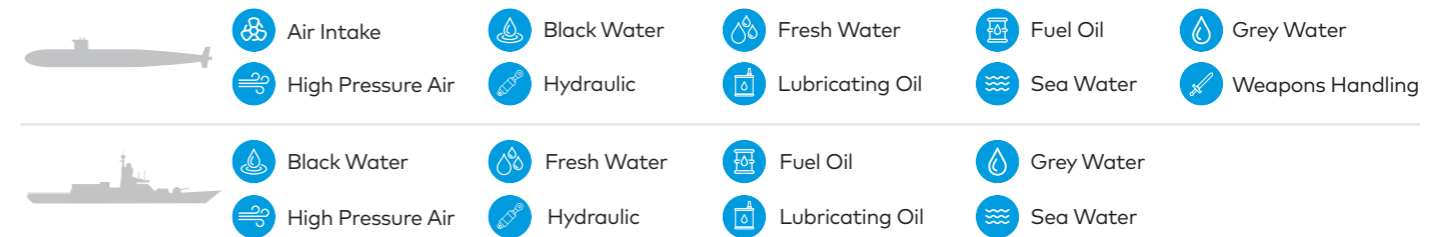


## Pressure Relief Valve

### Key Benefits

- > **Over pressure protection** - automatically vents excess pressure from a system
- > **Accurate performance** - repeatable crack and reseal pressures
- > **Adjustable** - the relief pressure can be adjusted in service
- > **Safe** - vent connection ensures all vented media can be safely piped away
- > **Versatile** - designed to work in a range of harsh environments with a range of liquids/gases
- > **Configurable** - a range of connections and seat options ensure easy integration into the system

### Systems Support

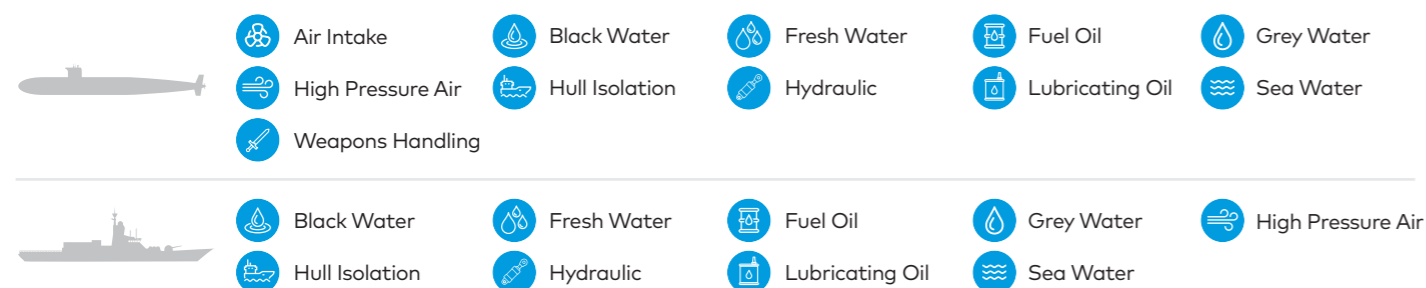


## Screwdown Non Return Valve

### Key Benefits

- > **Compact solution** - combines the function of a non return valve and a screwdown shut off valve. Prevents reverse flow automatically and can be manually overridden to shut off flow
- > **Shock proof** - qualified for extreme service
- > **Versatile** - designed to work in a range of harsh environments with a range of liquids/gases
- > **Configurable** - a range of connections and seat options ensure easy integration into the system
- > **Inline maintenance** - all service parts are top loaded

### Systems Support

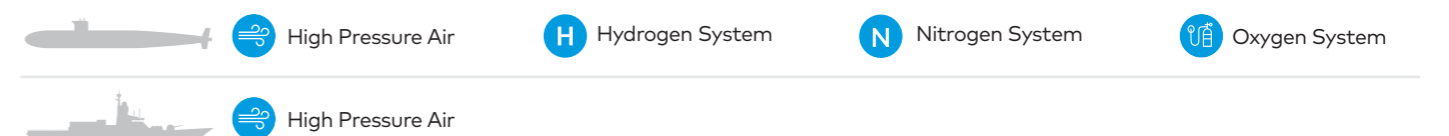


## Pressure Regulators / Manifold Valve

### Key Benefits

- > **Releases pressure safely** - air station is vented or shut off if pressure is too high, or can regulate and distribute a high pressure input to several low pressure outputs
- > **Versatile system** - varying output pressures from one input
- > **Long product life** - soft starts and safety diaphragm / slam shut mechanisms prevent damage to the air station and downstream equipment
- > **Consistent pressure** - once set, the pressure regulating domes automatically regulate output pressure
- > **Compact solution** - reduced number of valves - one valve does the job of many

### Systems Support



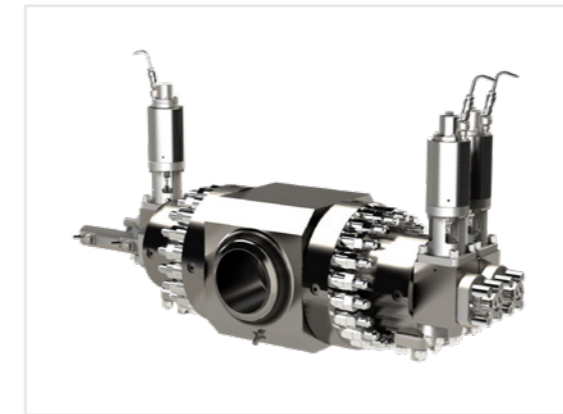
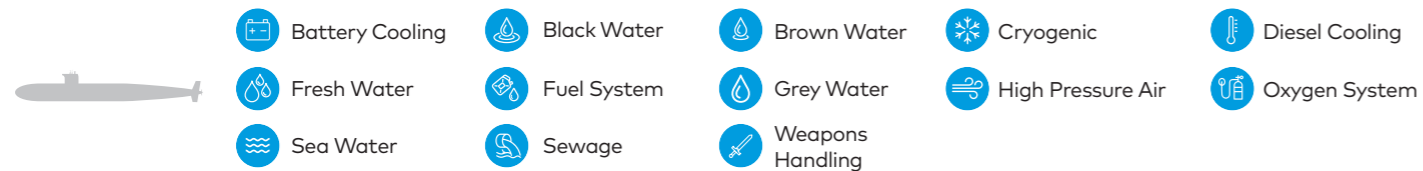


## Spring Loaded Safety Valve

### Key Benefits

- > **CE approval** - certified to TÜV, GL and ASME standards
- > **Safety back up** - spring reacts to close quickly in case of emergency
- > **Compact, top entry design** - uses less space and allows easy access for inline maintenance
- > **Wide range of configurations** - set pressure range from 0,2 to 300 bar, temperature range from -270 to 550°C, size range from DN 10 to DN 400
- > **Robust design** - proven naval marine design demonstrating both reliability and safety

### Systems Support



## Pilot Operated Safety Valve

### Key Benefits

- > **Trusted and reliable function** - tested in many nuclear reactors
- > **Compact, top entry design** - uses less space and allows easy access for inline maintenance
- > **High integrity pilot system** - fail safe, space saving option that eliminates need for external pipework
- > **Modular design for critical safety applications** - allows customisation of multiple safety redundancy configurations
- > **Robust design** - proven naval marine design demonstrating both reliability and safety

### Systems Support



## Oxygen Safety Controlled Relief Valve

### Key Benefits

- > **Pressure controlled** - self-regulating pressure to diving depths of submarine
- > **Special solutions for oxygen** - completely made of special steel for cryogenic fluids
- > **Actuator options** - remote control flexibility; works with spring and/or remote control system
- > **Low noise** - linear or proportional operation, gradual opening to reduce noise
- > **Compact, top entry design** - uses less space and allows easy access for inline maintenance

### Systems Support



## Safety Shut Off Valve

### Key Benefits

- > **Automatic function** - no external actuation required
- > **Zero leakage** - soft seal, watertight in every position
- > **Compact, top entry design** - uses less space and allows easy access for inline maintenance
- > **Robust design** - proven naval marine design demonstrating both reliability and safety
- > **Safe handling of systems** - low pressure side can be fully relieved in closed position

### Systems Support





## Cryogenic Valve

### Key Benefits

- > **Keyed stem ball interface** - ensures proper orientation of the ball within the valve assembly with respect to flow direction and venting
- > **Energised seat back gaskets** - enhances sealing throughout temperature fluctuations
- > **Thermal expansion** - independent bolting for each valve end connection ensures consistent sealing throughout thermal cycles
- > **Stem assembly** - accommodates IMI PBM Direct Mount Actuation for accurate alignment and increased cycling life
- > **Live loaded stem packings** - robust live loaded stem packing ensures reliable positive seal engagement throughout operating the thermal cycle and pressure range

### Systems Support

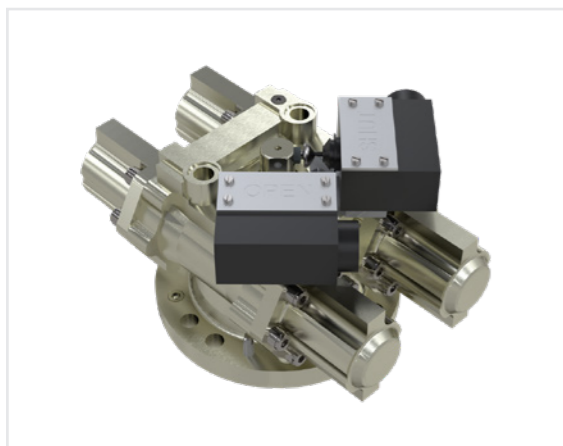
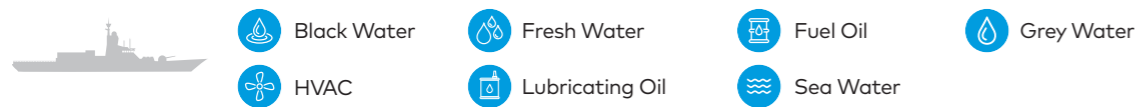


## OV Valve

### Key Benefits

- > **Manually actuated** - either by handle, lever or handwheel
- > **Leak proof** - utilises a floating ball between two seats, allowing sealing in both directions
- > **No circumferential leakage path** - OV seats work through pre compression and are not influenced by pressure
- > **Low and medium shock** - ideal for use in low and medium shock
- > **Versatile / cartridge system** - can be installed anywhere on any system
- > **Shock resistant** - uses shock resistant materials

### Systems Support



## Hydraulic Actuator (supports all systems)

### Key Benefits

- > **Robust design** - proven naval marine design demonstrating both reliability and safety
- > **Seismic tested** - withstands extreme vibration and shock
- > **Corrosion resistance** - due to choice of materials
- > **Fast operation** - high power to weight ratio
- > **Configurable** - a range of connections and switch options ensure easy integration into the system



Breakthrough Engineering for a better world.



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