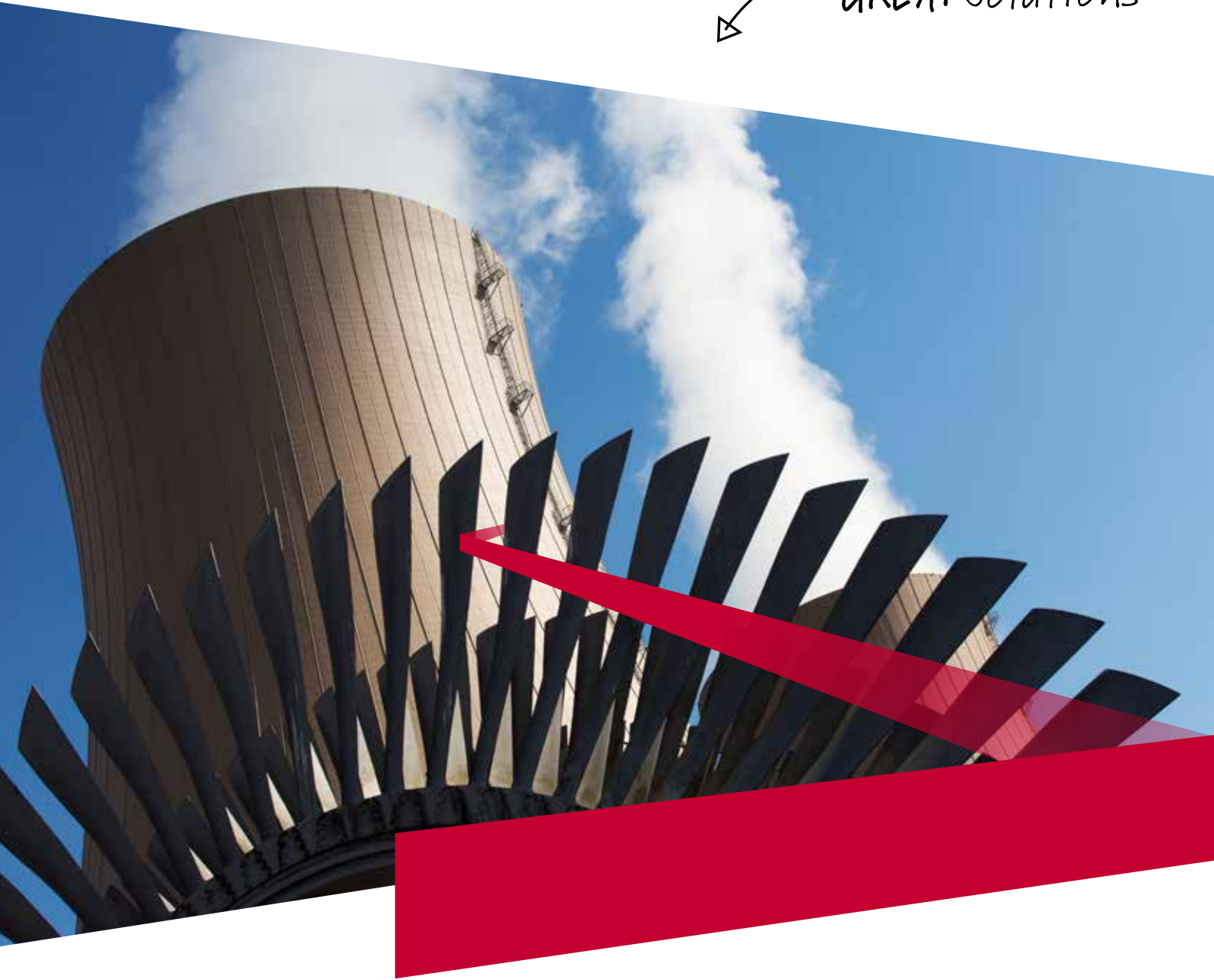




Precision Engineering

Engineering
GREAT Solutions



**Solutions for
Power Generation**
in the most
demanding
applications

 IMI NORGREN®


 IMI BUSCHJOST®

 IMI HERION®

 IMI MAXSEAL®

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Engineering GREAT solutions through people, products, innovation and service

IMI Precision Engineering is a world-leader in fluid and motion control. Building close, collaborative relationships with our customers, we gain a deep understanding of their engineering needs and then mobilise our resources and expertise to deliver distinctive products and solutions.

Wherever precision, speed and engineering reliability are essential, our global footprint, problem-solving capability and portfolio of high performance products enables us to deliver GREAT solutions which help customers tackle the world's most demanding engineering challenges.

> **Reliability**

We deliver and support our high quality products through our global service network.

> **High performance products**

Calling on a world-class portfolio of fluid and motion control products including IMI Norgren, IMI Buschjost, IMI FAS, IMI Herion and IMI Maxseal. We can supply these singly, or combined in powerful customised solutions to improve performance and productivity.

> **Partnership & Problem Solving**

We get closer to our customers to understand their exact challenges.





Production



Transportation



Refining



Petrochemical



Chemical



Power Generation

Setting the standard for safety, reliability and performance

IMI Precision Engineering has over 80 years experience in providing oil, gas and chemical solutions that are proven in safety, reliability and durability, in the most extreme environmental and operating conditions around the globe.

With world-class product ranges including IMI Norgren, IMI Buschjost, IMI Herion and IMI Maxseal, our products are designed to work effectively in aggressive environments and extreme temperatures and meet international standards such as:

- > ATEX
- > TÜV
- > TR-CU
- > INMETRO
- > CSA
- > KOSHA
- > DVGW
- > FM AND UL
- > NEMA



At the heart of our offering to the Energy sector are stainless-steel solenoid valves and air preparation equipment (filters, regulators and filter-regulators), pneumatic and hydraulic pressure switches, I/P and E/P converters, 2/2 way and 3/2 way process valves and Redundant Valve Manifold (RVM) systems.

Our work with leading national and international oil and gas companies and global suppliers means that we talk our customers' language, and can bring specialised experience about legislation, standards and specifications.

Our Reach

Global manufacturing and support

- > We have a global network of technical centres close to our key markets where skilled and experienced design and development engineers produce custom-built solutions to give our customers competitive advantage.
- > With established manufacturing facilities globally we have the manufacturing and support capabilities to be able to cope with the most demanding international projects.
- > With an established sales and service network in 75 countries, we have the reach and capability to ensure continuity of supply and local support where it is needed.

sales and manufacturing facilities in 75 countries give us the global reach, understanding and capabilities that customers look for



Sales & Service in 75 countries

- 📍 Sales, manufacturing and technical centres
- 📍 Sales locations
- 📍 Manufacturing locations

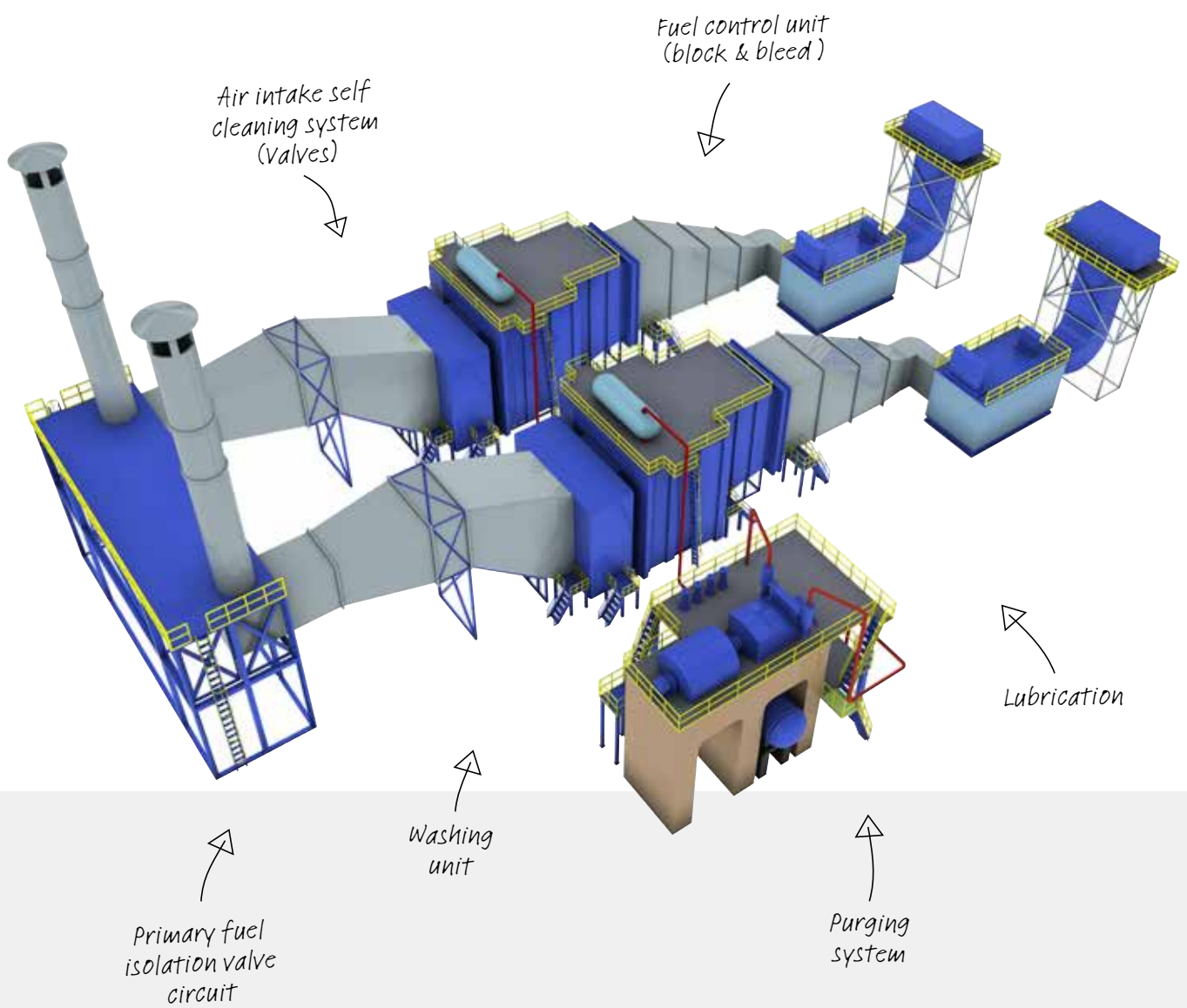


Industrial turbines & reciprocating engines

The gas and steam turbine market whether it is onshore or offshore is increasingly dynamic. Turbine manufacturers and end users have to balance safety with reliability as well as legislation with performance. Many factors can unsettle this harmonized equilibrium including the reliability and performance of key components on the turbines or auxiliary control systems.

IMI Precision Engineering has been helping our customers to reduce the life cost of critical gas and steam turbine systems whilst improving plant reliability for over 70 years. We work closely with everyone from manufacturers to end users which enable us to provide market leading products that are specific to our customer's individual requirements.

- > Deliver market leading fluid control products
- > Global network of energy team. Local support wherever your project or installation is.
- > Market leading performance for safety and reliability
- > Valves specifically designed for reliability and longevity in harsh conditions
- > Reduced overall maintenance costs



Key power generation applications and solutions



Robust design



High performance solenoid valves

Our IMI Maxseal range of solenoid valves were originally designed for the oil and gas industry and are typically specified for service in the most demanding environments on the planet. Given the robust nature of the design it thrived in such applications and is now the market leader in safety and reliability with SIL approval and globally certified. IMI Maxseal is the perfect choice for industrial applications both on and offshore where safety and reliability is critical. IMI Maxseal solenoid valves have over 50 years history in the turbine market whether it being the primary fuel isolation and vent valves for both liquid and gas fuel on gas/dual fuel turbines, trip valves on steam turbines, controlling the purging and washing systems or other supporting auxiliary control.

High flow characteristics



Solenoid valves – process control

Our unique internally piloted valves utilise the flow of the main valve stage to pilot the solenoid valve, thus having all the size and weight benefits of a piloted valve without the need for separate pneumatic pilot supply or vent lines.

The valve uses a full size orifice pilot which prevents the potential to block the pilot stage – a dangerous failure mode on most internally piloted valves. It is also fully back pressure tight and has a proof of closure switch located on the main valve stage.

With high pressure - high flow characteristics, sizes up to 4", a typical closing time of <100ms and the ability to withstand temperatures from arctic to above fuel preheat temperatures with one device, these valves are perfect for applications like fuel isolation on both aeroderivative and frame type turbines.

Simple installation



Direct acting SOVs

As with the internally piloted valve range, the SOV's direct acting design means there is no requirement for supplying or venting external pilot lines. The valves are simply installed in the process line and connected to the control system for both ease of installation and a reduced installation cost.

Unlike the internally piloted valves, these valves do not require any force assist from the media, therefore can operate under no flow, zero pressure conditions giving you the equivalent of an actuated ball valve package without any air/vent lines and as an incumbent unit from one manufacturer

The durability of these valves means that they can be used on a wide variety of media including sweet & sour gas, liquid fuels, lubricants and oil. They are used in many direct process line applications as well as pilot valves on larger gas and steam turbine applications.

- > SIL 3 rated
- > Up to 4" connections
- > 316SS as standard - Wide variety of material options available
- > Operating options available (i.e. internal/external switches, position indicators, tamperproof overrides etc.)
- > High temperature media options
- > Certified to ATEX Exd IIC T6-T4
- > High spring force = High safety factors (10x) – market leading
- > High flow, high pressure options
- > Fast acting
- > Reduced power coil option

We understand that one project requirement can be different from the next, so we have the option to manifold all of our valves. If you are looking for a redundant voting system, or require single or double block and bleed (isolation and vent) functionality, we have the system integration expertise to offer a complete control package to your requirements. Through our packaging experience, we can also make a unit to fit a required space/size with the ability to access the valves reducing time during maintenance periods.

SIL 3 rating



Manifold options



Instrument changeover solenoid valves

Our IMI Herion, IMI Buschjost and IMI Maxseal range of solenoid valves have been used in the industry for many years. These solenoid valves are used anywhere from purging systems to the main pilot valves for fuel systems on turbines, or automatic lubrication control on reciprocating engines. We have worked with Power Generation companies the world over to increase our customers reliability and safety.

Our high integrity valves have:

- > A Field proven track record
- > 10 year service interval (6 years to maintain SIL 3)
- > Wide range of flow and function options
- > Stainless Steel, Aluminium or Brass construction options
- > Industry leading Force Friction Ratio (FFR)
- > Cable terminations inside coil -
No additional Ex terminations required
- > Rated for 100% duty
- > Wide media and ambient temperature ranges
(leave figures out)
- > International approvals
- > SIL approved

Force friction ratio

The critical safety element of a solenoid valve is its Force Friction Ratio (FFR). The FFR is a measure of the relationship between the force presented by the spring return mechanism and the frictional resistance within the valve. In basic terms, the higher the FFR, the more likely the valve is to operate when demanded, as the spring will have a force in excess of the friction.

Poppet design solenoid valves generate much lower friction than spool design solenoid valves, and this advantage is greatly enhanced at extreme temperatures – both hot and cold.

IMI Maxseal and IMI Herion solenoid valves offer an FFR of 10 - the highest in the industry.

1C04
solenoid



stainless
steel

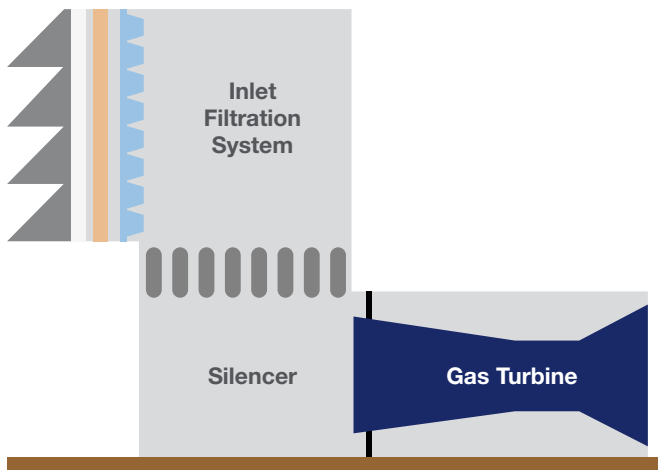
Air intake system: self cleaning filters

Our self cleaning filtration range was developed for regions where gas turbines are subjected to frequent dust, sand, chemical or environments which can reduce the efficiency, performance and reduce the time between maintenance intervals of the turbine or filters.

IMI Precision Engineering have developed a unique pulse valve which are supplied into self-cleaning systems. We can supply either individual valves or tank systems with the valves pre integrated, along with controllers and differential pressure

controllers. We also offer self cleaning pneumatic accessories and filters/regulators to support the system.

- > Integrated pulse valves in the tank
- > Controllers
- > Differential pressure controls
- > Pneumatic accessories - Filters and Regulators



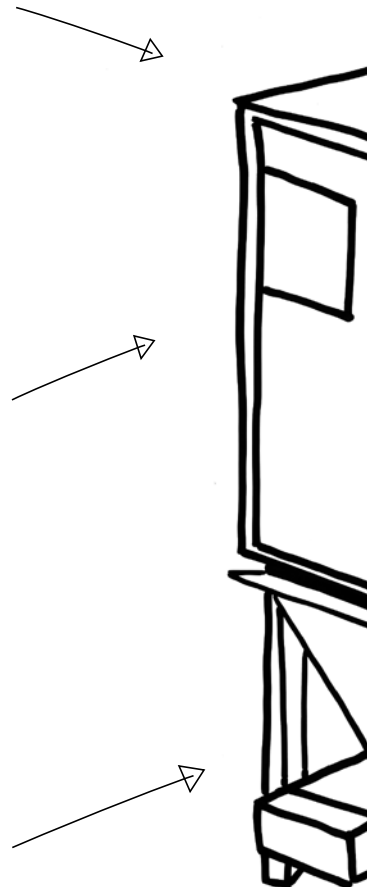
Filter cleaning system



Solenoid pilot operated



Pneumatic controller

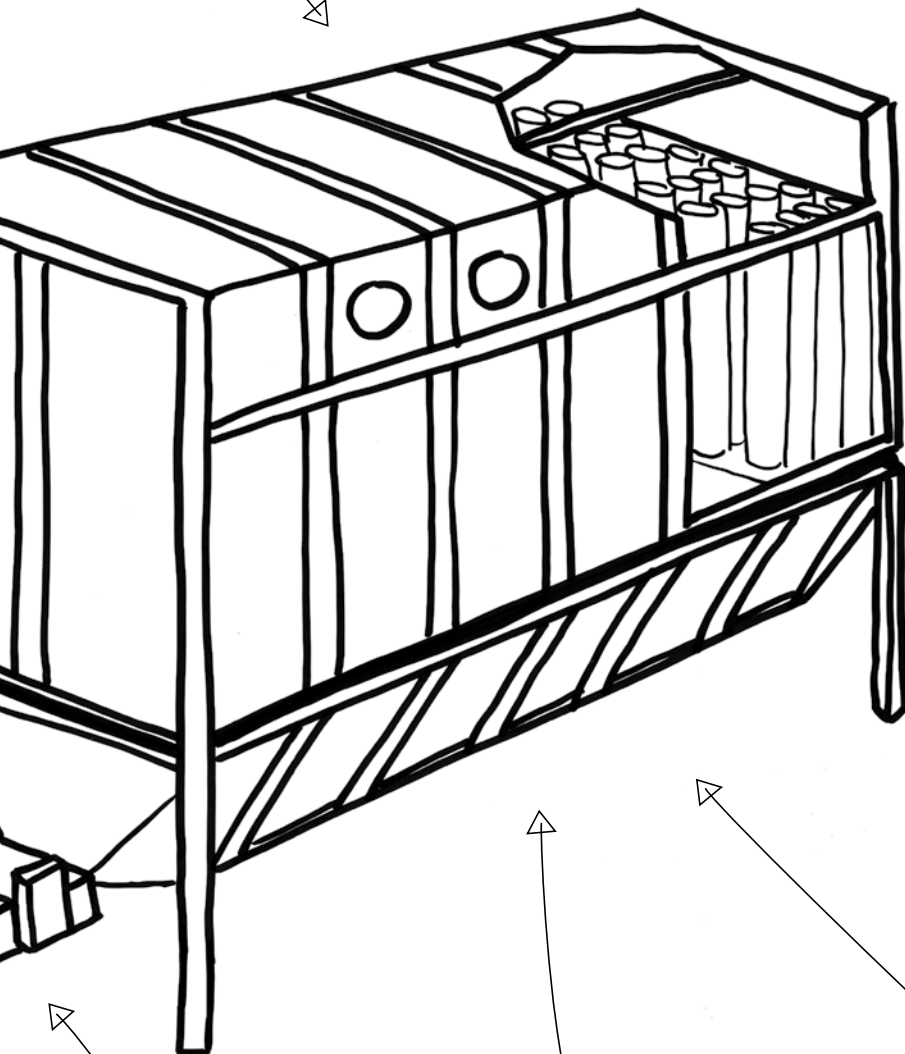




Controllers



Remote pilot operated



Differential pressure
Measuring transducer



Solenoid pilot operated



Filter cleaning system



Remote pilot operated



Differential
pressure controller



Valve for tank mounting

Pulse valve technology

One – Piece diaphragm

TPE material provides:

- > Longer life time 2,5 times more than rubber version
- > Higher stroke = higher flow
- > Integrated spring function
- > Integrated silencer reduces noise about 20% than external
- > Solenoid Valves and pilot valves in boxes are “dry core” valves – this eliminates the risk of the main pilot valve freezing in sub zero applications which is a common issue with “wet core” valves

*Longer
life time*



*One-piece
diaphragm*





Cooling circuit valves

Our Ex range of IMI Buschjost solenoid valves are used as control valves in cooling circuits on turbines and generators of various sizes and power output ranges. They are available to be used with air, water, hydrogen or seal oil type applications covering a wide range of media and ambient temperatures. These valves are designed to be back pressure tight to typical reverse flow conditions seen in cooling systems. These valves have many options available as standard including position indicators, switches and manual overrides depending on individual customer requirements.



Ex range
solenoid
valves

2/2 washing cycle valves

Valve for robust industry solutions - Ideal as isolation valves for washing cycle duty.

- > Ex rated coil
- > High flow rate
- > Suitable under vacuum conditions
- > Valve operates without pressure differential
- > From 1/2" – 2" flanged and threaded ports



High
flow rate

Redundant Valve Manifold (RVM) systems

Redundant systems are required to increase uptime by ensuring the process continues to run in the event of a valve failure; or to increase safety by ensuring the process can be shut down in the event of a failure - or both.

The issues with existing solutions

- > Current systems are hard piped systems, components bolted together on a back plate, or tie-rodged together
- > The complete systems are not SIL certified
- > Difficult to service and maintain
- > Incorrect configuration can be dangerous
- > Number of potential leaks
- > No failure indication for valves and outputs

The RVM system solves these problems. Combining safety and availability in a single convenient package. Our RVM system offers simpler installation, helps eliminate unplanned shutdowns and is available in either aluminium or stainless steel to suit both upstream and downstream applications.

- > System replaces components, panels and pipe work
- > Available in aluminium or stainless steel construction
- > Utilising industry proven products and technology

Modular design with bypass



Semi-modular



> **Three design options - Compact, semi-modular and modular**

Reduces potential leak paths and installation time. Mounted at the point of use next to the process valve.

> **Compact design**

Space saving with the smallest overall footprint

> **Semi-modular design**

Visual pressure indicators showing valve position status

> **Modular design**

Added benefit of a bypass function enabling valve removal online, plus visual pressure indicators showing valve position status

> **Valve position sensors**

Provide electrical feedback on the valve position status

> **Exhaust guards**

Prevent moisture and particle ingress from the environment

> **Cable terminations inside coil**

No additional Ex terminations required

> **SIL certified components enable complete SIL certified RVM systems**

Ensures safe operation

> **International approvals**

> **Diversity option**

Unique combination of valve technology from IMI Herion and IMI Maxseal on the same manifold



Diversity


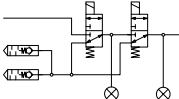
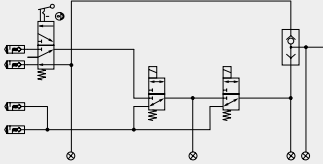
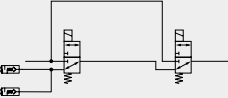
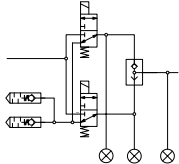
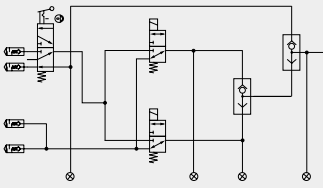
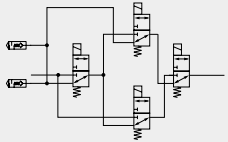
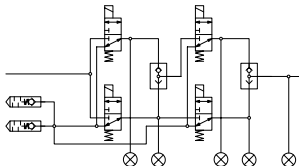
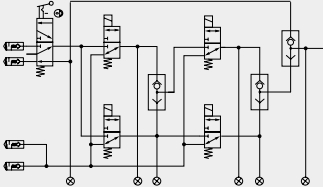


Compact design

Redundant Valve Manifold (RVM) functionality options

The RVM System is available in three functionality options, the selection of which will be dependent on the Safety Instrumented Function (SIF) that it is to be used within.

1oo2, 2oo2 double channel and uniquely 2oo3 triple channel systems are available.

<div>> Compact 1oo2</div> 	<div>> Semi modular 1oo2</div> 	<div>> Modular 1oo2 (with bypass)</div> 	<div>> 1oo2 “Safety” Double channel redundant system</div> <p>Redundancy for the process valve closure.</p> <p>Any one out of two solenoid valves needs to de-energise to ensure safety.</p>
<div>> Compact 2oo2</div> 	<div>> Semi modular 2oo2</div> 	<div>> Modular 2oo2 (with bypass)</div> 	<div>> 2oo2 “Availability” Double channel redundant system</div> <p>Redundancy for the process valve to remain open.</p> <p>Any one out of two solenoid valves needs to remain energised to ensure availability.</p>
<div>> Compact 2oo3</div> 	<div>> Semi modular 2oo3</div> 	<div>> Modular 2oo3 (with bypass)</div> 	<div>> 2oo3 “Safety and Availability” Triple channel redundant system</div> <p>Any two channels out of three need to operate to provide safety (process valve closure) and availability (process valve remain open).</p> <p>The RVM system combines the strength of “1oo2” and “2oo2” thus increasing both safety and availability functions.</p>

Hydraulic RVM systems

Hydraulic 2oo3 fail safe trip system for gas and steam turbines

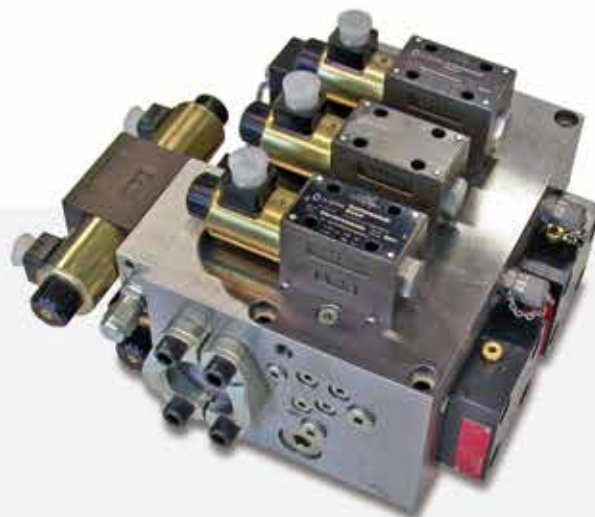
The IMI Herion Hydraulic 2oo3 system provides safety and availability for main shut off emergency process valves with hydraulic actuators.

Using three identical solenoid valves to create a flexible 2oo3 voting logic for unequalled failure tolerance, the system uses redundant cartridges which allow high flow rate and a quick response time.



- > Available for low and high operational pressure 5 – 320 bar
- > Different sizes provide high flow availability 200 – 4000 l/min
- > Cartridges sizes DN 16; 25; 32; 40; 50 AND 63
- > Fast reaction time
- > Safety Control – direct monitoring of solenoid valves position closed open (proximity switches)
- > SIL 3 approval
- > IP 65
- > Certification to ATEX, GOST
- > Redundant cartridges
- > Partial Stroke Testing Option
- > Maintaining Safety 2oo3 during operation (redundant 2oo3 system)
- > Prepared outlets for pressure transducers

Hydraulic
2oo3 system



Natural gas solutions

Our market-leading product ranges offer an extensive range of high quality components and complete system solutions to meet the specific requirements of the Compressed Natural Gas industry.

- > Helping to increase energy efficiency
- > Improving the environment by simplifying the delivery of CNG into vehicles and eliminating wastage
- > Improving safety
- > Solutions for CNG compressors and dispensers

Manifold solutions

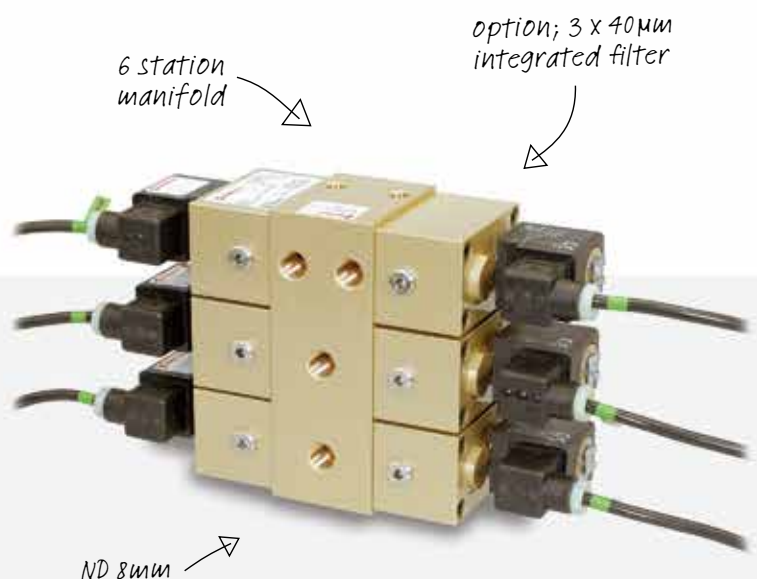
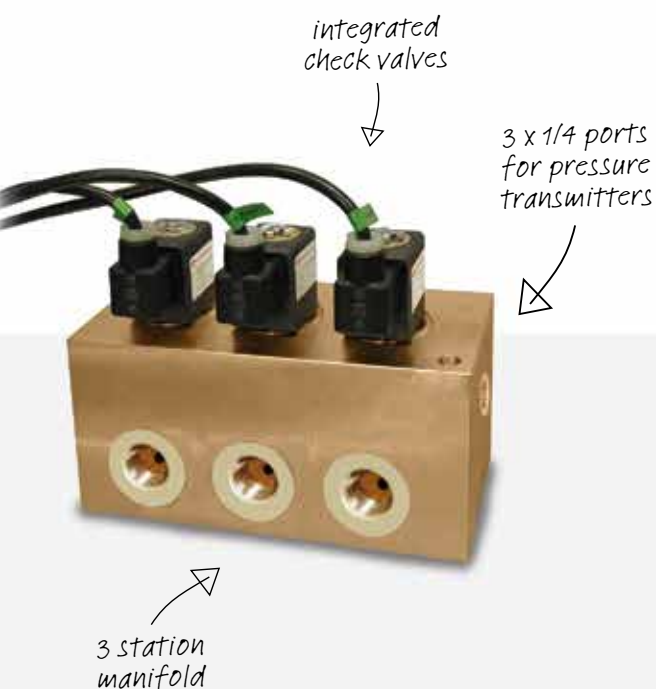
With 75 years' experience manufacturing sophisticated solenoid valves, we are confident in the reliability and performance of our products, and we are now providing value added solutions by incorporating our proven valve technology into customized valve manifolds to replace ball valves, rotatory actuators and pilot solenoids in priority panels and dispensers.

Three station manifolds

Solenoid valve manifold with integrated check valves which can be used in priority panels and even in a bus or truck dispenser.

Six station manifolds

Solenoid valve manifold with integrated check valves which can be used in a two sided small vehicle dispenser.





High pressure valves

With pressures up to 350 bar, we understand the need for valves to be safe, have very high levels of pressure integrity and to be reliable.

- > Body Material: Aluminium, Brass or Stainless Steel
- > PED: Compliant
- > Mounting position: Horizontal or Vertical
- > Interchangeable solenoids without the need for depressurisation
- > Temperature range from -40°C to +70°C
- > ATEX, IP65 and 97/23/EG approved



Pressure control solutions

Proven solutions for high pressure gas control on the outlet from the compressor and in downstream pressure reduction applications, such as in the dispenser.

- > Pressure range: up to 450 bar
- > Body materials: Aluminium bronze
- > Brass or Stainless Steel



Gas & air preparation solutions

IMI Precision Engineering Instrument Gas & Air preparation solutions protect sensitive and expensive instrumentation and controls from water, oil or particle contamination.

Proper Gas & Air preparation can reduce or eliminate the number of unplanned shutdowns due to:

- > Corrosion from condensates
- > Clogging from particulates
- > Seal softening and leakage due to attack from aggressive oils



Filtration systems

3-Stage filtration systems

- > Stage 1 – 25µ particles, 70% water
- > Stage 2 – 5µ particles, 90% water
- > Stage 3 – 0.01ppm oil, submicron particles, trace moisture



Filter regulators

IMI Norgren and IMI Maxseal 316 stainless steel filter regulators are specially suited for offshore applications

- > 316 Stainless Steel for corrosive environments
- > Suitable for instrument air or hydrocarbon gas



High pressure regulation

Proven solutions for high pressure liquid & gas regulation.

Spring loaded regulators

- > Heavy duty quick adjustment regulators from 1/4 to 1 porting
- > Liquid & Gas operating temperatures: -40°C to +150°C (-40°F to +300°F)
- > J44 – 1/2 port, steam applications to 300°C (570°F)
- > Piston, diaphragm, differential, back pressure, balanced and unbalanced configurations
- > J50 – 3/8 port, 750 bar (10,875 psi) inlet, outlet control to 550 bar (7975 psi)
- > J55 – 1/2 port 420 bar inlet (6090 psi) inlet, outlet control to 103 bar (1490 psi)

Dome loaded regulators

- > Pilot operated, balanced valve regulators in 3/8 to 2 porting
- > Liquid & Gas operating temperatures: -40°C to +150°C (-40°F to +300°F)
- > Up to 420 bar (6000 psi) inlet pressure and 300 bar outlet (4350 psi)
- > Series K16, K50





80400



316L Stainless Steel
construction

-60 to +80°C

SIL approved

Additional products

Our portfolio includes standard products and custom solutions suitable for the global energy industry.

Air piloted valves (APV'S)

APV's are required:

- > For applications with large, heavy duty actuators
- > To open or close the Armature/Valve (Globe/Gate/Butterfly...)
- > To fill or exhaust the Actuator when required e.g. Emergency Shut Down

Proportional expertise

Our pressure and flow control proportional valves incorporate advanced spool and balanced-poppet technologies. Unlike competitor products which rely upon miniature snap-action seats, our valves provide true stepless pressure or flow control. The result is smooth response, low noise, and a long trouble free cycle life. On-board digital electronics assure maximum flexibility and ease of tuning for specific application conditions. Self diagnostics, optional digital displays, and a variety of Fieldbus interfaces are all benefits of the microprocessor-based design.

140 FAILSAFE

100X



Type 422 - Fail freeze ATEX IS valve

The Type 422 IS is the only ATEX certified fail freeze proportional valve on the market today.

Fail Freeze operation means that if the signal to the valve fails suddenly, the unit will maintain its last output pressure, ensuring that critical systems do not shutoff or close on plant in the event of a power failure.

IS certification provides system designers, and users, the flexibility to safely use potentially flammable compressed process gases to pilot their applications, providing the opportunity to remove the need, and cost, of installing a pneumatic system.

One area of the Energy Sector that makes full use of these combined unique attributes is Gas Distribution. In reduction stations the natural gas is piped out of the line and into the Type 422 IS which then regulates it precisely positioning the actuator and the pipeline valve, the fail freeze capability ensures the gas stays on, even if power is lost locally.

- > Operating Temp: -10°C to +70°C
- > Linearity: <0.5% of span
- > Pressure range: 0.2 – 1.0 Bar
- > Response: <6 seconds
- > Power Consumption: <0.25W
- > Ingress protection: IP65



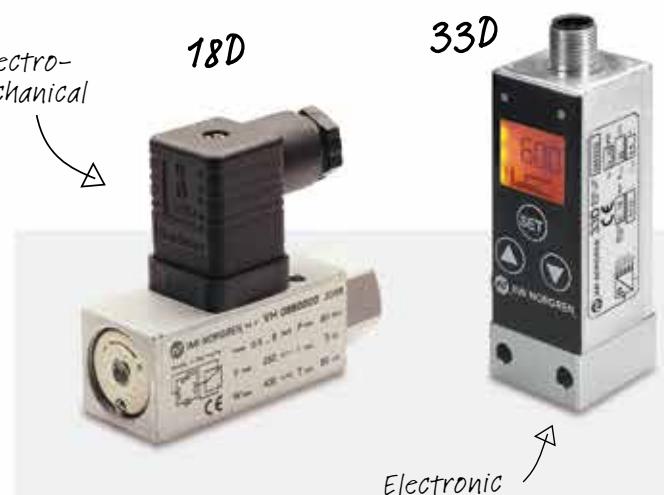
Pressure switches

Pressure sensor technology is critical when pressure monitoring for higher plant security or pressure control for higher functionality are needed in an application.

Electro-mechanical

18D

33D

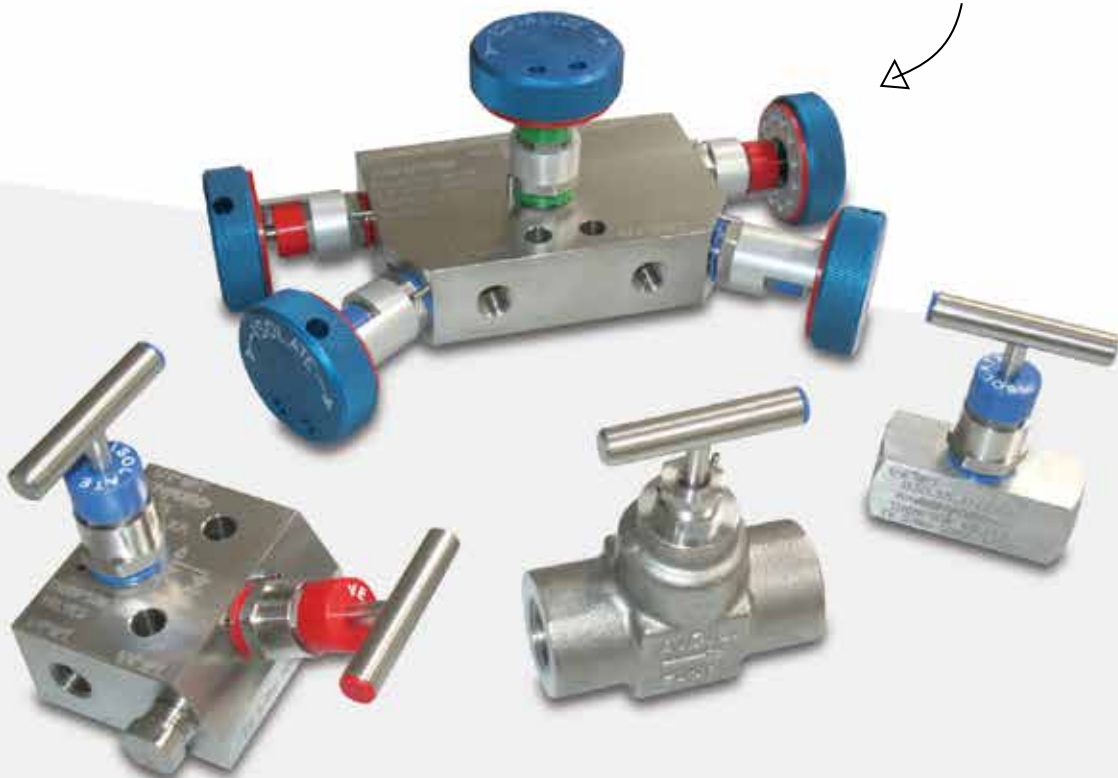




Instrumentation control valves

The first Ashford valves entered service in 1956 and today the product range extends from small bore instrument needle valves to globe valves and manifolds, both gland packed and bellows sealed. Products are in service throughout industry including oil production and refining, gas production and petrochemicals. In power generation these are found extensively in both fossil fuel and nuclear fuelled generating plants. The product range covers single needle valves (including Outside Screw & Yoke variants), 2-valve isolating and calibrating manifolds and 3 and 5-valve manifolds (remote and direct mounted). Standard products are suitable for use up to 6000psi (414 bar) and are available with a range of optional features including locking devices, panel mounting, T-bar or handwheel operation, stub pipes and a wide range of connection types.

Instrument needle valves, globe valves and manifolds





Nuclear class valves & regulators

Bellows sealed globe valves

- > Seat material to preferred specification
- > Inconel® 625, bellows
- > Stainless steel, carbon steel
- > Oblique Pattern
- > Threaded, welded or flanged connections

Bellows sealed needle valves and manifolds

- > Seat material to preferred specification
- > Inconel® 625, bellows
- > Stainless steel
- > Threaded or welded connections
- > Compact, lightweight and robust



IMI Precision Engineering operates four global centres of technical excellence and a sales and service network in 75 countries, as well as manufacturing capability in the USA, Germany, China, UK, Switzerland, Czech Republic, Mexico and Brazil.

For information on all IMI Precision Engineering companies visit www.imi-precision.com

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