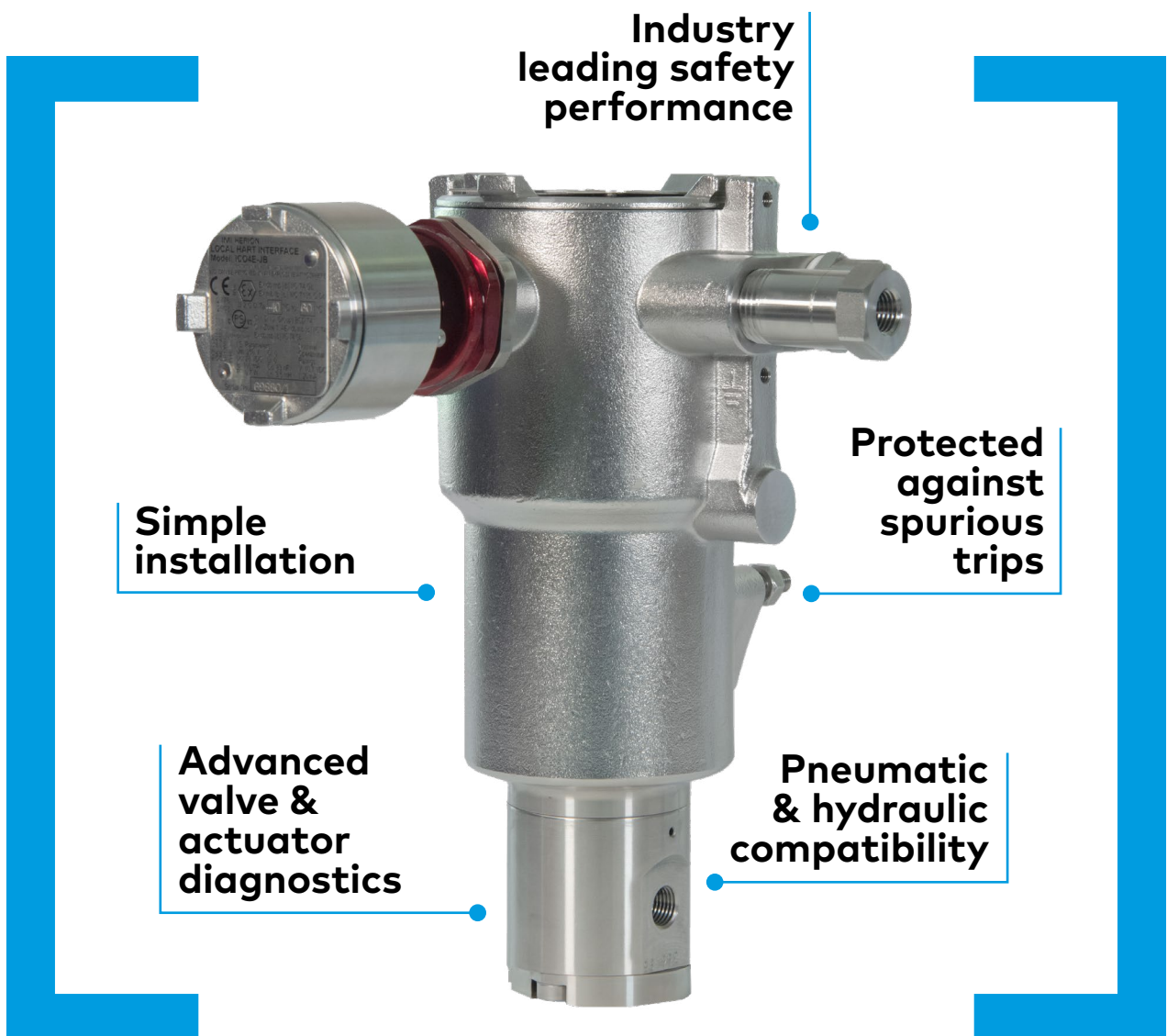


ICO4-PST Solenoid Valve

The Smart Solenoid Valve with Integrated Partial Stroke Testing and Valve Condition Monitoring



Breakthrough Engineering

IMI Critical Engineering's family of specialist companies design, manufacture and service custom-designed valves, actuators, and high integrity solenoid valves 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.

Oil, Gas and Chemical Brands

IMI Critical
Engineering



Stainless steel high integrity solenoid valves



Triple offset metal seated butterfly valves



Proportional valves and regulators



Pneumatic and hydraulic actuation



Critical application ball valves



Pneumatic and hydraulic SOVs for downstream applications



Control, HIPPS, and on/off valves



High integrity valves and regulators



SOVs, angle seat valves, and motorised valves

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

- > ATEX > KOSHA
- > TÜV > DVGW
- > TRCU > FM and UL
- > INMETRO > NEMA
- > CSA > ITRI



Upstream Solutions

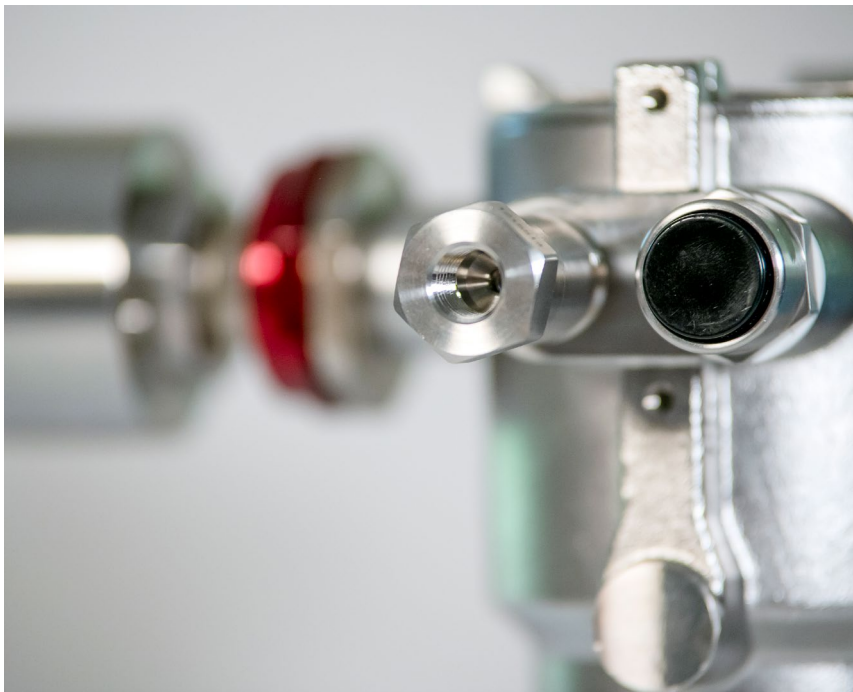


Maxseal has over 70 years' experience in providing oil, gas and chemical solutions with proven safety, reliability, and durability in the most extreme environmental and operating conditions around the globe. Maxseal valves are in operation at all the big international oil companies, and most of the significant nationals.

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, 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.

ICO4-PST: The Smart Solenoid Valve



Benefiting from IMI Critical Engineering's decades of experience in supplying valve solutions to the hydrocarbons industry, and Maxseal's expertise in high integrity solenoid valves, the ICO4-PST is the best performing, yet simplest to integrate, Partial Stroke Testing solution available.

The product was designed on the Safe, Simple, Secure principle:

- > **SAFE** – Best possible safety performance
- > **SIMPLE** – Allows for ideal actuator control
- > **SECURE** – Protected against unplanned shutdowns



Production



LNG



FPSO



Refining



Chemical



The Challenge

Partial Stroke Testing (PST)

Partial stroke testing, or PST, has been an established technique in the oil & gas industry to help prove the functionality of final element assemblies used in safety systems for many years now. This allows the operator to demonstrate that Emergency Shutdown Valves will work to a minimum performance level when required, and operate on demand.

The Compromises

The first PST were mechanical, but technology quickly developed to meet the changing demands of the industry, which was looking for more intelligent

systems able to provide diagnostic capability in addition to a simple partial stroke test. This led to the development of smart systems.

All current PST systems including Positioners, suffer from at least one of the following compromises:

- > Limited diagnostic coverage from the inability to test solenoid valves
- > Compatible only with pneumatic actuators
- > Increase in the number of safe failures thus increasing the risk of spurious trips
- > Unable to test the valve at the designed operating speed
- > Requiring additional electronic units to be fitted and engineered

Drawing on over 3 years technical market research with key players in the global oil & gas industry, we have developed the ICO4-PST Smart Solenoid Valve for integrated partial stroke testing.

The ICO4-PST allows the operator to address all the requirements of PST without compromise and is based on the market leading Maxseal ICO4 high performance solenoid valve which brings peace of mind to plant operators with regard to the functional safety of emergency shutdown systems.

ICO4-PST represents a step change in engineering offering levels of safety and reliability never seen before.

The Problem with Current PST Systems

There are two main types of intelligent system suitable for Partial Stroke Testing. These are Positioners and Electronic Systems. Both offer different approaches but each of these involves a series of compromises in order to achieve the goal.

Each technology clearly has its strengths, but it's also acknowledged that neither option currently offers a wholly satisfactory or reliable solution.

Positioners

Positioners are currently the most common type of intelligent PST system in use and are derived from control valve positioner technologies. They were the quickest development path available as they already had the technology built in to reliably move a valve to a given position. In fact these were made for relatively simple systems as the device could easily be configured to give any desired percentage of partial stroke.

With the addition of an ESD function, these devices became part of the control system for the actuator and therefore could be used to effectively create a redundant ESD operation when used with a solenoid valve.

There are a number of manufacturers of positioner systems and all use a similar fundamental approach to partial stroke testing. However, as time progressed, the compromises created by these systems became more apparent as other technologies were developed.

- > Requires reconfiguration of pneumatic control
- > Limited flow rates
- > Reduced Diagnostic Coverage
- > Does not test the valve at the designed operating speed
- > High safe failure rates
- > Not compatible with all valve types
- > Difficult to install, commission and service

Electronic Systems

As the industry sought PST systems to alleviate the issues with Positioners, many manufacturers turned to electronic systems that were able to perform a partial stroke in a similar manner to that required in an emergency. Many of these systems use electronic control boxes that are fitted close to the actuator and connect the power supply to the solenoid valve. To perform the test, these systems de-energise the solenoid valve and monitor the valve position and/or instrument pressure to determine the success of the test.

Electronic systems can deliver a high level of diagnostics while limiting many of the issues associated with the positioners.

However, even these systems are not entirely free of problems.

- > Additional equipment required - The most common is an electronic control box
- > Spurious trip risk
- > Solenoid valve selection resulting in poor SIL performance
- > Difficult to service
- > Costly



The Solution: ICO4-PST

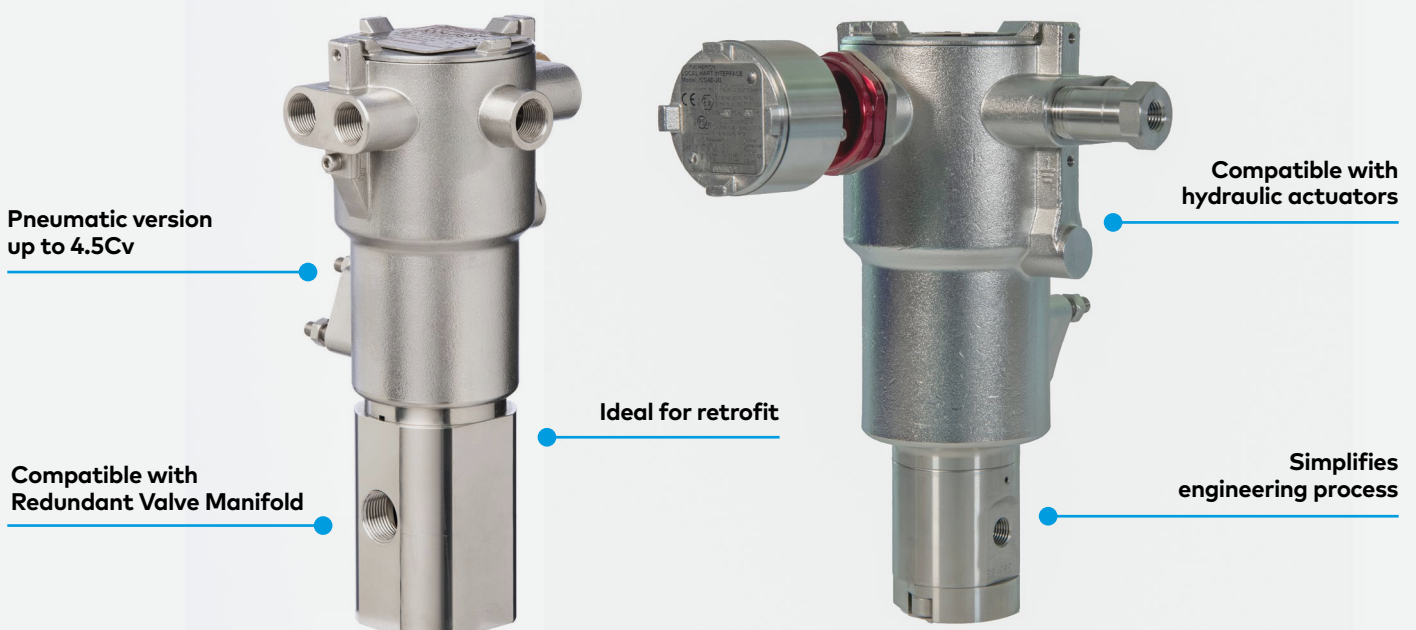
The First Smart Solenoid Valve with Fully Integrated Partial Stroke Testing

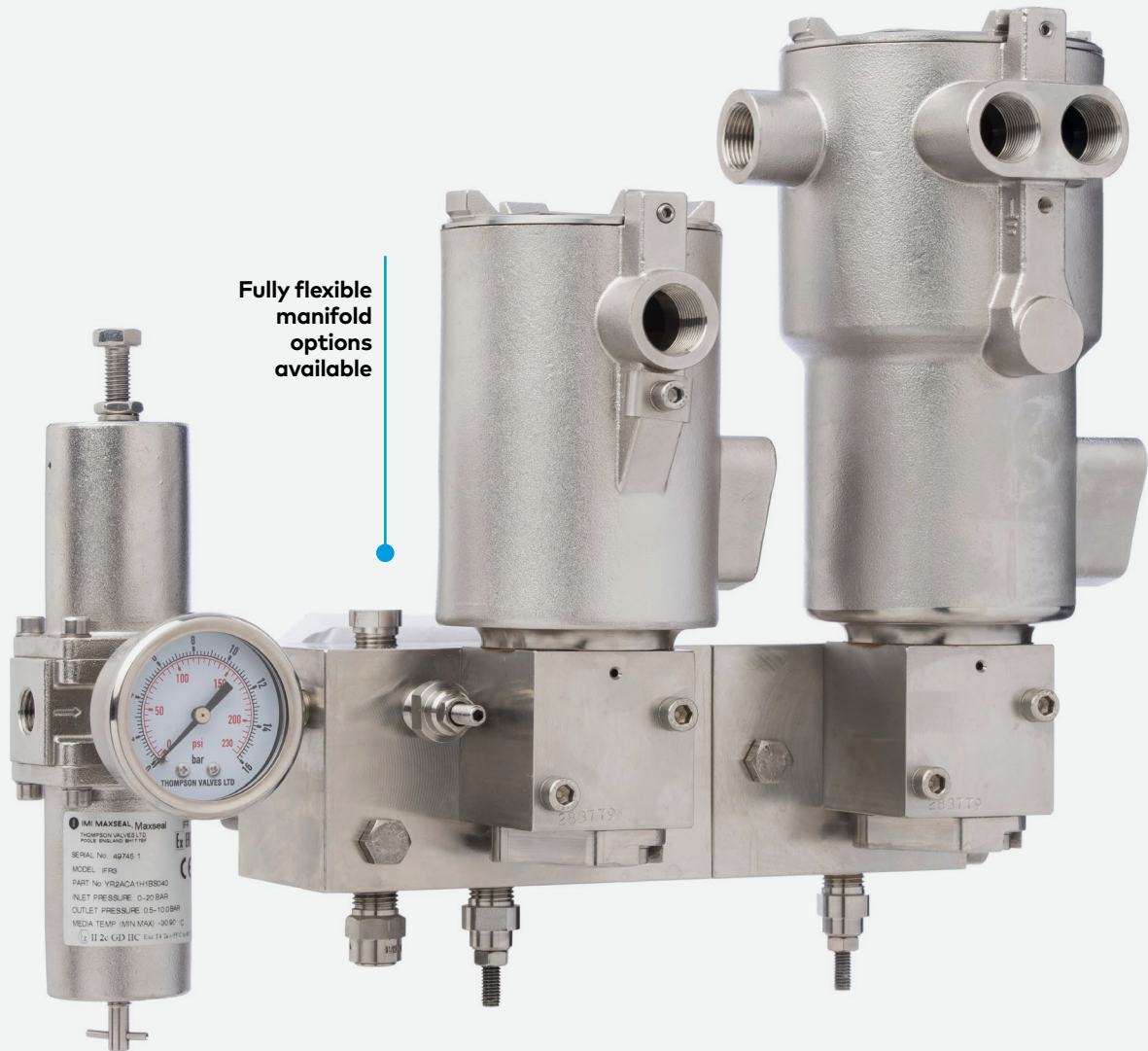
Working closely with customers in the global oil and gas industry, we see the need for a no compromise solution for partial stroke testing. It is clear that the best way to eliminate the compromises of positioner systems is to use the control mechanism of the electronic solution; whilst the best way to eliminate the compromises of the electronic solution is to employ the packaging of the positioner system. Now add to this the benefits of using a high integrity solenoid valve and we are left with a clear path – namely, the integration of the PST control electronics into the termination housing of a high integrity solenoid valve.

The Benefits of ICO4-PST

The ICO4-PST is the first fully integrated partial stroke testing solution with the control system built into the market leading Maxseal ICO4 high integrity solenoid valve. With the lowest safe and dangerous failure rates of any intelligent PST system on the market and always providing the highest possible Diagnostic Coverage, the best possible SIL performance is guaranteed.

- > No dedicated PST device required therefore significantly reduces engineering requirements
- > High level diagnostics with position, pressure and time monitoring
- > Simple Pass/Fail reporting
- > Redundancy on PST control & monitoring eliminates possibility of over-stroke or spurious trip
- > Compatible with valve speeds from 1.5 to 120 seconds
- > SIL3 capable
- > -40°C ... +60°C
- > Remote operation from DCS over HART 7 protocol
- > Local testing with 475, Trex, tablet computer or Local Control Panel
- > Complete system solutions including design, commissioning & training
- > Pneumatic and hydraulic compatible
- > Advanced valve condition monitoring





ICO4-PST: The Flexible Solution

Demonstrating our innovation and technical excellence, the ICO4-PST is reliable and flexible, and can be designed to your specification.

Manifold options are available depending specific environmental and application requirements.

- > **Solenoid configurations**
1001, 1002, 2002, 2003
- > **High flow rate Cv up to 4.5 Cv**
Reduces requirements for QEVs, pilot valves & boosters
- > **Actuator Types**
Pneumatic, hydraulic
Spring return
Quarter turn, linear
- > **Valves**
Ball, butterfly, gate, globe, HIPPS
- > **Valve Speeds**
1.5s to 120s
- > **Operating temperature range**
-40°C ... +60°C
- > **Retrofit**
Ideal for retrofit applications due to engineering simplicity

**The only solenoid valve with
integrated PST control electronics**

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