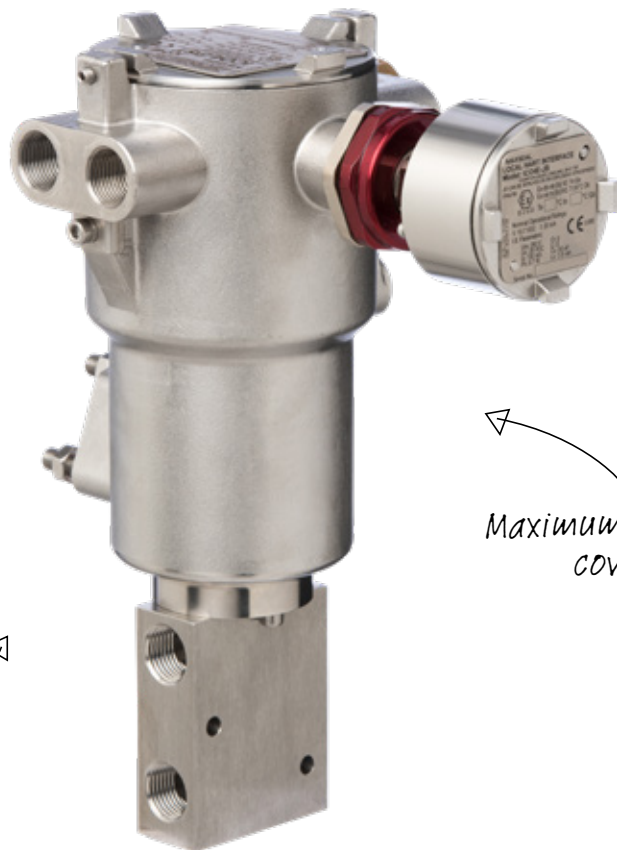


# ICO4-PST Solenoid Valve

## The Smart Solenoid for Integrated Partial Stroke Testing

*Simple  
Installation*



*Maximum diagnostic  
coverage*

*Reduced  
Downtime*



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## Breakthrough Engineering for a Better World

**Norgren is part of global engineering organisation IMI plc. IMI is at the forefront of delivering the solutions we need in a changing world and is focused on **creating tremendous value by solving key industry problems** in attractive markets and employing the best.**

Norgren has a proud history of creating innovative engineering solutions in precise motion control and fluid technology, and we collaborate with our customers across more than 50 countries in critical areas such as Factory Automation, Material Handling, Rail, Energy, Process Control, Life Science and Commercial Vehicles.

From improving speed, productivity, reliability and efficiency of equipment, to generating significant energy and cost savings, or lowering total cost of ownership across many industries, Norgren's high-quality solutions are designed to help customers pursue progress, achieve new goals and overcome problems.

With market-leading industry expertise, we offer the capability, resources, engineering intelligence and global support infrastructure to tackle the largest project demands.

Our world-class portfolio of fluid and motion control products include Norgren, Bimba, Buschjost, FAS, Herion, Kloehn and Maxseal. Supplied either individually or combined into powerful customised solutions to meet customer needs.

**Breakthrough engineering you can count on.**

# Setting the Standard for Safety, Reliability and Performance

**Norgren 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 Norgren, Buschjost, Herion and Maxseal, our products are designed to work effectively in aggressive environments and extreme temperatures and meet international standards such as:

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



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.



Production



Refining



Chemical



Transportation



Petrochemical



Power Generation





# Partial Stroke Testing (PST) – The Compromises

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**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 new 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 Solutions

**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.**

## 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 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

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



# Introducing ICO4-PST The First Smart Solenoid Valve with Fully Integrated Partial Stroke Testing

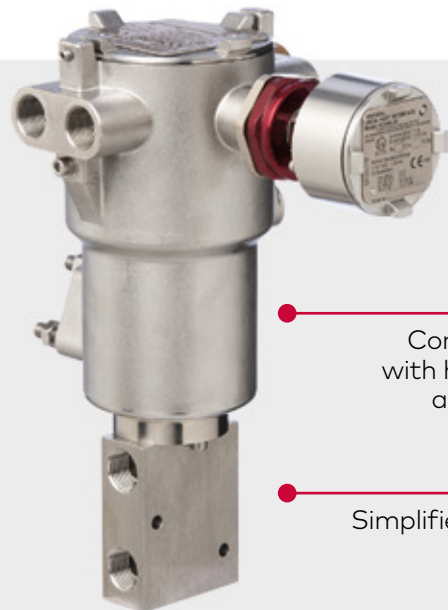
Working closely with customers in the global oil and gas industry, we see the need for a no compromise solution for partial stroke testing. It is clear that the best way to eliminate the compromises of positioner systems is to use the control mechanism of the electronic solution; whilst the best way 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 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
- » Dual override mechanism eliminates possibility of over-stroke
- » Compatible with valve speeds from 2 to 120 seconds
- » SIL 3 certified as 1oo1
- » -40°C ... +60°C
- » Local testing using HART 475 communicator, remote testing via HART

Compatible with  
Redundant Valve Manifold

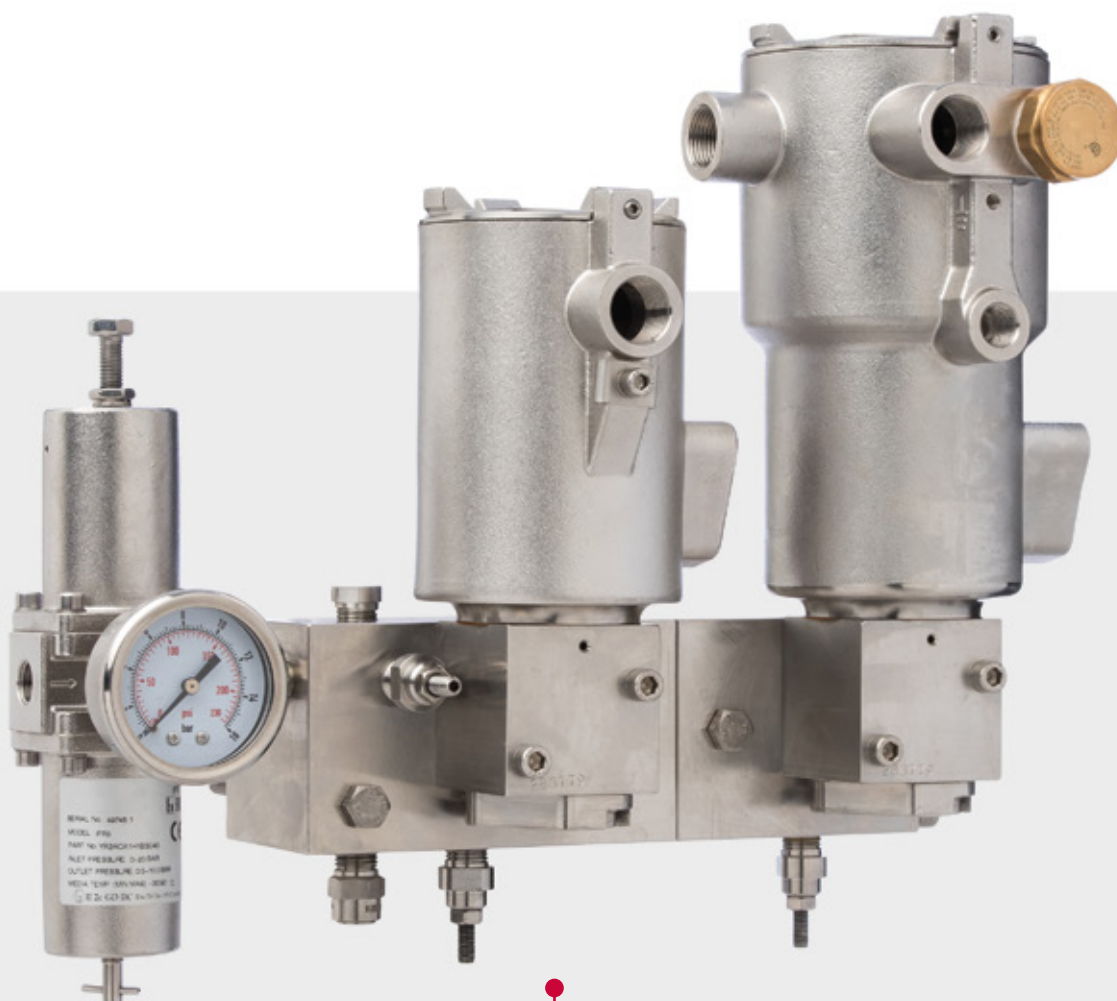
Ideal for retrofit



Compatible with hydraulic  
actuators

Simplifies engineering  
process

The only solenoid valve  
with integrated PST  
control electronics



Fully flexible manifold options available

## ICO4-PST The Flexible Solution

Another product of 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
  - 1oo1, 1oo2, 2oo2, 2oo3
- » High flow rate Cv up to 5.0
  - Reduces requirements for QEVs, pilot valves & boosters
- » Actuator Types
  - Pneumatic, hydraulic
  - Spring return
  - Quarter turn, linear
- » Valves
  - Ball, butterfly, gate, globe, HIPPS
- » Valve Speeds
  - 2s to 120s
- » Operating temperature range
  - -40°C ... +60°C
- » Retrofit
  - Ideal for retrofit applications due to engineering simplicity

Norgren operates four global centres of technical excellence and a sales and service network in 50 countries, as well as manufacturing capability in Brazil, China, Czech Republic, Germany, India, Mexico UK and the USA.

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