

Engineering  
GREAT Solutions



The world-leading provider of  
highly engineered flow control  
solutions for critical applications

# Contents

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<b>02</b>	Introduction
<b>03</b>	Our market-leading companies
<b>05</b>	Market drivers that guide our growth
<b>06</b>	Engineering great solutions
<b>07</b>	Industry sector: Oil & Gas
<b>09</b>	Industry sector: Fossil Power
<b>11</b>	Industry sector: Nuclear Power
<b>13</b>	Industry sector: Petrochemical
<b>15</b>	Industry sector: Iron & Steel
<b>17</b>	Process Industries
<b>19</b>	Aftermarket and Service
<b>21</b>	Our global reach

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# We deliver great solutions for customers tackling the world's most demanding engineering challenges

IMI Critical Engineering is a world-leading provider of critical flow control solutions that enable vital energy and process industries to operate safely, cleanly, reliably and more efficiently.

As part of IMI plc, we operate a global service network, with manufacturing facilities in 12 countries. We employ over 4,000 talented professionals across a range of disciplines. These include over 400 engineers, 150 project managers and over 250 dedicated aftermarket specialists – all committed to providing excellent service to our customers.

We design, manufacture and install customised, highly engineered solutions for new plant builds and also provide complete plant lifecycle service support. This ensures that our customers benefit from efficient maintenance, speedy issue resolution and plant optimisation at all times.

Our products are at the heart of complex energy and production processes. They control the flow of steam, gas and liquids in harsh environments – they are designed to withstand temperature and pressure extremes, as well as intensely abrasive or corrosive cyclical operations.

Our engineering expertise sets us apart. We combine technical knowledge, engineering design capability, application experience and innovative custom-designed products to deliver safe, reliable and durable solutions.



*“Global trends are generating rapid growth in a number of sectors. Our business is strategically placed to support our customers’ challenges with proven technology, application optimisation and solutions that are reliable and cost-effective”*

**Roy Twite**  
IMI Critical Engineering  
Divisional Managing Director

*Our market-leading companies*



# Our market-leading companies

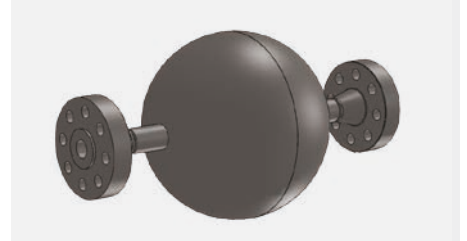
The unique combination of our IMI Critical Engineering companies' know-how and worldwide experience underpins our reputation as a leading global supplier to the major energy and industrial process sectors.

We help our customers control critical in-plant processes by providing superior, custom engineered valves, actuation and control systems.



 **IMI BOPP & REUTHER**

Established over 135 years ago, based in Mannheim, Germany IMI Bopp & Reuther is a highly regarded control valve business designing a wide range of valves, making plants and processes safer and more efficient.



 **IMI FLUID KINETICS**

One of the world's leading designers and manufacturers of silencer technologies within custom-designed products, which are engineered for a lifetime of service.



 **IMI CCI**

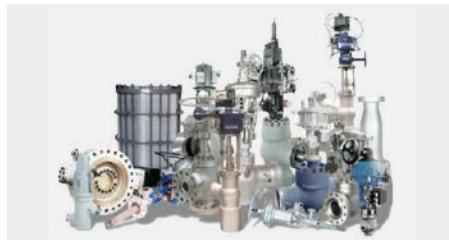
Presenting an unrivalled portfolio of technologies, including DRAG®, BTG, ABJ® and technology acquired from Sulzer®, to meet extreme pressure and temperature control needs.



 **IMI INTERATIVA**

A key supplier of butterfly isolation valves to the Oil & Gas, Sugar, Ethanol Production and Water Treatment process industries throughout Brazil and South America.

*Engineering GREAT Solutions*



 **IMI CCI**

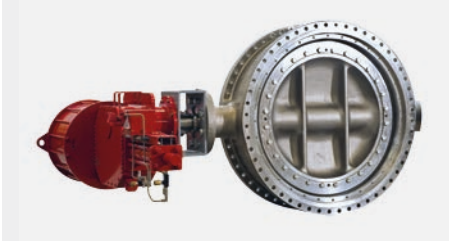
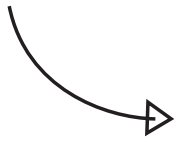
Operating in the Nuclear sector for over 50 years, a dedicated supply chain provides control valve, isolation and other services to meet today's aggressive refuel outages.



 **IMI NH**

IMI Newman Hattersley has proven technologies spanning over 60 years, including bellows sealed globe, ball and butterfly valves, meeting the high demands of next-generation nuclear reactors.

Our market drivers



### IMI ORTON

An international leader in the design and manufacture of triple eccentric metal seated butterfly valves, specialising in refining processes and cryogenic valves for LNG.



### IMI STI

Providing control solutions for actuation in critical applications, especially where reliability and performance are vital for process efficiency, plant safety and integrity.



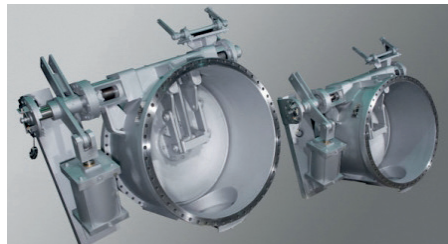
### IMI TRUFLO RONA

A leader in the Oil & Gas, LNG, Petrochemical and shipbuilding industries, producing a range of gate, globe, top & side entry ball valves.



### IMI REMOSA

A world leader in slide, gate, goggle and through conduit valves, actuation and control units, specialising in Fluid Catalytic Conversion (FCC) applications.



### IMI TH JANSEN

100 years of experience in the design and manufacture of butterfly and gate valves and blast furnace valves for the Iron & Steel, Power, and Petrochemical industries.



### IMI Z&J

IMI Zimmerman & Jansen services very high temperature applications with slide, gate and goggle valves as well as heading and unheading devices for delayed coker processes.



### IMI SSF

A manufacturer of high integrity special fasteners (bolts, set screws, stud bolts, nuts etc.) for critical applications in hostile environments such as offshore, subsea and nuclear.



### IMI TRUFLO MARINE

High integrity valves for faultless performance in extreme applications, with technology developed in the Naval Marine industry for nuclear submarines.



### IMI ZIKESCH

With over 100 years of experience, IMI Zikesch provides total aftermarket service along with a comprehensive valve product range.

# Market drivers that guide our growth

Like never before, a number of long-term global trends are driving the demand for cleaner sustainable energy, generated with efficient and reliable production processes. Each of the following market drivers pose significant challenges.



## Urbanisation

- > Mega cities and transport systems
- > 24-hour demand

Energy is an essential building block for the cities of tomorrow. The IMI Critical Engineering businesses design and deploy the technology necessary to support the growth with:

- > Attemperators for the most efficient combined cycle plants meeting “time of day” demands
- > Turbine bypass systems for super critical plants that serve primary power
- > Oil pipeline – transportation infrastructure



## Environmental emissions

- > Lower greenhouse gases
- > Higher energy efficiency

Environmental legislation is striving for a balance between safety and quality. IMI Critical Engineering is at the forefront of innovation to make this happen with:

- > Fugitive emission packing for LNG anti-surge valves
- > Next generation renewable resources



## Resource scarcity

- > Coal, gas, nuclear fuel
- > Demand for iron and steel

The demand for resources is driving existing and new facilities to be more efficient. IMI Critical Engineering is working with its industry partners to:

- > Harness energy from remote locations
- > Enhance efficiency for major industries

# Engineering great solutions

We deliver great solutions to our customers through a unique combination of engineering know-how and fluid controls technology. At the heart of our 'Engineering great solutions' ethos is customer value.

Our relentless drive to solve customers' fluid control problems has resulted in the creation of two proprietary training programmes: The Valve Doctor® programme and the IMI Critical Engineering University.

## The Valve Doctors®

Our dedicated team of Valve Doctors® are the industry's leading valve specialists and are focused on solving process flow problems for power, nuclear, oil & gas and petrochemical plants around the world.

Our focus extends beyond valve design to include plant operation, system layout and control system integration. The Valve Doctors® are the product of a comprehensive training programme that demands our specialists to work in partnership with our customers to achieve the highest levels of performance, safety and reliability.

## IMI Critical Engineering University

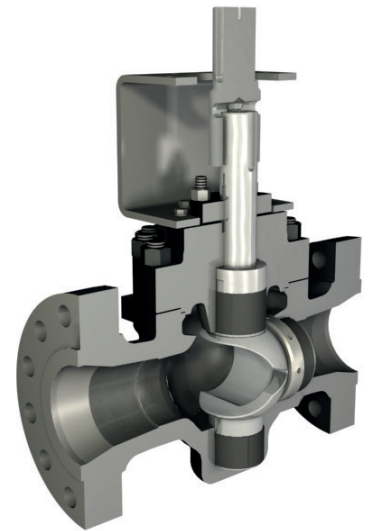
The IMI Critical Engineering University further helps to establish us at the forefront of valve technology by working with those customers who want to understand more about how to achieve the highest levels of performance and reliability.

## Worldwide engineers

Our staff of over 400 engineers worldwide understand how to convert industry knowledge, market insight and our customers' toughest challenges into solutions that give our customers a competitive advantage.

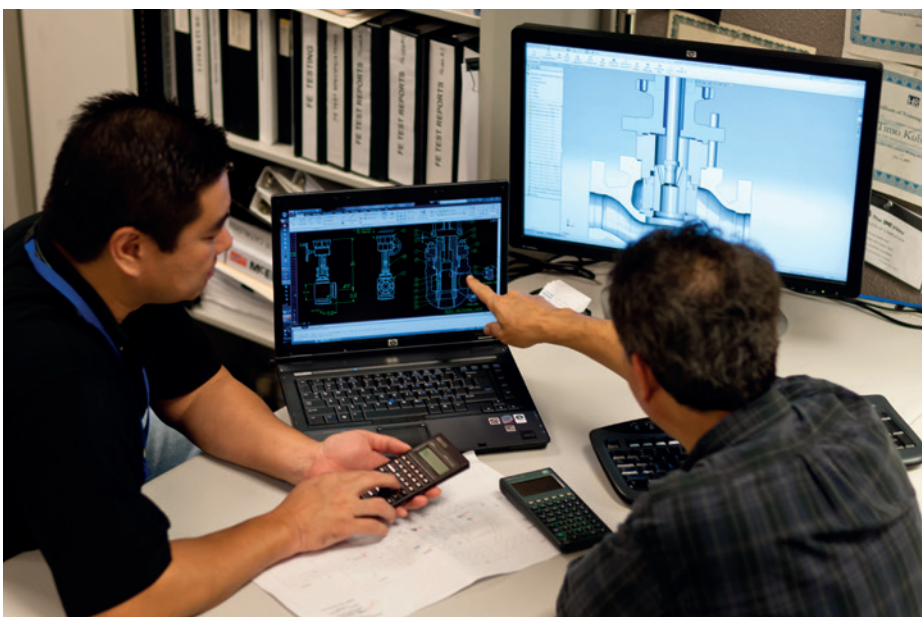
Our key customers are the world's leading players in the energy and process sectors and include Arcelor Mittal, Thyssen, Tata, Petrobras, Sinopec, Alstom, Mitsubishi Heavy Ind, Siemens, Shanghai Electric, Westinghouse, Urenco, Areva, Chevron and Bechtel.

*Custom engineered valves for critical processes*



*We serve the following sectors:*

- Oil & Gas
- Fossil Power
- Nuclear Power
- Petrochemical
- Iron & Steel
- Process Industries
- Aftermarket service



Our elite team – The Valve Doctors® operate on-site wherever they are needed around the world, diagnosing problems, evaluating process requirements, and optimising configurations.

Industry sector

# Oil & Gas

Engineering  
*GREAT Solutions*



 **IMI BOPP & REUTHER**

 **IMI CCI**

 **IMI FLUID KINETICS**

 **IMI INTERATIVA**

 **IMI ORTON**

 **IMI SSF**

 **IMI STI**

 **IMI TRUFLO RONA**

 **IMI ZIKESCH**

As the fastest growing sector, investment in oil and gas is significant. However, producing fields have aged such that the field profiles/mix have changed with smaller, more remote resources being commercialised. This leads to more demanding applications.

Working closely with process licensors and EPCs, our products protect the critical plant component. However, more importantly, our patented IMI STI actuation gives industry leading response times, accuracy and repeatability. This results in LNG trains running optimally, giving operators maximum output. As a result, IMI CCI is the world leader in compressor anti-surge valves.

The LNG process also relies on best-in-class isolation valves: IMI Truflo Rona ball valves and IMI Orton metal seated butterfly valves. Used on the liquefaction plant in a number of applications (cooling system, firefighting, and process valves), we also produce the cryogenic process valves and the loading/unloading valves. Our engineering expertise ensures safe faultless operation at  $-196^{\circ}\text{C}$ .

With the need to access remote fields, the growth of Floating Production Storage and Offloading (FPSO) and Floating Liquefied Natural Gas (FLNG) is supported by IMI Critical Engineering. Our valves enable

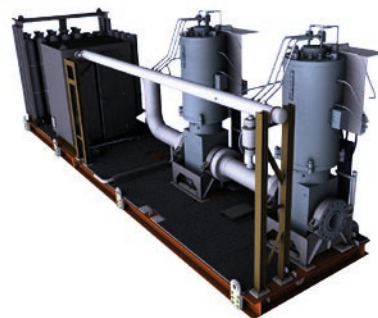


extreme processes to operate safely with the utmost reliability in what will be harsh environments – not only through the process on board, but also the powering and safety of the vessels.

## High Integrity Protection Systems (HIPPS)

As demand continues for hydrocarbon resources, higher utilization of fields is a requirement. For older fields this means enhanced oil recovery through injecting media to improve flow rates. However, many more difficult fields also contain significant levels of  $\text{H}_2\text{S}$  (sour gas).

As a result, more field owners/operators want to ensure the safety of the field as well as the equipment investment – and HIPPS is a key application. Leveraging a long history of experience, IMI CCI in Italy designs control and hardware for the system, which we are successfully supplying to onshore fields in the Middle East.



*HIPPS ensures  
your investment  
and production  
output is  
protected*



Production chokes

For noise and vibration control, DRAG® is the world leading solution

Fire & safety system valves

Surge relief valves

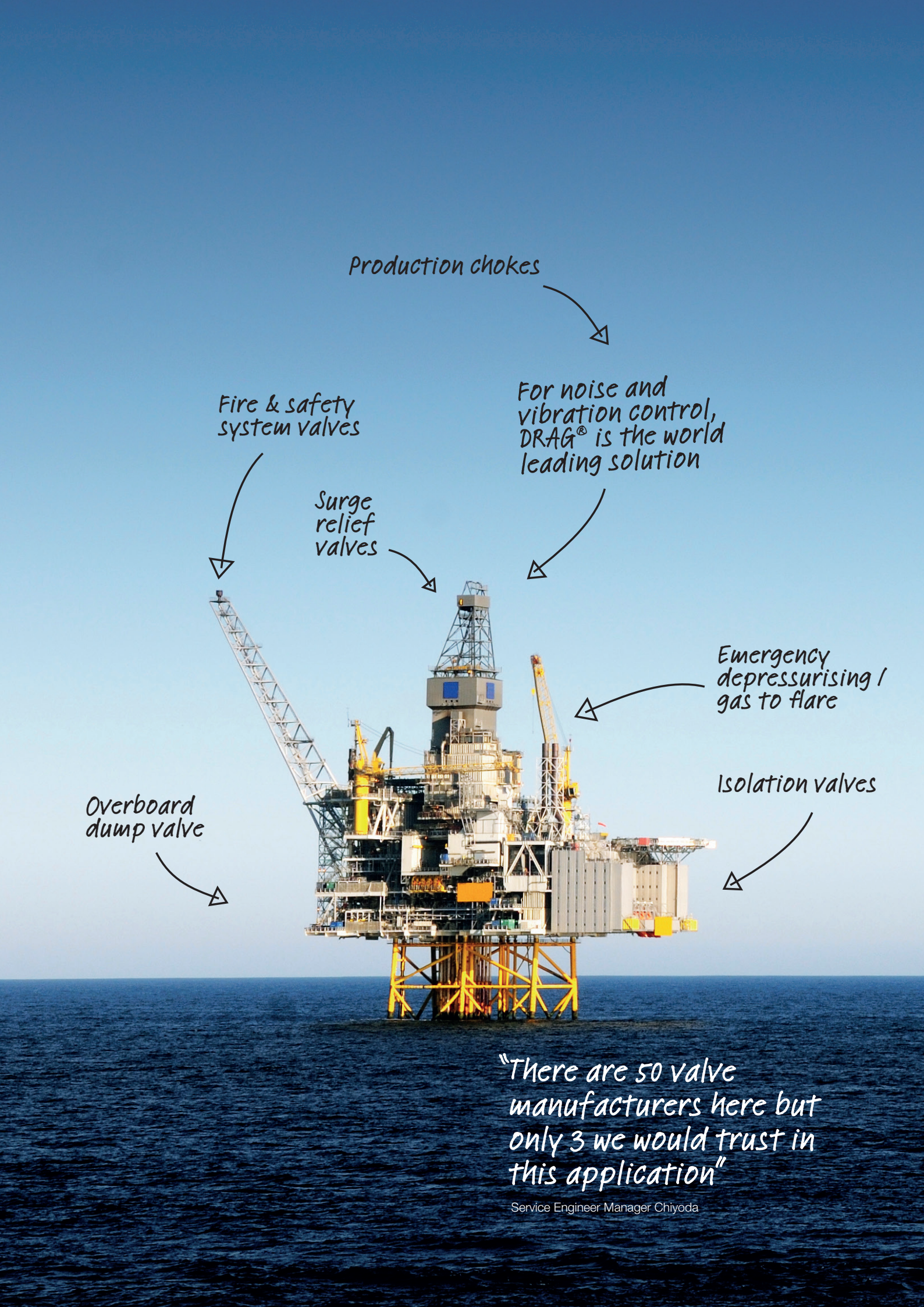
Emergency depressurising / gas to flare

Overboard dump valve

Isolation valves

"There are 50 valve manufacturers here but only 3 we would trust in this application"

Service Engineer Manager Chiyoda



Industry sector

# Fossil Power

Engineering  
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 **IMI BOPP & REUTHER**

 **IMI CCI**

 **IMI FLUID KINETICS**

 **IMI ORTON**

 **IMI STI**

 **IMI TRUFLO RONA**

 **IMI ZIKESCH**

IMI Critical Engineering has been the leading provider of customised severe service control valves for over 50 years through its IMI CCI and IMI Bopp and Reuther businesses for the power sector. With vast experience gained from over 20,000 valves installed, the know-how and expertise of IMI Critical Engineering remains unrivalled.

Supported by our engineers and specialists – dedicated teams of The Valve Doctors® – we draw on vast experience to provide the best solution to maximise system performance, reliability and uptime.

IMI Critical Engineering offers a broad portfolio of products. With control valves including DRAG®, BTG, ABJ and technology acquired from Sulzer®, we can assess process requirements and engineer the ideal combination of technologies to provide the optimised solution.

IMI Critical Engineering has 50 years' experience of working with fossil power plant operators, completing over 20,000 severe service installations worldwide. Over 6,000 turbine bypass valves are currently in operation where our engineering know-how meets plant operators' requirements for thermal shock, high-speed modulation, high rangeability, repeatable tight shut-off, and low noise with inline design for maintenance.



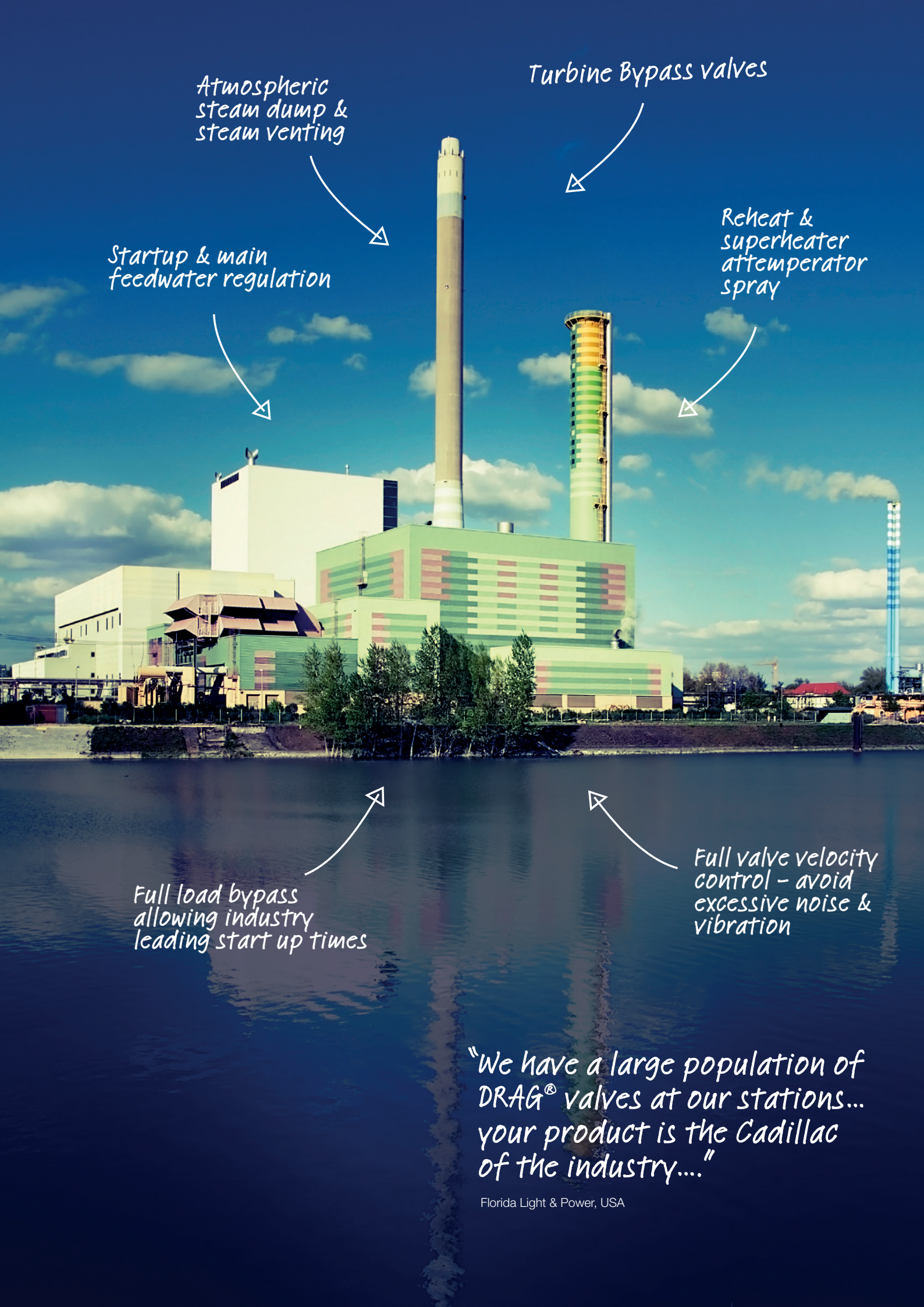
Supported by over 200 field service specialists, we can commission, service or support your power plant outage anywhere in the world. With manufacturing plants and service centres located around the world, 24-hour customer support is assured.

## Critical for pipeline services

As winters are very long and cold in Alaska, keeping the oil sufficiently heated is critical for pipeline services.

In order to ensure production is optimised and flow rates are maintained when temperatures drop to below -50°F, Alyeska Pipeline Services sought to develop a way of mechanically heating the crude oil by cycling the fluid through a pump. A solution was found in a design that could allow large size particulates to flow through the valve disk stack which could also withstand the seismic activity that occurs in the region. The team designed, built and shipped a custom design which would raise the temperature by nearly 14°F, giving the emergency crews the time necessary to repair any issues before the oil pressure decreased or froze.





Atmospheric steam dump & steam venting

Turbine Bypass valves

Startup & main feedwater regulation

Reheat & superheater attemperator spray

Full load bypass allowing industry leading start up times

Full valve velocity control - avoid excessive noise & vibration

"We have a large population of DRAG® valves at our stations... your product is the Cadillac of the industry...."

Industry sector

# Nuclear Power

Engineering  
*GREAT Solutions*



 **IMI BOPP & REUTHER**

 **IMI CCI**

 **IMI NH**

 **IMI STI**

 **IMI TH JANSEN**

 **IMI TRUFLO MARINE**

 **IMI ZIKESCH**

IMI Critical Engineering has several businesses dedicated to the Nuclear industry. With over 60 years of proven, reliable nuclear power plant service, over half of the world's nuclear power plants rely on our critical valve technology.

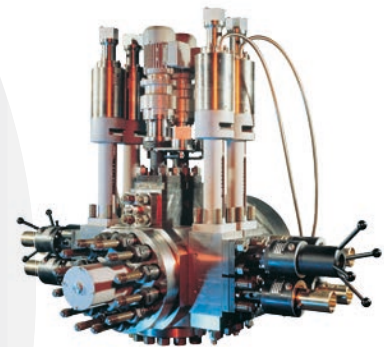
With over 250,000 of our products installed either in nuclear power plants or on vessels or submarines, we have the knowledge and experience to deliver the highest quality, reliability and safety in the industry.

Underpinning all of these offerings is a highly skilled level of technical expertise – over 35% of our workforce are graduate engineers.

Through IMI CCI, we supply severe service control valves featuring DRAG<sup>®</sup>, ABJ or technology acquired from Sulzer<sup>®</sup>, plus system medium actuated technology for isolation valves and pilot operated safety valves. With IMI Bopp & Reuther we compliment this with industry leading safety and safety relief valves. Combining a range of actuation options, including our QuickTrak<sup>®</sup>, we provide the highest performing valves in the industry.

To support nuclear power plant operations, we offer emergency core cooling system strainers and filtered containment venting systems to ensure safe systems.

IMI NH has proven technology for long life bellows sealed globe valves, full flow ball valves and high performance



butterfly valves, providing sustainable, cost-effective performance for nuclear power plant operators.

The full valve requirement at plants is complimented by IMI TH Jansen's butterfly valve technology for cooling/inlet systems.

IMI Truflo Marine is a specialist designer and manufacturer of high integrity valves, actuators and pressure reducing stations for critical seawater, nuclear and naval marine applications. The leader in the field of hull valves, its technology is critical on nuclear submarine fleets in navies around the world.

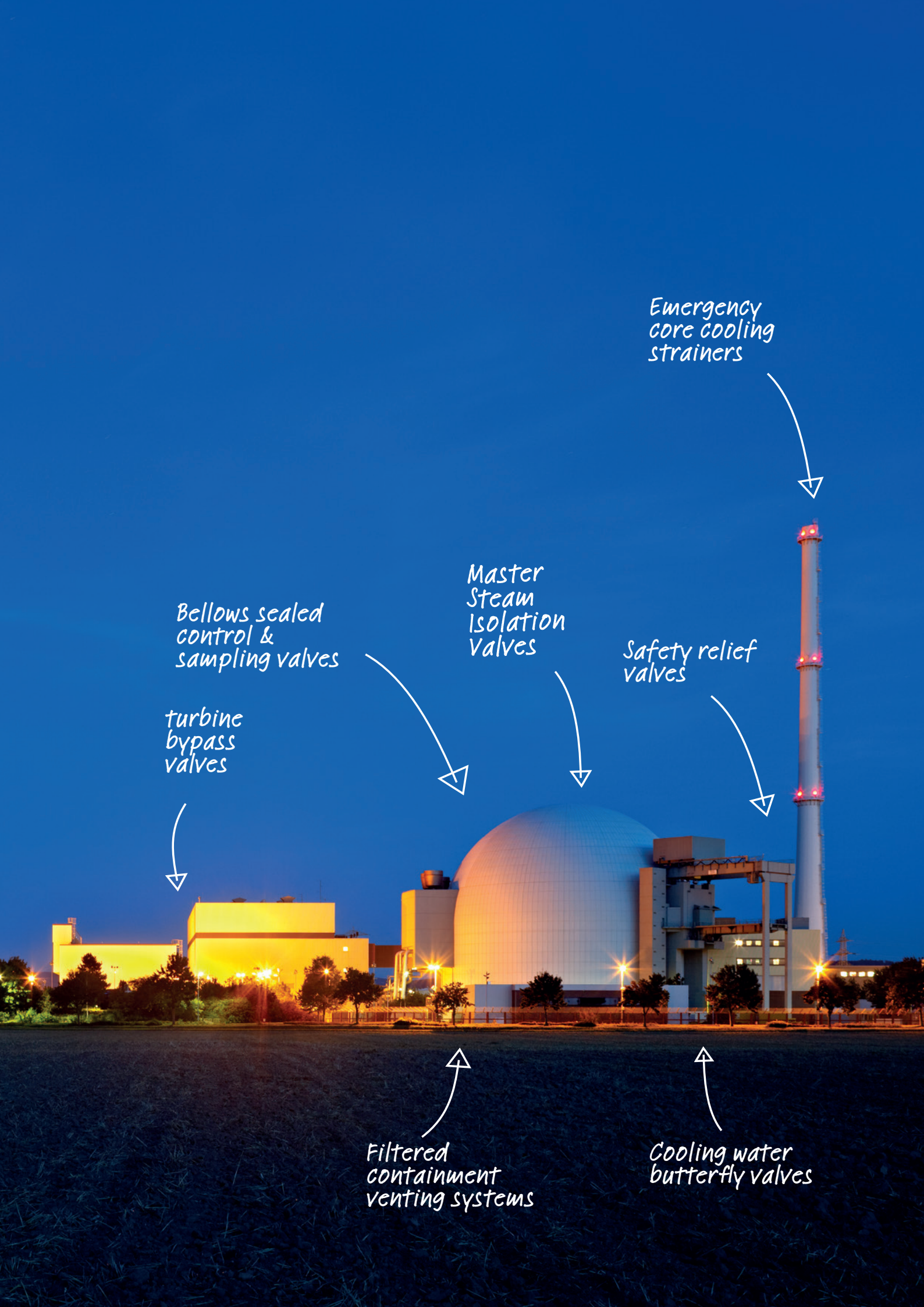
## Nuclear plant life extension

Following the Fukushima disaster and reviews of nuclear reactors around the world, EDF Energy was required to make additional safety improvements to the primary cooling circuits at Hinkley Point B and Hunterston B Advanced Gas-cooled Reactors (AGRs) in the UK. This required the addition of further nitrogen injection points, with associated valves and pipework for diverse reactor holddown. The new circuitry has the secondary function of introducing an additional reactor gas blowdown function.

Due to the critical application of the valves, the specification calls for conformance with ASME III Class 1. As it was necessary to avoid any increase in pressure drop, which would downgrade cooling system performance, EDF Energy sought a solution that used high-integrity full-bore ball valves. The valves were required to operate with utmost reliability and ensure zero leakage, even at high pressure and temperature. The sites were subsequently granted 7-year life extensions.

*ASME III Class 1 nitrogen injection valve*





Emergency  
core cooling  
strainers

Bellows sealed  
control &  
sampling valves

Master  
Steam  
Isolation  
Valves

Safety relief  
valves

turbine  
bypass  
valves

Filtered  
containment  
venting systems

Cooling water  
butterfly valves

Industry sector

# Petrochemical

Engineering  
*GREAT Solutions*

 **IMI BOPP & REUTHER**

 **IMI CCI**

 **IMI ORTON**

 **IMI REMOSA**

 **IMI SSF**

 **IMI STI**

 **IMI TH JANSEN**

 **IMI TRUFLO RONA**

 **IMI Z&J**

 **IMI ZIKESCH**

IMI Critical Engineering offers niche, highly engineered valves for critical applications in the Petrochemical sector, with world-leading technologies for delayed coking and fluid catalytic cracking.

Operating reliably and safely for the life of a refinery in extreme temperatures of 1,650°C and in erosive environments demands highly engineered solutions – the specialism of IMI Z&J (Zimmerman & Jansen) and IMI Remosa.

With 25-year lifecycles and extremely corrosive media, our products meet the exacting specifications of process licensors such as UOP, CB&I and Exxon, ensuring your plant performance is optimised.

IMI Remosa produces bespoke slide, butterfly, gate and through conduit valves that are designed for a specific plant. These are controlled by IMI Remosa's actuators and hydraulic control units to match the increasing demand for high availability and reliability, with diagnostic systems to reduce unscheduled downtime. Used in FCC, these are critical products for the conversion of heavy gas oil to gasoline the world over.

IMI Z&J are world-renowned specialists in delayed coker and dehydrogenation processes for ethylene and propylene.

Thermal cracking to produce hydrocarbon coke requires control of the drums and process, as well as, critically, the slide gate valves for top and bottom unheading.



A key part of the process, our bottom unheading devices ensure reliable and (most importantly) remote safe unheading to optimise operational efficiency.

For dehydrogenation processes (conversion of propane to propylene for plastics) IMI Z&J produces a range of inlet and outlet valves for air and hydrocarbon, as well as for purging.

Our wide range of products includes IMI Truflo Rona's top entry ball valves. These highly engineered valves are used in purified terephthalic acid (PTA) for plastic production, where the reaction between secondary petroleum and acetic acid is a highly corrosive medium.

IMI Bopp & Reuther offer a full range of safety and safety relief valves for processes which support safe and reliable plant.

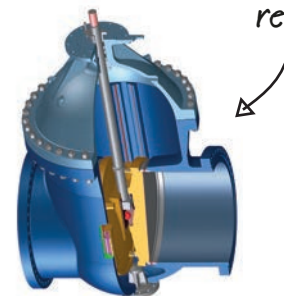
## Catofin projects

The shale gas revolution in the USA has led to low-cost availability of propane. Propane can be used, via a dehydrogenation process, as the feedstock for the production of ethylene and propylene.

This has resulted in major investment and upgrades to facilities for dehydrogenation units, using the Catofin® process. As a result, customers turned to IMI Z&J, which has 15 references globally for this technology – having worked on every major plant for the last 55 years.

IMI Z&J successfully delivered 42" wedge-in-wedge gate valves and 48" air inlet and outlet valves.

*Wedge-within wedge reactor valve*





Propane desuperheating

Top entry ball valves

Double disk through conduit

Goggle valves

Top unheading and bottom unheading devices

Sliding gate valves

Turbo expander valves

Industry sector

# Iron & Steel

Engineering  
*GREAT Solutions*



 IMI TH JANSEN

 IMI Z&J

As a truly global industry, smelting plant owners and operators want to ensure the huge investment is utilised to its maximum in a very competitive sector. To do this, they need the most reliable plants, with highest yield and lowest cost to run. For this, they turn to IMI Critical Engineering – specifically our IMI Z&J (Zimmermann & Jansen) and IMI TH Jansen businesses.

This industry needs tailor-made, non-standardised flow control equipment. IMI Z&J and IMI TH Jansen can design and manufacture such equipment – valves of up to 6m diameter, designed to individual plant requirements for total plant lifecycle duration (25+ years).

Typical products are hot blast valves, up to 2.5m diameter, with temperatures of 1,650°C with energy saving designs that, when closed, are man-safe, and Goggle valves up to 5m diameter for 1,100°C in operation. Other products include lever valves and control valves. IMI TH Jansen also makes flat plate gate valves and air separation valves. We also supply tuyere stocks (hot blast/air nozzles) for blast furnaces. IMI Z&J have also developed new technologies to help reduce owners' cost of production.

Our two key products are Top-gas Recovery Turbines (TRT) and No-Bell Top Charger (NBTC) for blast furnaces.

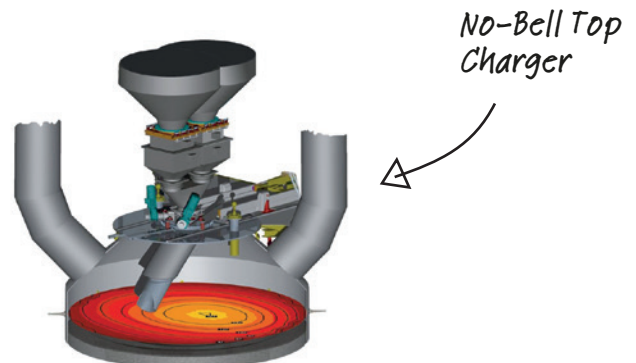


TRTs are specially designed low revolution turbines that use the hot gases from the blast furnace to generate power. The design has been optimised to reduce all drag and friction to produce a high efficiency turbine – 30 years' experience results in the lowest losses. They can simultaneously support two blast furnaces.

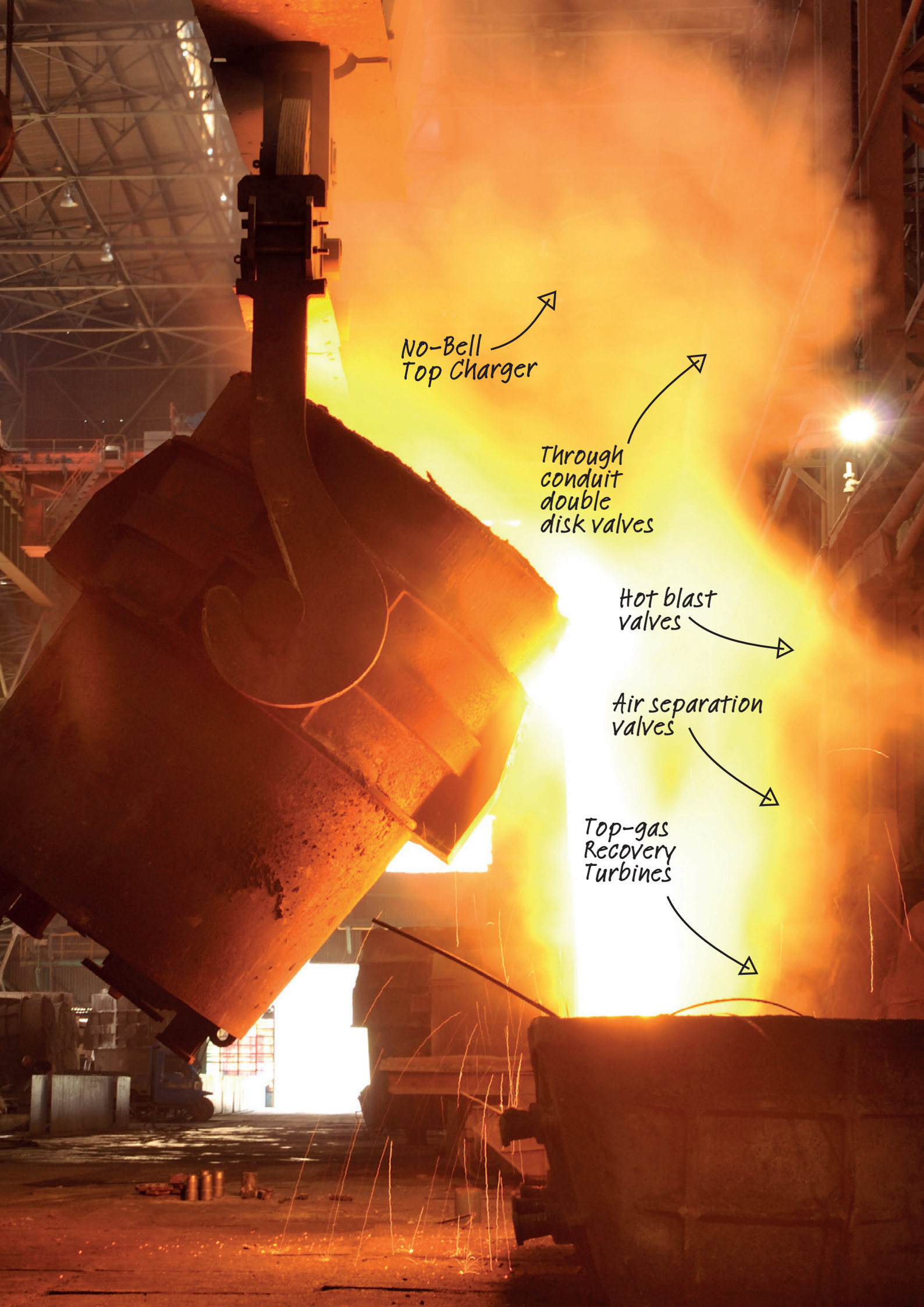
## Innovative technologies

Our No-Bell Top Charger has been designed to optimise burden distribution in the blast furnace. With a flexible chute design, it is possible to charge the burden and the coke to any position in the blast furnace.

The constantly tilting angle is perfectly guided (acoustic gas measurement) to give exact level control. This generates better gas exploitation, leading to increased output from the furnace, but also greatly reduces the consumption of the reducing agents – a significant saving for plant owners/operators.







No-Bell  
Top Charger

Through  
conduit  
double  
disk valves

Hot blast  
valves

Air separation  
valves

Top-gas  
Recovery  
Turbines

Industry sector

# Process Industries

Engineering  
**GREAT Solutions**

 **IMI BOPP & REUTHER**

 **IMI CCI**

 **IMI TH JANSEN**

 **IMI Z&J**

 **IMI ZIKESCH**

Across all our sectors, the chemical and process industries, safety and reliability are of paramount importance. It is essential for plants to operate without interruption, and turnarounds for plant maintenance or upgrades are fast and efficient.

We provide world class products across process industries where safety valves are required to protect pressure systems for steam, gases and liquids.

Safety valves have the function of preventing inadmissible overpressure in all pressurized systems like pipe systems, pressure vessels, power boilers and reactors, in order to avoid danger to people, plant and the environment. These are set typically to the Maximum Allowable Working Pressure (MAWP) - a higher pressure than the operating pressure of the system to be protected. For functional and operating requirements, third party certifications and approvals of safety valves are required by laws, code and standards. IMI Bopp & Reuther safety valves fulfil this for all areas of the world (CE-marking, ASME section I, III and VIII designator, Chinese and Russian type test approvals).

The IMI Bopp & Reuther Si series are most commonly used in process plants. The closed spring bonnet traps the process fluid in the valve and prevents a release to the environment. The straightforward design and reliable guidance of the stainless steel inside parts ensure free and repeated discharge cycles.

Conventional safety valves are usually selected where a short outlet pipe leads to the atmosphere, where fluid is safely discharged into low pressure systems and where the fluid is non-critical.

Our safety valves with bellows between the body and bonnet are designed for where there is excessive build-up of back pressure, where the fluid is highly viscous or contains solid fractions that could have a corrosive effect on inner parts, where there is media with a very high temperature, or where use of safety valves with lifting devices the environment should be 100% protected against pollution.

IMI CCI has process steam turbine bypass, steam conditioning and desuperheating products to ensure plant uptime and the most cost effective output. With class leading products, including BTG technology - IMI CCI are leaders in applications for sugar, ethanol, paper and pulp processing industries worldwide.

Our range of products serve high temperatures and ensure high repeatable quality, such as our range from IMI Z&J for production of float glass. IMI Th Jansen provides air separation valves used across the world and approved by process licensors for the production of oxygen, hydrogen and other gasses.

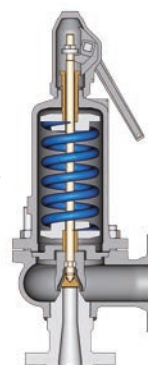
## Innovative technologies

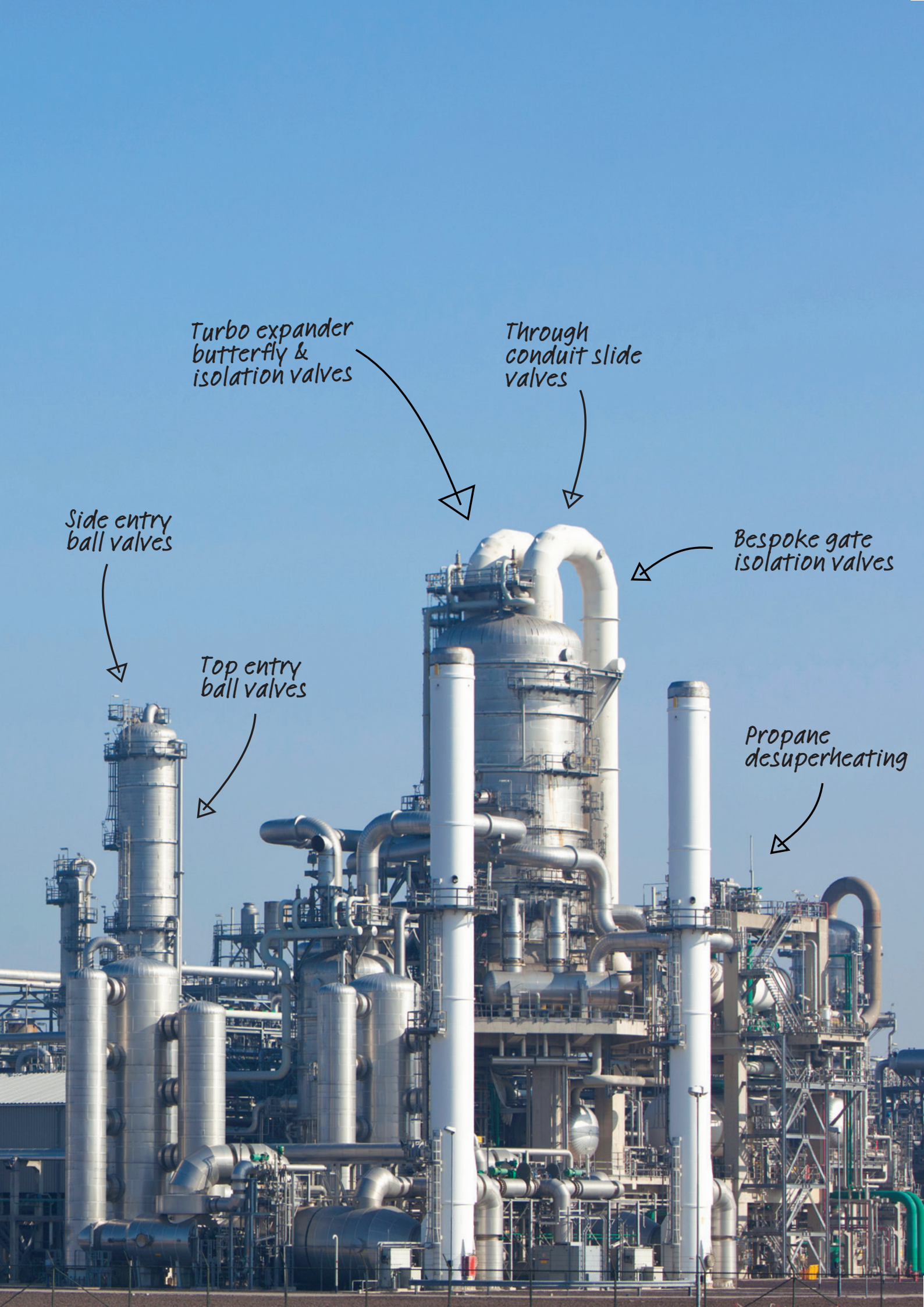
- > For vapour, gases and liquids
- > Protection of pressure vessels
- > Protection of heat exchangers
- > Suitable for all industrial applications
- > Chemical industry
- > Petrochemical industry
- > Technical gases
- > Cooling and oxygen applications
- > Power generation and power supply
- > Steam boiler up to PN 40

*Conventional safety valve*



*Economic for heating system and water use*





Turbo expander butterfly & isolation valves

Through conduit slide valves

Side entry ball valves

Bespoke gate isolation valves

Top entry ball valves

Propane desuperheating

Industry sector

# Aftermarket and Service

Engineering  
**GREAT Solutions**

 **IMI BOPP & REUTHER**

 **IMI CCI**

 **IMI CCI**

 **IMI ORTON**

 **IMI INTERATIVA**

 **IMI REMOSA**

 **IMI STI**

 **IMI TH JANSEN**

 **IMI TRUFLO MARINE**

 **IMI TRUFLO RONA**

 **IMI Z&J**

 **IMI ZIKESCH**

IMI Critical Engineering has always prided itself on best in class customer support of our products. Our reputation was built on solving customer's problems, resulting in IMI Critical businesses developing the products we have today to provide the robust, reliable and efficient service expected in the harshest of environments.

Our products are designed for the most extreme of environments – extremes of temperature, pressure, erosive media and severity of operation. Our engineers in IMI CCI, IMI Remosa or IMI Z&J in particular act as consultants partnering with customers through the design stage. It is crucial that we therefore support commissioning with our field service technicians – whenever and where ever your project is in the world.

We have our own in-house field service technician team, backed up with planners, coordinators and health & safety to ensure true 24 hour service capability - 7 days a week across the world.

With 15 manufacturing plants supported by service centres across the world, we can provide OEM parts to meet your outage or turnaround requirements. With portable workshops, we can set up on site to ensure outage or refinery turnarounds are managed to time and cost safely.

Our field service technicians can also support service and repair on any installed valves and regularly asked to replace, upgrade or repair competitor's valves due to performance or reliability issues. We have a team able to engineer upgrades and replacement to meet your existing installation and configuration. This is critical for major refinery projects, where existing infrastructure to support the valves must be used.

IMI Critical has over 250 field service technicians across the world. These are also supported by our world renowned Valve Doctors® for any plant operation issues you have. In addition with IMI Bopp & Reuther and IMI Zikesch we have built even further on our capability.

We can provide aftermarket services for every valve, across all phases of a valve's lifecycle, all over the world. This has added over 100 service technicians to the IMI CCI team with, 4 additional manufacturing facilities and an efficient back office, providing fast and effective support – assisting you from the erection and commissioning of the plant, through regular maintenance and any retrofits as may be required.

Since 1955, IMI Remosa has been operating in the field of industrial maintenance and specifically within refineries and petrochemical plants. With its proven experience in these areas, we are an excellent source of problem-solving as a consultant for engineering, retrofitting and repair work for any type of valve installed in FCC Units and Expander Power Recovery Units. This capability allows the replacement of the internals, along with the modification of the valve inside geometry, without removing the valve from the line.

IMI Z&J has a field service team which will oversee installation and commission of what are the largest valves in the world. We are experts in refinery turnarounds with technicians based out of our manufacturing locations in Duren, Germany and Houston, USA. Our expertise will ensure your plant is optimised whether it is delayed coking in petrochemical, blast furnaces in iron & steel mills or the glass industry.

*Valve Doctors  
solve your plant  
problems*

*More than 250  
service engineers*

*24 hour response  
to all global  
locations*

*Health and  
Safety of  
paramount  
importance*

*Turnarounds  
on refineries  
planned and  
managed*



# Our global reach

For more than 50 years, our business has been synonymous with innovation and performance in the severe service valve and controls industry. We have manufacturing operations in 19 countries and support our customers on the ground via local manufacturing facilities and our global service network, which includes 200 dedicated aftermarket specialists.

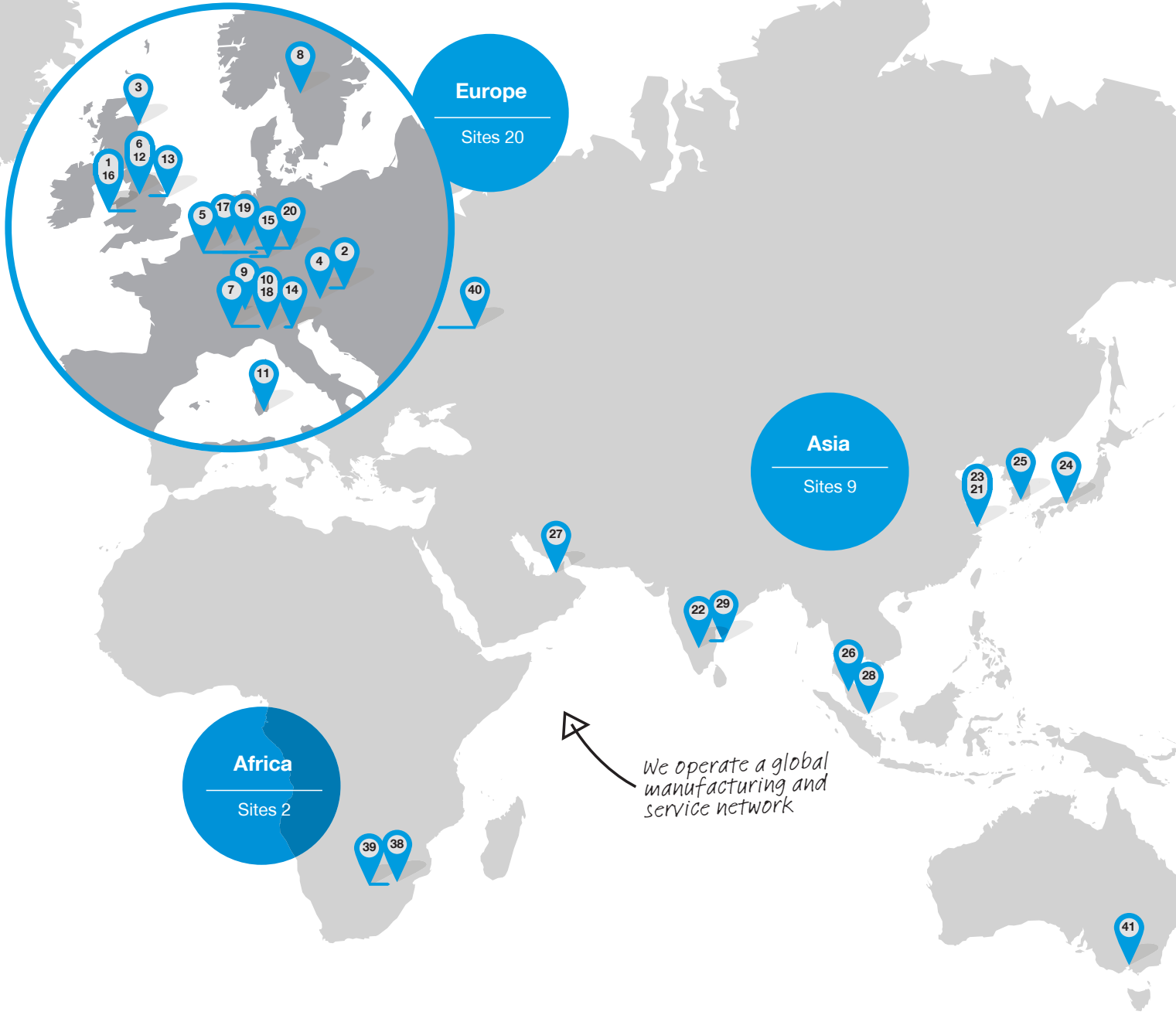


## Europe

<b>1</b> <b>IMI Critical Engineering HQ</b> Birmingham, UK	<b>6</b> <b>IMI CCI Manchester</b> Manchester UK	<b>11</b> <b>IMI Remosa</b> Cagliari Italy
<b>2</b> <b>IMI Bopp &amp; Reuther Mannheim</b> Mannheim, Germany	<b>7</b> <b>IMI CCI Milan</b> Milan Italy	<b>12</b> <b>IMI Scott</b> Manchester UK
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<b>17</b> <b>IMI Truflo Rona Belgium</b> Herstal Belgium	<b>22</b> <b>IMI CCI Bangalore</b> Karnataka India	<b>27</b> <b>IMI CCI Middle East</b> Dubai UAE
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<b>20</b> <b>IMI Zikesch Wesel</b> Wesel, Germany	<b>25</b> <b>IMI CCI Korea</b> Paju Korea	



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 Texas, USA

**31**  
**IMI CCI Houston**  
 Texas, USA

**32**  
**IMI CCI RSM**  
 California  
 USA

**33**  
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 PURCHASE ORDER NO : 4500039697  
 ITEM NO : ALL  
 ITEM DESCRIPTION : CONTROL VALVE

**FINAL  
(For Record)**

<input type="checkbox"/> APPROVED	<input type="checkbox"/> WITH COMMENT		
<input type="checkbox"/> REVIEWED	<input type="checkbox"/> RESUBMIT		
This approval or review does not relieve the vendor / subcontractor of his responsibilities to meet all requirements of the purchase order			
	ORIGINAL	CHEKED	APPD(PRJ)
SIGN			
DATE			
<b>SAMSUNG ENGINEERING CO., LTD</b>			

D01	2009-10-10	FINAL(FOR RECORD)	<i>HEA Jung KPM</i>		<i>Yun Hee Choi</i>
C01	Feb 28	FOR FINAL	<i>HEA Jung KPM</i>		<i>Yun Hee Choi</i>
A01	Nov 7	FOR APPROVAL	<i>HEA Jung KPM</i>		<i>Yun Hee Choi</i>
REV	DATE	DESCRIPTION	PREPARED BY	CHECKED BY	APPROVED BY



**SAUDI ARABIAN MINING COMPANY(MA'ADEN)**

**MA'ADEN AMMONIA PROJECT**



**WorleyParsons**  
resources & energy

**Worley Parsons**



**SAMSUNG ENGINEERING**

**SAMSUNG ENGINEERING CO., LTD.  
SEOUL KOREA**

**SECL PROJECT NO. : SC2158**



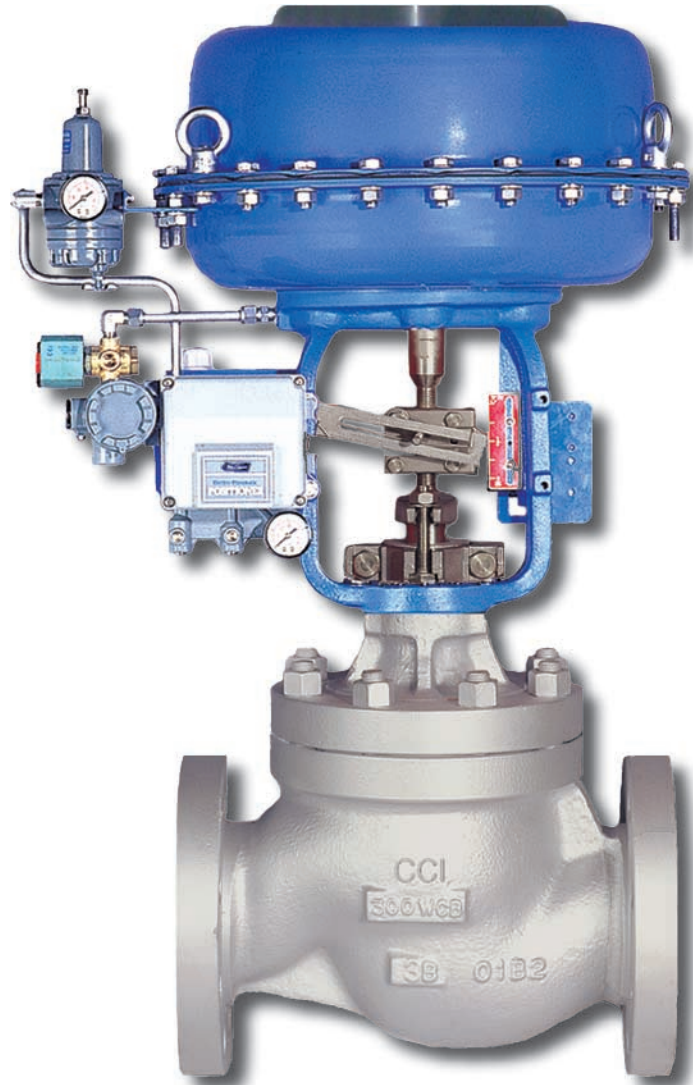
**Uhde GmbH**



**CCI Ltd.**



# Control Valves for General Applications



MD-502-7000-IN-GEN-1017-0027 D01

## CCI's 840G/840H delivers superior control performance and reliability.



**Figure 1: 840G Typical valve with diaphragm and handwheel or manual shutoff**

The series 840 cage-guided valve is specially designed using recent advancements in control valve technology. It is used to control a wide variety of relatively clean liquids and gases at high pressure differentials. Configured with either flow-to-open or flow-to-close trims, the valve is well suited for steam, gas or liquids, where flow-to-close is typically used for liquid service and flow-to-open for steam and gas.

The series 840 valve is flexible, allowing a variety of trim types to be installed in the body. In addition, its cage-guided construction reduces plug vibration and provides stable performance throughout travel. All 840 trims have a quick change design to guarantee convenient repair and easy trim replacement.

The design of the 840H (drilled-hole-cage) valve is primarily used for severe service applications requiring anti-cavitation or low-noise trim. In most cases, high pressure drop in process conditions may cause erosion, noise or vibration, which can affect process control. The 840H is a good solution to this severe service.

The flanged body design is configured to meet ISA S75.03 face to face dimensions. Weld end body configurations are available with socket weld ends through 2" size and butt weld ends through 16".

The CCI MSD-II spring-diaphragm actuator is standard for this product and is pre-selected by valve size. Built in reverse (spring close) or direct (spring open) acting configurations, this unit provides control and seat loading in line with industry values. Refer to the CCI MSD-II actuator catalog for more detailed information.

Standard materials allow compliance with NACE MR0175 and are also suitable for power plant and refinery applications. The soft seat option meets FCI 70-2 Class VI seat leakage.

### Specifications

Valve Size	1" through 20"
Ratings	ANSI Class 150 -2500 (DIN and JIS available) Table 2
End Connections	Raised Face Flange, Weld Ends (BW and SW)
Materials	Table 1
Temperature	Table 3
Flow Characterization	Linear on equal percentage to suit your application
Flow Coefficient	Table 4
Seat Leakage	Standard ANSI Class IV, Option-ANSI Class V or VI
Dimensions	Tables 5 and 6
Trim	Quick Change Trim (Single Port, Window-Cage, Drilled-Hole-Cage)

**Wide choice of design and material meet wide application requirements.**

Part	Material
Body & Bonnet	Carbon Steel, Stainless Steel, Alloy Steel, Monel, Hastelloy B/C, Alloy 20, Titanium, Bronze, Al-Bronze, Duplex Nickel, Other Casting, Forged Material
Trim	316SS, 316L, A20, 410SS, UNS31803, Hastelloy B/C, 17-4PH, Monel, Ni-Alloy, Al-Bronze, Titanium
Gasket	Spiral Wound: 304 or 316SS with Teflon, Grafoil Flat: Teflon, Grafoil, Soft Filters
Balance Seal	Glass Filled TFE, EPDM, Viton, Graphite, Inconel, Carbon
Packing	V-TFE, Glass Filled Teflon, Graphite, Bellows Seal

Valve Size	ANSI Class Ratings					
	#150	#300	#600	#900	#1500	#2500
~1"	*	*	*			
1 1/2"	*	*	*			
2"	*	*	*			
3"						
4"						
6"						
8"						
10"						
12"						
14"~16"						
18"~20"						

**Table 2: Range of Supply: Series 840 Valve End Connections: RF, RTJ, BW (if required, SW connections can be supplied in sizes marked with\*)**

**Table 1: Materials**



**Wide Application**

Power: NPP, TPP, CCPP, Co-Gen, DH

Oil & Gas: Onshore, Offshore, Refinery

Petro-chem: NCC, Ethylene, BTX, PS, SM, VCM, PVC, LDPE, HDPE

Fine-Chem: HCL, H<sub>2</sub>SO<sub>4</sub>, NHO<sub>3</sub>, Acetit Acid, PTA, AN, NH<sub>3</sub>, Pulp & Paper

Chemical: Dyes, Cosmetics, Caprolaktam

Cryogenic: LNG

**Accessories**

All types are available to meet requirements

**Fail Mode**

Fail-to-close on loss of air is standard. Fail-to-open on loss of air is also available.

Diaphragm, piston, hydraulic, and electric actuation is available.

**Quick Change Trim**

All internal parts can be inspected easily by removing bonnet and cage.

**Multi-spring**

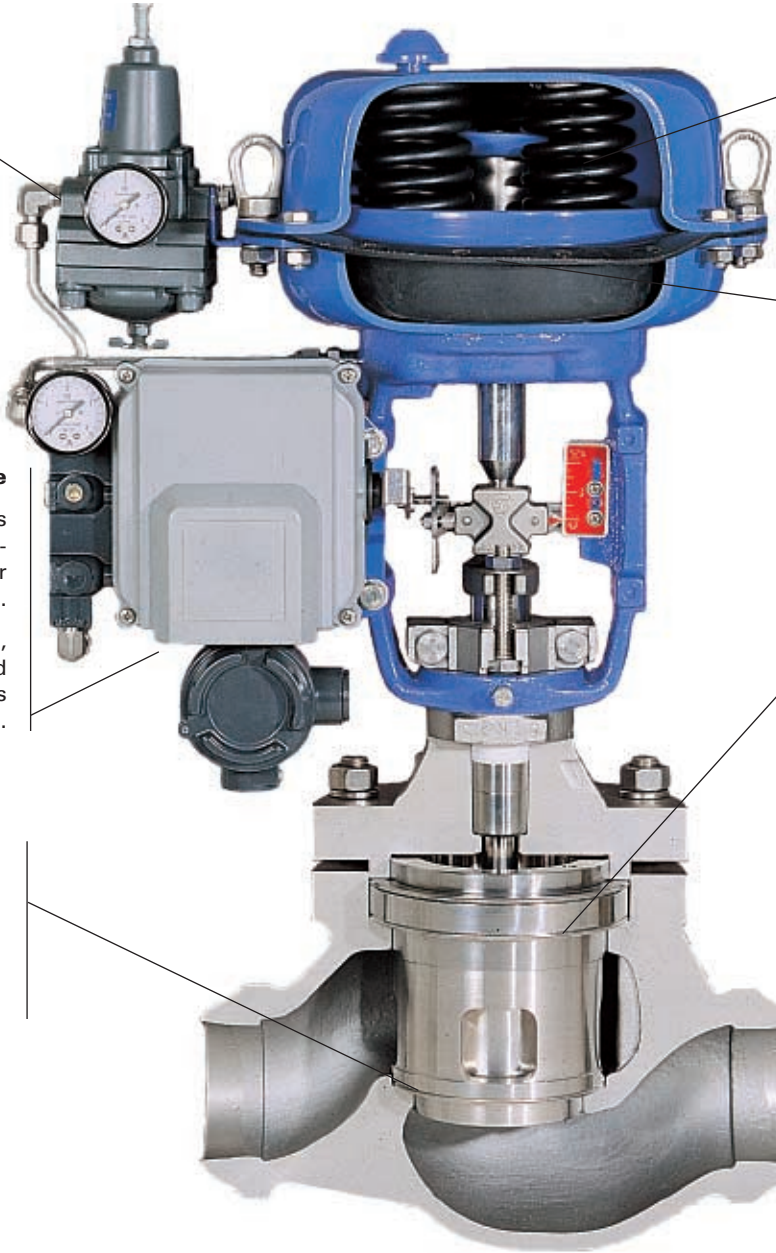
Multi-spring design allows very low hysteresis and dead band.

**Rolling Diaphragm Actuator**

Rolling Diaphragm design minimizes variance of effective pressure area and increases accuracy

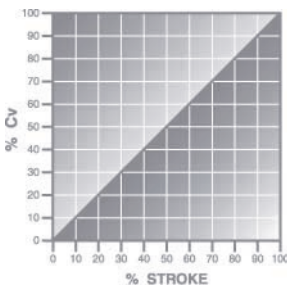
**Proven Trim Design**

Single P-port, multi-step, V-notch type cage

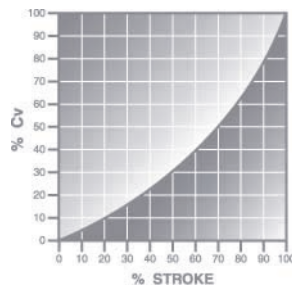


**Valve Performance Characteristics (% Cv vs. % Stroke)**

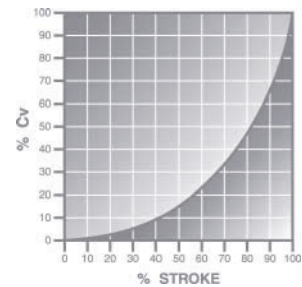
Valves are custom characterized to accommodate a wide range of variables.



**Linear**



**Modified Equal Percentage**



**Equal Percentage**

MD-502-7000-IN-GEN-1017-0027 D01

## All the benefits of CCI's proven technology combined with a full compliment of features.

### Features

- Simple to change capacity and characteristics: A simple cage change is all that is required to change between reduced and full-sized capacity trims or between linear and equal percentage characteristics.
- Tight shutoff: A variety of shutoff classes from ANSI IV through VI are available to meet application requirements.
- Sour gas/corrosive fluid capable: The wide choice of body and trim materials allows the series 840 valves to be applied to corrosive/sour gas services with full compliance to NACE requirements.
- Easy maintenance: Top-entry design and a cage-retained seat ring allow for quick inspection or trim change.

Valve Trim	ANSI Class	Seat Type	Bonnet Type		Seat Leakage
			Standard	Extended	
1/2"~4"	#150 through #900	Soft	-30C ~ 230C	-196C ~ 230C	VI
	#150 through #2500	Metal	-30C ~ 300C	-196C ~ 565C	IV, V
6"~20"	#150 through #600	Soft	-30C ~ 230C	-196C ~ 230C	VI
	#150 through #2500	Metal	-30C ~ 300C	-196C ~ 565C	IV, V

**Table 3: Temperature Range Series 840 Valves**

### Series 840 Valves Model Classification

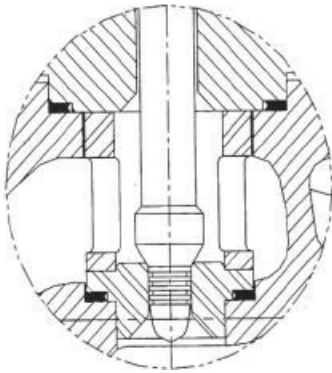
1st		2nd	
Body Design		Trim Design	
840	Globe	G	Cage Guide, Top Guide
860	Angle	H	Drilled Hole Cage
830	3 Way	T	3 Way (Diverting, Mixing)
800	Severe Globe	D	Standard DRAG®
		TBS	Turbine Bypass

For more detail of models, please contact your authorized CCI representative.

## Series 840 valve quick change trim for ease of maintenance

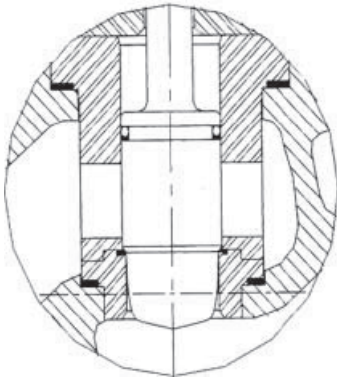
### Quick Change Trim

"Quick Change Trim" is now a popular and basic requirement for all types of control valves. According to the Practical Guide to Control Valves edited by Instrument Society of America (ISA), "Valve Trim shall be of the Quick Change type for ease of maintenance, no internal components shall be screwed or welded into the valve bodies or bonnets. Trim shall be designed to provide equal pressurization around the plug in order to minimize vibration and prevent any potential problem from binding."



### Quick Change Trim

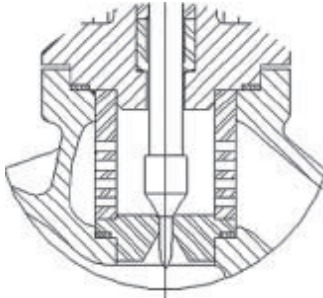
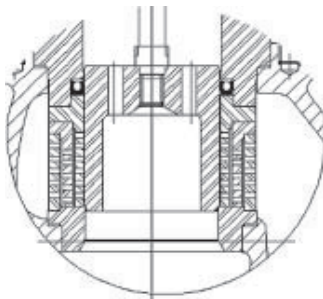
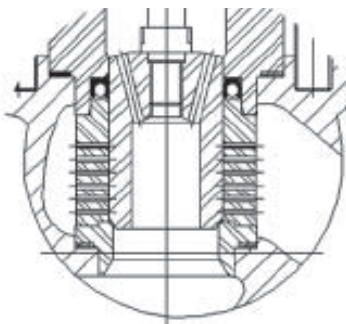
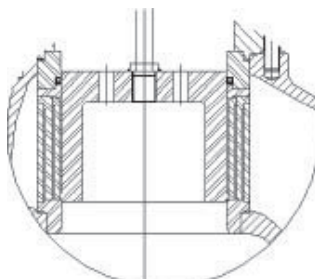
Unbalanced Design, Multi-step, (Cascade) Trim, EQ%



### Quick Change Trim

Cage Guide Design, Balanced Trim, Metal/Soft Seat

Figure 2: Quick Change Trim

**Anti-Cavitation****Multi-Stage Anti-Cavitation****Low-Noise****Multi-Stage Low-Noise****Figure 3: Stages****Drilled-Hole-Cage/ 840H**

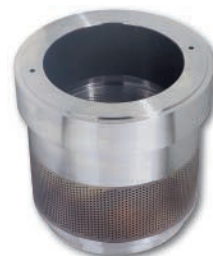
The 840H Drilled-Hole-Cage trim provides proven performance in high pressure drop applications without cavitation, noise, erosion and vibration—common problems associated with general trim design. The Drilled-Hole-Cage trim design is suitable for most pressure drop services except very severe services with very high pressure drop.

**Anti-Cavitation**

Cavitation occurs in liquid process when local pressure fluctuations near the liquid vapor pressure result in the sudden growth and collapse of vapor bubbles (cavities) in downstream liquid. Cavitation often produces high levels of noise and vibration in the system. To avoid this cavitation problem, the right number of multi-stage and multi-path trim design should be adopted.

**Low-Noise**

High mass flow and/or pressure drop in compressible fluids like gas or steam is a major source of noise and accompanies vibration in the system. The right source treatment depends on the right multi-path, multi-stage trim. CCI Drilled- Hole-Cage design provides noise attenuation in a modular design.



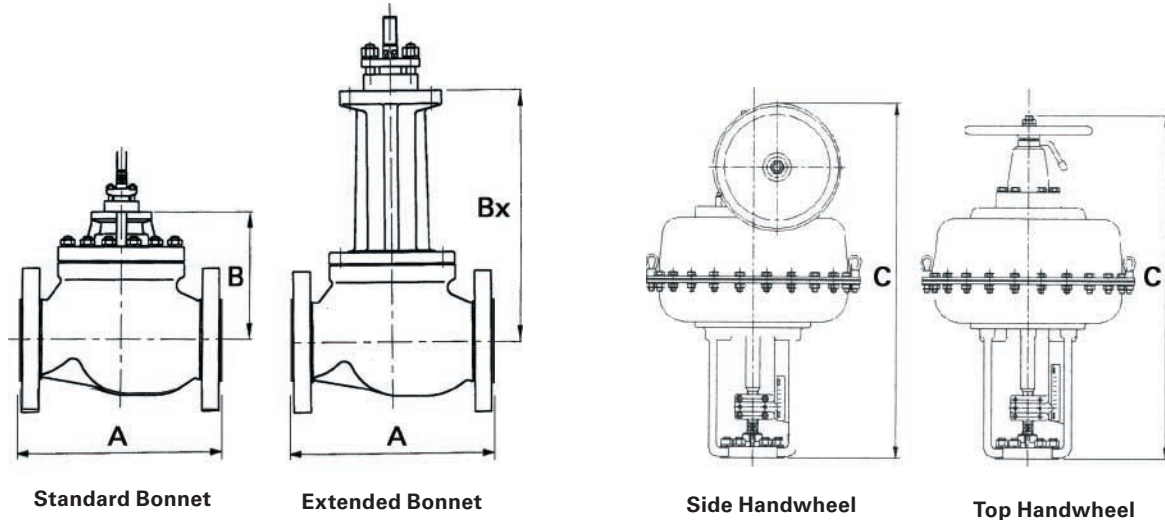


MD-502-7000-IN-GEN-1017-0027 D01

## Rated Series 840 Valve Capacity (CV)

			840G / Standard Cage						840H / Drilled Hole Cage					
			ANSI Class						ANSI Class					
(Inches)			#150~300		#400~600		#900~1500		#150~300		#400~600		#900~1500	
Body Size	Stroke	Plug Size	Linear	EQ%	Linear	EQ%	Linear	EQ%	Linear	EQ%	Linear	EQ%	Linear	EQ%
3/4	0.4	1/8	0.1	0.1	0.1	0.1								
		5/32	0.2	0.2	0.2	0.2								
	0.8	1/4	0.8	0.8	0.8	0.8								
		3/8	3.0	3.0	3.0	3.0	3.0	3.0						
		1/2	5.2	5.2	5.2	5.2	5.2	5.2						
		5/8	7.0	7.0	7.0	7.0	7.0	7.0						
		3/4	9.0	9.0	9.0	9.0	9.0	9.0						
1	0.4	1/8	0.1	0.1	0.1	0.1								
		5/32	0.2	0.2	0.2	0.2								
	0.8	1/4	0.8	0.8	0.8	0.8								
		3/8	3.0	3.0	3.0	3.0	3.0	3.0						
		1/2	5.2	5.2	5.2	5.2	5.2	5.2						
		5/8	7.0	7.0	7.0	7.0	7.0	7.0						
		3/4	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
1	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0		
1 1/2	1.2	1 1/2	30	30	30	30	30	30	26	24	26	24	26	24
2	1.6	2	55	55	55	55	52	52	40	40	40	40	40	40
2 1/2	1.6	2 1/2	75	75	75	75	75	75	65	60	65	60	65	60
3	2.0	3	110	110	110	110	105	95	95	90	95	90	95	90
4	2.0	4	190	190	190	190	180	170	160	140	160	140	150	140
5	2.8	5	280	280	280	280			250	220	250	220	250	220
6	2.8	6	400	400	400	400	360	320	340	290	340	290	330	290
8	4.0	8	740	740	625	570	590	545	620	560	530	480	530	480
10	4.0	10	1050	1050	940	835	890	770	850	700	760	670	760	670
12	5.2	12	1650	1650	1500	1340	1150	1000	1300	1100	1300	1100	870	720
14	5.2	13	2000	2000	1790	1550			1480	1140	1450	1250		
16	5.2	15	2700	2700	2100	1800			2300	2000	1850	1850		

Table 4: For valve sizes greater than 16", consult with factory



End	ANSI Class																			
	#150				#300				#600				#900				#1500			
	A		B	Bx	A		B	Bx	A		B	Bx	A		B	Bx	A		B	Bx
RF	BW	RF			BW	RF			BW	RF			BW	RF			BW	RF		
1"	184	210	146	275	197	210	146	275	210	210	146	275	273	279	190	350	273	279	190	350
1 1/2"	222	251	146	275	235	251	146	275	251	251	146	275	333	330	190	350	333	330	190	350
2"	254	286	159	340	267	286	159	340	286	286	159	340	375	375	225	444	375	375	225	444
2 1/2"	275	292	180	350	292	292	180	350	311	311	250	366	410	410	200	480	410	410	266	480
3"	298	318	206	440	318	318	206	440	337	337	227	463	441	460	304	524	460	460	304	524
4"	352	368	239	504	368	368	239	504	394	394	285	530	511	530	345	600	530	530	345	600
5"	403	425	300	590	425	425	300	590	457	457	310	630	514	533	400	650	533	533	400	650
6"	451	473	316	630	473	473	316	630	508	508	327	720	714	768	440	851	768	768	440	851
8"	543	566	365	630	566	566	316	630	610	610	327	720	814	832	440	851	972	832	440	851
10"	673	708	405	720	708	708	465	775	752	752	450	878	991	991	460	860	1067	991	460	860
12"	737	775	445	775	775	775	445	775	920	920	465	920	1130	1130	500	1005	1219	1130	500	1005
14"	889	927	515		927	927	515													
16"	1057	1057	515		1057	1057	515													

Table 5: Face-to-Face (A) and Height (B, Bx) Dimension in mm

Item Size	290	340	400	500	650
Standard	390	420	510	660	870
Top Handwheel	590	640	780	1000	
Side Handwheel			750	980	1230

Table 6: Diaphragm Actuator Height (Top to Bottom Yoke in mm) (C)

**Valve Model:**

**840G**



**840H**



**Body Configuration:**

Globe (casting, forging) Under/Over Flow, RF, BW, SW, RTJ

Globe (casting, forging) Under/Over Flow, RF, BW, SW, RTJ

**Trim Design:**

Quick Change Trim, Window Cage, Top-Guided, Cage-Guided

Drilled-Hole-Cage, Anti-Cavitation, Low-Noise Design, 1 Stage, Multi-Stage

**Leakage Class:**

ANSI IV, V, VI (soft), EQ%, Linear, Quick Open

ANSI IV, V, VI (soft), EQ%, Linear Modified Linear

**Design Feature:**

- Quick Response
- High Resolution
- Easy Maintenance
- Wide Application
- Top Entry Servicing
- Easy Maintenance
- Fail Mode, Manual Override

- Anti-Cavitation Trim
- Low-Noise Trim
- High Rangeability
- Built for Severe Service
- Compact, Easy Maintenance

**Size & ANSI Class:**

Valve Size	150	300	600	900	1500	2500
~6"						
~12"						
~20"						

Valve Size	150	300	600	900	1500	2500
~6"						
~12"						
~20"						

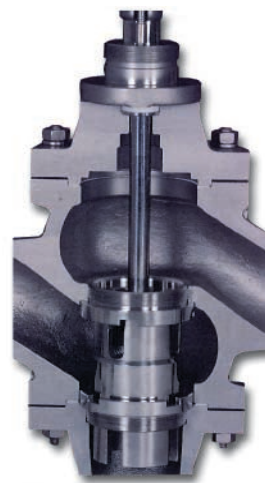
**860G**



**860H**



**830T**



Angle (casting, forging) Under/Over Flow, RF, BW

Angle (casting, forging) Under/Over Flow, RF, BW

3 Way, Diverting, Mixing, BW, RF

Quick Change Trim, Window Cage, Top Guided, Cage Guided

Drilled-Hole-Cage, Anti-Cavitation, Low Noise Design, 1 Stage, Multi- Stage

Linear, Full or Reduced Port

ANSI IV, V, VI (soft), EQ%, Linear, Quick Open

ANSI IV, V, VI (soft), EQ%, Linear, Modified Linear

ANSI III, IV

- Quick Response
- High Resolution
- Easy Maintenance
- Wide Application
- Top Entry Servicing
- Easy Maintenance
- Fail Mode, Manual Override

- Anti-Cavitation Trim
- Low-Noise Trim
- High Rangeability
- Built for Severe Service
- Compact, Easy Maintenance
- Recommendable for Flashing Application

- High Capacity
- Stable Operation with Cage Guiding
- Durability by Rugged Structure
- Various Body and Trim Design
- QA in Accordance to ANSI B16.34

Valve Size	150	300	600	900	1500	2500
~6"						
~12"						
~20"						

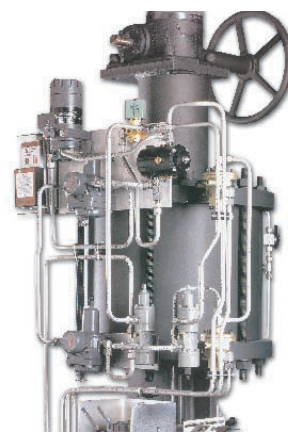
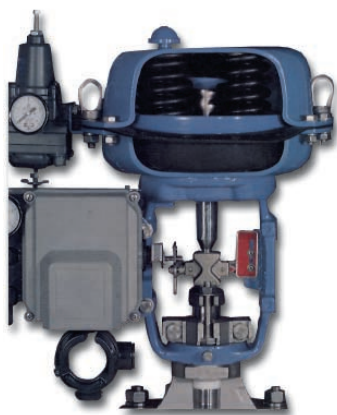
Valve Size	150	300	600	900	1500	2500
~6"						
~12"						
~20"						

Valve Size	150	300	600	900
~12"				
~20"				

**Pneumatic Actuators:**

**MSD II Diaphragm**

**Piston**



**Type:**

Multi-Spring Rolling Diaphragm

Double Acting or Spring Return Piston

**Action:**

Direct Acting (DA) for Fail Open,  
Reverse Action (RA) for Fail Close

Fail Open, Fail Close or Fail In Place

**Material:**

Case: Carbon Steel  
Yoke: Carbon Steel  
Diaphragm: EPDM + Nylon

Cylinder: Amalgon  
Shaft: Stainless Steel  
End Cap: Aluminum  
Yoke: Carbon Steel

**Manual Override:**

Top Mounted or Side Gear

Hand Wheel with Gear Box

**Design Features:**

- Low Hysteresis, Dead Band
- Low Air Consumption
- Extra Long Lifetime
- Quick Response

- High Resolution
- Dynamic Response
- Very Fast Stroking Speed
- Very Low Dead Band, Hysteresis, Linerarity

**Size & Stroke:**

Dia	Stroke
290	40mm
340	50mm
400	70mm
500	70mm
500L	100mm
650	130mm

Area	Stroke
50	6"
113	~12"
200	~18"
313	~24"
400	~24"

## Positioner



### Electro-Pneumatic (E/P)

Input: 4 – 20 mA DC,  
AC below 24 V  
Enclosure: Exdm II B(C) T6  
Exia II BT6 IP66



### Pneumatic-Pneumatic (P/P)

Input: 3 – 15 Psi (0.2 -7kgf/cm<sup>3</sup>)  
Supply: 20 – 100 Psi (1.4 -7.0 kgf/cm<sup>3</sup>)



### Intelligent Positioner

Input: 4 – 20 mA DC, AC  
Smart/HART Protocol  
Fieldbus/Profibus

### I/ P Transducer



### Position Transmitter

Output: 4 – 20 mA DC, AC  
Protection: IP67

## Air Handling Parts



### Air Filter Regulator

Max Supply Pressure: 15 kgf/cm<sup>3</sup>  
Max Output Pressure: 4 - 7 kgf/cm<sup>3</sup>  
Aluminum, Stainless  
Aluminium with Epoxy Coating for  
Offshore Application



### Volume Booster

Max Supply: 10 kfg/cm<sup>3</sup>  
Max In/Output: 7 kgf/cm<sup>3</sup>

## Others

### Solenoid

12 VAC, 12 VDC  
24 VAC, 24 VDC

### Limit Switch

Lever, Proximity

### Lock Up Valve

### Quick Exhaust Valve





CCI is the world's leading manufacturer and supplier of control valve solutions. The company has a proven track record of solving customers' control valve problems with its unique DRAG® tortuous path valve technology.

CCI has earned a distinguished reputation in the severe service valve industry since it designed, built and patented the first DRAG® valve in 1967. From this first DRAG® valve came the vision for a series of products that revolutionized the severe service control valve industry. The strategic acquisition of Sulzer's valve and control division in 1997 and BTG Valves in 2001, complimented CCI's position as the leader in severe service.

Since 1996, CCI has produced conventional control valves in its Kimpo, Korea plant, producing ported cage and drilled-hole-cage valves suitable for general or less severe service applications.

CCI is the only valve company in the world dedicated to solving problems in severe service valves. Over 35% of CCI's workforce are graduate engineers, giving CCI the highest percentage of graduate engineers in the control valve industry. In addition to design engineering and technical support, CCI engineers are utilized in sales, project management, quality assurance, procurement & manufacturing.

CCI has manufacturing, sales and service locations strategically located worldwide to offer expert help with your specific problem applications.



CCI BTG Valve



CCI Globe Valve



CCI Spraywater Valve



**Engineering**

CCI's engineers work in close contact with the company's sales and service organizations with a view to ensuring the right products are chosen for particular installations and that they perform as intended once they are installed. CCI's continuing commitment to research and product development is its guarantee that it will continue to meet the requirements in the future.

**CCI's Quality Assurance Program**

CCI's Quality Assurance program is a system of planned actions designed to ensure that all requirements are applied to all activities affecting the construction and function of our products. The program executes quality assurance policies and procedures; ensures compliance with contractual requirements; and certifies conformance to governing codes, specifications and standards.



CCI 100D Valve



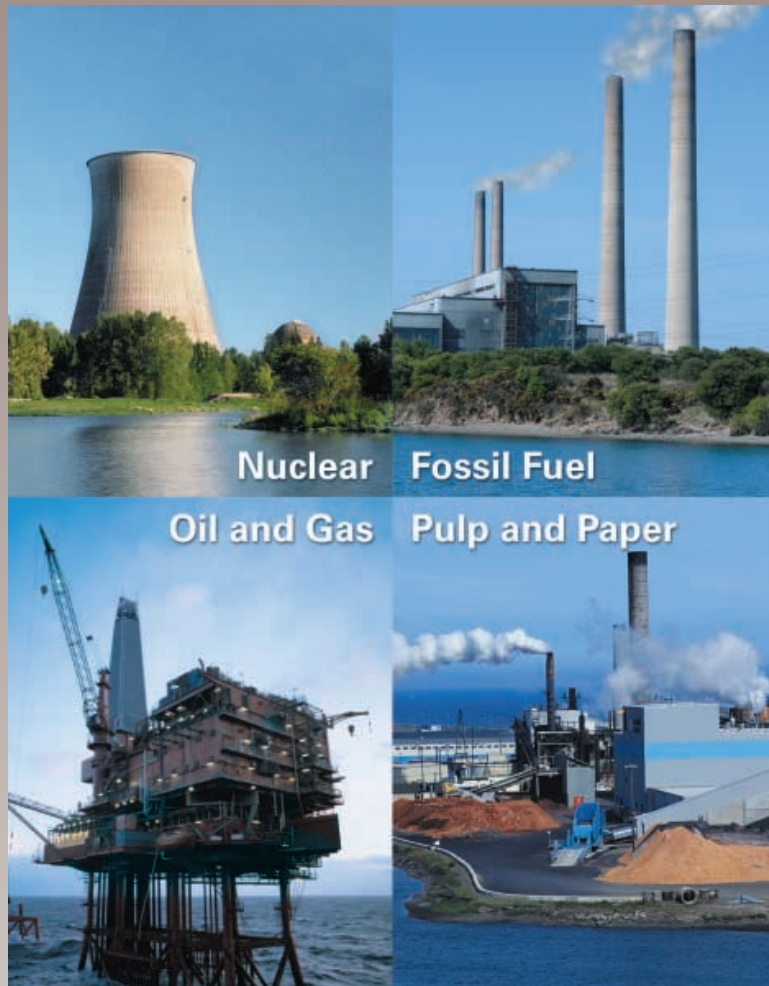
CCI Choke Valve



CCI Steamjet Valve



Throughout the world, companies turn to CCI to solve their severe service control valve problems. CCI has provided custom solutions for these and other industry applications for more than 30 years.



Nuclear

Fossil Fuel

Oil and Gas

Pulp and Paper

**Sales and service locations worldwide.**

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 Fax: (949) 858-1878  
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 USA

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 Carlberggasse 38/Pf.19  
 1233 Vienna  
 Austria



**We Solve Control Valve Problems**



**Contact us at:**  
[info@ccivalve.com](mailto:info@ccivalve.com)

**Visit us online at:**  
[www.ccivalve.com](http://www.ccivalve.com)

# MSD II ACTUATORS

The MSD II is a pneumatic, spring-opposed diaphragm actuator operating from plant air. Excellent long-term accuracy and reliability is achieved through the use of multiple springs in the actuator.

The rugged one-piece yoke, the pressed steel diaphragm case and the special nylon reinforced diaphragm provide dependable, high thrust performance. Additionally, the precision formed diaphragm eliminates friction and reduces variations in the effective area during operation which, in turn, results in exceptional linearity.

An optional top or side-mounted manual override is available on both direct and reverse acting actuators. Six different sizes of the MSD II actuators with various accessories can virtually satisfy all application requirements.

## Features

**Excellent Performance:** As a multi-spring type, operation is precise and repeatability is excellent minimizing the hysteresis error.

**Fast Response:** The pressure-tight chamber to which air pressure is connected has a small volume for fast response.

**Rugged Construction:** All parts are engineered and tested for long life under millions of cycles.

## Specifications

<b>Type:</b>	Multi-spring opposed rolling diaphragm
<b>Action:</b>	Direct Acting (DA) Reverse Acting (RA)
<b>Materials:</b>	See Table 1 on Page 3
<b>Operating Temperature</b>	-20°F to 180°F (-30°C to 80°C)
<b>Operating Pressure:</b>	See Table 2 on Page 4
<b>Maximum Stroke</b>	0.8 in. to 5 in. (20mm to 130mm)
<b>Manual Override</b>	Top mounted (all sizes) or Side mounted (400, 500, 650 only)
<b>Accessories:</b>	Positioner, filter regulator, solenoid valve, limit switches, position transmitter, booster and transducer are available for actuator mounting.
<b>Dimensions:</b>	See Tables 3, 4 and 5 on Pages 5, 6 and 7

Actuator Size	Effective Diaphragm (inch <sup>2</sup> /cm <sup>2</sup> )	Actuator Stem Size Diameter ø(mm)	Maximum Stroke (inch/mm)	Thrust at 3psi (lbs/Kgf)	Max Allowable Operating Pressure (psig)/(Kg/cm <sup>2</sup> G)
250	42/270	1/25	0.8/20	120/54	70/5
290	53/340	1/25	1.6/40	150/68	70/5
340	82/530	1/25	2.0/50	235/106	60/4
400	116/750	1.3/32	2.8/70	330/150	60/4
500	194/1250	1.3/32	2.8/70	550/250	60/4
500L	194/1250	1.3/32	4.0/100	550/250	60/4
650	326/2100	1.3/32	5.1/130	925/420	60/4

Table 1 MSD II Actuator Assembly Materials

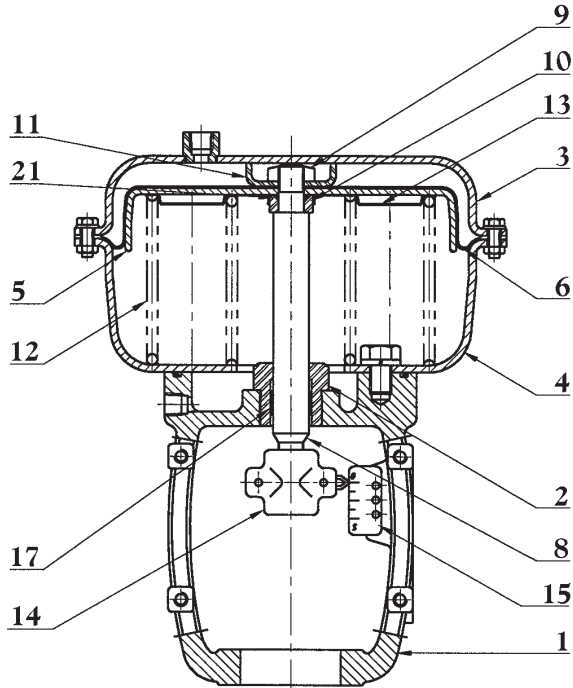


Figure 1  
Direct Acting (DA)

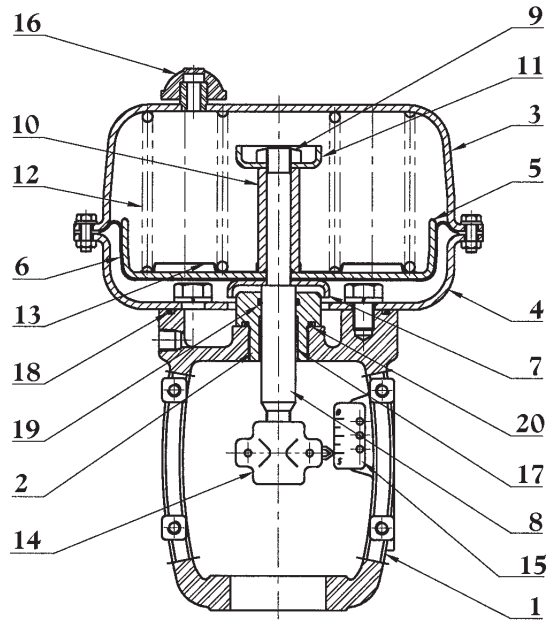


Figure 2  
Reverse Acting (RA)

NO.	PART NAME	MATERIAL
1	Yoke	Cast Steel (A216 WCB) Nodular Cast Iron (A395)
2	Guide Bushing	Brass
3	Upper Diaph. Case	Carbon Steel
4	Lower Diaph. Case	Carbon Steel
5	Diaph. Plate	Carbon Steel
6	Diaphragm	EPDM / Nylon
7	Diaph. Washer	304 SS
8	Actuator Stem	316 SS
9	Stem Nut	304 SS
10	Spacer	304 SS
11	Stopper	304 SS
12	Spring	Spring Steel
13	Spring Guide	304 SS
14	Stem Clamp	304 SS
15	Travel Indicator	304 SS
16	Venting Cap	Brass
17	DU-Bearing	Graphite / 316 SS
18	O-Ring	EPDM
19	O-Ring	EPDM
20	O-Ring	EPDM
21	O-Ring	EPDM

Table 2 Operating Spring Range

Unit: (psi) / (kg/cm<sup>2</sup>), (inch/

Actuator Size	Off-Balance Pressure	RA (Air Fail Close)			DA (Air Fail Open)		
		Spring Range	Set Pressure	Stroke	Spring Range	Set Pressure	Stroke
250	3/0.2	3~ 15/0.2~ 1.0	21/1.4	0.8/20	3~ 15/0.2~ 1.0	21/1.4	0.8/20
	6/0.4	8~ 18/0.4~ 1.2	24/1.6	0.8/20	6~ 18/0.4~ 1.2	27/1.8	0.8/20
	9/0.6	9~ 18/0.6~ 1.2	24/1.6	0.8/20	6~ 12/0.4~ 1.2	30/2.0	0.8/20
	12/0.8	12~ 21/0.8~ 1.4	27/1.8	0.8/20	6~ 18/0.4~ 1.2	33/2.2	0.8/20
290	3/0.2	3~ 15/0.2~ 1.0	21/1.4	1.6/40	3~ 15/0.2~ 1.0	21/1.4	1.6/40
		3~ 15/0.2~ 1.0	21/1.4	2.0/50	3~ 15/0.2~ 1.0	21/1.4	2.0/50
	6/0.4	6~ 18/0.4~ 1.2	24/1.6	0.8/20	6~ 18/0.4~ 2.0	39/2.6	1.2/30
		6~ 30/0.4~ 2.0	36/2.4	1.2/30	6~ 30/0.4~ 2.0	39/2.6	1.2/30
	9/0.6				6~ 18/0.4~ 1.2	30/2.0	0.6/20
					6~ 30/0.4~ 2.0	42/2.6	1.2/30
12/0.8	12~ 24/0.8~ 1.6	30/2.0	0.8/20	6~ 18/0.4~ 1.2	33/2.2	0.6/20	
				6~ 30/0.4~ 2.0	45/3.0	1.2/30	
	3/0.2	3~ 15/0.2~ 1.0	21/14	1.6/40	3~ 15/0.2~ 1.0	21/14	1.6/40
	3/0.2	3~ 15/0.2~ 1.0	20/50	1.6/40	3~ 15/0.2~ 1.0	21/14	2.0/50
340	6/0.4	3~ 15/0.2~ 1.0	24/1.6	1.6/40	3~ 15/0.2~ 1.0	24/1.6	1.6/40
		6~ 30/0.4~ 2.0	36/2.4	1.6/40	6~ 30/0.4~ 2.0	39/2.6	1.6/40
	9/0.6	9~ 27/0.6~ 1.8	38/2.2	1.6/40	6~ 30/0.4~ 2.0	42/2.8	1.6/40
	12/0.8	12~ 30/0.8~ 2.0	36/2.4	1.2/30	6~ 24/0.4~ 1.6	39/2.6	1.2/30
	16/1.2	18~ 30/1.2~ 2.0	36/2.4	0.8/20	6~ 18/0.4~ 1.2	39/2.6	0.8/20
400	5/0.2	3~ 15/0.2~ 1.0	21/1.4	2.0/50	3~ 15/0.2~ 1.0	21/1.4	2.0/50
		3~ 15/0.2~ 1.0	21/1.4	2.8/70	3~ 15/0.2~ 1.0	21/1.4	2.8/70
	6/0.4	6~ 18/0.4~ 1.2	24/1.6	2.0/50	6~ 18/0.4~ 1.2	27/1.8	2.0/50
		6~ 18/0.4~ 1.2	24/1.6	1.6/40	6~ 18/0.4~ 1.2	27/1.8	1.6/40
	9/0.6	9~ 21/0.6~ 1.4	27/1.8	1.6/40	6~ 18/0.4~ 1.2	30/2.0	1.6/40
		9~ 27/0.6~ 1.8	33/2.2	12.0/50	6~ 18/0.4~ 1.2	30/2.0	2.0/50
	12/0.8	12~ 21/0.8~ 1.4	27/1.8	1.2/30			
12~ 21/0.8~ 1.4		27/1.8	1.8/40	8~ 18/0.4~ 1.2	33/2.2	1.6/40	
12~ 30/0.8~ 2.0		36/2.4	2.0/50				
500 500L	3/0.2	3~ 15/0.2~ 1.0	21/1.4	2.8/70	3~ 15/0.2~ 1.0	21/1.4	2.8/70
		3~ 15/0.2~ 1.0	21/1.4	4.0/100	3~ 15/0.2~ 1.0	21/1.4	4.0/100
	6/0.4	6~ 18/0.4~ 1.2	24/1.6	2.8/70	3~ 15/0.2~ 1.0	24/1.6	2.8/70
		6~ 18/0.4~ 1.2	24/1.6	2.8/70	3~ 15/0.2~ 1.0	24/1.6	4.0/100
		6~ 30/0.4~ 2.0	36/2.4	2.6/70	6~ 30/0.4~ 2.0	36/2.4	2.6/70
	9/0.6	9~ 21/0.6~ 1.4	27/1.6	2.0/50	9~ 21/0.6~ 1.4	33/2.2	2.0/50
12/0.8	12~ 30/0.8~ 2.0	36/2.4	2.0/50	6~ 24/0.4~ 1.6	39/2.6	2.0/50	
650	3/0.2	3~ 15/0.2~ 1.0	21/1.4	5.0/130	3~ 15/0.2~ 1.0	21/1.4	5.0/130
	6/0.4	6~ 18/0.4~ 1.2	21/1.6	5.0/130	6~ 18/0.4~ 1.2	21/1.6	5.0/130

Table 3 Standard Actuator Dimensions

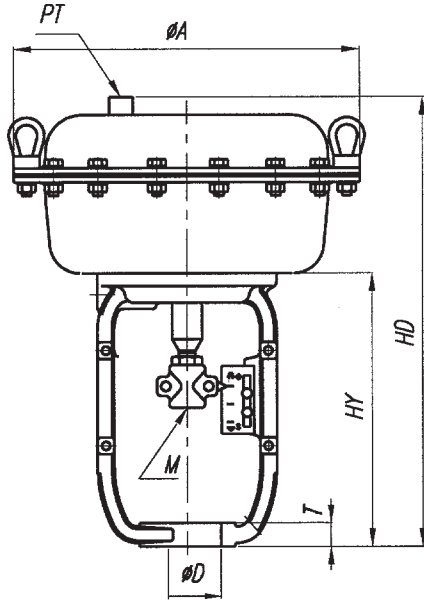


Figure 3 Direct Acting (DA)

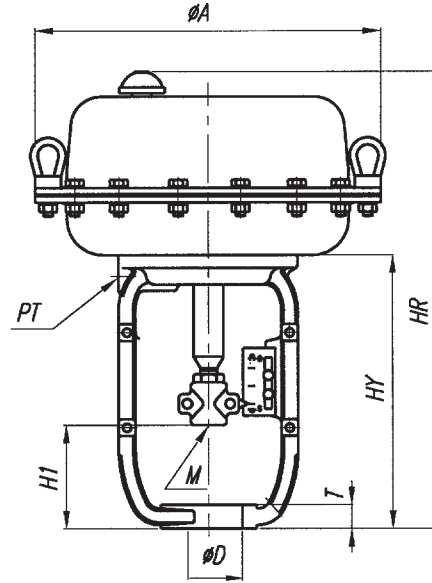


Figure 4 Reverse Acting (RA)

Unit: inch/mm

Size	250	290	340	400	500	500L	650
øA	9.8/250	11.4/290	13.4/340	15.8/400	19.7/500	19.7/500	25.6/650
HD	13.2/335	14.8/375	15.5/400	18.1/460	22.0/558	22.0/588	29.5/750
HR	13.6/345	15.2/385	16.1/410	18.5/470	22.4/568	23.5/598	29.7/753
HY	7.9/200	9.1/230	9.1/230	9.8/250	11.8/300	11.8/300	14.4/366
H1	3.0/75			3.6/92	3.8/97	4.0/102	4.8/122
øD	2.2/56			3.2/80			3.9/100
T	0.8/20			1.0/25			1.6/40
M	M14 * 1.5P			M24 * 1.5P			
PT	1/4"						3/8"

Note: All dimensions are for reference only

Table 4 Dimensions (With Top-Mounted Manual Override)

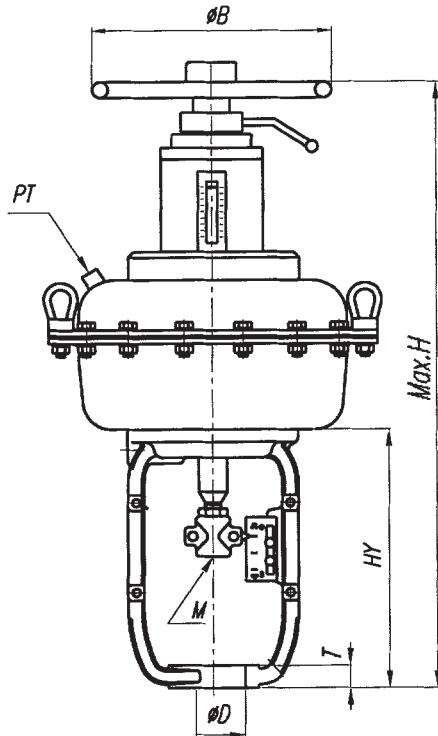


Figure 5 Direct Acting (DA)

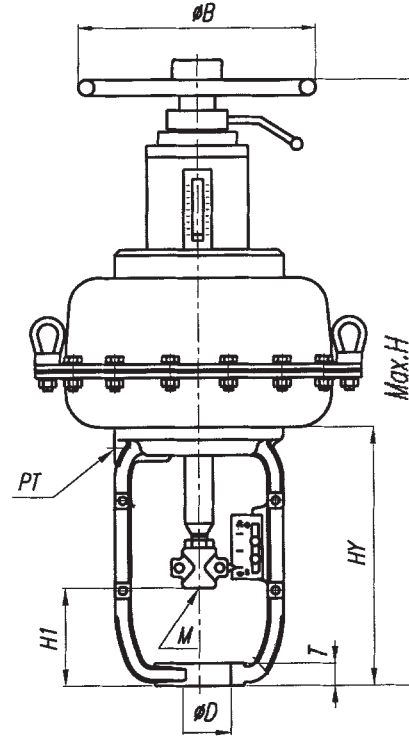


Figure 6 Reverse Acting (RA)

Unit: inch/mm

Turnes Per	250	290	340	400	500	500L	650
øB	8.7/210			11.8/300			15.8/400
H	20.9/530	23.6/600	25/635	29.9/760	35.4/900	36.6/930	53.1/1350
HY	7.9/200	9.1/230	9.1/230	9.8/250	11.8/300	11.8/300	14.4/366
H1	3.0/75			3.6/92	3.8/97	4.0/102	4.8/122
øD	2.2/56			3.2/80			3.9/100
T	0.8/20			1.0/25			1.6/40
M	M14 * 1.5P			M24 * 1.5P			
PT	1/4"						3/8"
Turns Per 10mm Travel	2.5			2			

Note: All dimensions are for reference only

Table 5 Dimensions (With Side-Mounted Manual Override)

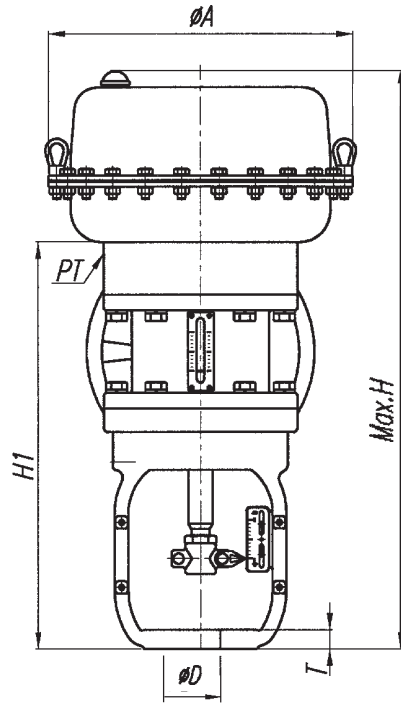


Figure 7

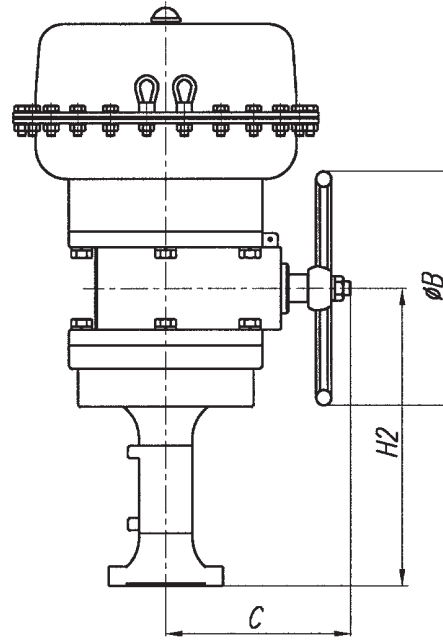


Figure 8

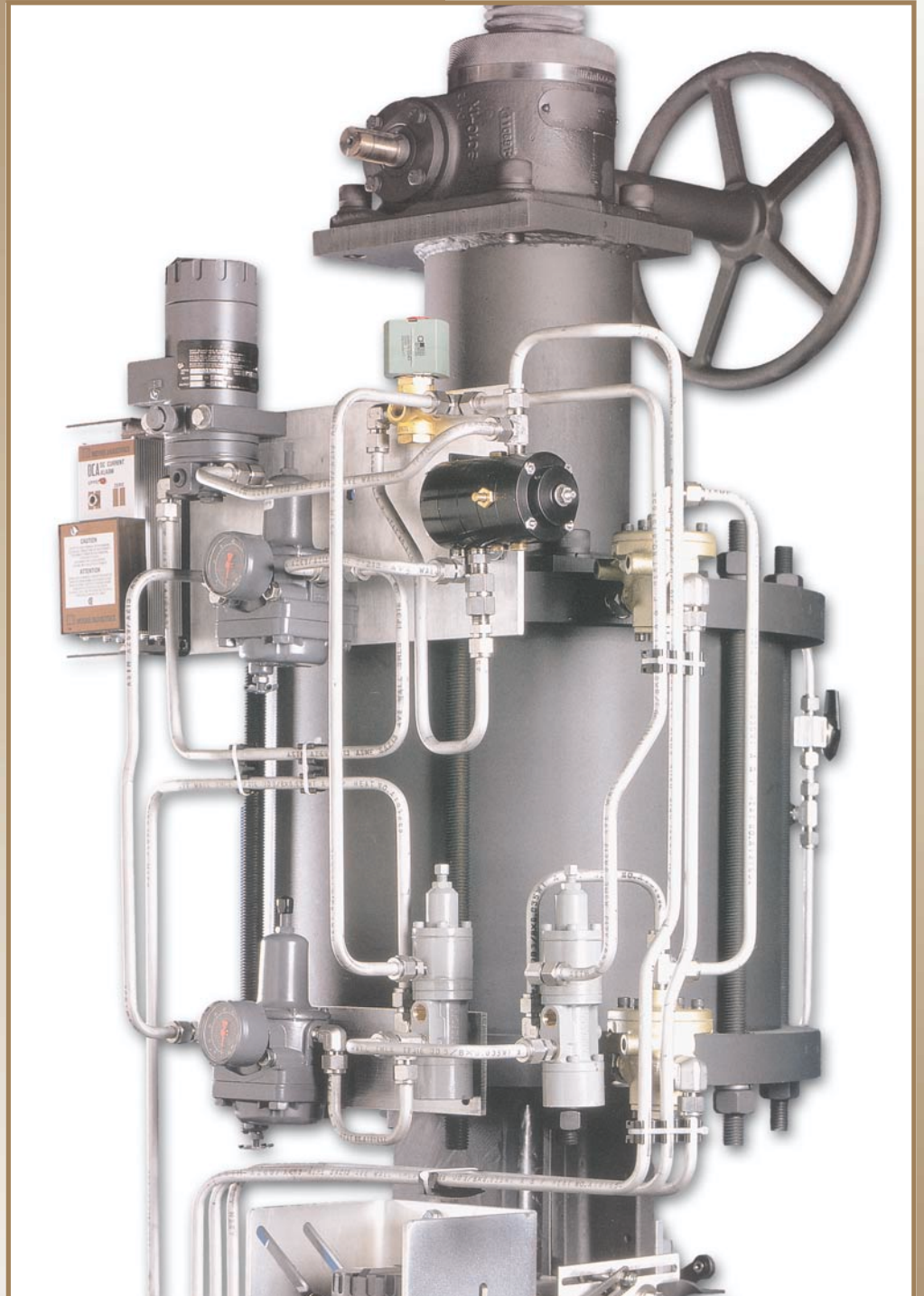
Unit: inch/mm

Size	400	500	500L	650
$\phi A$	15.8	19.7/500	19.7/500	25.6/650
H	27.9/710	35/890	36.2/920	45.7/1160
H1	19.5/495	24/610	24/610	29/736
H2	13.7/348	15.9/403	15.9/403	19.7/500
C	9.5/240	9.7/245	9.7/245	12.6/320
$\phi B$		11.8/300		15.8/400
$\phi D$		3.2/80		3.9/100
T		1.0/25		1.6/40
M	M24 * 1.5P			
PT		1/4"		3/8"
Turns Per 10mm Travel	4	4	4	4

Note: All dimensions are for reference only



# Pneumatic Actuators





## CCI Pneumatic Actuators

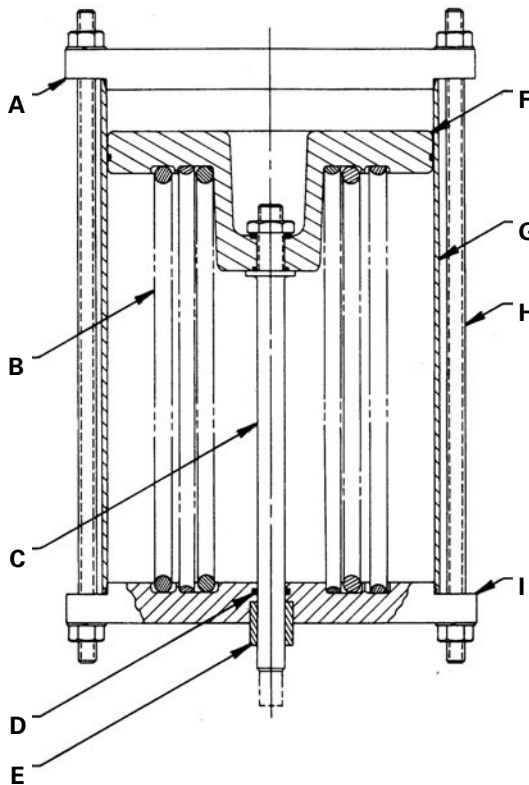


Figure 1: Actuator Assembly

A	Upper Cap
B	Spring(s)
C	Shaft
D	O-Ring
E	Bushing
F	Piston
G	Cylinder
H	Stud
I	Lower Cap

As process control requirements become more stringent, buying the proper control valve/actuator system becomes more and more important. One of the most cost-effective methods of accurately controlling a fluid process is with a CCI DRAG® control valve and a high-performance pneumatic actuator. CCI's pneumatic actuator can be custom-tailored to meet your most demanding control specifications. CCI's control expertise and experience is proven through our application of these high performance actuators to the most demanding applications industry has to offer.

The CCI pneumatic actuator is a piston type unit operating from plant air for stiffness and thrust. Thrust capabilities are available up to 40,000 pounds at 100 psig supply. Actuator control is through a variety of positioners that can accommodate virtually any signal range, e.g., 4–20 mA, 3–15 psig (0.2–1.0 kg/cm<sup>2</sup>), 3–27 psig (0.2–1.8 kg/cm<sup>2</sup>). CCI pneumatic actuators can easily be split-ranged when valves are installed in parallel for greater rangeability.

The standard fail-open configuration can be seen in Figure 1. Actuators which fail closed or lock in place are also available. A handwheel-operated manual override is available for those valve which may require stroking in a power failure condition. The standard actuator includes an integral bypass valve to equalize cylinder pressures when the override is used. Field experience has shown this configuration to be extremely reliable and trouble-free for years. The standard materials can be seen in Table 1.

CCI actuators come in five sizes in various thrust loads required. The five sizes are 50 in<sup>2</sup> (322 cm<sup>2</sup>), 113 in<sup>2</sup> (729 cm<sup>2</sup>), 200 in<sup>2</sup> (1,290 cm<sup>2</sup>), 313 in<sup>2</sup> (2,019 cm<sup>2</sup>) and 400 in<sup>2</sup> (2,580 cm<sup>2</sup>).

The actuator size, stroking time, and resolution are determined using a computer program, with input as specified by the customer's needs. Typical actuator sizes for given valve sizes can be seen in Table II.

Sufficient air supply at the valve is important to ensure proper operation. CCI actuators will operate with supply air pressure up to 150 psig (10 kg/cm<sup>2</sup>), and as low as 40 psig (3 kg/cm<sup>2</sup>). Operation outside these limits requires special sizing for unique circumstances. The air line to the valve must be large enough to minimize pressure drops and ensure adequate flow when a high stroking speed is required.

Air consumption (in SCFM) can be estimated by calculating the swept volume:

$$V_s = \text{Area (in}^2\text{)} \times \text{Stroke (in)}$$

and divide by the stroking time (in seconds):

$$Q_1 (\text{CFM}) = 60V_s / 1728 t (\text{sec})$$

to convert to SCFM,

$$Q_2 (\text{SCFM}) = Q_1 P_s (\text{psia}) / 14.7$$

where:  $P_s$  = Supply Pressure

Air lines must be sized for no more than 5 psig pressure drop at the actuator inlet, at the flow rate calculated above.

### Description of Operation (Figure 2)

As the control signal (electrical or pneumatic) varies, the air pressure on one side of the positioner diaphragm changes. This moves the diaphragm, and with it the spool in the positioner valve moves. This valve supplies air to one side of the piston and vents the other side, which moves the stem in the desired direction. As the stem moves, it rotates a cam (through a linkage) which applies tension to the diaphragm, until a force balance is restored to the diaphragm and it returns to its neutral position, which closes the positioner valve and stem movement stops. The positioner is not affected by

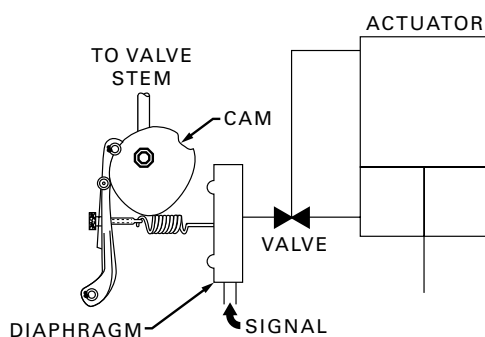


Figure 2

## Typical Globe Valves - Sizes and Dimensions

**Table 1: Material**

Part	Material
End Caps	Aluminum
Spring	Steel
Shaft	SS
O-Ring	Buna-N*
Yoke	Steel
Cylinder	Amalgon* (filament wound reinforced epoxy)
Tubing	SS
Fittings	SS
Bolting	Plated Steel

**Table 2: Typical Valve Stroke**

Valve Size	Typical DRAG® Valve Stroke
< 4"	50 in <sup>2</sup> 3½"
4" – 8"	113 in <sup>2</sup> 6" > 8"
8" – 12"	200 in <sup>2</sup> 10" > 12"
12" – 20"	313 in <sup>2</sup> 14" > 20"
> 20"	400 in <sup>2</sup> > 20"

**Table 3: Typical Valve Stroke**

	Low Temp. –20 to 450°F (–29 to 232°C)	High Temp. 450 to 1050°F (232 to 566°C)
Dead Band	1%	2%
Hysteresis	1%	2%
Resolution	1%	2%
Linearity	3%	3%

supply air pressure fluctuations, as long as the supply remains above 60 psig (4 kg/cm<sup>2</sup>). The positioner's outputs may signal boosters if faster stroking speed is required. Since the positioner is a closed loop device, it is highly accurate and resistant to changes in forces on the stem, due to changes in the process. This results in excellent fluid control under severe conditions of high flow rates and high pressure drops.

### Actuator Performance

Presented here as examples are some data from standard models, and some from ultra-high performance actuators for specially demanding applications. Please note that these values are typical of installed use and are not the laboratory figures.

### Static Performance

The static performance criteria relate valve position to the input signal, and are influenced by friction and valve hydraulic loads.

Dead band is the measure of the smallest change in control signal required to achieve any stem movement. It is sometimes referred to as sensitivity.

Resolution is the smallest change in stem position possible, in response to a change in control signal equal to dead band.

Hysteresis is the difference in stem position for the same control signal when approached from upscale and downscale.

Linearity is a measure of the deviation from an ideal straight line along the position versus signal graph.

The values in Table 3 are typical in service for DRAG® valves:

CCI is fully equipped to conduct actuator performance testing, both static and dynamic per ISA S26. Source inspection is also available.

### Dynamic Response

Dynamic response parameters measure the valve's position as a function of time when the signal is changing. Common parameters for dynamic response are over or undershoot, or time to stabilize in response to a step input, and frequency response at –3dB for sine wave testing. Specifying these parameters is not cost effective unless the dynamic response of the valve is crucial to the rest of the system.

At CCI, if dynamic response requirements are present, a control schematic is designed so as to ensure compliance. Computer simulation of pneumatic actuator response to step and sine wave signals enables our project engineer to meet your control element needs. Because of the custom nature of these schematics no data will be presented here, but your CCI representative can consult the factory about your requirement.

### Stroking Speeds

Typical stroking speeds for DRAG® valves vary from .25 in/sec. to 2 in/sec., with speeds up to 6 in/sec. in modulating mode and 12 in/sec. in on-off operation. These specifications translate into stroke times from less than one second to more than 30 seconds. Our computer simulation allows us to select a control circuit to meet the needs of your application.

### Fail Modes

Fail modes available include fail-open, fail-closed, and fail in place, with solenoid trip modes including open and closed, plus special circuits for other requirements including redundancy and multiple fail modes.

**Table 4: Standard Actuators**

Typical Stroke	0-6	8-12	14-18	20-24
50 in <sup>2</sup> (322 cm <sup>2</sup> )	Yes	-	-	-
113 in <sup>2</sup> (729 cm <sup>2</sup> )	Yes	Yes	-	-
200 in <sup>2</sup> (1290 cm <sup>2</sup> )	-	Yes	Yes	-
313 in <sup>2</sup> (2019 cm <sup>2</sup> )	-	-	Yes	Yes
400 in <sup>2</sup> (2580 cm <sup>2</sup> )	-	-	Yes	Yes

All sizes available as fail-open, fail-closed or fail in place.

As an example of CCI's capability, the following data are from a high performance actuator supplied to an electric power utility for 500°F (260°C) steam turbine bypass service:

*Actuator:*  
 113 in<sup>2</sup> (729 cm<sup>2</sup>)  
 Fail Closed  
 Manual Override Option  
 12-inch (30.5 cm) Stroke  
 Redundant Solenoid Trip Mode  
*Stroke Speed:*  
 2 seconds—open  
 2 seconds—closed

*Dead Band:*  
 1.5%  
*45%-55% Step:*  
 < 1% Overshoot  
 < 5 seconds to position  
*Sine Wave Response:*  
 -3dB at 3Hz with no resonance to 2 Hz  
 This specification was met on 24 valves supplied.

## Product Range Specifications

### Factory Adjusted

Every actuator built at CCI is fully factory adjusted and inspected before shipment. Positioner travel and gain adjustments are made, as are pressure settings and volume booster and limit switch settings (if the actuator is so equipped). In addition to any customer performance requirements, every actuator is put through our series of operability tests, including stroking speed and fail mode tests. Our commitment to quality ensures a highly reliable product.

### Other Actuators

Virtually any type of actuator may be used on a DRAG® valve. Electromechanical actuators are used for modulating duty, where stroking speed may be low and high stiffness is required, or in locations where only electrical power is available. Hydraulic actuators, either self-contained (electric or air pump with each unit) or externally-powered, may also be used for certain applications. Advantages include dynamic response, static performance and excellent thrust.

### The Bottom Line:

#### BETTER CONTROL INCREASES EFFICIENCY.

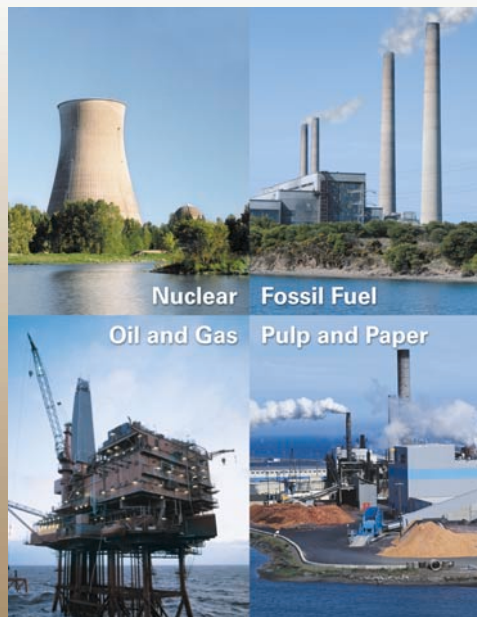
The best way to get better process control is by specifying a CCI DRAG® valve with a high performance pneumatic actuator. With high reliability and excellent control, your process will perform most efficiently. Over 25 years of building control valves for demanding service enables us to custom design an integrated control system optimized for your application.

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We Solve Control Valve Problems



**SULZER** Valves

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**www.ccivalve.com**



**QuickTrak™**  
**Intelligent Digital**  
**Valve Controller**



- Improved Performance
- High Reliability
- Precise Positioning
- Fast Stroking/Response
- Reduced Maintenance
- Quick Calibration and Tuning

#### The QuickTrak™ System

CCI's QuickTrak™ system features a pneumatic digital valve controller that combines a microprocessor-based control system and a valve positioning device for dependable pneumatic actuator control for fast stroking and precise valve positioning applications.

#### Trends in Actuation Technology

Reliable pneumatic actuation systems have been available for severe service control valve applications for several years; however, using pneumatic actuator technology in valve applications such as turbine bypass, compressor recycle, and process steam posed new performance challenges. These include a need for:

1. Very fast stroking speed for relatively long stroke lengths.
2. Precise valve stem positioning requiring resolution similar to hydraulic actuators.

The limited flow capacity (Cv) of conventional valve positioners seriously reduces the speed of pneumatic actuators, so complex control schemes were developed using booster relays and quick exhaust valves to move the actuators faster. This solution met the fast stroking needs of the severe service market, but tuning all of the control accessories was tedious and time consuming, and the large number of components reduced overall system reliability. The complicated schematics also led to problems of overshoot and instability and worsened the resolution of the system.

#### CCI's Technological Breakthrough – The Future of Actuation Control

QuickTrak™ is specifically designed to answer the challenges faced by traditional actuators and meet the performance requirements of severe service applications, bringing tomorrow's technology to your process today.

**QuickTrak™ Eliminates Mechanical Linkages** — CCI's all-in-one total actuation system is free from cumbersome mechanical linkages to make your process more efficient and easier to control. This feature also makes it very simple to install and calibrate without any concern for backlash or linkage breakage. A magneto-restrictive probe, mounted inside the actuator to avoid damage, provides feedback to the controller to ensure highly accurate position.

**QuickTrak™ Offers Remote Mounting Capabilities** — Because QuickTrak™ functions without mechanical linkages, the controller, the direct drive pneumatic positioner module, and the fail-safe module can be easily mounted either on the actuator or remotely.

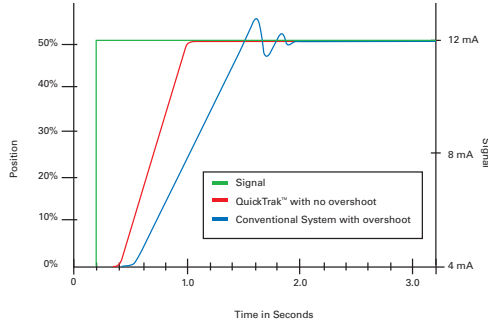


Before: Antiquated actuation schematic

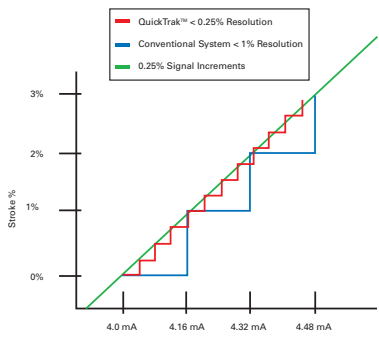


After: Streamlined state-of-the-art QuickTrak™ solution

**"The QuickTrak™ will do for actuation what MD-502-7000® IN-GEN-1017-0027 ID01 does for severe service valves." Stuart Carson, CCI President**



**Figure 1: Stroke Speed/Dead Time on Seat** QuickTrak™ provides fast stroking with small dead time on seat and no visible overshoot.



**Figure 2: Resolution** QuickTrak™ responds to 0.25% change in input signal, significantly improving process control.

**QuickTrak™ Boasts High Capacity** — The extremely high capacity of this system (roughly 50 times higher than conventional pneumatic positioners) makes it possible to achieve very fast position control without any booster relays. The high capacity spool also provides a stiffer actuator, allowing for control of small increment steps without overshoot.

**QuickTrak™ Makes System Tuning a Breeze** — Conventional pneumatic system calibration involves not only positioner calibration, but also tuning of all accessories individually. With QuickTrak™, the controller automatically calibrates and tunes the entire system with an easy user interface, maintaining its calibration between system outages.

**QuickTrak™ Offers Easy Diagnostics** — The state-of-the-art digital controller design enables easy communication with the plant’s control system and incorporates diagnostic capabilities. The control module is equipped with a PLC to store valve signature information and provide data for valve diagnostics. Communication to the QuickTrak™ is possible through a conventional 4-20 mA control signal as well as network protocols including HART™, Foundation Fieldbus, and Profibus (pending.)

**QuickTrak™ Provides Unmatched Stroke Speed and Resolution** — QuickTrak™ provides a digital pneumatic actuator control system capable of fast stroking speed (less than one second for a valve stroke of 20 inches/500 mm) and very accurate process control through precise stem positioning. Resolution for the system is less than 0.25%, which is comparable to hydraulic actuators and significantly better than the 1% available for actuators with positioners.

**QuickTrak™ Will Meet Your Performance Needs** —

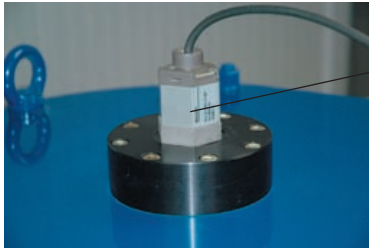
QuickTrak™’s fast stroke and superior resolution and hysteresis allow the unit to be applied on severe service pneumatic actuators that demand fast stroking and precise positioning. CCI’s QuickTrak™ system covers a wide range of actuator size and stroke length requirements.

**Table 1: Performance Comparison of Various Actuators**

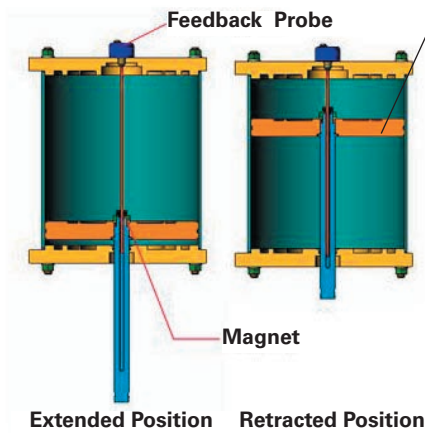
Valve performance characteristics		Pneumatic piston with positioner and accessories	Pneumatic piston with QuickTrak™ *	Hydraulic
Dead time on seat		>500 millisecond	<150 millisecond	<100 millisecond
Hysteresis	High Friction	<2.0%	<1.0%	<0.4%
	Low Friction	<1.0%	<0.5%	<0.4%
Resolution & deadband	High Friction	<2.0%	<1.0%	<0.1%
	Low Friction	<1.0%	<0.25%	<0.1%

\* Resolution and hysteresis characteristics may be limited by valve/actuator combination. Consult factory for details.

# CCI's innovative QuickTrak™ Intelligent digital valve controller



Position feedback probe



- Remote mounting capability
- Direct drive pneumatic positioning module
- Requires no mechanical linkage for position feedback



- Push-button or hand-held communications
- Remote mounting capability
- Automatic system calibration and tuning
- Advanced control module

QuickTrak™ Intelligent Digital Valve Controller

	Conventional Pneumatics	Hydraulic	Electro-Hydraulic	QuickTrak® Pneumatic*
Improved Performance		X	X	<b>X</b>
High Reliability	X			<b>X</b>
Precise Positioning		X	X	<b>X</b>
Fast Stroking	X	X		<b>X</b>
Fast Response		X		<b>X</b>
Reduced Maintenance	X			<b>X</b>
Quick Calibration and Tuning		X	X	<b>X</b>
Low Air Consumption		NA	NA	<b>X</b>
Remote Mounting Capability				<b>X</b>

\* Only CCI's QuickTrak™ provides hydraulic-like performance in a maintenance free, easy-to-tune actuation solution.

MD-502-7000-IN-GEN-1017-0027 D01

**Use this checklist to evaluate the benefits of  
CCI's QuickTrak™ design**

Benefits		QuickTrak™	Competitors
1	<b>Improves Plant Performance:</b> Reduced dead time on seat, fast stroking with no visible overshoot, low percentage resolution and hysteresis.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	<b>Provides Cost-Effective Solution:</b> High-performance pneumatic valve controller with electro-hydraulic performance.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	<b>Reduces System Maintenance:</b> Fewer components increase reliability and reduce costly time spent tuning accessories.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4	<b>Easy System Tuning:</b> QuickTrak™ controller tunes the whole pneumatic system with easy user interface.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	<b>Eliminates Accessories Typically Found in High Performance Pneumatics:</b> Quick exhausts, volume boosters, and lock-up valves are eliminated by high Cv digital positioning system.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6	<b>Incorporates Integral Electronic Position Feedback:</b> Mechanical linkages are eliminated by probe mounted inside actuator.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
7	<b>Designed Specifically for Severe Service Applications:</b> Optional remote mounting capability allows resistance to temperature and vibration.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
8	<b>Redundant Actuation Control:</b> Provides a simple, highly reliable, redundant actuation control system for critical service nuclear applications.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
9	<b>Integral Programmable Controlled Deceleration and Damping:</b> Controlled valve stroke speed allows for full system protection and control.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
10	<b>Reduces Step Response Time:</b> QuickTrak™ instantaneously responds to a change in input signals as low as 0.25%.	<input checked="" type="checkbox"/>	<input type="checkbox"/>



**Travel Control**

- Define signal polarity
- Define upper and lower limits
- Optional snap action relay protects valve trim

**Tuning**

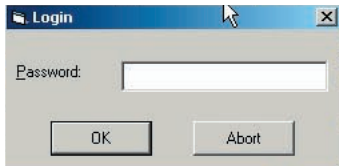
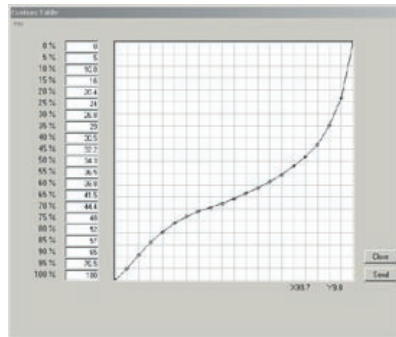
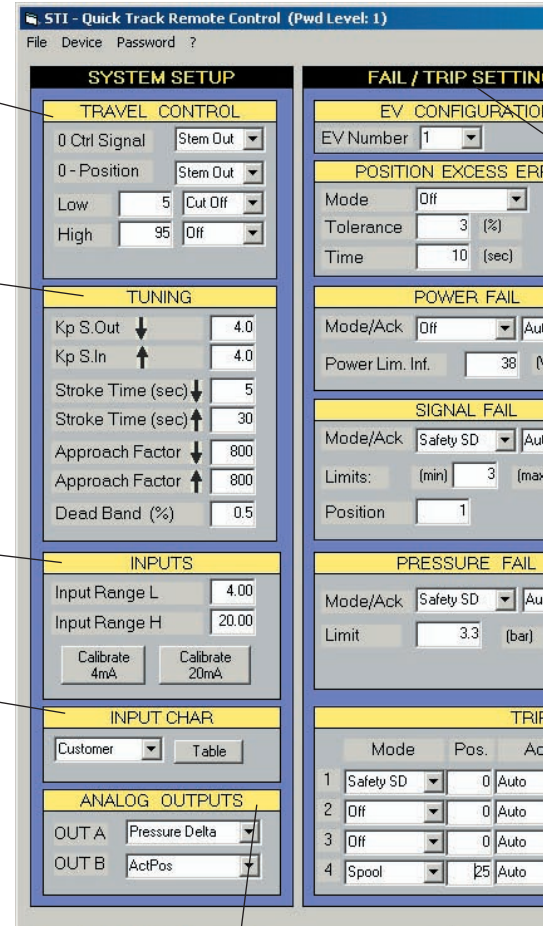
- Set PID tuning parameters allow for full system tuning
- Full valve speed control
- Innovative damping function stiffens actuator for hydraulic-like performance

**Inputs**

- Calibrate input signal to maximize control span

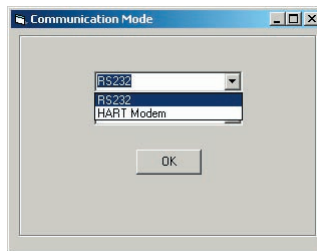
**Input Characterization**

- User input signal characterization allows for optimal system performance



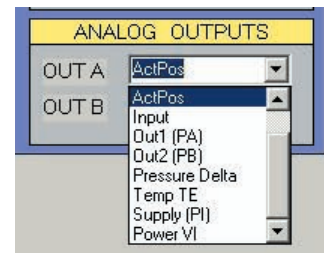
**Password Protected**

Secure your system with password protection



**Select Communication Mode**

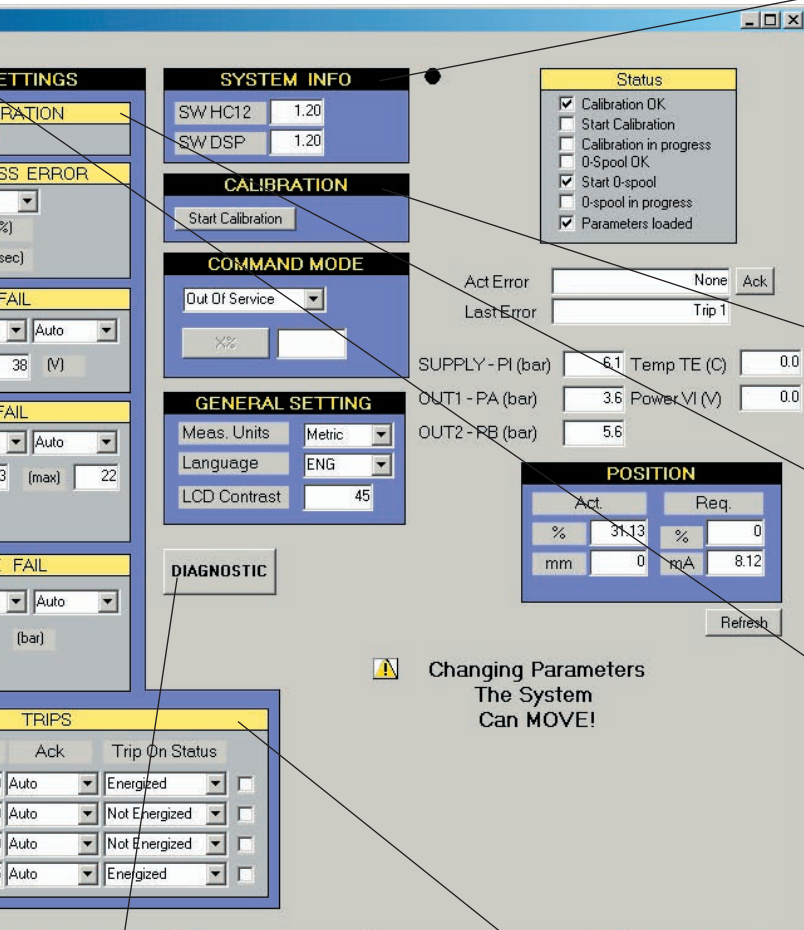
QuickTrak's™ Remote Control software interacts with RS232 and HART™ communication protocol



**Analog Outputs**

Select from a list of optional outputs

\*CCI's QuickTrak™ allows for full control of all system tuning and calibration from the front panel. The remote control software is an optional user interface environment.



**System Information**

- In/Out service modes protect users and equipment
- Select measurement units and language for front panel and diagnostics readouts
- Easily witness
  - Valve position
  - System status
  - Error reports
  - System I/O's

**Calibration**

- One-touch system tuning and calibration

**EV Configuration**

- QuickTrak™ provides two integrated control relay outputs for control of safety systems and alarms

**Failure/Trip Settings**

- CCI QuickTrak™ provides a variety of settings and actions for failure and trip conditions. The system is fully customizable to meet the requirements of severe service applications

**Failure Settings**

- Four failure modes can be programmed independently or linked together
- Define your system requirements
  - Failure Mode - Safety trip or control point position
  - Acknowledgement - Automatic or hold
  - Limits - Easily set your safety limits

**Trip Settings**

- QuickTrak™ controller accepts four separate trip signals, with independent actions and priority

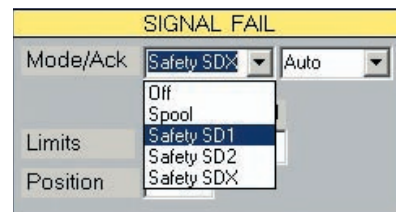
**QuickTrak™ Diagnostic**

Front panel digital communication of system status includes:

- Inlet, top and bottom pressure
- Demand Signal (%)
- Valve Position (%)
- Servo Temperature
- Error Codes (QuickTrak™ displays error code with alarm indicator)

On-line Valve Diagnostics – Optional Package (Pending)

- Alarm / Safety counter
- Trip counter
- System counter
- Position data log
- Delta P data log
- Temperature data log



### QuickTrak™ Inputs

- **Input control signal:** Analog 4-20 mA, Hart™ 4-20 mA, or Fieldbus (pending)
- Over current protection:** Input circuitry limits current to prevent damage to controller
- Reverse polarity protection:** No damage occurs if loop current reverses
- **Power supply:** 120 Vac  $\pm 10\%$  50-60 Hz  $\pm 5\%$ ; 240 Vac  $\pm 10\%$  50-60 Hz  $\pm 5\%$ ; 120 Vdc  $\pm 10\%$  0.7A; 48 Vdc  $\pm 10\%$  1.5A; 24 Vdc  $\pm 10\%$  3A
- **Solenoid trip signal (if applicable):** 240 Vac, 110 Vac, 110 Vdc, 24 Vdc
- **Air supply:** Recommended operating range is 60 psig to 100 psig (4.5 barg to 7.0 barg). Air shall be free of oil, water, and dust; maximum particle size to be 5 microns. Comply with ISA 7.3, PARA.4.1

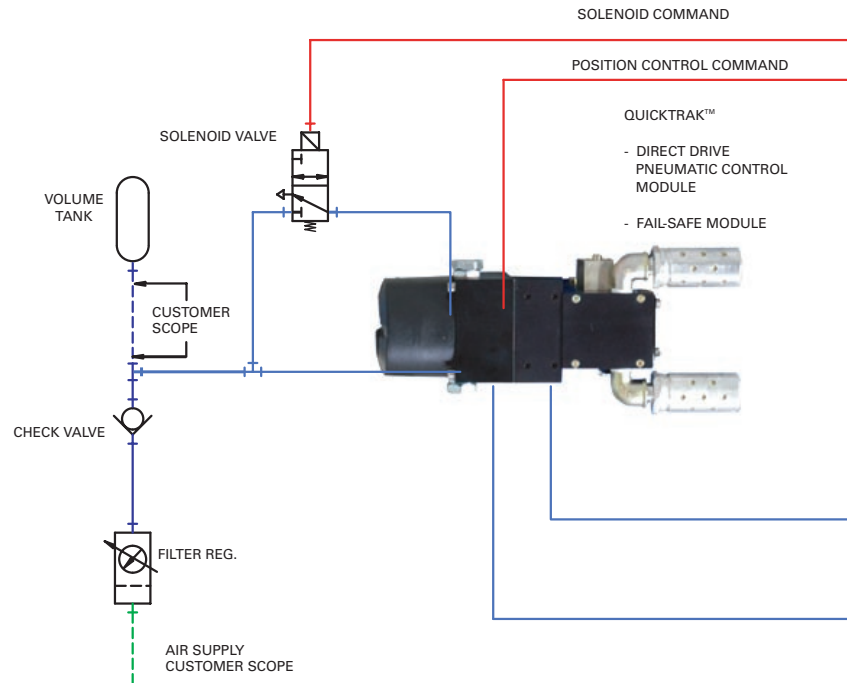


Exhibit: Control schematic for piston actuation with QuickTrak™

### QuickTrak™ Outputs

- Analog 4-20 mA position feedback signal; two output signals available
- Hart™ communication feedback signal optional
- Digital communication for diagnostic package

### Controller Type

Microprocessor-based closed-loop controller receives electric power for electronics and positioning module control.

### Actuator Fail Mode Upon Power Supply Failure

Can be set to user-selected fail position: open, closed, or in-place. The system does not rely on any additional power source like batteries, making it extremely reliable and maintenance free.

### Actuator Fail Mode Upon Input Signal Failure

**Controller shutoff input signal:** If the input falls below 3 mA or rises above 21 mA, the controller will set the actuator to user-selected fail position: open, closed, or in-place. Fail mode location can be selected at any discrete location between 0% and 100% of the stroke. Once the input signal is re-established within control signal limits, the controller will regain control within a few seconds and position the control valve according to the input signal.

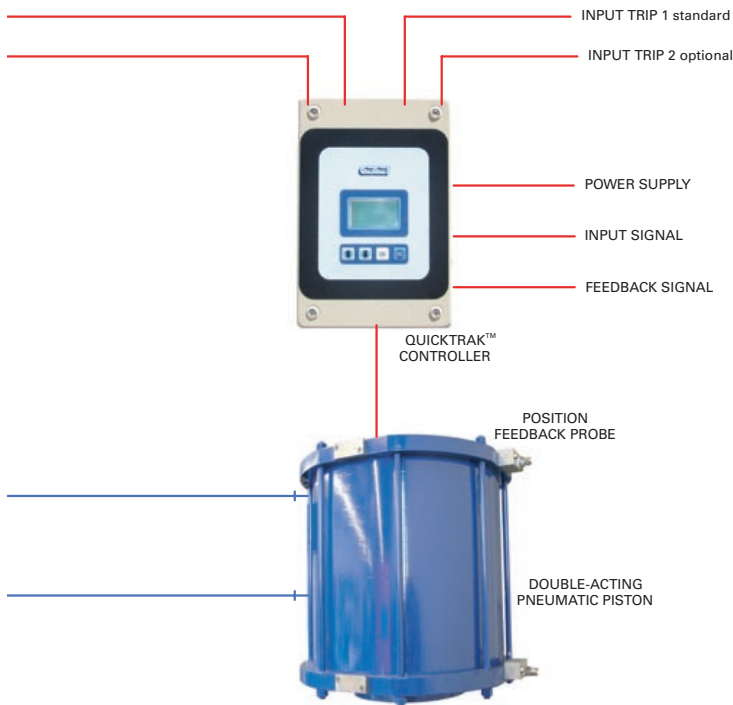
### Actuator Fail Mode Upon Air Failure

Can be set to user-selected fail position: open, closed, or in-place

### Steady State Air Consumption

At (7 barg) 1.6 Nm<sup>3</sup>/hr

## All agency approvals available Hart-Fieldbus-latest communication technology



### Valve System Performance

(control valve with low-volume double-acting piston actuator)

- Valve linearity: ISA-S75.13 < 0.1% terminal based
- Valve linearity: ISA-S75.13 < 0.2% zero based
- Valve hysteresis: ISA-S75.13 < 0.4%
- Valve dead band: ISA-S75.13 and IEC 60534-4 < 0.35%
- Valve resolution: ISA-S75.13 < 0.25%
- Valve dead time on seat: < 150 millisecond
- Valve stroke speed: < 1 second (Consult factory for details)

### Communication Ports

- Hart™ protocol connection
- RS232 DB-9 connection for configuration
- Fieldbus protocol (pending)

### Communication Protocols

- Hart™
- Fieldbus – optional (pending)
- Profibus PA – optional (pending)

### Configuration Interface Options

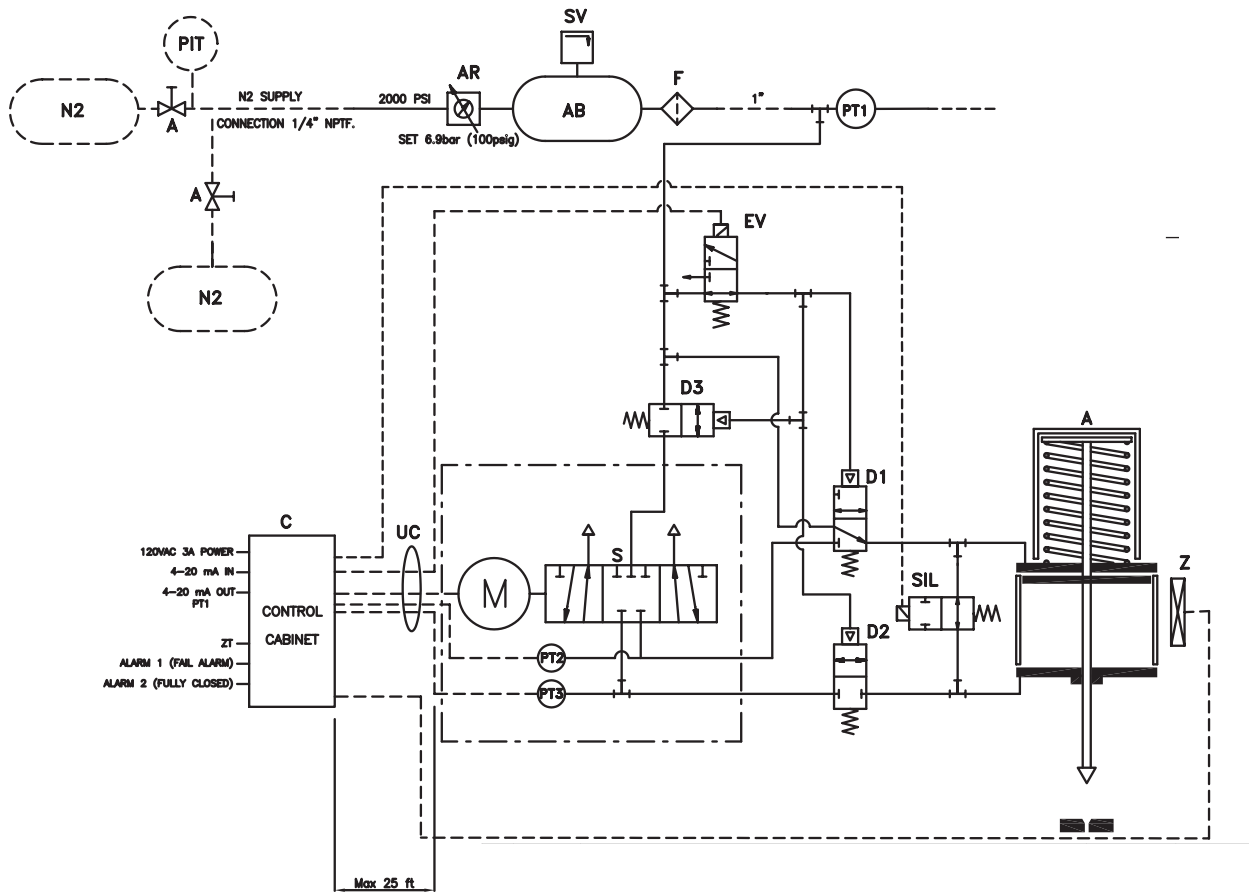
- Local push-button communication – standard
- Laptop or PDA – optional

### Valve Diagnostics

PLC provides option to store original valve signature and initiate alerts and alarms. Valve performance can be periodically compared to original valve signature to predict valve performance degradation and recommend preventive maintenance plan option. (Consult factory for details)

### Electrical Classifications

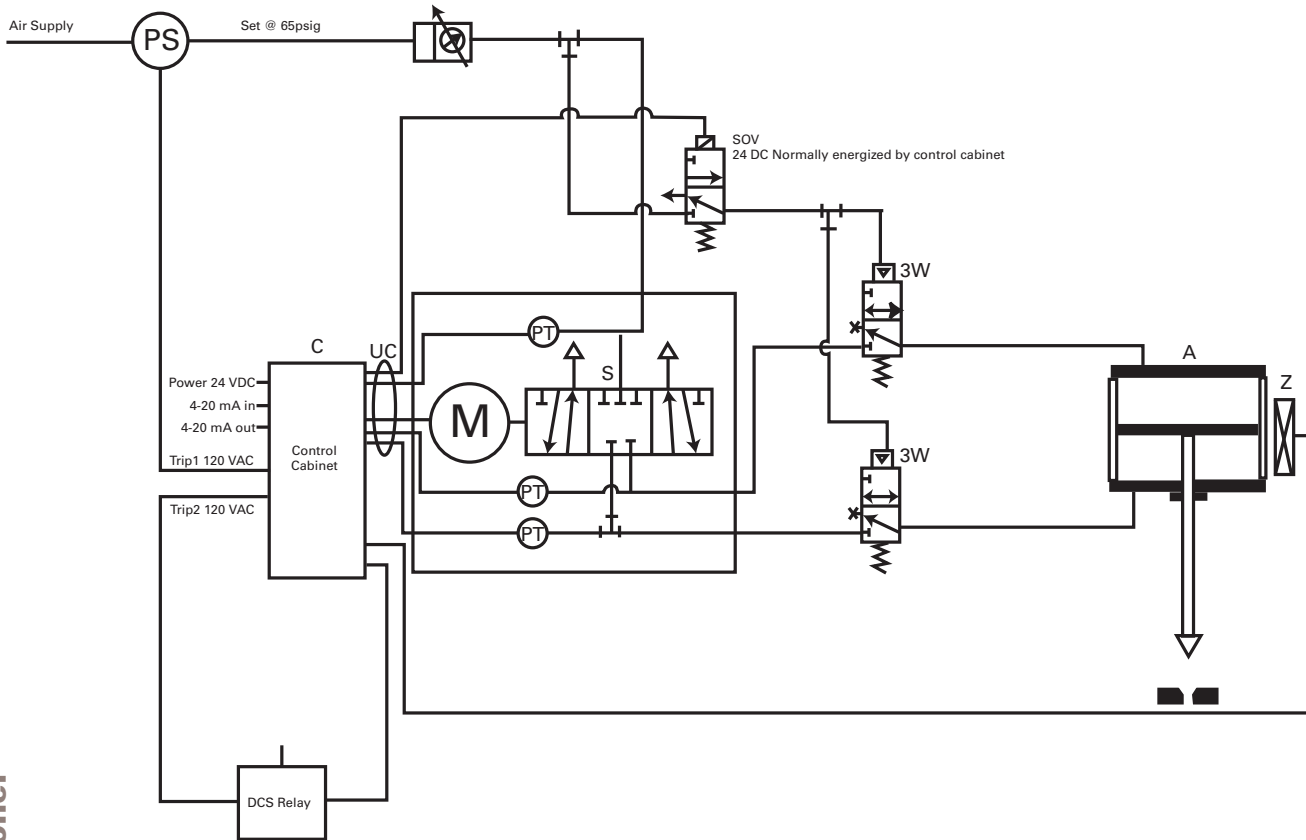
- UL /CSA Ordinary Location IP66 NEMA 4X
- UL Hazardous Locations Explosion Proof Class 1 Division 1, Group B, C, D, enclosure rated NEMA 4X
- CSA Hazardous Locations Explosion Proof Class 1 Division 1, Group B, C, D, enclosure rated NEMA 4X
- ATEX II 2 G EExd IIC T6/T5 for motor enclosure and II 2 G EExd IIB T6/T5 for controller enclosure, EN 50014:1999, EN 50018:2000



**Fully Customizable, Zero Bleed, Remote Location Schematic**

- Motive power nitrogen bottle (1 bottle per year)
- Stroke speed (adjustable in both directions)
  - Closing 4 to 5 minutes
  - Opening 1.5 seconds
- Fail safe
  - Spring fail open in 30 seconds

- Lock up system
  - Servo valve isolated
  - Full pressure on top of cylinder
  - Bottom cylinder isolated
- Remote Mounting 25'
- Independent trip signals



### Custom Engineered Solution with Safety Lockup

- Opening/closing 4-10 seconds
- Fail in place schematic
- Panel remote mounted controller and servo
- Trip 1 controller by QuickTrak™
- Trip 2 independent from control room
- Control room interlock controlled by QuickTrak's™ energized relay
- Remote mounted design protects system from heat and vibration
- Custom stroking time protects equipment



**Oil & Gas**



**Nuclear**



**Fossil Power**



**CHP/Cogen**

Throughout the world, companies rely on CCI to solve their severe service control valve problems. CCI has provided custom solutions for these and other industry applications for more than 80 years.

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www.ccivalve.com**



**We Solve Control Valve Problems®**

**Product Bulletin**62.1:DVC6000  
February 2008**DVC6000 Series**

# DVC6000 Series FIELDVUE® Digital Valve Controllers

DVC6000 Series FIELDVUE® digital valve controllers (figures 1 and 2) are communicating, microprocessor-based current-to-pneumatic instruments. In addition to the traditional function of converting a current signal to a valve-position pressure signal, DVC6000 Series digital valve controllers, using HART® communications protocol, give easy access to information critical to process operation. This can be done using a 375 Field Communicator at the valve or at a field junction box, or by using a personal computer or a system console within the control room. Using HART communication protocol, information can be integrated into a control system or received on a single loop basis.

DVC6000 Series digital valve controllers can be used on single- or double-acting actuators. The digital valve controller receives feedback of the valve travel position plus supply and actuator pneumatic pressure. This allows the instrument to diagnose

not only itself, but also the valve and actuator to which it is mounted. This provides you with very cost effective maintenance information, as the required maintenance can be performed on the instrument and valve when there really is a need.

Wiring is economical because DVC6000 Series digital valve controllers use two-wire 4 to 20 mA loop power. This provides for low cost replacement of existing analog instrumentation. The DVC6000 Series digital valve controller's two-wire design avoids the high cost of running separate power and signal wiring.

**Note**

**Neither Emerson, Emerson Process Management, nor any of their affiliated entities assumes responsibility for the selection, use, or maintenance of any product. Responsibility for the selection, use, and maintenance of any product remains with the purchaser and end-user.**



W7957-1 / IL

Figure 1. DVC6010 Digital Valve Controller Mounted on a Sliding-Stem Valve Actuator



W9131-1

Figure 2. DVC6010 Digital Valve Controller Mounted on Type 585C Piston Actuator





# DVC6000 Series

## Specifications

### Available Configurations

**Valve-Mounted Instrument:**

*DVC6010:* Sliding-stem applications  
*DVC6020:* Rotary applications and long-stroke sliding-stem applications  
*DVC6030:* Quarter-turn rotary applications

**Remote-Mounted Instrument<sup>(1)</sup>:**

*DVC6005:* Base unit for 2-inch pipestand or wall mounting  
*DVC6015:* Feedback unit for sliding-stem applications  
*DVC6025:* Feedback unit for rotary or long-stroke sliding-stem applications  
*DVC6035:* Feedback unit for quarter-turn rotary applications

DVC6000 Series digital valve controllers can be mounted on Fisher and other manufacturers rotary and sliding-stem actuators.

### Input Signal

**Point-to-Point:**

*Analog Input Signal:* 4-20 mA DC, nominal; split ranging available  
 Minimum Voltage Available at Instrument Terminals must be 10.5 VDC for analog control, 11 VDC for HART communication (see instrument instruction manual for details)  
*Minimum Control Current:* 4.0 mA  
*Minimum Current w/o Microprocessor Restart:* 3.5 mA  
*Maximum Voltage:* 30 VDC  
*Overcurrent Protection:* Input circuitry limits current to prevent internal damage  
*Reverse Polarity Protection:* No damage occurs from reversal of loop current

**Multi-drop:**

*Instrument Power:* 11 to 30 VDC at approximately 8 mA  
*Reverse Polarity Protection:* No damage occurs from reversal of loop current

### Output Signal

Pneumatic signal as required by the actuator, up to 95% of supply pressure  
**Minimum Span:** 0.4 bar (6 psig)  
**Maximum Span:** 9.5 bar (140 psig)  
**Action:** ■ Double, ■ Single Direct, and ■ Single Reverse

### Supply Pressure<sup>(2)</sup>

**Minimum Recommended:** 0.3 bar (5 psig) higher than maximum actuator requirements  
**Maximum:** 10.0 bar (145 psig) or maximum pressure rating of the actuator, whichever is lower

### Steady-State Air Consumption<sup>(3,4)</sup>

**Standard Relay:**

*At 1.4 bar (20 psig) supply pressure:* Less than 0.38 normal m<sup>3</sup>/hr (14 scfh)  
*At 5.5 bar (80 psig) supply pressure:* Less than 1.3 normal m<sup>3</sup>/hr (49 scfh)

**Low Bleed Relay<sup>(5)</sup>:**

*At 1.4 bar (20 psig) supply pressure:* Average value 0.056 normal m<sup>3</sup>/hr (2.1 scfh)  
*At 5.5 bar (80 psig) supply pressure:* Average value 0.184 normal m<sup>3</sup>/hr (6.9 scfh)

### Maximum Output Capacity<sup>(3,4)</sup>

*At 1.4 bar (20 psig) supply pressure:* 10.0 normal m<sup>3</sup>/hr (375 scfh)  
*At 5.5 bar (80 psig) supply pressure:* 29.5 normal m<sup>3</sup>/hr (1100 scfh)

### Independent Linearity<sup>(6)</sup>

±0.50% of output span

### Electromagnetic Interference (EMI)

Tested per IEC 61326-1 (Edition 1.1). Meets emission levels for Class A equipment (industrial locations) and Class B equipment (domestic locations). Meets immunity requirements for industrial locations (Table A.1 in the IEC specification document). Immunity performance is shown in table 2.

### IEC 61010 Compliance Requirements (Valve-Mounted Instruments Only)

**Power Source:** The loop current must be derived from a separated extra-low voltage (SELV) power source

**Environmental Conditions:** Installation Category I

(continued)

**Specifications (continued)**

**Electrical Classification**

**Hazardous Area:**



Explosion proof, Division 2, Dust-Ignition proof, Intrinsically Safe



Explosion proof, Non-incendive, Dust-Ignition proof, Intrinsic Safety

ATEX Flameproof, Type n, Intrinsic Safety

IECEX Flameproof, Type n, Intrinsic Safety



Flameproof, Intrinsic Safety



Flameproof, Intrinsic Safety

Refer to tables 3, 4, 5, 6, 7, and 8 for specific approval information

**Electrical Housing:** Meets NEMA 4X, CSA Type 4X, IEC 60529 IP66

**Other Classifications/Certifications**

TIIS Japan

KISCO Korea Industrial Safety Corp.



Russian GOST-R

FSETAN Russian – Federal Service of Technological, Ecological and Nuclear Inspectorate

Contact your Emerson Process Management sales office for classification/certification specific information

**Connections**

**Supply Pressure:** 1/4 NPT internal and integral pad for mounting 67CFR regulator

**Output Pressure:** 1/4 NPT internal

**Tubing:** 3/8-inch metal, recommended

**Vent (pipe-away):** 3/8 NPT internal

**Electrical:** 1/2 NPT internal conduit connection.

**optional—**M20 internal conduit connection, spring clamp terminal connection<sup>(7)</sup>

**Operating Ambient Temperature Limits<sup>(2)</sup>**

–40 to 80°C (–40 to 176°F) for most approved valve-mounted instruments

–60 to 125°C (–76 to 257°F) for remote-mounted feedback unit.

–52 to 80°C (–62 to 176°F) for valve-mounted instruments utilizing the Extreme Temperature option (fluorosilicone elastomers).

**Construction Materials**

**Housing, module base and terminal box:**

ASTM B85 A03600 low copper aluminum alloy (standard)

CF8M (cast 316 stainless steel) (optional for valve-mounted instruments only)

**Cover:** Thermoplastic polyester

**Elastomers**

*Standard:* Nitrile

*Optional:* Fluorosilicone

**Stem Travel**

**DVC6010, DVC6015:**

0 to 102 mm (4 inches) maximum travel span

0 to 6.35 mm (0.25 inch) minimum travel span

**DVC6020, DVC6025:** 0 to 606 mm (23.875

inches) maximum travel span

**Shaft Rotation (DVC6020, DVC6025, DVC6030 and DVC6035)**

0 to 50 degrees minimum

0 to 90 degrees maximum

**Mounting**

Designed for direct actuator mounting or remote pipestand or wall mounting. Mounting the instrument vertically, with the vent at the bottom of the assembly, or horizontally, with the vent pointing down, is recommended to allow drainage of moisture that may be introduced via the instrument air supply.

(continued)

# DVC6000 Series

## Specifications (continued)

<p><b>Weight</b></p> <p><b>Valve-Mounted Instruments.</b>  <i>Aluminum: 3.5 kg (7.7 lbs)</i>  <i>Stainless steel: 7.7 kg (17 lbs)</i></p> <p><b>Remote-Mounted Instruments.</b>  <i>DVC6005 Base Unit: 4.1 kg (9 lbs)</i>  <i>DVC6015 Feedback Unit: 1.3 kg (2.9 lbs)</i>  <i>DVC6025 Feedback Unit: 1.4 kg (3.1 lbs)</i>  <i>DVC6035 Feedback Unit: 0.9 kg (2.0 lbs)</i></p>	<p><b>Options</b></p> <ul style="list-style-type: none"> <li>■ Supply and output pressure gauges or ■ Tire valves,</li> <li>■ Integral mounted filter regulator,</li> <li>■ Stainless steel housing, module base and terminal box (valve-mounted instruments only),</li> <li>■ Low-Bleed Relay, ■ Extreme Temperature</li> </ul>
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NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 – Process Instrument Terminology.  
 1. 3-conductor shielded cable, 22 AWG minimum wire size, is required for connection between base unit and feedback unit. Pneumatic tubing between base unit output connection and actuator has been tested to 15 meters (50 feet) maximum without performance degradation.  
 2. The pressure/temperature limits in this document and any other applicable code or standard should not be exceeded.  
 3. Normal m<sup>3</sup>/hour – Normal cubic meters per hour at 0°C and 1.01325 bar, absolute. Scfh – Standard cubic feet per hour at 60°F and 14.7 psia.  
 4. Values at 1.4 bar (20 psig) based on a single-acting direct relay; values at 5.5 bar (80 psig) based on double-acting relay.  
 5. The Low Bleed Relay is offered as standard relay for DVC6000 SIS tier, used for On/Off applications.  
 6. Typical value. Not applicable for DVC6020 digital valve controllers in long-stroke applications or remote-mounted DVC6005 digital valve controllers with long pneumatic tubing lengths.  
 7. ATEX/IEC approvals only.

## Features

- **Improved Control**—Two-way digital communications give you current valve conditions. You can rely on this real-time information to make sound process management decisions. By analyzing valve dynamics through AMS™ ValveLink® Software you can identify control areas needing improvement and maintain a high level of system performance.
- **Environmental Protection**—You can avoid additional field wiring by connecting a leak detector or limit switch to the auxiliary terminals in the DVC6000 Series digital valve controller. In this way, the instrument will issue an alert if limits are exceeded.
- **Enhanced Safety**—You can check instrument and valve operation and keep the process running smoothly and safely from a remote location. Access is possible at a field junction box, marshalling panel, or within the safety of the control room using either a 375 Field Communicator, a notebook PC, or a system workstation. Your exposure to hazardous environments is minimized and you can avoid having to access hard-to-reach valve locations.
- **Hardware Savings**—DVC6000 Series digital valve controllers, when used in an integrated system, allow you to realize significant hardware and installation cost savings by replacing other devices in the process loop, such as positioners and limit switches, with a FIELDVUE digital valve controller.
- **Built to Survive**—Field-tough DVC6000 Series digital valve controllers have fully encapsulated printed wiring boards that resist the effects of vibration, temperature, and corrosive atmospheres. A separate weather-tight field wiring terminal box isolates field-wiring connections from other areas of the instrument.
- **Increased Uptime**—With the self-diagnostic capability of DVC6000 Series digital valve controllers, you can answer questions about a valve's performance, without pulling the valve from the line. You can run diagnostics (I/P and relay integrity, travel deviation, and on-line friction and deadband analysis and trending) while the valve is in service and operating. You can also compare the present valve/actuator signature (bench set, seat load, friction, etc.) against previously stored signatures to discover performance changes, before they cause process control problems.
- **Faster Commissioning**—The two-way communication capability allows you to quickly commission loops by remotely identifying each instrument, verifying its calibration, reviewing stored maintenance notes, and more.
- **Easy Maintenance**—DVC6000 Series digital valve controllers are modular in design. The module base can be removed from the instrument housing without disconnecting the field wiring, pneumatic connections or stem linkages. This module contains the critical sub-modules so component removal is quick and simple.

Table 1. DVC6000 Product Level Capabilities

CAPABILITY	DIAGNOSTIC TIER LEVEL					
	AC	HC	AD	PD	SIS <sup>(1)</sup>	ODV
Auto Calibration	X	X	X	X	X	X
Burst Communication		X	X	X	X	X
Custom Characterization	X	X	X	X	X	X
Alerts		X	X	X	X	X
Step Response, Drive Signal Test & Dynamic Error Band, Valve Signature			X	X	X	X
Performance Tuner			X	X	X	X
Travel Control – Pressure Fallback			X	X		X
Performance Diagnostics				X		X
Partial Stroke Testing					X	X
Lead/Lag Input Filter <sup>(2)</sup>						X

1. Refer to Bulletin 62.1:DVC6000 SIS for information on DVC6000 Series FIELDVUE<sup>®</sup> digital valve controllers for Safety Instrumented System (SIS) Solutions.  
2. Refer to brochure part # D351146X012 / D351146X412 for information on Fisher optimized digital valves for compressor antisurge applications.

● **Travel Control – Pressure Fallback**—Valve position feedback is critical to the operation of a digital valve controller. Without this feedback, the control valve assembly traditionally goes to its fail safe position. DVC6000 Series digital valve controllers can detect position feedback problems caused by a travel sensor failure or linkage failure and continue to operate in “pressure control” mode. If a problem with the valve position feedback is detected, the instrument will automatically disable the travel sensor, send an alert, and control its output pressure much like an I/P transducer. This allows the valve assembly to continue to operate with reduced accuracy until maintenance can be scheduled.

**Diagnostics**

DVC6000 Series digital valve controllers are packed with user-configurable alerts and alarms. When integrated with a HART communication-based system, these flags provide real-time notification of current and potential valve and instrument problems. With AMS ValveLink Software, tests can be performed to identify problems with the entire control valve assembly. Diagnostic capabilities available are Performance Diagnostics (PD) and Advanced Diagnostics (AD). Refer to table 1 for details on the capabilities of each diagnostic tier.

**Performance Diagnostics**

Performance Diagnostics enables the use of diagnostics while the valve is in service and operating.

- Red/Yellow/Green Condition Indicator (see figure 3)
- I/P and Relay Integrity Diagnostic
- Travel Deviation Diagnostic
- One-Button Diagnostic

The One-Button Diagnostic, (shown in figure 4), is a 20 second sweep which runs the I/P and Relay Integrity, Relay Adjustment Travel Deviation, Supply Pressure, and Air Mass Flow Performance Diagnostic tests. When the sweep is complete, AMS ValveLink Software will show any errors, possible causes, and recommended actions to resolve the error(s).

- On-Line/In-Service Friction and Deadband Analysis (see figure 5)
- Friction and Deadband Trending

While all diagnostics can be run while the valve is inline, only the Performance Diagnostics can be performed while the valve is in service and operating.

# DVC6000 Series

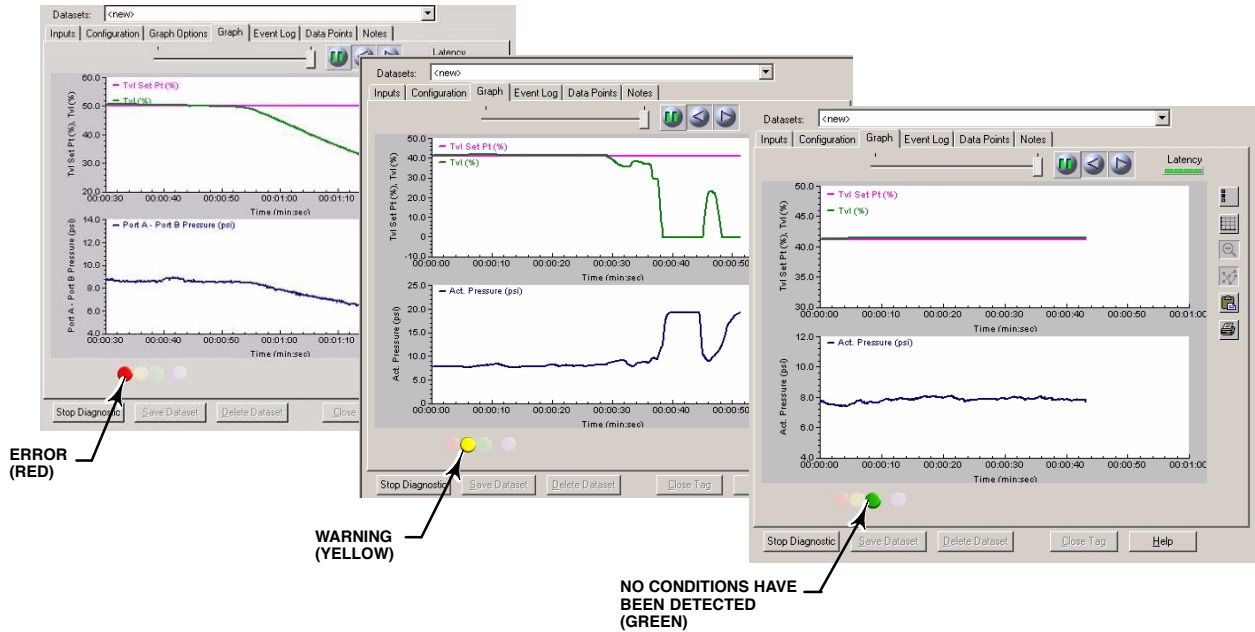


Figure 3. Red/Yellow/Green Condition Indicators, Shown in AMS™ ValveLink® Software

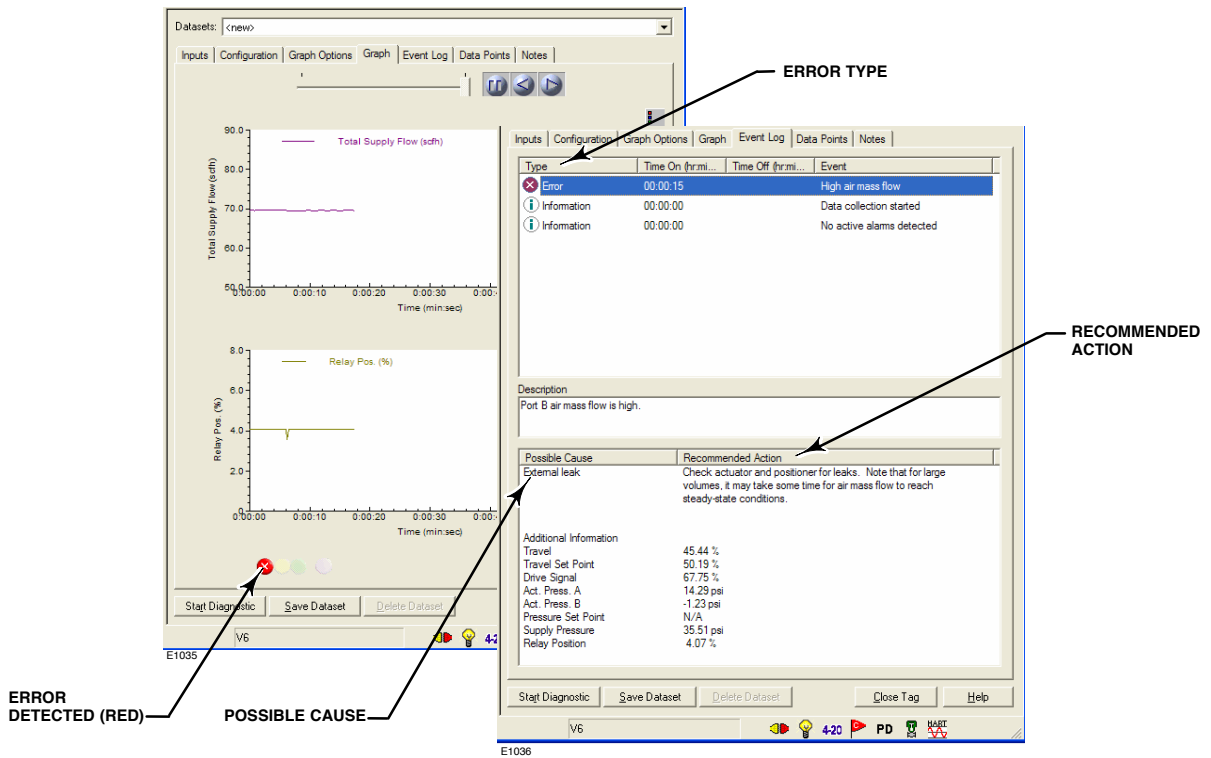


Figure 4. One-Button Sweep—Air Mass Flow Diagnostic

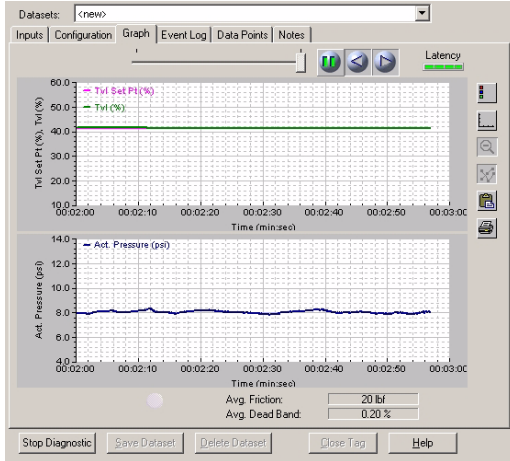


Figure 5. Valve Friction and Deadband Analysis

### Advanced Diagnostics

Advanced Diagnostics include the following dynamic scan tests:

- Valve Signature (see figure 6)
- Dynamic Error Band
- Instrument Drive Signal

These diagnostic scans vary the positioner set point at a controlled rate and plot valve operation to determine valve dynamic performance. The valve signature test allows you to determine the valve/actuator friction, bench set, spring rate, and seat load. The Dynamic Error Band test is a combination of hysteresis and deadband plus “slewing.” Hysteresis and deadband are static measurements. However, because the valve is moving, a dynamic error, or “slewing” error is introduced.

Dynamic scan tests give a better indication of how the valve will operate under process conditions which are dynamic, not static.

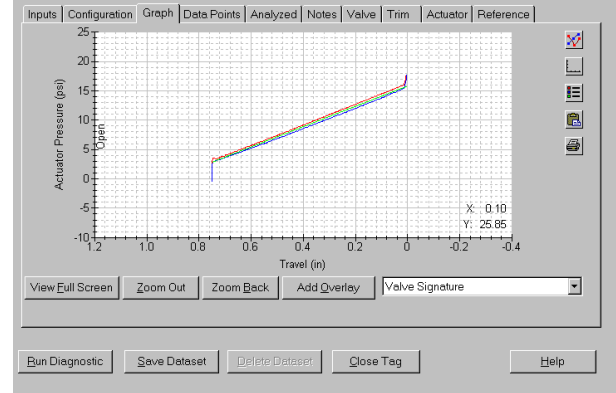


Figure 6. The Valve Signature Display

The Step Response Test checks the valve assemblies response to a changing input signal, and plots travel versus time. The end results of this test allow you to evaluate the dynamic performance of the valve. The Performance Step Test (25 pre-configured points) provides a standardized step test with which to evaluate your valve performance. It utilizes small, medium and large changes.

Advanced Diagnostics are performed with AMS ValveLink Software. The valve must be out of service for Advanced Diagnostics to be performed.

### Integration

- **Non-HART® Systems**—Because DVC6000 Series digital valve controllers operate with a traditional 4 to 20 mA control signal, they directly replace older analog instruments. Microprocessor-based electronics provide improved performance along with repeatable and reliable configuration and calibration.

- **Modbus with AMS™ ValveLink® Software and HART® Multiplexers**—HART communication allows you to extract more value from DVC6000 Series digital valve controllers beyond their inherent improved performance. When integrated into a multiplexer network and using AMS ValveLink Software, the device and valve information is real-time. From the safety of a control room, multiple instruments can be monitored for alerts and alarms. Additionally, tasks such as configuration, calibration and diagnostic testing do not require special trips to the field. AMS ValveLink Software can communicate via Modbus to the distributed control system (DCS) to provide critical information such as valve travel alerts and alarms (figure 7).

# DVC6000 Series

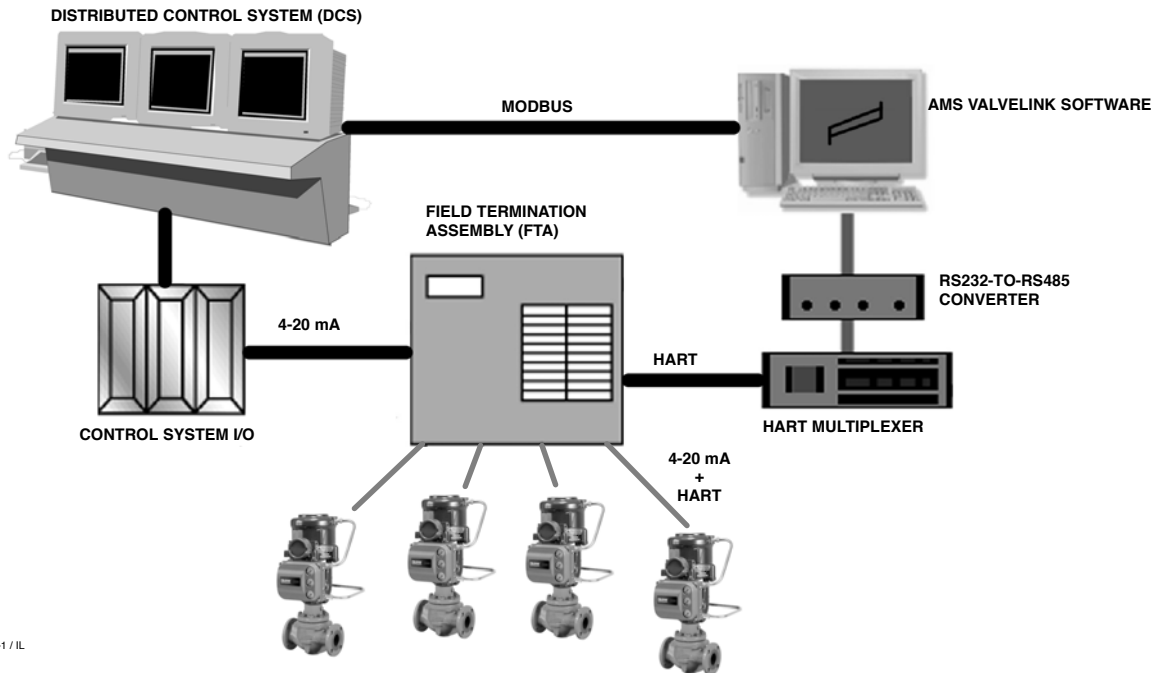


Figure 7. Integrate Information from the Digital Valve Controller into a Non-HART® Compatible Control System With AMS™ ValveLink® Software's Modbus Interface

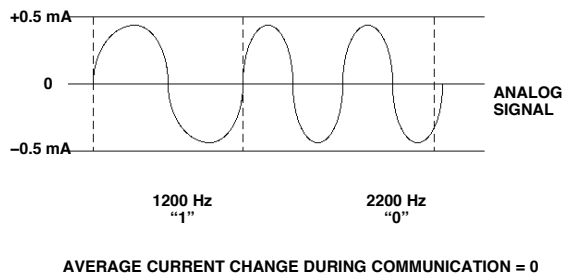


Figure 8. HART® Frequency Shift Keying Technique

- Integrated Control System**—A control system with HART communication capabilities has the ability to directly gather information from DVC6000 Series digital valve controllers. Information such as valve travel, alerts and alarms can be seamlessly accessed to provide a view into the field device from the safety of the control room.

## Communication

### HART® Protocol Overview

The HART (Highway Addressable Remote Transducer) protocol gives field devices the

capability of communicating instrument and process data digitally. This digital communication occurs over the same two-wire loop that provides the 4 to 20 mA process control signal, without disrupting the process signal (figure 8). In this way, the analog process signal, with its faster response, can be used for control. At the same time, the HART digital communication gives access to calibration, configuration, diagnostic, maintenance, and additional process data. The protocol provides total system integration via a host device.

The HART protocol gives you the capability of multidropping, where you can network several devices to a single communications line. This process is well suited for remote applications such as pipelines, custody transfer sites, and tank farms.

### 375 Field Communicator

You can perform configuration and calibration at the valve or anywhere on the two-wire loop via a 375 Field Communicator (figure 9). Powerful tools such as the Setup Wizard and Auto Travel Calibration automate the tasks of commissioning DVC6000 Series digital valve controllers. These automation tools not only save time, but also provide accurate and repeatable results.



W9128

*Figure 9. Perform Configuration and Calibration at the Valve or Anywhere on the 4 to 20 mA Loop with the 375 Field Communicator*

**AMS™ ValveLink® Software**

AMS ValveLink Software is a Windows®-based software package that allows easy access to the information available from DVC6000 Series digital valve controllers.

Using AMS ValveLink Software, you can monitor the performance characteristics of the valve and obtain vital information without having to pull the valve from the line. I/P and Relay Integrity and Travel Deviation Diagnostics, as well as On-Line Friction and Deadband Analysis and Trending can be run while the valve is in service and operating. Valve Signature, Dynamic Error Band, and Step Response are displayed in an intuitive user-friendly environment that allows easy interpretation of data.

Diagnostic graphs can be superimposed over those previously stored to view areas of valve degradation. This allows plant personnel to concentrate efforts on equipment that needs repair, avoiding unnecessary maintenance. This diagnostic capability is readily accessible and available to you either in the control room or on the plant floor. In addition to the diagnostic features, AMS ValveLink Software

contains an Audit Trail, Batch Runner for automating repetitive tasks, and Trending to view valve performance.

AMS ValveLink Software provides integration into AMS and DeltaV™ systems, with HART and Fieldbus communications.

**Principle of Operation**

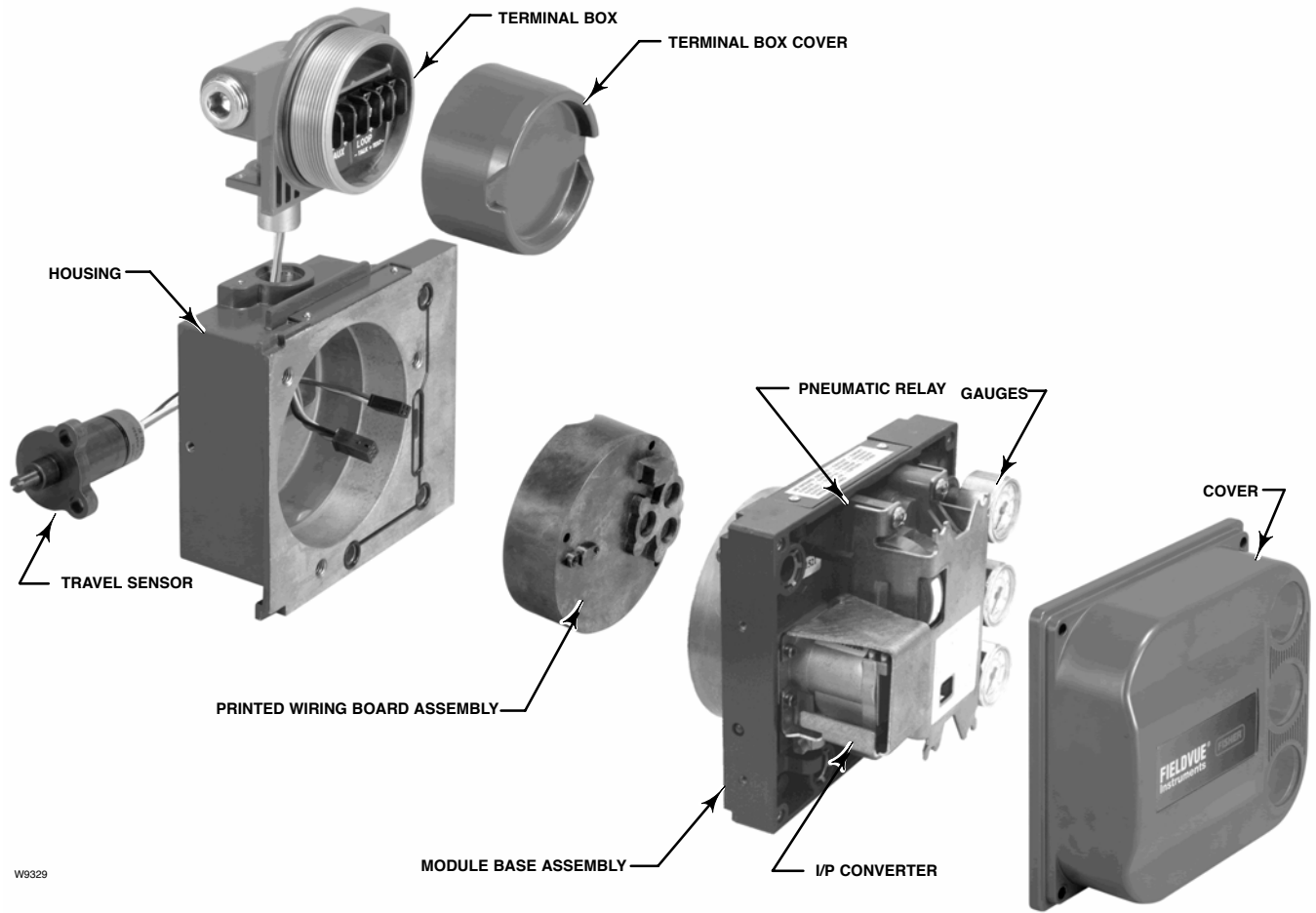
DVC6000 Series instruments (figures 10 and 11) receive a set point and position the valve where it needs to be.

- The input signal provides electrical power and the set point simultaneously. It is routed into the terminal box through a twisted pair of wires.
- The input signal is then directed to the printed wiring board assembly where the microprocessor runs a digital control algorithm resulting in a drive signal to the I/P converter.
- The I/P converter assembly is connected to supply pressure and converts the drive signal into a pressure output signal.
- The I/P output is sent to the pneumatic relay assembly. The relay is also connected to supply pressure and amplifies the small pneumatic signal from the I/P converter into a single larger pneumatic output signal used by a single-acting actuator. For double-acting actuators, the relay accepts the pneumatic signal from the I/P converter and provides two pneumatic output signals.
- The change in relay output pressure to the actuator causes the valve to move.
- Valve position is sensed through the feedback linkage by the instrument's travel sensor. The travel sensor is electrically connected to the printed wiring board to provide a travel feedback signal used in the control algorithm.

The valve continues to move until the correct position is attained.



# DVC6000 Series



W9329

Figure 10. DVC6000 Series Digital Valve Controller Assembly (Valve-Mounted Instrument)

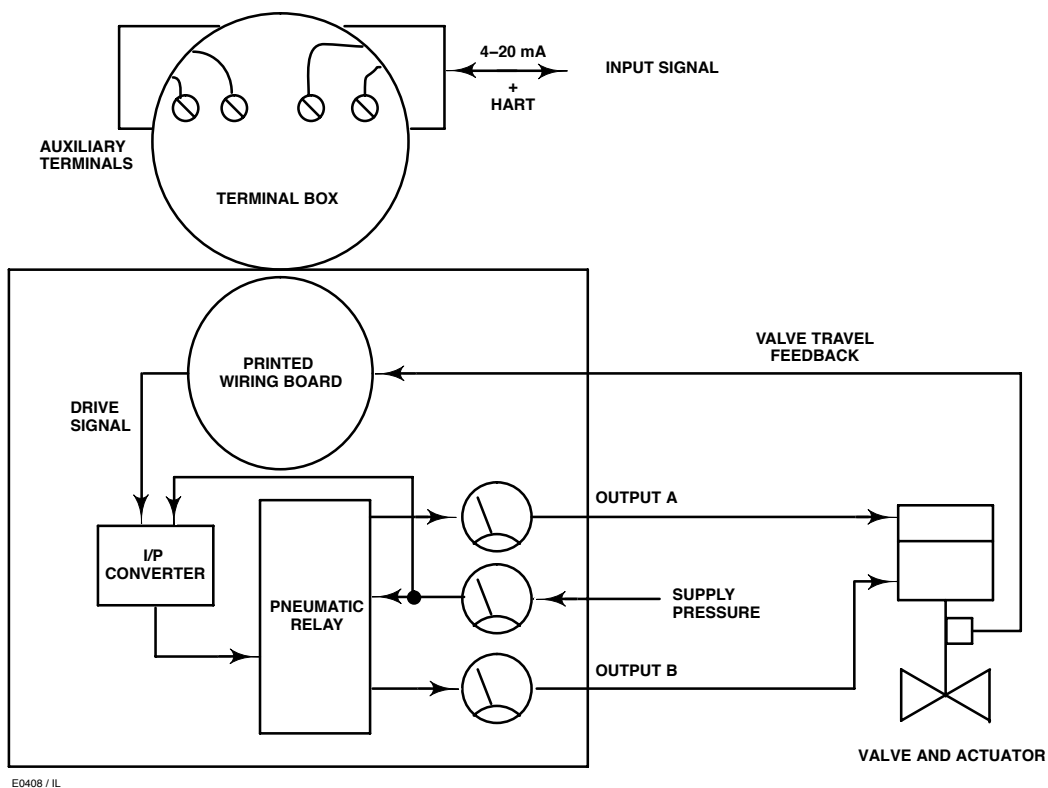


Figure 11. DVC6000 Series Digital Valve Controller Block Diagram

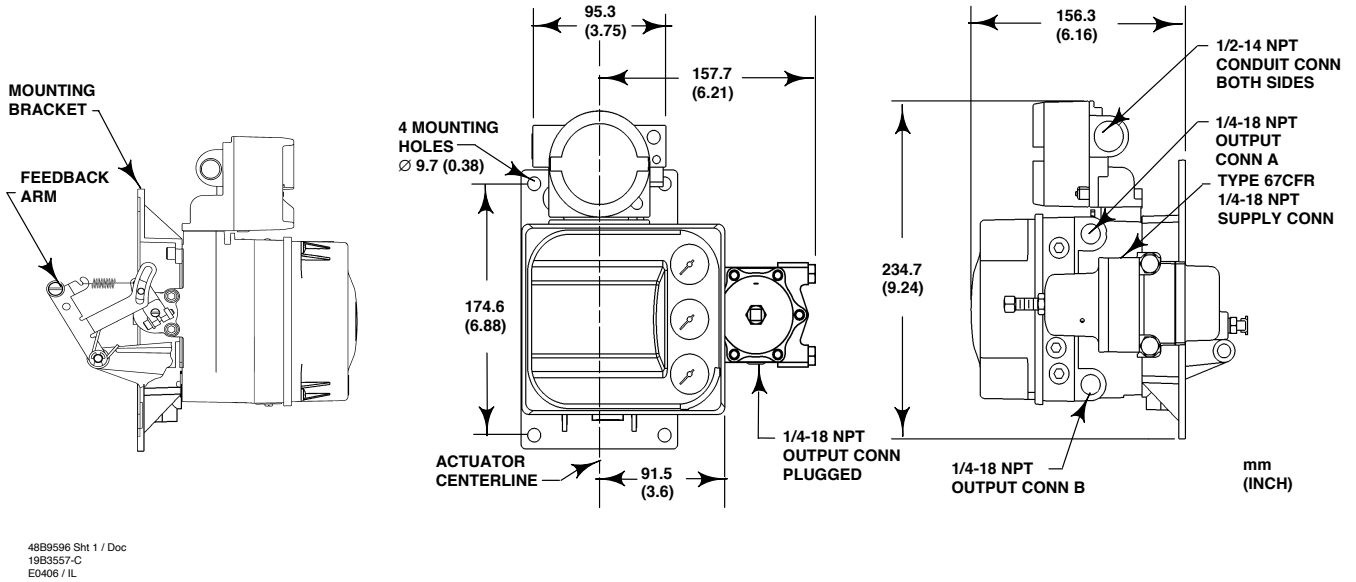


Figure 13. Dimensions for Type DVC6020 Digital Valve Controller with Integrally Mounted Filter Regulator

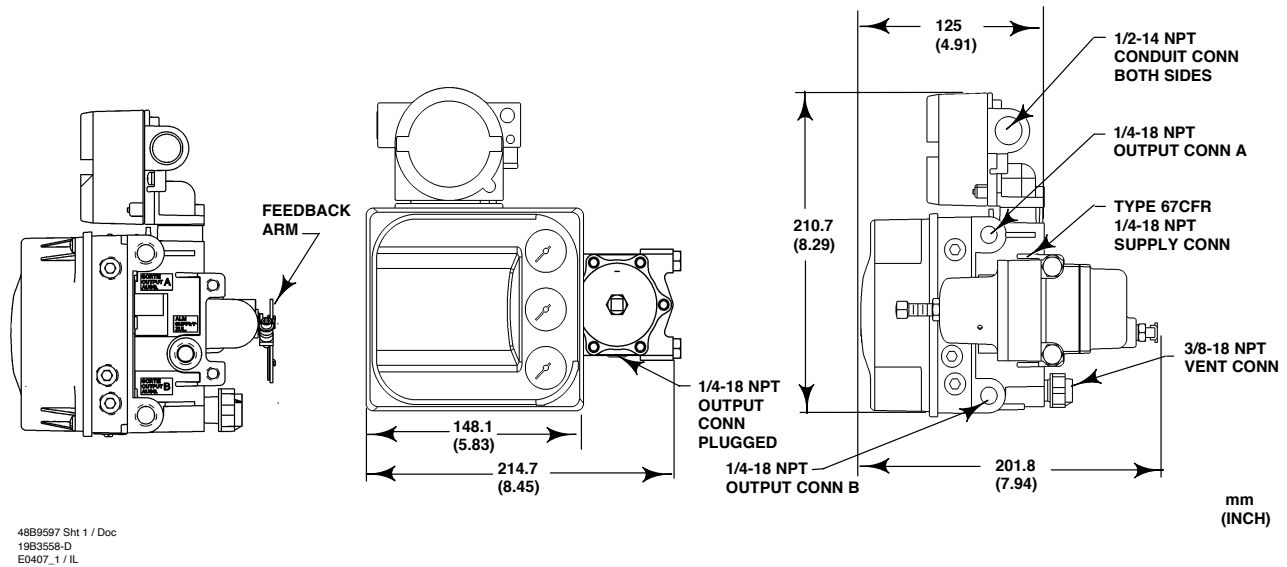
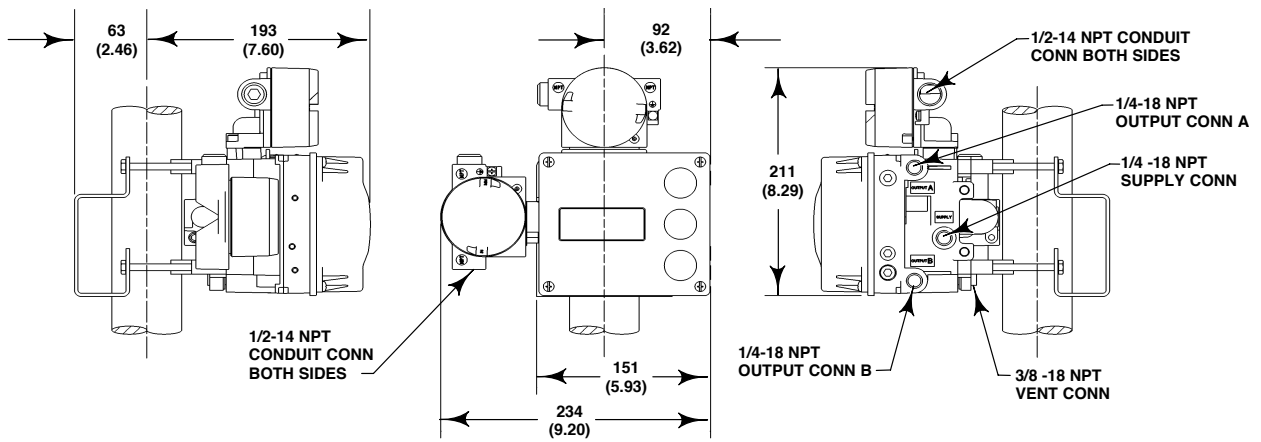
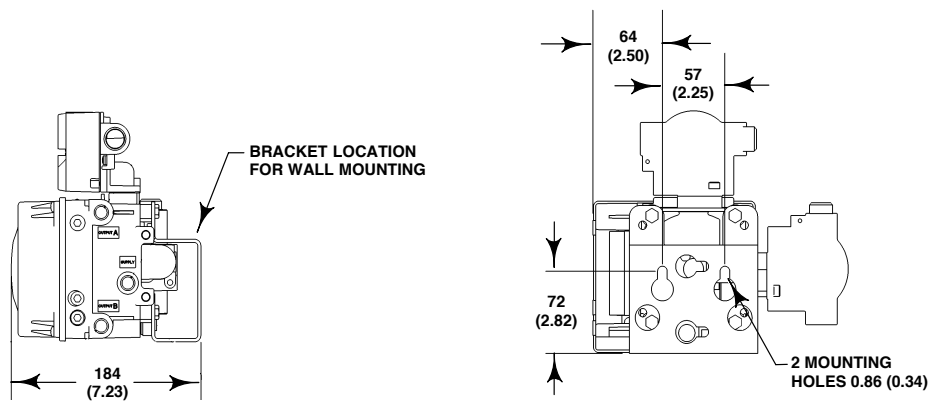


Figure 14. Dimensions for Type DVC6030 Digital Valve Controller with Integrally Mounted Filter Regulator

# DVC6000 Series



**PIPESTAND MOUNTED**

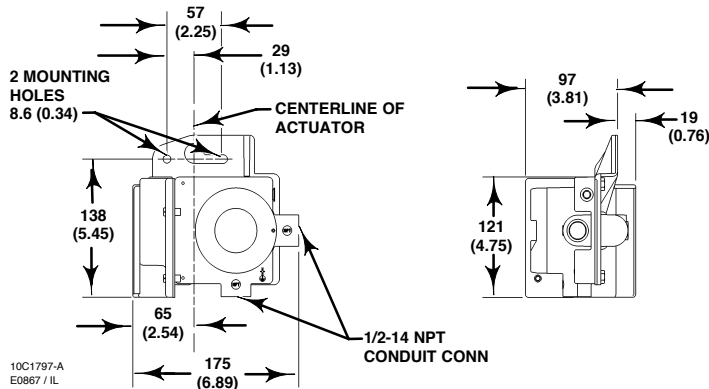


**WALL MOUNTED**

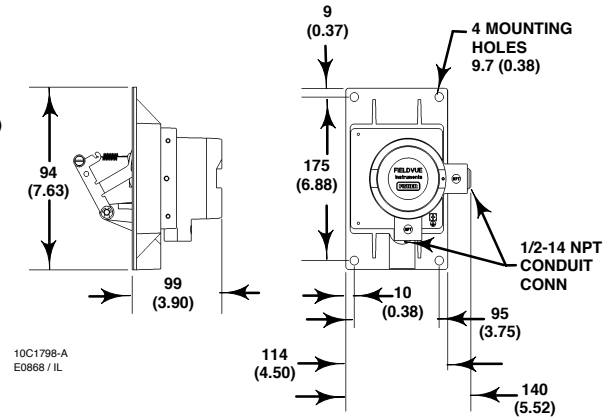
mm  
(INCH)

10C1795-A / DOC  
10C1796-A / DOC  
E1030

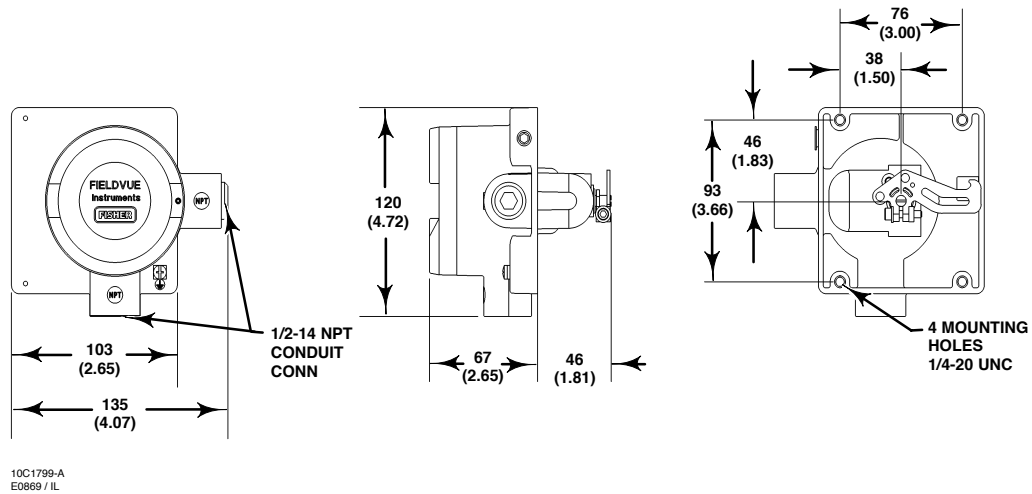
Figure 15. Dimensions for Remote-Mounted Instruments—Type DVC6005 Base Unit



**TYPE DVC6015 SLIDING STEM ACTUATOR MOUNTING  
UP TO 102 mm (4-INCH) TRAVEL**



**TYPE DVC6025 ROTARY AND LONG-STROKE SLIDING STEM  
ACTUATOR MOUNTING**



**TYPE DVC6035 ROTARY ACTUATOR SHAFT MOUNTING**

mm  
(INCH)

Figure 16. Dimensions for Remote-Mounted Instruments—Feedback Units

## DVC6000 Series

Table 2. Immunity Performance

PORT	PHENOMENON	BASIC STANDARD	TEST LEVEL	PERFORMANCE CRITERIA <sup>(1)</sup>	
				Point-to-Point Mode	Multi-drop Mode
Enclosure	Electrostatic discharge (ESD)	IEC 61000-4-2	4 kV contact 8 kV air	A <sup>(2)</sup>	A
	Radiated EM field	IEC 61000-4-3	80 to 1000 MHz @ 10V/m with 1 kHz AM at 80%	A	A
	Rated power frequency magnetic field	IEC 61000-4-8	60 A/m at 50 Hz	A	A
I/O signal/control	Burst	IEC 61000-4-4	1 kV	A <sup>(2)</sup>	A
	Surge	IEC 61000-4-5	1 kV (line to ground only, each)	A <sup>(2)</sup>	A
	Conducted RF	IEC 61000-4-6	150 kHz to 80 MHz at 3 Vrms	A	A

1. A = No degradation during testing. B = Temporary degradation during testing, but is self-recovering.  
2. Excluding auxiliary switch function, which meets Performance Criteria B.

Table 3. Type DVC6000 Series, Hazardous Area Classifications for Canada—CSA

CERTIFICATION BODY	TYPE	CERTIFICATION OBTAINED	ENTITY RATING		TEMPERATURE CODE	ENCLOSURE RATING	
CSA	DVC60x0 DVC60x0S (x = 1,2,3)	(Intrinsic Safety) Class/Division Class I,II,III Division 1 GP A,B,C,D, E,F,G per drawing 29B3428	$V_{max} = 30$ VDC $I_{max} = 226$ mA $C_i = 5$ nF $L_i = 0.55$ mH		T5 ( $T_{amb} \leq 80^\circ\text{C}$ )	4X	
		(Explosion Proof) Class/Division Class I, Division 1 GP B,C,D	---		T6 ( $T_{amb} \leq 80^\circ\text{C}$ )	4X	
		Class I Division 2 GP A,B,C,D Class II Division 1 GP E,F,G Class III Division 1	---		T6 ( $T_{amb} \leq 80^\circ\text{C}$ )	4X	
	DVC6005	(Intrinsic Safety) Class/Division Class I,II,III Division 1 GP A,B,C,D,E, F,G per drawing 29B3520	$V_{max} = 30$ VDC $I_{max} = 226$ mA $C_i = 5$ nF $L_i = 0.55$ mH	$V_{oc} = 9.6$ VDC $I_{sc} = 3.5$ mA $C_a = 3.6$ $\mu\text{F}$ $L_a = 100$ mH		T6 ( $T_{amb} \leq 60^\circ\text{C}$ )	4X
		(Explosion Proof) Class/Division Class I, Division 1 GP C,D	---		T6 ( $T_{amb} \leq 60^\circ\text{C}$ )	4X	
		Class I Division 2 GP A,B,C,D Class II Division 1 GP E,F,G Class III Division 1	---		T6 ( $T_{amb} \leq 60^\circ\text{C}$ )	4X	
	DVC60x5 (x = 1,2,3)	(Intrinsic Safety) Class/Division Class I,II,III Division 1 GP A,B,C,D, E,F,G per drawing 29B3520	$V_{max} = 10$ VDC $I_{max} = 4$ mA $C_i = 0$ nF $L_i = 0$ mH		T4 ( $T_{amb} \leq 125^\circ\text{C}$ ) T5 ( $T_{amb} \leq 95^\circ\text{C}$ ) T6 ( $T_{amb} \leq 80^\circ\text{C}$ )	4X	
		(Explosion Proof) Class/Division Class I, Division 1 GP B,C,D	---		T4 ( $T_{amb} \leq 125^\circ\text{C}$ ) T5 ( $T_{amb} \leq 95^\circ\text{C}$ ) T6 ( $T_{amb} \leq 80^\circ\text{C}$ )	4X	
		Class I Division 2 GP A,B,C,D Class II Division 1 GP E,F,G Class III Division 1	---		T4 ( $T_{amb} \leq 125^\circ\text{C}$ ) T5 ( $T_{amb} \leq 95^\circ\text{C}$ ) T6 ( $T_{amb} \leq 80^\circ\text{C}$ )	4X	

Table 4. DVC6000 Series, Hazardous Area Classifications for United States—FM

CERTIFICATION BODY	TYPE	CERTIFICATION OBTAINED	ENTITY RATING		TEMPERATURE CODE	ENCLOSURE RATING	
FM	DVC60x0 DVC60x0S (x = 1,2,3)	(Intrinsic Safety) Class/Division Class I,II,III Division 1 GP A,B,C, D,E,F,G per drawing 29B3427	V <sub>max</sub> = 30 VDC I <sub>max</sub> = 226 mA C <sub>i</sub> = 5 nF L <sub>i</sub> = 0.55 mH P <sub>i</sub> = 1.4 W		T5 (T <sub>amb</sub> ≤ 80°C)	4X	
		(Explosion Proof) Class/Division Class I, Division 1 GP B,C,D	---		T6 (T <sub>amb</sub> ≤ 80°C)	4X	
		Class I Division 2 GP A,B,C,D Class II,III Division 1 GP E,F,G Class II,III Division 2 GP F,G	---		T6 (T <sub>amb</sub> ≤ 80°C)	4X	
	DVC6005	(Intrinsic Safety) Class/Division Class I,II,III Division 1 GP A,B,C,D, E,F,G per drawing 29B3521	V <sub>max</sub> = 30 VDC I <sub>max</sub> = 226 mA C <sub>i</sub> = 5 nF L <sub>i</sub> = 0.55 mH P <sub>i</sub> = 1.4 W	V <sub>oc</sub> = 9.6 VDC I <sub>sc</sub> = 3.5 mA C <sub>a</sub> = 3.6 μF L <sub>a</sub> = 100 mH P <sub>o</sub> = 8.4 mW	T6 (T <sub>amb</sub> ≤ 60°C)		4X
		(Explosion Proof) Class/Division Class I, Division 1 GP C,D	---		T6 (T <sub>amb</sub> ≤ 60°C)		4X
		Class I Division 2 GP A,B,C,D Class II,III Division 1 GP E,F,G Class II,III Division 2 GP F,G	---		T6 (T <sub>amb</sub> ≤ 60°C)		4X
	DVC60x5 (x = 1,2,3)	(Intrinsic Safety) Class/Division Class I,II,III Division 1 GP A,B,C,D, E,F,G per drawing 29B3521	V <sub>max</sub> = 10 VDC I <sub>max</sub> = 4 mA C <sub>i</sub> = 0 nF L <sub>i</sub> = 0 mH P <sub>i</sub> = 10 mW		T4 (T <sub>amb</sub> ≤ 125°C) T5 (T <sub>amb</sub> ≤ 95°C) T6 (T <sub>amb</sub> ≤ 80°C)		4X
		(Explosion Proof) Class/Division Class I, Division 1 GP A,B,C,D	---		T4 (T <sub>amb</sub> ≤ 125°C) T5 (T <sub>amb</sub> ≤ 95°C) T6 (T <sub>amb</sub> ≤ 80°C)		4X
		Class I Division 2 GP A,B,C,D Class II,III Division 1 GP E,F,G Class II,III Division 2 GP F,G	---		T4 (T <sub>amb</sub> ≤ 125°C) T5 (T <sub>amb</sub> ≤ 95°C) T6 (T <sub>amb</sub> ≤ 80°C)		4X

## DVC6000 Series

Table 5. DVC6000 Series, Hazardous Area Classifications—ATEX

CERTIFICATE	TYPE	CERTIFICATION OBTAINED	ENTITY RATING		TEMPERATURE CODE	ENCLOSURE RATING	
ATEX	DVC60x0 DVC60x0S (x = 1,2,3)	Ⓔ II 1 G D Gas EEx ia IIC T5/T6—Intrinsic Safety Dust T85°C (T <sub>amb</sub> ≤ 80°C)	U <sub>i</sub> = 30 VDC I <sub>i</sub> = 226 mA C <sub>i</sub> = 5 nF L <sub>i</sub> = 0.55 mH P <sub>i</sub> = 1.4 W		T5 (T <sub>amb</sub> ≤ 80°C) T6 (T <sub>amb</sub> ≤ 75°C)	IP66	
		Ⓔ II 2 G D Gas EEx d IIB+H2 T5/T6—Flameproof Dust T90°C (T <sub>amb</sub> ≤ 85°C)	---		T5 (T <sub>amb</sub> ≤ 85°C) T6 (T <sub>amb</sub> ≤ 75°C)	IP66	
		Ⓔ II 3 G D Gas EEx nCL IIC T5/T6—Type n Dust T85°C (T <sub>amb</sub> ≤ 80°C)	---		T5 (T <sub>amb</sub> ≤ 80°C) T6 (T <sub>amb</sub> ≤ 75°C)	IP66	
	DVC6005	Ⓔ II 1 G D Gas EEx ia IIC T5/T6—Intrinsic Safety Dust T85°C (T <sub>amb</sub> ≤ 80°C)	U <sub>i</sub> = 30 VDC I <sub>i</sub> = 226 mA C <sub>i</sub> = 5 nF L <sub>i</sub> = 0.55 mH P <sub>i</sub> = 1.4 mW	U <sub>o</sub> = 9.6 VDC I <sub>o</sub> = 3.5 mA C <sub>o</sub> = 3.6 uF L <sub>o</sub> = 100 mH P <sub>o</sub> = 8.4 mW		T5 (T <sub>amb</sub> ≤ 80°C) T6 (T <sub>amb</sub> ≤ 75°C)	IP66
		Ⓔ II 2 G D Gas EEx d IIB T5/T6—Flameproof Dust T90°C (T <sub>amb</sub> ≤ 80°C)	---		T5 (T <sub>amb</sub> ≤ 80°C) T6 (T <sub>amb</sub> ≤ 70°C)	IP66	
		Ⓔ II 3 G D Gas EEx nL IIC T5/T6—Type n Dust T85°C (T <sub>amb</sub> ≤ 80°C)	---		T5 (T <sub>amb</sub> ≤ 80°C) T6 (T <sub>amb</sub> ≤ 75°C)	IP66	
	DVC60x5 (x = 1,2,3)	Ⓔ II 1 G D Gas EEx ia IIC T4/T5/T6—Intrinsic Safety Dust T130°C (T <sub>amb</sub> ≤ 125°C)	U <sub>i</sub> = 10 VDC I <sub>i</sub> = 4 mA C <sub>i</sub> = 0 nF L <sub>i</sub> = 0 mH P <sub>i</sub> = 10 mW			T4 (T <sub>amb</sub> ≤ 125°C) T5 (T <sub>amb</sub> ≤ 95°C) T6 (T <sub>amb</sub> ≤ 80°C)	IP66
		Ⓔ II 2 G D Gas EEx d IIC T4/T5/T6—Flameproof Dust T130°C (T <sub>amb</sub> ≤ 125°C)	---			T4 (T <sub>amb</sub> ≤ 125°C) T5 (T <sub>amb</sub> ≤ 95°C) T6 (T <sub>amb</sub> ≤ 80°C)	IP66
		Ⓔ II 3 G D Gas EEx nA IIC T4/T5/T6—Type n Dust T130°C (T <sub>amb</sub> ≤ 125°C)	---			T4 (T <sub>amb</sub> ≤ 125°C) T5 (T <sub>amb</sub> ≤ 95°C) T6 (T <sub>amb</sub> ≤ 80°C)	IP66



Table 6. DVC6000 Series, Hazardous Area Classifications—IECEX

CERTIFICATE	TYPE	CERTIFICATION OBTAINED	ENTITY RATING		TEMPERATURE CODE	ENCLOSURE RATING	
IECEX	DVC60x0 DVC60x0S (x = 1,2,3)	Gas Ex ia IIC T5/T6—Intrinsic Safety	U <sub>i</sub> = 30 VDC I <sub>i</sub> = 226 mA C <sub>i</sub> = 5 nF L <sub>i</sub> = 0.55 mH P <sub>i</sub> = 1.4 W		T5 (T <sub>amb</sub> ≤ 80°C) T6 (T <sub>amb</sub> ≤ 75°C)	IP66	
		Gas Ex d IIB+H2 T5/T6—Flameproof	---		T5 (T <sub>amb</sub> ≤ 80°C) T6 (T <sub>amb</sub> ≤ 75°C)	IP66	
		Gas Ex nC IIC T5/T6—Type n	---		T5 (T <sub>amb</sub> ≤ 80°C) T6 (T <sub>amb</sub> ≤ 75°C)	IP66	
	DVC6005	Gas Ex ia IIC T5/T6—Intrinsic Safety	U <sub>i</sub> = 30 VDC I <sub>i</sub> = 226 mA C <sub>i</sub> = 5 nF L <sub>i</sub> = 0.55 mH P <sub>i</sub> = 1.4 W	U <sub>o</sub> = 9.6 VDC I <sub>o</sub> = 3.5 mA C <sub>o</sub> = 3.6 μF L <sub>o</sub> = 100 mH P <sub>o</sub> = 8.4 mW	T5 (T <sub>amb</sub> ≤ 80°C) T6 (T <sub>amb</sub> ≤ 75°C)	IP66	
		Gas Ex d IIB T5/T6—Flameproof	---		T5 (T <sub>amb</sub> ≤ 80°C) T6 (T <sub>amb</sub> ≤ 75°C)	IP66	
		Gas Ex nC IIC T5/T6—Type n	---		T5 (T <sub>amb</sub> ≤ 80°C) T6 (T <sub>amb</sub> ≤ 75°C)	IP66	
	DVC60x5 (x = 1,2,3)	Gas Ex ia IIC T4/T5/T6—Intrinsic Safety	U <sub>i</sub> = 10 VDC I <sub>i</sub> = 4 mA C <sub>i</sub> = 0 nF L <sub>i</sub> = 0 mH P <sub>i</sub> = 10 mW	---		T4 (T <sub>amb</sub> ≤ 125°C) T5 (T <sub>amb</sub> ≤ 95°C) T6 (T <sub>amb</sub> ≤ 80°C)	IP66
		Gas Ex d IIC T4/T5/T6—Flameproof	---		T4 (T <sub>amb</sub> ≤ 125°C) T5 (T <sub>amb</sub> ≤ 95°C) T6 (T <sub>amb</sub> ≤ 80°C)	IP66	
		Gas Ex nA IIC T4/T5/T6—Type n	---		T4 (T <sub>amb</sub> ≤ 125°C) T5 (T <sub>amb</sub> ≤ 95°C) T6 (T <sub>amb</sub> ≤ 80°C)	IP66	

Table 7. DVC6000 Series, Hazardous Area Classifications—NEPSI

CERTIFICATE	TYPE	CERTIFICATION OBTAINED	ENTITY RATING		TEMPERATURE CODE	ENCLOSURE RATING
NEPSI	DVC60x0 (x = 1,2,3)	Gas Ex ia IIC T5/T6 —Intrinsic Safety Dust DIP A21 T5	U <sub>i</sub> = 30 V I <sub>i</sub> = 226 mA C <sub>i</sub> = 5 nF L <sub>i</sub> = 0.55 mH P <sub>i</sub> = 1.4 W		T5 (T <sub>amb</sub> ≤ 80°C) T6 (T <sub>amb</sub> ≤ 75°C)	IP66
		Gas Ex d IIC T5/T6 <sup>(1)</sup> —Flameproof Dust DIP A21 T5	---		T5 (T <sub>amb</sub> ≤ 80°C) T6 (T <sub>amb</sub> ≤ 75°C)	IP66

1. Except acetylene.

Table 8. DVC6000 Series, Hazardous Area Classifications—INMETRO

CERTIFICATE	TYPE	CERTIFICATION OBTAINED	ENTITY RATING		TEMPERATURE CODE	ENCLOSURE RATING
INMETRO	DVC60x0 (x = 1,2,3)	BR—Ex ia IIC T5	U <sub>i</sub> = 30 V I <sub>i</sub> = 180 mA C <sub>i</sub> = 5 nF L <sub>i</sub> = 0.55 mH P <sub>i</sub> = 1.4 W		T5(T <sub>amb</sub> ≤ 80°C)	---
		BR—Ex d IIB+H2 T6	---		T6 (T <sub>amb</sub> ≤ 75°C)	---

# DVC6000 Series

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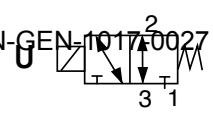
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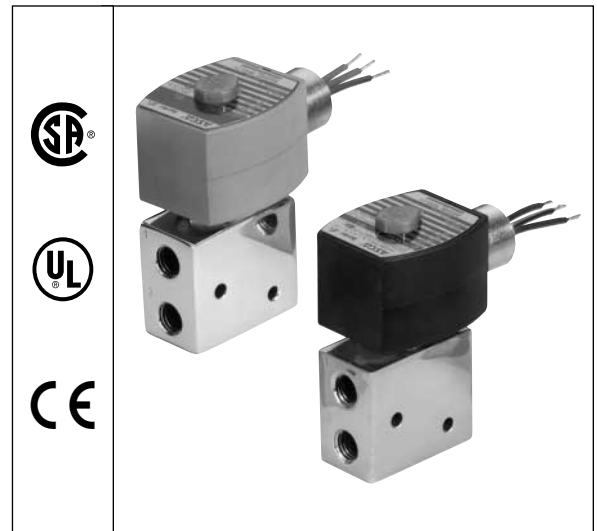


**Features**

- Designed for high flow piloting with no minimum operating pressure required; e.g., power plants, refineries, chemical processing.
- Balanced Poppet construction for high flow at minimum power levels.
- PTFE rider rings and graphite-filled seals reduce friction and eliminate sticking to provide exceptional service life.
- 316 Stainless Steel construction for highly corrosive atmospheres.
- Available with manual reset. *See Special Service Section.*

**Construction**

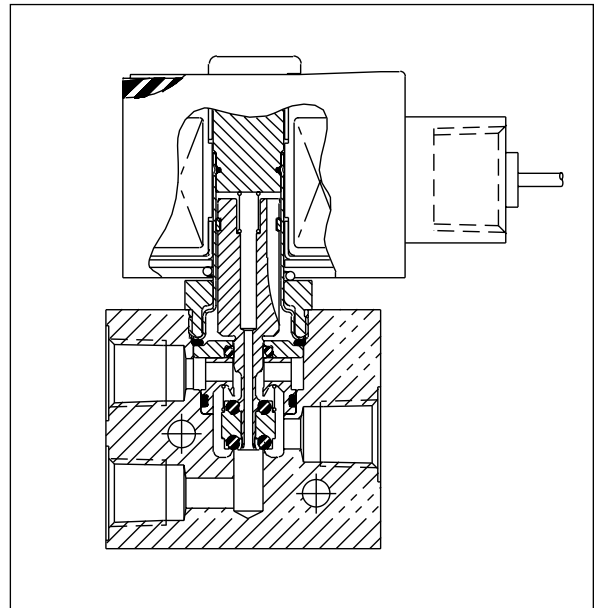
Valve Parts in Contact with Fluids		
Body	Brass	316 Stainless Steel
Core Tube	305 Stainless Steel	
Stem and Insert	303 Stainless Steel	
Core and Plugnut	430F Stainless Steel	
O-ring Holder	430F Stainless Steel	
Springs	302 Stainless Steel	
Seals and Discs	NBR	FKM
	VMQ (Low-Temperature Construction)	
Rider Ring	PTFE	



**Electrical**

Standard Coil and Class of Insulation	Watt Rating and Power Consumption				Spare Coil Part Number			
	DC Watts	AC			General Purpose		Explosionproof	
		Watts	VA Holding	VA Inrush	AC	DC	AC	DC
F	11.6	12	24	24	276000	238710	276002	238714

**Standard Voltages:** 24/50-60, 120/50-60, 240/50-60, and 480/50-60, or 6, 12, 24, 120, and 240 DC.



**Solenoid Enclosures**

**Standard:** For Brass Valves: Standard Solenoid enclosure is Types, 1, 2, 3, 3S, 4, and 4X.  
For 316 Stainless Steel valves: Standard Solenoid enclosure is Explosionproof and Watertight Types 3, 3S, 4, 4X, 6, and 6P.

**Optional:** Explosionproof and Watertight, Types 3, 3S, 4, 4X, 6, 6P, 7, and 9. (To order, add prefix "EF" or, for Explosionproof Stainless Steel trim and hub on Brass-Bodied valves, add "EV" to catalog number.)  
*See Optional Features Section for other available options.*

**Nominal Ambient Temperature Ranges:**

8327G41,-42, -21, -22, -31, -32: -4°F to 131°F  
(-20°C to 55°C)

8327G51 and -52: -40°F to 131°F (-40°C to 55°C)

*Refer to Engineering Section for details.*

**Approvals:**

CSA certified. UL listed General Purpose Valves. Meets applicable CE directives.

*Refer to Engineering Section for details.*

**Specifications (English units)**

Pipe Size (ins.)	Orifice Size (ins.)	Cv Flow Factor		Maximum Operating Pressure Differential (psi)			Max. Fluid Temp. °F	Brass Body	316 Stainless Steel Body	Constr. Ref. No.	Watt Rating/Class of Coil Insulation	
		Ports 1-2	Ports 2-3	Air-Inert Gas	Water	Light Oil @ 300 SSU		Catalog Number	Catalog Number		AC	DC
<b>UNIVERSAL OPERATION (Pressure at any port)</b>												
1/4	1/4	.49	.56	150	150	150	176	8327G41	—	1	12.0/F	11.6/F
1/4	1/4	.49	.56	150	150	150	248	—	EV8327G42	1	12.0/F	11.6/F
<b>UNIVERSAL LOW-TEMPERATURE OPERATION (Pressure at any port)</b>												
1/4	1/4	.49	.56	150	—	—	131	8327G51	—	1	12.0/F	11.6/F
1/4	1/4	.49	.56	150	—	—	131	—	EV8327G52	1	12.0/F	11.6/F

**Specifications (Metric units)**

Pipe Size (ins.)	Orifice Size (mm)	Kv Flow Factor m3/h		Maximum Operating Pressure Differential (bar)			Max. Fluid Temp. °C	Brass Body	316 Stainless Steel Body	Constr. Ref. No.	Watt Rating/Class of Coil Insulation	
		Ports 1-2	Ports 2-3	Air-Inert Gas	Water	Light Oil @ 300 SSU		Catalog Number	Catalog Number		AC	DC
<b>UNIVERSAL OPERATION (Pressure at any port)</b>												
1/4	6	.42	.48	10	10	10	79	8327G41	—	1	12.0/F	11.6/F
1/4	6	.42	.48	10	10	10	119	—	EV832742	1	12.0/F	11.6/F
<b>UNIVERSAL LOW-TEMPERATURE OPERATION (Pressure at any port)</b>												
1/4	6	.42	.48	10	—	—	54	8327G51	—	1	12.0/F	11.6/F
1/4	6	.42	.48	10	—	—	54	—	EV8327G52	1	12.0/F	11.6/F

**Dimensions: inches (mm)**

**FLOW DIAGRAMS**

OPERATION	DE-ENERGIZED	ENERGIZED
NORMALLY CLOSED PRESSURE AT 3		
NORMALLY OPEN PRESSURE AT 1		
UNIVERSAL PRESSURE AT ANY PORT		

**Constr. Ref. 1**

**IMPORTANT:** Valves may be mounted in any position.

# **TOPWORX**

Process automation solutions for  
**today and tomorrow**

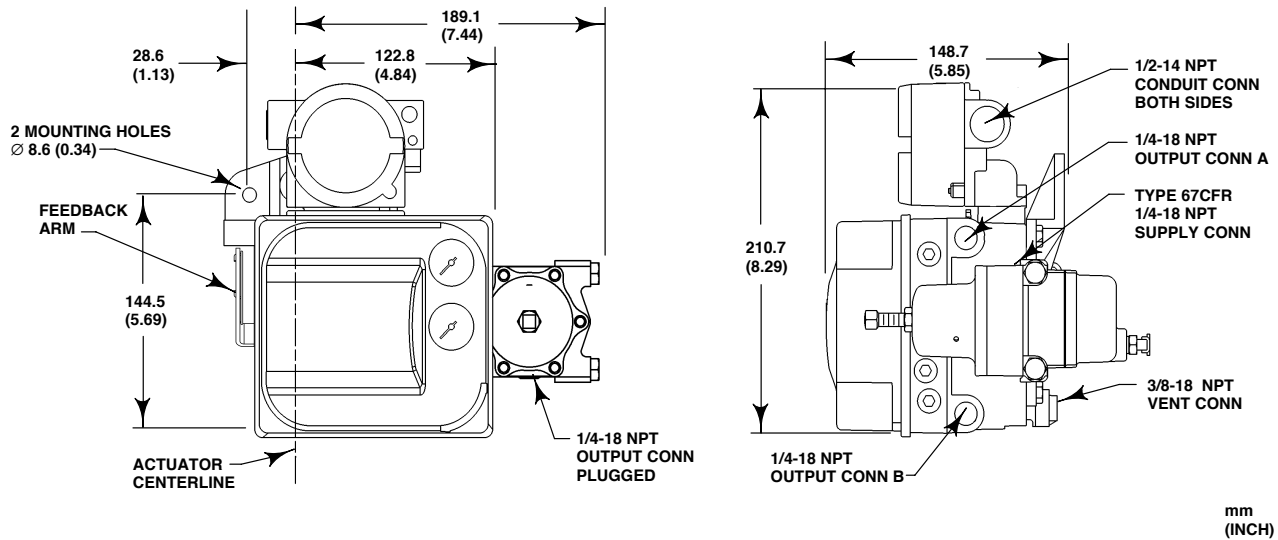


Position Sensing

Valve Control

Field Networking

# DVC6000 Series



48B7710 Sht 1 / Doc.  
 19B3538-C  
 E0405 / IL

Figure 12. Dimensions for Type DVC6010 Digital Valve Controller with Integrally Mounted Filter Regulator

## Installation

The DVC6010 digital valve controller is designed for yoke mounting to sliding stem actuators. Type DVC6020 digital valve controllers are designed for mounting to rotary actuators or long stroke sliding stem actuators (over 4-inches travel). Type DVC6030 digital valve controllers are designed for mounting on virtually any quarter-turn actuator. Dimensions for valve-mounted instruments are shown in figures 12, 13, and 14. Dimensions for remote-mounted instruments are shown in figures 15 and 16.

The DVC6005 digital valve controller base unit may be remote mounted on 2-inch pipestand or wall. The remote-mounted DVC6005 base unit connects to the DVC6015, DVC6025, or DVC6035 feedback unit mounted on the actuator. Feedback wiring and pneumatic tubing to the control valve assembly must be connected in the field.

The digital valve controllers are 4 to 20 mA loop powered and do not require additional power. Electrical connections are made in the terminal box.

All pressure connections on the digital valve controllers are 1/4 NPT internal connections. The digital valve controller outputs are typically connected to the actuator inputs using 3/8-inch diameter tubing. Remote venting is available.

## Ordering Information

When ordering, specify:

1. Actuator type and size
2. Maximum actuator travel or rotation
3. Options
  - a. Supply pressure regulator
  - b. Supply and output gauges
  - c. HART filter
  - d. Stainless steel housing (valve-mounted instruments only)
  - e. Remote mounting

### Note

**Neither Emerson, Emerson Process Management, nor any of their affiliated entities assumes responsibility for the selection, use, or maintenance of any product. Responsibility for the selection, use, and maintenance of any product remains with the purchaser and end-user.**

TopWorx is the leader in field networking, valve control, and position sensing solutions for the process industries.



We promise to provide:

- Products with superior **quality and value**
- People with leading **experience and expertise**
- Service with outstanding **speed and excellence**

When you do business with TopWorx, you *will* see a difference in these critical areas.

#### Quality and Value

Our years of working with plants, mills, and pipelines have resulted in a portfolio of top quality, high performance products. We never compromise our designs – every product is built to operate safely and reliably in demanding plant conditions. Yet we aggressively work to reduce costs in order to deliver maximum value for price paid.

#### Experience and Expertise

At TopWorx, everything starts with the customer. With over fifty years of experience in the process industries, we have a deep understanding of customer needs. We couple our process experience with our expertise in modern technologies to create state-of-the-art solutions for today's customers.

#### Speed and Excellence

We believe that good service doesn't have to be a lost art. Instead, we have instilled a passion for serving customers that drives everything we do. That's why our customers consistently rank us among their top vendors when it comes to their overall "buying experience."





**Valve Control Solutions**

Valvetop® valve control solutions enable automated on/off valves to communicate via FOUNDATION Fieldbus, DeviceNet, and AS-Interface. Better yet, Valvetop discrete valve controllers attach to both rotary and linear valves and actuators, operate in the most demanding plant conditions, and carry a variety of global certifications.



**Position Sensing Solutions**

GO® Switch leverless limit switches provide reliable position sensing in extremely hot, cold, wet, dirty, abusive, corrosive, and explosive plant conditions. Using a unique hybrid design, GO Switches combine the advantages of proximity sensors and mechanical limit switches into a single technology that outperforms all others.



**Field Networking Solutions**

Networkx™ field networking solutions offer a complete portfolio of best-in-class components that connect field devices to control systems via a variety of fieldbus protocols. In addition, Networkx Support Services help optimize your network by helping with bus network selection, design, implementation, and troubleshooting.





# Discrete Valve Controllers designed by customers... delivered by TopWorx

The Valvetop® range of discrete valve controllers and monitors is the direct result of extensive customer research. We've coupled our experience in the process industries with our expertise in bus networking, sensor, and solenoid technologies to create the finest switchboxes and valve controllers available anywhere.



## Discrete Valve Controllers



### DXP

#### EXPLOSION PROOF / FLAMEPROOF

Tropicalized Aluminum  
Class 1 Division 1 & 2 Groups C-D  
EEx d IIB II2G  
IP67, Type 4, 4X, 7

Options available:  
Pilot Valve - Aluminum, 304SS, 316SS,  
Single or Dual Coil



### TXP

#### EXPLOSION PROOF / FLAMEPROOF

Direct-mount Aluminum  
Class 1 & 2 Division 1 & 2 Groups C-G  
EEx d IIB II2G  
EEx d IIB + H2 II2G (Flattop only)  
IP67, Type 4, 4X, 7, 9

Options available:  
Pilot Valve - Aluminum, 316SS



### TXS

#### EXPLOSION PROOF / FLAMEPROOF

Direct-mount 316L Stainless Steel  
Class 1 & 2 Division 1 & 2 Groups C-G  
EEx d IIB II2G  
EEx d IIB + H2 II2G (Flattop only)  
IP67, Type 4, 4X, 7, 9

Options available:  
Pilot Valve - 316SS



Valvetop discrete valve controllers combine bus networking, position sensors, and pilot valves into a variety of globally certified enclosures suitable for every application need.

### Options



#### Sensor-Communications Modules

TopWorx Sensor-Communications Modules are microprocessor based "brains" that combine bus networking, position sensors, solenoid outputs, and wiring terminals into a sealed module that drops into a variety of Valvetop platforms.

- FOUNDATION Fieldbus
- DeviceNet
- Profibus
- AS-Interface

## The Valvetop difference

**Valvetop works with all major control systems.** With today's process plants shifting toward modern fieldbus networking technologies, the link between automated valves and the control system is more important than ever. Valvetop has been proven to work with all major control systems, including ABB, Emerson, Honeywell, Invensys, Rockwell, Siemens, Smar, and Yokogawa.

### Valvetop offers the broadest range on the market today.

Whether your environment is explosion proof, intrinsically safe, non-incendive, general purpose, or your conditions are hot, cold, wet, dirty, abusive, corrosive, explosive, or your application is rotary, linear, bus or conventional, Valvetop has a product to meet your needs.

**MD-502-7000-IN-GEN-1017-0027 D01**  
**Valvetop delivers high quality and performance at affordable costs.** To deliver the value that today's customers require, we have coupled state-of-the-art technology with aggressive sourcing and low cost manufacturing to ensure that customers receive the biggest 'bang for their buck'.

"I love the TopWorx DVC direct mount feature and LEDs. My client will benefit from having LEDs on the TopWorx device. Also, having one DO block for valve feedback will save my client money on licensing fees."

Engineering Contractor



### DVC / DVM

#### NON-INCENDIVE

Direct-mount Resin with LEDs  
 Class 1 Division 2 Groups A-D  
 EEx nc IIC II3G  
 Type 4, 4X

Options available:  
 Pilot Valve - Aluminum, 316SS



### TVC

#### NON-INCENDIVE

Direct-mount Resin  
 Class 1 Division 2 Groups A-D  
 Type 4, 4X

Options available:  
 Pilot Valve - Aluminum, 316SS,  
 Single or Dual Coil



### TVG

#### GENERAL PURPOSE

Direct-mount Resin  
 Ordinary Locations  
 Type 4, 4X

Options available:  
 Pilot Valve - Aluminum, 316SS,  
 Single or Dual Coil



### TPS

#### GENERAL PURPOSE

Direct-mount Puck with LEDs  
 Ordinary Locations



#### Position Sensors

- Hermetically sealed GO Switches
- Inductive and reed proximity sensors
- Mechanical limit switches
- Potentiometers
- 4-20mA position transmitters



#### Integral Pilot Valves

- Low power solenoid pilots
- Aluminum, 304, and 316SS valve bodies
- Single or Dual Coil
- Pushbutton or palm actuated manual overrides
- Up to 3.0 Cv

Note: All Valvetop products are intrinsically safe when used with an appropriate barrier or isolator, as long as (a) they contain "simple apparatus" sensors such as GO Switch, reed, or mechanical switches and (b) the solenoid coils are specifically rated for intrinsic safe use.

# Valvetop Ordering Guide

Choose one option from each category to build a complete model number.

Ordering Examples:  
DXP-FF0GNEBPA2  
TVC-M22GNEM

✔ Denotes **FastTrack Delivery** option most likely to be available for immediate shipment. - see page 15 for details.

MD-502-7000-IN-GEN-1017-0027 D01



Enclosure	Bus/Sensor	Area Classification	Visual Display	Shaft
<p><b>DXP, TXP, TXS, TVC, TVG,</b></p> <p>✔ <b>DXP</b> Tropicalized Aluminum</p> <p>✔ <b>TXP</b> Direct-mount Aluminum</p> <p>✔ <b>TXS</b> Direct-mount 316L Stainless Steel</p> <p>✔ <b>TVC Direct-mount Resin</b> ←</p> <p><b>TVG</b> Direct-mount Resin (Area class G only)</p>	<p><b>Bus Networking</b></p> <p>✔ <b>AS</b> AS-Interface (Area Class must be 1, 2 or G)</p> <p>✔ <b>FF</b> FOUNDATION Fieldbus (Pilot must be P, R, or U) (DXP only)</p> <p>✔ <b>DN</b> DeviceNet (Area Class must be 1) (DXP only)</p> <p>✔ <b>MB</b> Modbus (Area Class must be 1) (DXP only)</p> <p>✔ <b>PB</b> Profibus DP (T Series only, Area Class 1, 2 or G)</p> <p><b>GO Switches</b></p> <p>✔ <b>L2</b> (2) GO Switches, SPDT hermetic seal</p> <p>✔ <b>L4</b> (4) GO Switches, SPDT hermetic seal (DXP only)</p> <p><b>Mechanical Switches</b></p> <p>✔ <b>M2</b> (2) Mechanical SPDT</p> <p>✔ <b>M4</b> (4) Mechanical SPDT</p> <p>✔ <b>M6</b> (6) Mechanical SPDT (DXP only)</p> <p>✔ <b>T2</b> (2) Mechanical DPDT</p> <p>✔ <b>K2</b> (2) Mechanical SPDT gold contacts</p> <p>✔ <b>K4</b> (4) Mechanical SPDT gold contacts</p> <p><b>Proximity Switches</b></p> <p>✔ <b>R2</b> (2) SPDT Hermetic Seal</p> <p>✔ <b>R4</b> (4) SPDT Hermetic Seal</p> <p>✔ <b>P2</b> (2) SPDT Hermetic Seal 3 amp</p> <p>✔ <b>P4</b> (4) SPDT Hermetic Seal 3 amp</p> <p><b>Inductive Sensors</b></p> <p>✔ <b>E2</b> (2) p-f NJ2-V3-N, inductive NAMUR</p> <p>✔ <b>E4</b> (4) p-f NJ2-V3-N, inductive NAMUR</p> <p>✔ <b>I2</b> Inductive proximity NPN N/C (T Series only)</p> <p><b>Analog Output</b> (DXP available w/ 2 switch options only for L, M, E, T and K*) (T Series available w/ 2 switch options only for M &amp; R*)</p> <p>✔ <b>X</b> 4-20mA transmitter (0-180°)</p> <p>✔ <b>C</b> Auto Calibration</p> <p><b>*Examples:</b> LX = (2) GO Switches with transmitter OX = no switches with transmitter AM = AS-I w/ mechanical switches (T Series only)</p>	<p><b>DXP only</b></p> <p>✔ <b>0</b> Intrinsically Safe* Class I Div 1 &amp; 2 Groups A-D Zone 0 EEx ia IIC II 1 G IP67 (Pilot 0, 1, 2, or 3 (24V) P, R, U (FF) only) Type 4, 4X, and 7</p> <p>✔ <b>1</b> Explosion Proof/Flameproof Class I Div 1 &amp; 2 Class II Div 2, Grps A-D (Hermetic seal only) Groups C-D Zone 1 EEx d IIB II 2 G IP67 Type 4, 4X, and 7</p> <p><b>T Series only</b></p> <p>✔ <b>1</b> Explosion Proof/Flameproof Class I &amp; II Div 1 &amp; 2** Groups C, D, E, F &amp; G Zone 1 EEx d IIB II 2 G IP67 (Encl TXP &amp; TXS only)</p> <p><b>H</b> Zone 1 EEx d IIB+H2, II 2 G IP67 (TXP &amp; TXS with Visual Display F only; Pilot 0 only)</p> <p>✔ <b>2</b> Non-Incendive Class I &amp; II Div 2 (Hermetic seal only) Grps A-G Type 4, 4X</p> <p>✔ <b>G</b> General Purpose Ordinary Locations Type 4, 4X</p> <p>* With appropriate I.S. barrier ** Certifications pending</p>	<p>✔ <b>G</b> Standard 90° Green OPEN, Red CLOSED</p> <p><b>B</b> 90° Black OPEN, Yellow CLOSED</p> <p>✔ <b>F</b> Flat top w/ skirt indicator (TXP &amp; TXS only)</p> <p><b>4</b> 45° Green OPEN, Red CLOSED</p> <p><b>X</b> 45° Black OPEN, Yellow CLOSED</p>	<p>✔ <b>S</b> 1/4" DD 304 stainless steel (DXP only)</p> <p>✔ <b>N</b> NAMUR 304 stainless steel</p>
<b>Enclosure</b>	<b>Bus/Sensor</b>	<b>Area Class.</b>	<b>Visual Display</b>	<b>Shaft</b>

Enclosure	Bus/Sensor	Area Classification	Visual Display	Conduit Entries	Pilot Valve
<p><b>DVC, DVM, IVC, IVM</b></p> <p>✔ <b>DVC</b> Direct-mount Resin</p> <p>✔ <b>DVM</b> Direct-mount Resin</p> <p><b>IVC</b> Direct-mount Resin</p> <p><b>IVM</b> Direct-mount Resin</p>	<p><b>Bus Networking</b></p> <p>✔ <b>AS</b> AS-Interface (DVC &amp; DVM only; Area Class Z2 only)</p> <p>✔ <b>FF</b> FOUNDATION Fieldbus (DVC &amp; DVM only)</p> <p>✔ <b>DN</b> DeviceNet (DVC &amp; DVM only; Area Class Z2 only)</p> <p>✔ <b>MB</b> Modbus (DVC &amp; DVM only; Area Class Z2 only)</p> <p><b>Proximity Switches</b></p> <p>✔ <b>D2</b> (2) Proximity sensors Herm sealed SPDT (IVC &amp; IVM only)</p>	<p>✔ <b>Z0</b> Intrinsically Safe* Class I Div 1&amp;2, Grps A-D; Class II Div 2 Grps F &amp; G Zone 0 EEx ia IIC, II 1 G (IVC - S44 or S45 only) (DVC-FF - P44 or P45 only)</p> <p>✔ <b>Z2</b> Non-Incendive Class I, Div 2, Grps A-D Class II Div 2, Grps F &amp; G Zone 2 EEx nc IIC</p> <p>* With appropriate I.S. barrier</p>	<p>✔ <b>B</b> Dome and LEDs</p> <p><b>N</b> Dome only</p>	<p>✔ <b>P</b> (2) 1/2" NPT conduit</p> <p><b>M</b> (2) M20 metric conduit</p>	<p><b>Blank</b> No valve - DVM &amp; IVM only</p> <p>✔ <b>S44</b> 24Vdc, 4-way Aluminum (Not available with FF)</p> <p><b>S45</b> 24Vdc, 4-way 316 Stainless Steel (Not available with FF)</p> <p><b>144</b> 110Vac, 4-way (IVC only)</p> <p><b>145</b> 110Vac, 4-way 316 Stainless Steel (IVC only)</p> <p>✔ <b>P44</b> Piezo valve, 4-way Aluminum (Bus option FF only)</p> <p><b>P45</b> Piezo valve, 4-way 316 Stainless steel (Bus option FF only)</p>
<b>Enclosure</b>	<b>Bus/Sensor</b>	<b>Area Class.</b>	<b>Visual Disp.</b>	<b>Conduit Entries</b>	<b>Pilot Valve</b>



**Did you know?**  
 MD-502-7000-IN-GEN-1017-0027 D01  
 TopWorx offers the broadest range of valve control solutions available:

- Zone 0, 1, 2 and Division 1 & 2 hazardous areas
- ATEX, UL, and CSA certifications
- Direct-mount low profile switchboxes
- Wide array of bus networks, sensors, and solenoids
- Thousands of mounting kits to attach to valves and actuators

Conduit Entries	O-Rings	Pilot	Spool Valve	Valve Cv	Manual Override
<p><b>DXP only</b>  <b>E</b> (2) 3/4" NPT</p> <p>4 (2) 3/4" NPT            (2) 1/2" NPT</p> <p><b>M</b> (2) M20</p> <p>3 (4) M20</p> <hr/> <p><b>T Series only</b>  <b>E</b> (2) 1/2" NPT</p> <p><b>M</b> (2) M20</p>	<p><b>DXP only</b>  <b>B</b> Buna-N</p> <hr/> <p><b>T Series only</b>  <b>M</b> Buna/EPDM</p>	<p><b>Blank</b> No pilot device(s)</p> <p><b>DXP only</b></p> <p><b>1</b> (1) 24Vdc pilot, .5W, fail open/closed</p> <p>2 (2) 24Vdc pilots, .5W, fail last position</p> <p>3 (2) 24Vdc pilots, .5W, block center</p> <p><b>7</b> (1) 110Vac pilot, 1.1W, fail open/closed</p> <p>8 (2) 110Vac pilots, 1.1W, fail last position</p> <p>9 (2) 110Vac pilots, 1.1W, block center</p> <p><b>P</b> (1) piezo pilot, fail open/closed (FF only)</p> <p><b>R</b> (2) piezo pilots, fail last position (FF only)</p> <p><b>U</b> (2) piezo pilots, block center (FF only)</p> <hr/> <p><b>T Series only</b></p> <p><b>Blank</b> No pilot device</p> <p><b>1</b> (1) 24Vdc pilot, 1W, fail open/closed</p> <p>2 (2) 24Vdc pilots, 1W, fail last position (TVC &amp; TVG only)</p> <p>7 (1) 110Vac pilot, 3W, fail open/closed</p> <p>8 (2) 110Vac pilots, 3W, fail last position (TVC &amp; TVG only)</p> <p><b>A</b> (1) 220Vac pilot, 3W, fail open closed</p> <p><b>B</b> (2) 220Vac pilots, 3W, fail last position (TVC &amp; TVG only)</p>	<p><b>Blank</b> No spool valve</p> <p><b>A</b> Aluminum hard coat anodized</p> <p><b>S</b> 304 Stainless Steel (DXP only)</p> <p>6 316 Stainless Steel</p>	<p><b>Blank</b> No spool valve</p> <p><b>DXP only</b></p> <p><b>2</b> 1.2 Cv (1/4" NPT ports)</p> <p>3 3.0 Cv (1/2" NPT ports)</p> <p><b>C</b> 1.0 Cv (1/4" NPT ports) (-50°C)</p> <p><b>T Series only</b></p> <p>2 1.0 Cv (1/4" NPT ports)</p> <p>3 3.0 Cv (1/2" NPT ports)</p>	<p><b>Blank</b> No override</p> <p><b>DXP only</b></p> <p><b>1</b> Single Pushbutton Momentary/Latching</p> <p>2 Dual Pushbutton Momentary/Latching</p> <p>3 Single Pushbutton Momentary</p> <p>4 Dual Pushbutton Momentary</p> <p><b>A</b> Single palm actuator Momentary/Latching</p> <p><b>B</b> Dual palm actuator Momentary/Latching</p> <p><b>C</b> Single palm actuator Momentary</p> <p><b>D</b> Dual palm actuator Momentary</p>
<b>Conduit Entries</b>	<b>O-Rings</b>	<b>Pilot</b>	<b>Spool Valve</b>	<b>Valve Cv</b>	<b>Manual Override</b>

Enclosure	Bus/Sensor	Area Classification	Target	Wiring
<p><b>TPS</b></p> <p><b>TPS</b> Puck Position Sensor</p>	<p><b>Bus Networking</b>  <b>AS</b> AS-Interface (Wiring must be 3)</p> <p><b>Proximity Sensors</b></p> <p><b>02</b> (2) 2 wire inductive NPN N/C 15-130VAC/VDC; 100mA</p> <p><b>05</b> (2) SPST 200mA @ 30VDC/AC</p>	<p><b>G</b> General Purpose Ordinary Locations Type 4, 4X</p> <p></p>	<p><b>0</b> Universal target fits most NAMUR actuators</p>	<p><b>3</b> Euro-change connector (4 pin)</p> <p>4 Micro-change connector (4 pin)</p>
<b>Enclosure</b>	<b>Bus/Sensor</b>	<b>Area Class.</b>	<b>Target</b>	<b>Wiring</b>

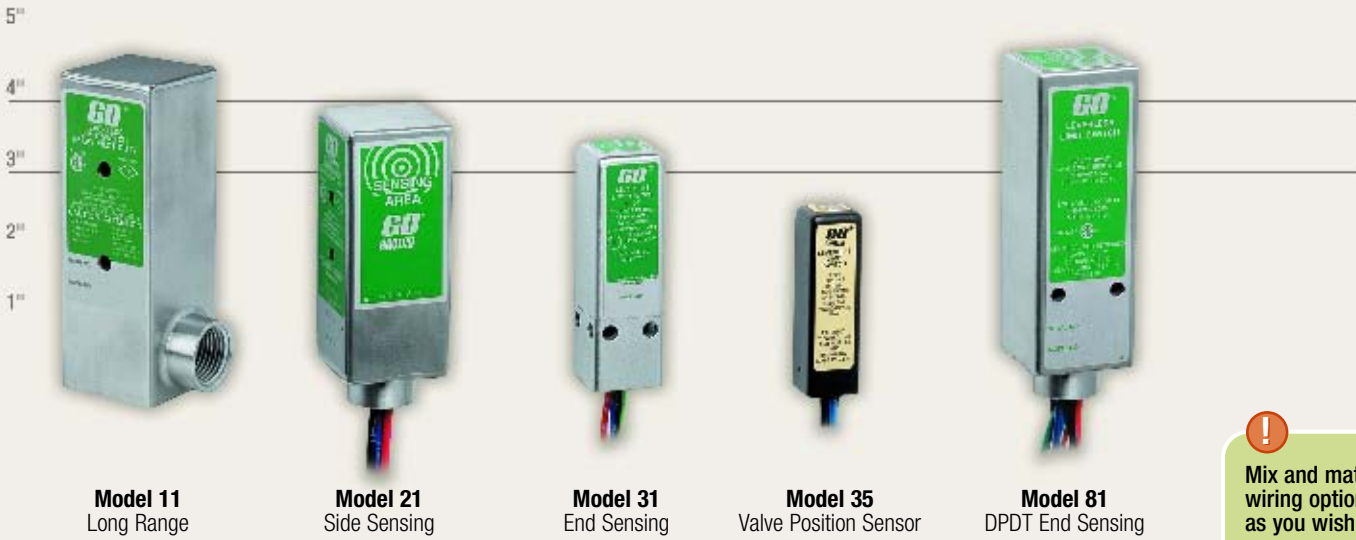
# Leverless Limit Switches built to last in the most demanding plant conditions



GO® Switch leverless limit switches provide reliable, durable position sensing in the most demanding plant conditions. Unlike mechanical limit switches or inductive proximity sensors, GO Switches use a unique hybrid technology that eliminates wear and tear. As a result, GO Switches are more dependable and last longer in the toughest applications.



Square Switches



**Model 11**  
Long Range

**Model 21**  
Side Sensing

**Model 31**  
End Sensing

**Model 35**  
Valve Position Sensor

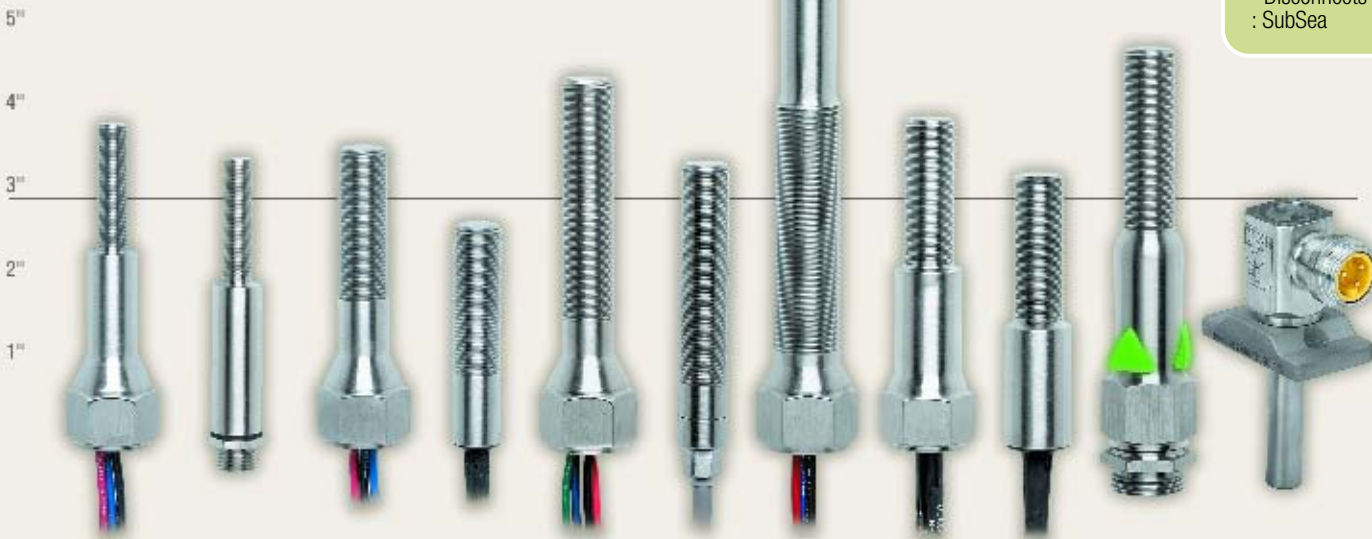
**Model 81**  
DPDT End Sensing



Mix and match wiring options as you wish

- : Lead Wires
- : Cable
- : Quick Disconnects
- : SubSea

Round Switches



**Model 71**  
3/8" Diameter

**Model 73**  
5/8" Diameter

**Model 75**  
Long Threads

**Model 77**  
Long Body

**Model 7H**  
DPDT

**Model 7C-7F**  
Cylinder Position Sensors

**Model 72**  
3/8" Diameter

**Model 74**  
5/8" Diameter

**Model 76**  
Long Threads

**Model 7G**  
DPDT

**Model 7L**  
BriteLite LEDs

## The GO Switch difference

**Unique hybrid technology.** GO Switches have a one-of-a-kind “leverless limit switch” design that combines the advantages of existing limit switch and proximity sensor technologies. As a result, GO Switches deliver better performance in the most demanding applications.

**Reliability in a variety of industries.** For over forty years, GO Switches have set the standard for mission-critical position sensing in the automotive, cement, chemical, diecasting, food & beverage, hydrocarbon, manufacturing, mining, oil & gas, petrochemical, power generation, pulp and paper, steel & aluminum, tire & rubber, and water & wastewater industries.

**Durability when it matters most.** GO Switches last longer in plant conditions that are hot, cold, wet, dirty, abusive, corrosive,

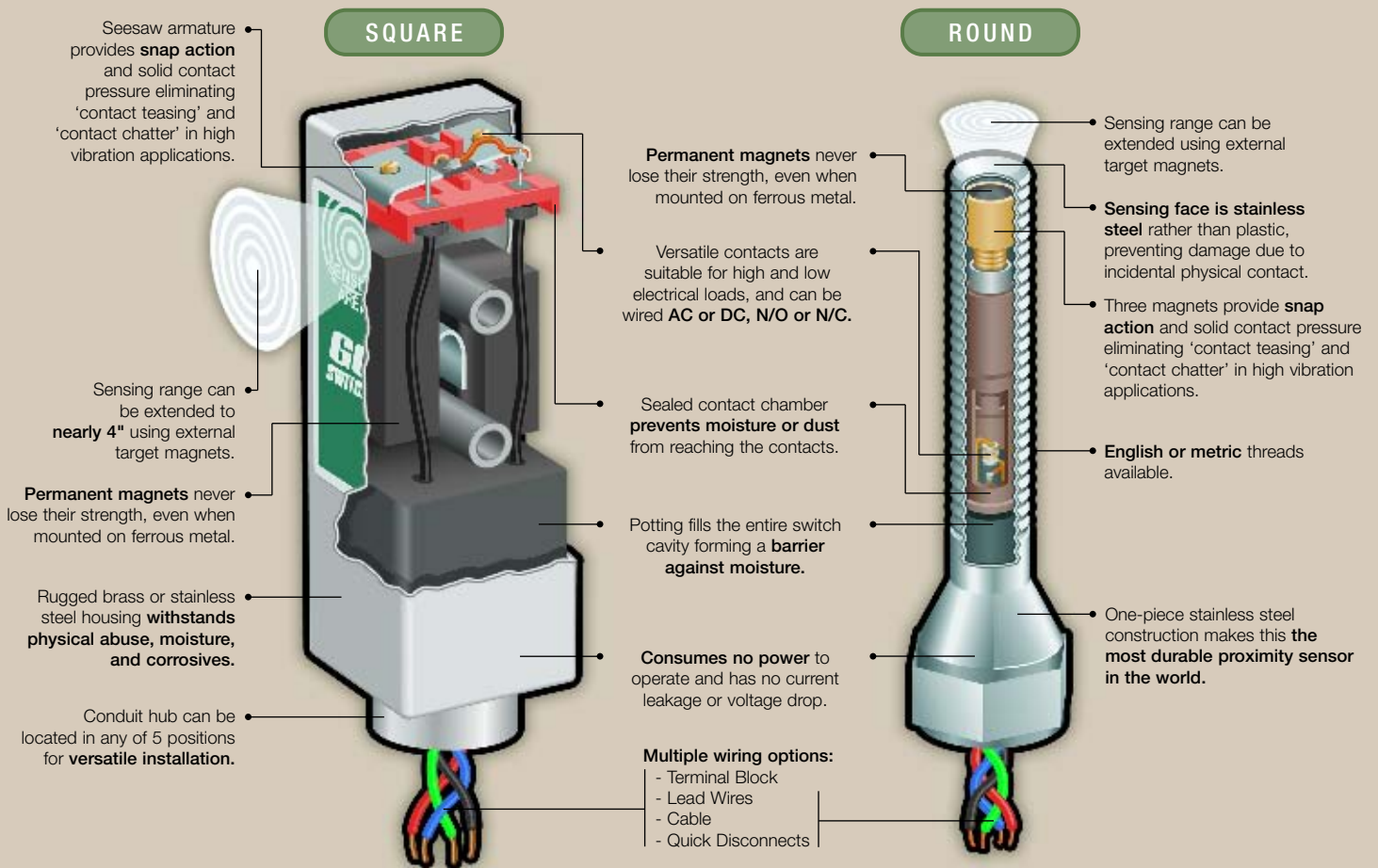
MD-502-7000-IN-GEN-1017-0027 D01 and explosive. A wide variety of GO Switches are certified for use in all hazardous areas including Zone 0 (intrinsically safe), Zone 1 (explosion proof), and Zone 2 (non-incendive). With no exposed moving parts and no delicate electronics, GO Switches have been designed to withstand caustics, corrosives, salt water, submersion, physical abuse, vibration, and temperatures ranging from -58°F/ -50°C to 400°F/204°C.

“GO Switch is one of the most reliable products in our plant. I wish everything we buy would last as long and perform as well as GO Switch.”

Lead Engineer - Oil Refinery

## Leverless Limit Switches

GO Switches outperform conventional limit switches and proximity sensors in the toughest applications.



### Options Available

- Explosion Proof
- SPDT or DPDT
- HiTemp™ to 350°F
- SubSea™ Submersible
- Latching

### Options Available

- Explosion Proof
- SPDT or DPDT
- HiTemp™ to 400°F
- SubSea™ Submersible
- Hermetically Sealed
- High Pressure to 10,000psi
- English or metric threads

# GO Switch Ordering Guide

MD-502-7000-IN-GEN-1017-0027 D01



Ordering Examples:  
11-12110-00  
73-13528-A2

✔ Denotes **FastTrack Delivery** option  
- see page 15 for details.

Model	Contact Form	Sensing Range	Outlet Position
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**Square Body (11, 21, 81)**

- ✔ 11 1-1/2" square x 4-9/16"  
Add 1/2" for bottom conduit outlet
- ✔ 21 1-1/2" square x 3-13/16"  
Add 1/2" for bottom conduit outlet
- ✔ 81 1-1/2" square x 3-7/8"  
Add 1/2" for bottom conduit outlet

**Round Body (71-7H)**

- 71 3/8" x 3-15/16" - 1/2" NPT conduit
- 72 3/8" x 3-3/8" - No conduit
- ✔ 73 5/8" x 3-5/8" - 1/2" NPT conduit
- ✔ 74 5/8" x 2-3/4" - No conduit
- 75 5/8" x 4-5/16" - 1/2" NPT conduit
- 76 5/8" x 3-3/16" - No conduit
- 77 3/4" x 5-13/16" - 1/2" NPT conduit
- ✔ 7G 5/8" x 4" - 1/2" NPT conduit
- 7H 5/8" x 3-1/4" - No conduit

Note: For metric threads add "M" after first group. Example: 73M-XXXX-XX

Models 71-72 : 12mm  
Models 73-76 : 18mm  
Models 7G-7H : 18mm

- ✔ 1 Single Pole Double Throw (Form C)
- ✔ 2 Double Pole Double Throw (Form CC)  
(Models 81, 7G, 7H only)
- 3 Single Pole Double Throw (Form C)  
Latching (maintained contact)  
(Models 11 & 21, Outlet 2, 4, 5 only)
- 5 Double Make Double Break (Form Z)  
Two-circuit (Models 11 & 21 only)
- ✔ 6 Double Make Double Break (Form Z)  
Two-circuit, Latching (maintained contact)  
(Models 11 & 21, Outlet 2, 4, 5 only)

**Square Body**

- ✔ 0 1/4" end sensing  
(Model 81 only)
- ✔ 1 Standard sensing - 3/8" side sensing  
(Models 11 & 21 only)
- ✔ 2 Extended sensing - 9/16" side sensing  
(Model 11, Contact Form 1 or 3 only)
- 7 Precision sensing - 1/4" side sensing  
(minimal differential) (Models 11 & 21 only)

**Round Body**

- ✔ 3 Standard sensing - .100" end sensing  
(Models 73-77, 7G-7H; Enclosure 2 or 6 only)
- 4 .072" end sensing  
(Models 73-77; Enclosure 3;  
Approvals 2, 7, 8, or 9 only)
- 5 .060" end sensing  
(Models 73-77; Enclosure 4;  
Approvals 2, 7, or 8 only)
- 6 .040" end sensing  
(Models 71 & 72 only)

**Square Body**

- ✔ 1 Behind sensing area (Models 11 & 21 only)
- 2 Left of sensing area  
(Models 11 & 21 only)
- 3 Right of sensing area  
(Models 11 & 21 only)
- 4 Same side as sensing area  
(Models 11 & 21 only)
- ✔ 5 Bottom of enclosure

**Round Body**

- ✔ 5 Bottom of enclosure

**Model**

**Contact Form**

**Sensing Range**

**Outlet Position**



### Did you know?

- There are GO Switch options for virtually any tough application:
- Zone 0, 1, 2 and 20, 21, 22
  - ATEX, UL, CSA, and other certifications
  - High temperatures up to 400°F / 204°C
  - Underwater to depths of 23,000 ft. / 7,000 meters
  - High pressure to 10,000 psi / 700 Bar
  - Nuclear power plant qualified switches
  - Extended sensing up to 4" with target magnets
  - LEDs, DPDT contacts, metric threads

## Enclosure Material

### Square (11, 21, 81)

- ✓ 1 Brass with flat black lacquer coating
- ✓ 2 Stainless steel\*
- 3 Brass with corrosion resistant coating
- 4 Stainless steel with corrosion resistant coating

\* Stainless steel switches are recommended for wet or harsh environments.

### Round (71-7H)

- ✓ 2 303 stainless steel (rated 2,000psi) (Models 71-77, 7G-7H; Sensing 3 only)
- 3 HiPressure - 303 stainless steel (rated 5,000psi) (Models 73-77; Sensing 4; Approval 2, 7, 8, or 9 only)
- 4 HiPressure - 303 stainless steel (rated 10,000psi) (Models 73-77; Sensing 5; Approval 2, 7, 8 only)
- 6 316 stainless steel (rated 2,000psi)
- 7 HiPressure - 303 stainless steel (rated 3,500psi) (Models 73, 75, 77; Sensing 4; Approval 3 only)

**Enclosure Material**

## Approvals

### Square Body

- ✓ 0 CSA / FM Cl I, Div 2, Grps A-D; Cl II, Div 2, Grps F & G; Cl III Terminal block (Models 11 & 21 only) (Contact Form 1 or 3; Wiring 00 only)
- 2 HiTemp to 350°F (Models 11, 21 & 81; Contact Form 1 or 3) (Sensing 1 (0 for Model 81); Enclosure 2; Wiring F only)
- ✓ 3 UL Cl I, Div 1 & 2; Grps A-D; Cl II, Div 1 & 2, Grps E-G; Cl III (Enclosure 2 or 4 only) (Lead seal required)
- ✓ 4 CSA / FM Cl I, Div 1; Grps A-D; Cl II, Div 1, Grps E-G; Cl III (Enclosure 2 or 4 only) (Lead seal required)
- ✓ 6 CSA FM Cl I, Div 2; Grps A-D; Cl II, Div 2, Grps E-G; Cl III (Lead seal required)
- 7 CSA certified General Purpose
- ✓ 8 UL listed General Purpose

### Round Body

- 2 HiTemp to 400°F (Models 71-77, 7G-7H) (Wiring F only)
- ✓ 3 UL Cl I Div 1 & 2 Grps A-D; Cl II Div 1 & 2, Grps E-G (Models 71, 73, 75 & 77; 7G only) (Wiring A, B, or F only) (Lead seal required)
- ✓ 4 CSA Cl I Div 1; Grps A-D; Cl II Div 1, Grps E-G; Cl III (Models 71, 73, 75 & 77; 7G only) (Wiring A, B, or F) (Lead seal required)
- ✓ 6 CSA Cl I, Div 2; Grps A-D; Cl II, Div 2; Grps E-G; Cl III (Models 71, 73, 75, 77, 7G only) (Wiring A, B, or F only) (Lead seal required)
- 7 CSA certified General Purpose
- ✓ 8 UL listed General Purpose
- 9 CENELEC: EEx d IIC T6 Zone 1 (Models 73, 75, 77; 7G) (Wiring A or B only)
- ✓ T ATEX Zone 1 EEx d IIC T6 (-20°C to +50°C), II 2G (Models 73 & 7G only) -20°C to 50°C with Wiring A & B -40°C to 150°C with Wiring H

**Approvals**

## Wiring Options

### Terminal Block

- ✓ 00 (Models 11 & 21 only)

### Lead Wires - 18 Gauge (7G - 7H = 20 gauge)

- ✓ A2 36"
- A3 72"
- A4 144"
- A\_\_\_ Greater than 144" - specify length in 5 ft. increments

### Cable - 18 Gauge (7G - 7H = 20 gauge)

- ✓ B2 36"
- B3 72"
- B4 144"
- B\_\_\_ Greater than 144" - specify length in 5 ft. increments

### Water Resistant Squeeze Connector

- (Models 72, 74, 76 only) (Approval 7 or 8 only)
- C2 36"
- C3 72"
- C4 144"
- C\_\_\_ Greater than 144" - specify length in 5 ft. increments

### Mini Change Connector

- (Models 11, 21, 81, 71, 73, 75, 77, 7G only) (Approval 7 or 8 only; 3 pin is 8 only)
- ✓ DCA 3 pin
- DCD 4 pin
- DCH 7 pin (7G and 81 only)

### Micro Change Connector

- (Models 11, 21, 81, 72, 74, 76) (Approval 7 or 8 only; 3 pin is 8 only)
- ✓ DBA 3 pin
- DBD 4 pin

### SubSea Connector

- (Models 73, 75, or 77 only) (11, 21, or 81, Enclosure 2 or 4 only) (Approval 7 or 8 only; 3 pin 8 only)
- 3DD 3 pin
- 4DD 4 pin
- 8DD 8 pin
- 3DE 3 pin 90°
- 4DE 4 pin 90°

### HiTemp™ Leads (Teflon insulated)

- 18 gauge (7G - 7H = 20 gauge) (Models 11, 21, 81, 71-77; 7G-7H only)
- F2 36"
- F3 72"
- F4 144"
- F\_\_\_ Greater than 144" - specify length in 5 ft. increments

### HiTemp™ Leads (Peek insulated)

- (Models 71-77)
- H2 36"
- H3 72"
- H4 144"
- H\_\_\_ Greater than 144" - specify length in 5 ft. increments

**Wiring Options**



# Field Networking Solutions make it easy to connect and communicate

MD-502-7000-IN-GEN-1017-0027 D01

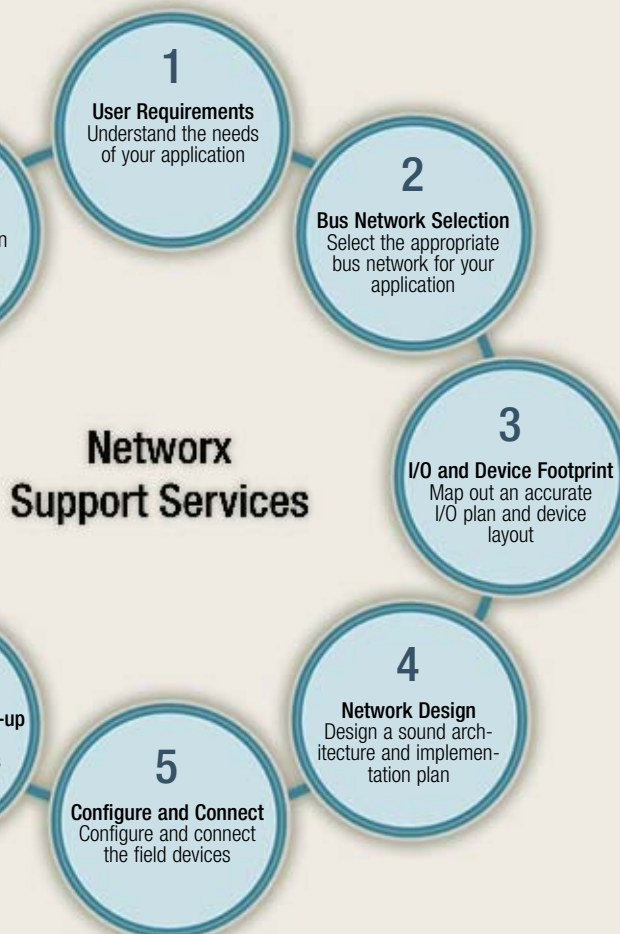
TopWorx has assembled a complete portfolio of products and services that enable process manufacturers to reap the benefits of modern bus networking technologies. Networkx™ is a comprehensive, single solution that delivers everything you need to build a modern network.

**networkx**



## Networkx Support Services

Networkx Support Services help plant personnel understand and implement bus networking technologies. We can help select the appropriate protocol for your application, map out an accurate I/O plan, design a sound implementation plan, configure and connect the field devices, commission and start-up the process, and troubleshoot any potential problems.



## HazLink® Connectivity Enclosures

Networkx HazLink® connectivity enclosures make it safe and simple to use bus networks in Class I Division 1 and 2 (Zone 1 and 2) hazardous areas.

HazLink connectivity options:

- Disconnect Switches
- I/O Modules
- Wiring Tees

## Cables, Connectors & Cordsets

Networkx provides a vast selection of connectivity options to meet your needs, including bulk cabling, field installable connectors, linking modules, tees, terminators, and pre-molded cordsets that meet the specifications of each fieldbus protocol.

## The Networkx difference

**Networkx bridges the gap between the control room and the field.** With a variety of connectivity components for every major protocol, Networkx takes charge of the critical physical layer between field devices and the control system. Networkx enables you to link devices safely and economically in every process environment and application.

### Networkx is a single source for 'best-in-class' products.

The Networkx portfolio is a collection of the best products available from a variety of sources. With all the leading products under one umbrella, Networkx delivers the finest quality and most extensive selection all from a single source.

**Networkx complements your control system.** Since Networkx is a neutral solution, it works well with all major process control systems available today, including ABB, Emerson, Honeywell,

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Invensys, Rockwell, Siemens, Smar, and Yokogawa systems. In fact, several of these companies frequently recommend our products and services to help meet their customers' needs.

“TopWorx provided us with some very helpful conceptual design information that led us to what I feel is an excellent bus design. Our design offers better potential for reliability and is actually cheaper than conventional bus designs by eliminating expensive AS-i power supplies.”

Engineering Specialist - Food & Beverage Processor

## Power Supplies & Repeaters

Networkx power supplies are specifically designed for each protocol. Our selection includes bulk power supplies for control systems and devices, bus-level power supplies and power conditioners for network communications isolation, and repeaters for extending distance limits.



## I/O Modules, Tees & Disconnect Switches

Networkx Input/Output Modules provide a cost-effective way to connect conventional (non-bus) analog and discrete devices to bus networks. Wiring Tees connect field devices to bus lines. Disconnect Switches allow users to repair or replace field devices without disturbing the network.

## Masters & Gateways

Networkx masters and gateways control sensor level buses and facilitate connection to higher-level buses. Gateways show up as a node on the higher-level bus and act as a master for the sensor level bus to initialize and diagnose the network and identify and control the field devices.



# TopWorx delivers Experience + Expertise wherever and whenever you need it

In the process industries, availability is critical to success. And most process plants operate 24 hours a day, 7 days a week. So part of our vision at TopWorx is to make sure that if you need help, you can get it whenever and wherever you need it.

That's why we've created a global support system to serve the unique needs of process plants. Whether you need training for your personnel, configuration of your devices, or quick answers during a start-up, TopWorx can help deliver the kind of support you need.



"I know of no other vendor that could have offered the type of outstanding support that TopWorx has provided to our company."

Engineering Manager  
Pharmaceutical Manufacturer

## TopWorx Channel Partners

### TopWorx Channel Partners are available around the world.

An important part of our global support system is the relationship that TopWorx enjoys with hundreds of companies around the world. These specialized channel partners have proven expertise in areas such as bus networking, valve automation, or systems integration and must meet rigid criteria in order to become Certified Channel Partners.

#### Certified Product Distributor TOPWORX

These partners are authorized to sell and support one or more TopWorx product groups: Valvetop, GO Switch or Networx.

#### Certified Service Provider TOPWORX

These partners are qualified to deliver Network Support Services to our customers on behalf of TopWorx.

#### Certified Product Integrator TOPWORX

These partners are able to integrate one or more TopWorx product groups into larger, more sophisticated control systems and automated valve packages.

[www.topworx.com](http://www.topworx.com)

### TopWorx.com is available around the clock.

Please visit [www.topworx.com](http://www.topworx.com) to find out more about TopWorx products and services, to learn about bus networking, valve control, and position sensing, to access technical specifications and drawings, and to contact TopWorx personnel.



# TopWorx serves you with Speed + Excellence

At TopWorx, we are passionate about delivering a great “buying experience” to our customers. Whether it's a technical question over the phone, finding a drawing on the website, or ordering product for quick delivery, we have the people and processes in place to exceed your expectations.

“I'm truly impressed with the extraordinary service and support. If this is how TopWorx supports its customers, there is no doubt whom I shall look to in the future.”

Team Leader  
Original Equipment Manufacturer



## FastTrack™ Delivery

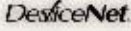



Standard products that are most likely to be available for immediate shipment.

### Zone 1 / Div 1 Explosion/Flame Proof\*

### Zone 2 / Div 2 Non-Incendive\*

### General Purpose / Ordinary Locations

\* Many Valvetop and GO Switch products are intrinsically safe - please refer to the TopWorx catalog or [www.topworx.com](http://www.topworx.com) for details.

Valvetop	Integral Pilot	No Pilot	Integral Pilot	No Pilot	Integral Pilot	No Pilot
	<b>DXP-FF_G□EBPA2</b> FOUNDATION Fieldbus 5/2 Aluminum pilot valve <input type="checkbox"/> For Shaft, choose S or N _ For Area Classification, choose 0 (I.S.) or 1 (Exp. Proof)	<b>DXP-FF_G□EB</b> FOUNDATION Fieldbus	<b>DVC-FFZ_BPP44</b> FOUNDATION Fieldbus 5/2 Aluminum _ For Area Classification, choose 0 (I.S.) or 2 (Non-Inc)			
	<b>DXP-DN1G□EB1A2</b> DeviceNet 5/2 Aluminum pilot valve <input type="checkbox"/> For Shaft, choose S or N	<b>DXP-DN1G□EB</b> DeviceNet	<b>DVC-DNZ2BPS44</b> DeviceNet 5/2 Aluminum pilot valve			
	<b>TXP-AS1GNEM1A2</b> AS-Interface Aluminum pilot valve	<b>TXP-AS1GNEM</b> AS-Interface	<b>TVC-AS2GNEM1A2</b> AS-Interface 24V Aluminum pilot valve			<b>TVG-ASGGNEM</b> AS-Interface  <b>TPS-ASG03</b> AS-Interface Puck Style
	<b>DXP-L21G□EB1A2</b> (2) GO Switches 24V 5/2 Aluminum pilot valve <input type="checkbox"/> For Shaft, choose S or N	<b>DXP-L21G□EB</b> (2) GO Switches				
			<b>TVC-R22GNEM1A2</b> (2) SPST proximity 24V Aluminum valve	<b>TVC-R22GNEM</b> (2) SPST proximity		<b>TVG-R2GGNEM</b> (2) SPST proximity  <b>TPS-05G03</b> (2) SPST proximity Puck Style
	<b>TXP-M21GNEM1A2</b> (2) Mechanical 24V Aluminum pilot valve	<b>TXP-M21GNEM</b> (2) Mechanical				<b>TVG-M2GGNEM</b> (2) Mechanical
<b>Valvetop Accessories</b>	<b>4N20080-G41SC</b> NAMUR 20/80 Stainless Bracket	<b>4N30080-G41S</b> NAMUR 30/80 Stainless Bracket	<b>4N30130-G41S</b> NAMUR 30/130 Stainless Bracket	<b>4N50130-G41S</b> NAMUR 50/130 Stainless Bracket		
GO Switch	Round	Square	Round	Square	Round	Square
	<b>73-13523-A2</b> SPDT, stainless 3 ft. leads	<b>21-11524-A2</b> SPDT, stainless 3 ft. leads	<b>73-13526-A2</b> SPDT, stainless 3 ft. leads	<b>11-12110-00</b> SPDT 9/16" sensing Side Terminals	<b>73-13528-A2</b> SPDT, stainless 3 ft. leads	<b>21-11518-A2</b> SPDT, 3/8" sensing 3 ft. leads
	<b>73-13524-A2</b> SPDT, stainless 3 ft. leads		<b>7G-23526-A2</b> DPDT, stainless 3 ft. leads	<b>11-11110-00</b> SPDT 3/8" sensing Side Terminals	<b>73-13528-DCA</b> SPDT, stainless Mini Connector	
	<b>73-1352T-A2</b> SPDT, ATEX 3 ft. leads		<b>LPS-DZ2_A2</b> Proximity, 3 ft. leads _ Choose R or G LED color	<b>21-11510-00</b> SPDT 3/8" sensing Bottom Terminals	<b>74-13528-B2</b> SPDT, stainless 3 ft. cable	
	<b>7G-23523-A2</b> DPDT, stainless 3 ft. leads		<b>7L_-1356E-A2</b> GO Switch, 3 ft. leads _ Choose R or G LED color	<b>81-20516-A2</b> DPDT 1/4" sensing Bottom Leads	<b>74-13528-DBA</b> SPDT, stainless Micro Connector	
<b>GO Switch Accessories</b>	<b>AMP3</b> Plastic covered Target Magnet	<b>AMS4</b> Stainless covered Target Magnet	<b>AMC5</b> Stainless covered Target Magnet	<b>ABS9</b> 70 Series Stainless Mounting Bracket	<b>A-ECB</b> 3 pin, 6 ft. Mini Connector	<b>A-EBB</b> 3 pin, 6 ft. Micro Connector

Note: This list is subject to change – please refer to [www.topworx.com](http://www.topworx.com) for the most current list of FastTrack Delivery products.

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# INSTRUCTION MANUAL

## Volume booster

# AV

### DESCRIZIONE



Progettati per raggiungere elevate prestazioni nelle applicazioni di regolazione, gli amplificatori volumetrici STI serie AV da 1/4" e 3/4" forniscono un grande effetto di amplificazione. L'amplificatore di flusso contiene una valvola di by-pass interno con funzione stabilizzante, regolabile con un nottolino alloggiato nel corpo. Operando su di esso si aumenta la stabilità del circuito posizionario – amplificatore – attuatore.

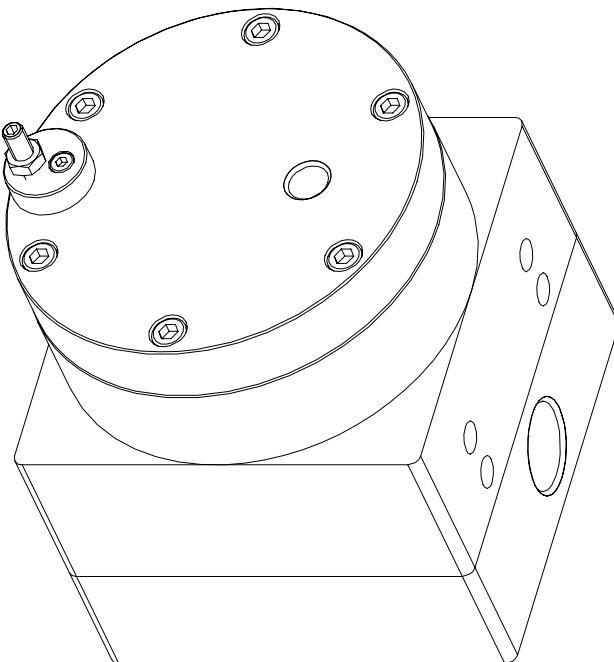


Gli amplificatori di flusso devono essere installati ed utilizzati in accordo con i dati di progetto e montati su attuatori STI

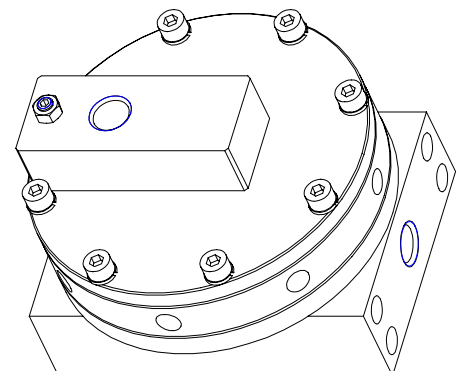
### DESCRIPTION

Designed to meet high control applications, STI series AV 1/4" and 3/4" size relay produces a high volume boosting action. The volume booster contains an integral stabilizing by-pass valve controlled by a screwdriver adjustment in the body. Opening this valve improves the stability of the positioner - volume booster – actuator circuit.

The volume booster units must be installed and used according the design limitations and mounted on STI actuators



model AV 3/4"



model AV 1/4"

### 1. AVVERTENZE GENERALI DI SICUREZZA



- 1.1 Prima di effettuare qualsiasi intervento, gli operatori devono leggere il manuale, adottando le prescrizioni specifiche di sicurezza e le norme antinfortunistiche generali previste dalla legislazione vigente nella nazione di destinazione.
- 1.2 La manutenzione e l'utilizzo devono essere fatti da operatori qualificati
- 1.3 E' sconsigliato al cliente o a terzi (escluso il personale autorizzato da STI s.r.l.) apportare modifiche di qualunque genere al prodotto.

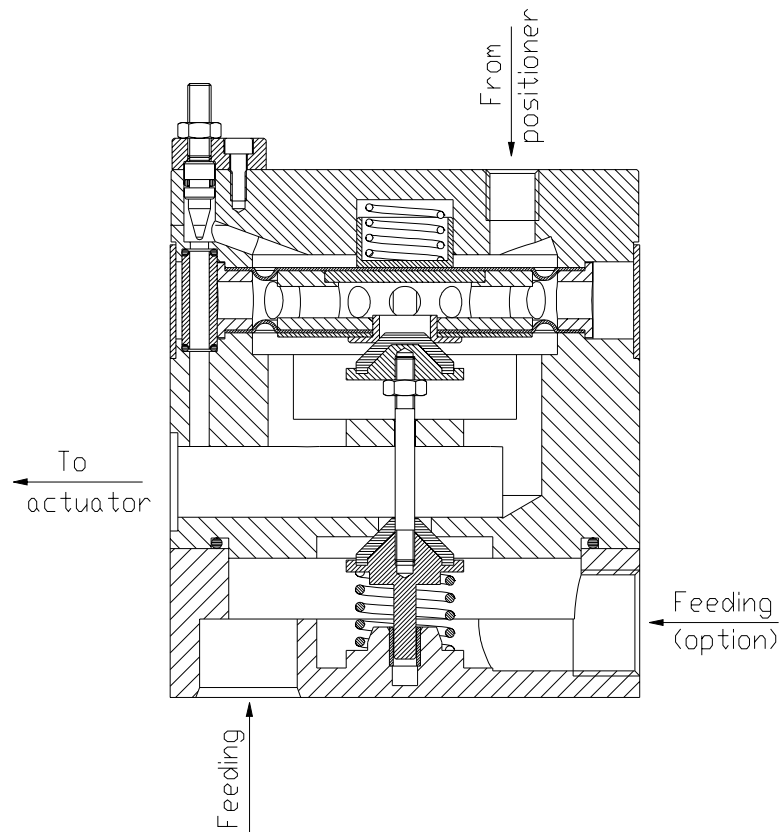
### 1. GENERAL SAFETY INSTRUCTIONS

- 1.1 Before any operations is made, operators shall follow the safety instructions of this manual and adopt the safety precautions required by the country where the product is installed.
- 1.2 Operation and maintenance shall be carried out only by skilled staff
- 1.3 It is not advisable that customers or end users (except STI s.r.l. duly authorized staff) modify the actuator characteristics.



# INSTRUCTION MANUAL

## Volume booster

**AV**

### 2. FUNZIONAMENTO

L'unica richiesta di regolazione dell'amplificatore di flusso è per il by-pass. Prima dell'utilizzo chiudere completamente il by-pass in senso antiorario. Con l'attuatore in funzione aprire lentamente fino all'attivazione dell'amplificatore per grandi cambiamenti del segnale ed il contemporaneo movimento dell'attuatore senza attivazione del booster per piccoli cambiamenti di segnale. Se l'attuatore deve funzionare on off il by-pass deve essere completamente chiuso.

### 3. INSTALLAZIONE

Alimentare sempre il posizionatore ed l'amplificatore di flusso con un'alimentazione comune.

Assicurarsi che la dimensione del tubo d'alimentazione sia sufficiente .

- Soffiare le tubazione prima di connetterle per evitare la presenza di sporcizia
- Non esagerare con l'uso di sigillante per tubi e solo su filetti maschio. Un sigillante che non secci è consigliato
- Collegare l'amplificatore di flusso ad una sorgente d'aria strumenti pulita e non lubrificata



### 2. OPERATION

The only operating requirement of the volume booster is adjustments of the by-pass restriction for stable the actuator.

Prior to operation , turn the bypass adjusting screw counter clockwise to the fully closed position. With the actuator in operation, slowly turn the by-pass screw until the booster operates in response to large changes in the input signal, yet allows small changes to move the actuator without booster firing. If the on off actuator is to be used, the by-pass should be closed.

### 3. INSTALLATION

Always pipe the positioner and the volume booster AV with one common supply.

Ensure that piping is of proper size to meet the capacity demands of the booster.

- Blow out all piping before connections are made, to prevent dirt.
- Use pipe sealant sparingly and only on male threads. A non-hardening sealant is strongly recommended
- Connect the volume booster to a source of clean, oil free instrument air.

**INSTRUCTION MANUAL**  
**Volume booster****AV****4. MANUTENZIONE**

Prima di effettuare qualsiasi intervento e/o manutenzione è necessario accertarsi che:

- Il personale sia abilitato al tipo di intervento
- Il servomotore, gli accessori e le apparecchiature connesse siano in sicurezza
- L'aria di alimentazione sia esclusa
- L'energia elettrica e altre fonti di energia e segnali siano stati esclusi
- Le camere del servomotore, le relative connessioni ed accessori non siano in pressione
- Il servomotore sia svincolato da ogni cinematismo



**ATTENZIONE: Non è richiesto nessun tipo di lubrificazione**

**4. MAINTENANCE**

Before any type of operation and/or maintenance is made, make sure that:

- Staff is qualified for the required operation.
- Actuator, accessories and all connected equipment are in their safety conditions.
- Air supply is disconnected.
- Power or other energy sources and signals are removed.
- Cylinder chambers and relevant connections and accessories are not under pressure.
- Actuator is free from any cinematic mechanism

**WARNING: No lubrication of any sort is needed**

**Technical data**

Model	AV 3/4"	AV 1/4"	AV 1/4" SS
Housing material	aluminum	aluminum	Stainless steel
Diaphragm material	polyurethane	polyurethane	polyurethane
Size	3/4"	1/4"	1/4"
Feeding connections	Plug-in (or 3/4" NPT F)	Plug-in (or 1/4" NPT F)	1/4" NPT F
Outlet connections	Plug-in	Plug-in (or 1/4" NPT F)	1/4" NPT F
Signal connection	1/4" NPT F	1/4" NPT F	1/4" NPT F
Operating temperature	-20°C(-40°C) ÷ +80°C	-20°C(-40°C) ÷ +80°C	-40 ÷ +80°C
Design pressure	10 bar	10 bar	10 bar

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# INSTRUCTION MANUAL

## 3 way pneumatic valve



### INDICE

- 1.0 Avvertenze generali di sicurezza
- 2.0 Principio di funzionamento
- 3.0 Caratteristiche tecniche
- 4.0 Condizioni per l'immagazzinamento
- 5.0 Installazione
- 6.0 Manutenzione

#### 1.0 AVVERTENZE GENERALI DI SICUREZZA



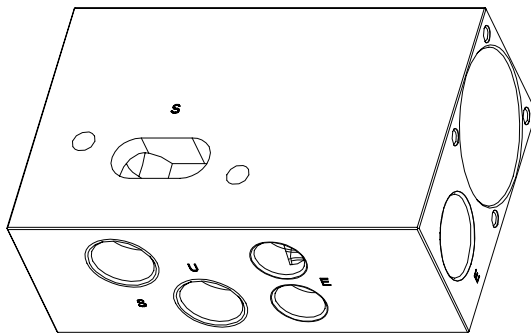
- 1.1 Prima di effettuare qualsiasi intervento, gli operatori devono leggere il presente manuale, adottando le prescrizioni specifiche di sicurezza e le norme antinfortunistiche generali previste da direttive comunitarie e dalla legislazione della Nazione di destinazione.
- 1.2 La manutenzione deve essere effettuata solo da operatori qualificati
- 1.3 E' vietato apportare modifiche ai commutatori senza approvazione di STI.

### INDEX

- 1.0 General safety instructions
- 2.0 Working principle
- 3.0 Technical features
- 4.0 Storage
- 5.0 Installation
- 6.0 Maintenance

#### 1.0 GENERAL SAFETY INSTRUCTIONS

- 1.1 Before any maintenance is performed, personnel shall follow the safety instructions of this manual and adopt the safety precautions and general accident-prevention rules required by EU safety regulations and by specific laws valid in the country where the product is installed.
- 1.2 The 3-way pneumatic valve's maintenance shall be carried out only by skilled staff.
- 1.3 No modifications to the 3-way pneumatic valve shall be undertaken without approval of STI

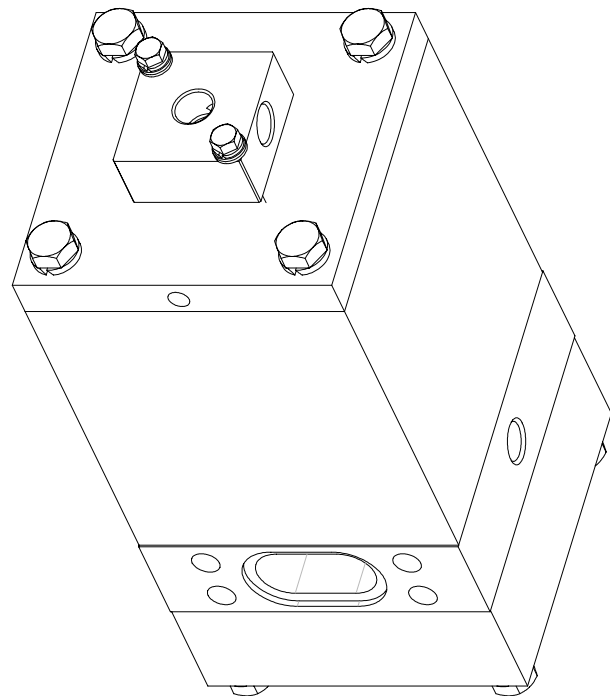


#### 2.0 PRINCIPIO DI FUNZIONAMENTO



Sono valvole ad azionamento pneumatico 3 vie e 2 posizioni per applicazioni che necessitano di alta portata; sono disponibili nelle misure 1/4", 1/2", 1" e 1" 1/2

I commutatori a 3-vie possono essere usati singolarmente o multipli e simultaneamente pilotati da un presso stato differenziale ottenendo così un dispositivo di "lock up".



#### 2.0 WORKING PRINCIPLE

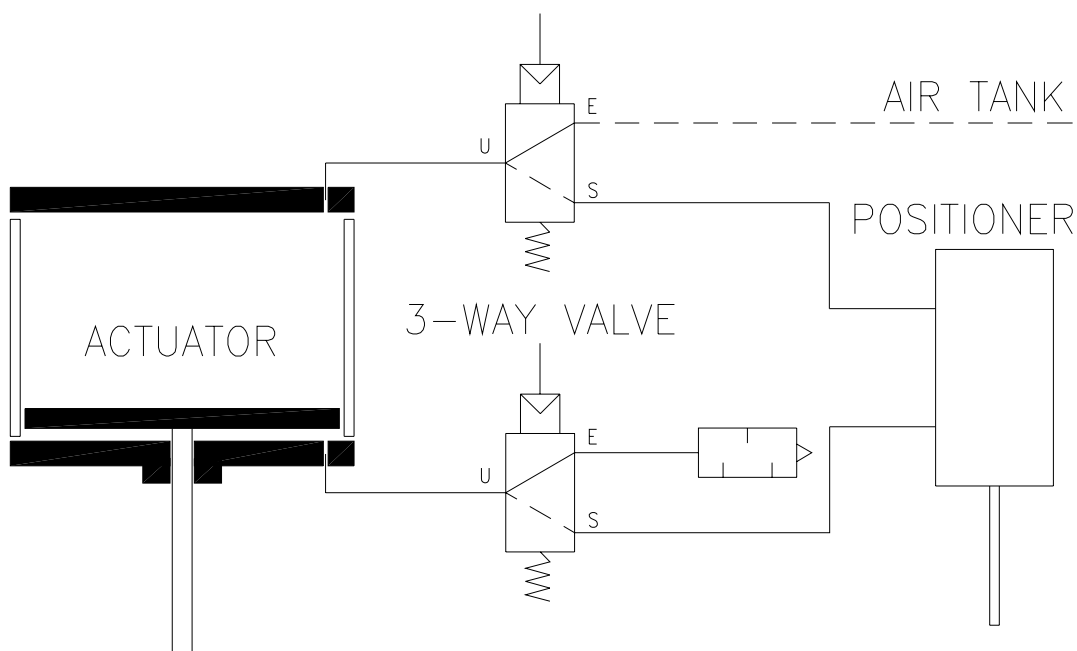
The 3-way, 2-position valves are pilot operated, and designed for high flow applications. The 3-way valve is available in sizes 1/4", 1/2", 1" and 1" 1/2.

The STI 3-way valve can be used in one or more synchronous units piloted by a pneumatic pressure switch in order to achieve the function of a lock up device.



# INSTRUCTION MANUAL

## 3 way pneumatic valve



### 3.0 CARATTERISTICHE TECNICHE / TECHNICAL FEATURES

	CO 1/4"	CO 1/2"	CO 1"	CO 1" 1/2
Pressione operativa Operating pressure	$P_{min} = 2.5 \text{ bar}$ $P_{max} = 10 \text{ bar}$	$P_{min} = 2.5 \text{ bar}$ $P_{max} = 10 \text{ bar}$	$P_{min} = 2.5 \text{ bar}$ $P_{max} = 10 \text{ bar}$	$P_{min} = 2.5 \text{ bar}$ $P_{max} = 10 \text{ bar}$
Temperatura d'esercizio Working temperature	-10 to +70°C	-10 to +70°C	-10 to +70°C	-10 to +70°C
Temperatura di immagazzinamento Storage temperature	-40 to +80°C	-40 to +80°C	-40 to +80°C	-40 to +80°C
Materiali Materials	Anodised aluminum / brass	Anodised aluminum / brass	Anodised aluminum	Anodised aluminum
CV U↔E CV U↔S	1 1	2.5 2.5	6.5 6.5	13 10.5
Consumo d'aria Air consumption	Not present	Not present	Not present	Not present
Conessioni Port size	Signal: 1/8" NPT Others: 1/4" NPT	Signal: 1/8" NPT Others: 1/2" NPT or Plug-in	Signal: 1/4" NPT Others: 1" NPT or Plug-in	Signal: 1/4" NPT Others: Plug-in

#### 4.0 CONDIZIONI DI IMMAGAZINAMENTO

- 4.1 Immagazzinare i commutatori in luoghi asciutti e puliti, adottando le precauzioni necessarie per impedire il contatto con polvere, sporcizia ed umidità.
- 4.2 Non rimuovere gli eventuali fermi meccanici e le protezioni dalle varie connessioni

#### 4.0 STORAGE

- 4.1 Store the 3-way valve in a dry and clean place. Take all necessary measures to avoid its contact with dust, dirt and humidity during storage.
- 4.2 Do not remove the threaded connector protections and/or mechanical locks.



# INSTRUCTION MANUAL

## 3 way pneumatic valve

### 5.0 INSTALLAZIONE



- 5.1 Se il commutatore resta immagazzinato per un lungo periodo si consiglia di verificare le sue condizioni prima di installarlo.
- 5.2 Utilizzare aria strumenti (priva di polvere, olio ed acqua)
- 5.3 Accertarsi la pulizia delle tubazioni prima di collegare le connessioni pneumatiche
- 5.4 E' indispensabile l'installazione di un riduttore di pressione qualora la pressione di alimentazione superi la pressione massima consentita (si consiglia di tarare il riduttore a 7 bar/ 0.7 Mpa)
- 5.5 Collegare le connessioni pneumatiche secondo lo schema pneumatico
- 5.6 Aumentare gradualmente la pressione dell'aria di alimentazione fino al massimo valore operativo.

### 6.0 MANUTENZIONE



#### ATTENZIONE: Contiene molla prevaricata

Prima di eseguire qualsiasi tipo di operazione e/o manutenzione, assicurarsi che:

- il personale sia qualificato per tali operazioni
- l'aria di alimentazione, il segnale di controllo e qualsiasi altra fonte di energia siano disconnesse
- il commutatore e tutti gli accessori collegati siano in condizioni di sicurezza
- l'energia elettrica e le altre sorgenti siano disconnesse
- l'attuatore sia svincolato da ogni possibile fonte di movimento esterna



#### ATTENZIONE: non è richiesta lubrificazione

#### 6.1 Problemi e soluzioni



- La valvola non commuta completamente
- Verificare la pressione minima di alimentazione sia uguale a quella del commutatore
  - Verificare eventuali riduzioni dell'alimentazione dovuti alle dimensioni dei tubi e raccordi
  - Verificare la corretta installazione, sporcizia o danneggiamenti
- Per ogni problema contattare STI s.r.l.

### 5.0 INSTALLATION

- 5.1 Should the 3-way valve be stored for a long time, it is recommended to check its condition before the installation.
- 5.2 Only dry, clean instrument air supply (without dust, oil and water) shall be used.
- 5.3 Before installing the pneumatic connections, make sure that pipes are free of debris.
- 5.4 A pressure reducer is absolutely necessary when air supply pressure is greater than the max operating air pressure (it's recommended to set the pressure reducer at 7 bar/ 0.7 Mpa)
- 5.5 Install the pneumatic connections according to the pneumatic diagram.
- 5.6 After installation, gradually increase air supply to the max. operating pressure.

### 6.0 MAINTENANCE

#### WARNING: Preloaded spring inside

Before any type of operation and/or maintenance is performed, make sure that:

- personnel performing the work is qualified for the required operation
- air supply, control signal and any other energy sources are disconnected
- 3-way valve, accessories and all connected equipment are under safety conditions
- power or other energy sources and signals are removed.
- actuator is free from any kinematic mechanism

#### WARNING: No lubrication of any sort is needed

#### 6.1 Trouble Shooting Hints

- Valve not shifting completely when energized
- Check to insure that the minimum supply pressure is equal to that shown in the Technical Features chart (para. 3.0).
  - Check for possible restrictions in air supply, such as undersized hoses, fittings, or quick disconnects.
  - Check for proper installation, dirt or damage.
- For any problem contact STI s.r.l.

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**MANUALE D'ISTRUZIONE**

**DISPOSITIVO DI BLOCCO PER MANCANZA ARIA  
SERIE AL - MOD. 101÷104**

**INSTRUCTION MANUAL**

**AIR-LOCK DEVICE FOR AIR FAILURE  
AL SERIES - MOD. 101÷104**

**MANUEL D'INSTRUCTION**

**DISPOSITIF DE BLOCAGE POUR MANQUE D'AIR  
TYPE AL - MOD. 101÷104**

## ITALIANO

### APPLICAZIONE

Il dispositivo pressostatico di air-lock viene applicato su attuatori pneumatici quando è richiesto l'isolamento dell'attuatore dai dispositivi di comando (posizionatore o distributori elettropneumatici), nel caso in cui la pressione dell'aria di potenza scenda al di sotto del valore di sicurezza di operabilità.

Il dispositivo pressostatico tipo AL è stato progettato per soddisfare diversi sistemi di air-lock, per garantire la posizione specifica di sicurezza dell'attuatore, come richiesto dall'organo regolante ad esso applicato.

Il dispositivo di air-lock è costituito principalmente da un pressostato pneumatico provvisto di taratura di set e differenziale fissa di circa 20 kPa (15 psi) **che aziona simultaneamente uno o più commutatori sincroni a 3 vie**, secondo la funzione richiesta.

**Anche nel caso di un graduale abbassamento della pressione aria fino al valore di set, l'intervento del sistema di commutazione è istantaneo. La differenziale evita l'inopportuna continua commutazione allorchè la pressione aria oscilla intorno al valore di set.**

### FUNZIONAMENTO (fig. 1)

Il dispositivo pressostatico può essere tarato per intervenire con una pressione variabile da 20 a 93 kPa (15÷70 psi): **ruotando la vite di regolazione (1) in senso orario, la pressione di taratura aumenta.**

La figura (1) mostra il dispositivo nelle condizioni di mancanza d'aria.

Quando la pressione del segnale pilota inviata nella connessione A, supera il valore di taratura, si alza il pistone (8) vincendo il carico della molla (5); la stessa pressione passa attraverso il foro centrale della valvola (9) e, attraverso il condotto (23), aziona istantaneamente il gruppo di commutazione.

La commutazione mette in comunicazione la connessione U con la S chiudendo la E.

Se il valore di pressione alla connessione A scende al di sotto del valore di taratura, il pistone (8) spinto dalla molla (5) chiude il foro centrale della valvola (9) e, spostando verso il basso la valvola (9), immette nell'atmosfera l'aria compressa inviata precedentemente nel condotto (23) facendo ritornare istantaneamente il gruppo di commutazione.

Il ritorno di commutazione mette in comunicazione la connessione U con la E, chiudendo la connessione S.

Le connessioni vengono distinte dalle lettere E - S - U.

## TIPICHE APPLICAZIONI

Gli schemi pneumatici di fig. 2 - 3 - 4 mostrano i dispositivi di air-lock collegati a servomotori pneumatici.

**Lo schema (fig. 2)** mostra i due tipici sistemi di air-lock in fine corsa, con stelo servomotore esteso o retratto.

**Lo schema (fig. 3)** mostra un sistema di air-lock in posizione, per cilindri a doppio o semplice effetto.

**Lo schema (fig. 4)** mostra un sistema di air-lock in posizione, coordinato da circuiti logici esterni.

Per questi tipi di circuiteria, su richiesta, il dispositivo di air-lock standard può essere corredato di attacco per il prelievo di un segnale di stato di tipo logico atto ad identificare la posizione del dispositivo di commutazione. Questo segnale ha valore "0" di pressione quando il dispositivo di commutazione è in posizione di air-lock (valore di pressione alla connessione A inferiore al valore di taratura). Quando il dispositivo di commutazione è nella posizione di normale esercizio (valore di pressione alla connessione A superiore al valore di taratura) il segnale di stato avrà un valore di pressione corrispondente all'alimentazione dell'attuatore. L'utilizzo di questo segnale è limitato al collegamento di eventuali componenti del tipo statico (pressostati - lampade pneumatiche - boosters ecc.) che solitamente vengono anche utilizzati per realizzare sistemi di ripristino.

N.B.: Onde evitare ritardi nei tempi di intervento è consigliabile che il componente ausiliario venga installato in prossimità del sistema di air-lock e collegato con tubazione di piccola capacità (4 x 6 mm).

Per la realizzazione di sistemi di air-lock, dove il ripristino delle condizioni normali di esercizio è subordinato al consenso di circuiterie esterne, il dispositivo di air-lock, su richiesta, può anche essere fornito di commutatore pneumatico ausiliario.

Come si può notare dallo schema (fig. 4), il segnale alla connessione A coordinato dal deviatore a 3 vie aggiuntivo, il quale è in grado di ripristinare il dispositivo di air-lock, con un segnale di riassetto di tipo impulsivo (pulsante pneumatico, ecc.), avente una pressione superiore al valore di taratura.

Il tempo necessario all'impulso per garantire il ripristino, dipende dalla capacità e distanza del collegamento.

Lo schema (fig. 4) è puramente indicativo, e può essere adottato anche per sistemi di air-lock in fine corsa e con circuiterie diverse.

Nell'utilizzo su centrali termoelettriche, l'intervento dell'air-lock può essere richiesto non solo per mancanza d'aria di alimentazione, ma anche da un sistema logico di sicurezza o di avviamento, o per mancanza di energia elettrica.

In questo caso è sufficiente prevedere sulla connessione di impulso dell'air-lock, una valvola elettromagnetica a 3 vie, indicata con \* sullo schema di fig. 3.

## DATI TECNICI

### CARATTERISTICHE STANDARD

#### Pressostato Pneumatico:

- campo di taratura: 15 ÷ 70 psi (1 ÷ 5 bar)  
(per intervento dispositivo di air-lock in diminuzione della pressione aria alimentazione)  
*(su richiesta altri campi)*
- massima pressione in ingresso 145 psi (10 bar)
- limiti di temperatura ambiente standard:  
- 20°C ÷ + 80°C  
(- 4°F ÷ +175°F)  
*(a richiesta esecuzioni per bassa-alta temperatura)*
- tempi di azionamento  
(riferiti ad una capacità del cilindro di 1 litro)
  - 0,5 sec/l per air-lock DN 1/4" (mod. AL/CC-2-3)
  - 0,12 sec/l per air-lock DN 1/2" (mod AL/CA-2-3)
  - 0,05 sec/l per air-lock DN 1"
- connessioni Pressostato:  
segnale pilota : DN 1/8" NPT  
segnale di stato : DN 1/8" NPT

#### Gruppo di commutazione:

- modello **AL/CC-2-3** serie AL 101  
connessioni DN 1/4" NPT F  
(diam. tubo 6/8 - 8/10 mm)
- modello **AL/CA-2-3** serie AL 102  
connessioni DN 1/2" NPT F  
(diam. tubo 10/12 - 13/15 mm)
- modello **AL/R-2**  
esecuzione speciale del pressostato pneumatico ausiliario a 3 vie con connessioni DN 1/4"

### MATERIALI

#### Pressostato pneumatico:

- semicorpi inferiore e superiore : alluminio
- otturatore : acciaio inox
- molla di taratura : acciaio per molle
- pistone : alluminio

#### Gruppo di commutazione:

- corpo : alluminio
- cassetto DN 1/4" : alluminio ossidato duro
- guarnizioni : Buna N™





## ENGLISH

### APPLICATION

An air-lock pressure static device is mounted on pneumatic actuators when they are to be isolated from control devices (positioners, electro-pneumatic distributors, etc.) whenever air pressure falls below operating safety point.

The pressure switch device AL type has been designed to meet different air-lock systems, to guarantee a specific safety position of actuators, as required by the final control element.

The air-lock device consists mainly in a pneumatic pressure switch with set point calibration and fix differential of 20 kPa (15 psi) approx., **operating one or more 3-way synchronous commutators**, depending upon the function required.

**Switching device operates immediately, also in case of a gradual air pressure decrease to the set value.**

**The differential avoids a continuous, inopportune commutation when air pressure swings around the set point.**

### PRINCIPLE OF OPERATION (Fig. 1)

Pressure static device can be adjusted for operation within 20 ÷ 93 kPa (15 ÷ 70 psi); to increase the set pressure you will rotate in a clock-wise direction the control screw (1) .

Fig. 1 shows the device in an air failure condition. When pilot pressure sent to connection "A" overcomes the set point, piston (8) lifts, overcoming spring load (5). The same pressure passes through the central hole of valve (9) and, through duct (23), it operates immediately the switching group.

When switching pipings U and S are connected while piping E closes.

When supply pressure to connection "A" falls below the set point, piston (8) pushed by spring (5) closes the central hole of valve (9); by moving valve (9) downwards, compressed air formerly flowing through duct (23) is vented to the atmosphere.

Switching group reverts immediately.

Switching reversion connects piping U to E and closes S. Connections are marked by letters E - S - U.

## TYPICAL APPLICATIONS

Pneumatic diagrams fig. 2, 3 and 4 show air-lock devices connected to pneumatic actuators.

**Scheme fig. 2** shows the two typical systems of stroke-extremity air-lock device, with actuator stem retracted or extended.

**Scheme fig. 3** shows an air-lock system in last position, for single or double acting cylinders.

**Scheme fig. 4** shows an air-lock system in last position, coordinated by external logic circuits.

Upon request, you can complete the standard air-lock device, foreseen for these circuitries, with a connection able to accept a logic status signal to identify the switching device position.

The signal has a "0" pressure, when switching device is in air-lock position (pressure to connection A lower than the set point).

When switching device is on normal operation (pressure to connection A higher than the set point) the status signal has a pressure equal to the supply pressure to the actuator.

This signal can be used only if the system is connected to static components (pressure switches, pneumatic lamps, boosters, etc.) which are usually used as re-set systems.

**REMARKS:** In order to avoid delays on actuation time, the auxiliary component should be installed near the air-lock, and connected with small capacity pipe (4 x 6 mm).

For air-lock systems where the restore of normal operating conditions is subject to a consent from external circuitries, the air-lock device can be fitted with a pneumatic auxiliary switch.



As remarkable from fig. 4 signal to connection A is controlled by the 3-way additional switch, which will reset the air-lock device thanks to an impulse (pneumatic push button, etc.) with a pressure higher than the set figure. The time needed by the impulse to guarantee the reset depends upon capacity and distance of connections.

Our fig. 4 is merely indicative, and can be used also for air-lock systems in stroke extremity and with different circuitries.

In thermoelectric power stations, air-lock operation can be required not only by air supply failure, but also by a logic safety device or a logic starting device, or by electric power failure.

In this case, a 3 way solenoid valve only, marked by \* on fig. 3 must be fitted on the impulse connection of the air-lock device.



## TECHNICAL SPECIFICATION

### STANDARD SPECIFICATIONS

**Pneumatic pressure switch:**

- setting range 15 ÷ 70 psi (1 ÷ 5 bar)  
(for intervention of the air-lock device when air supply pressure decreases)  
(*other ranges upon request*)
- inlet maximum pressure 145 psi (10 bar)
- standard ambient temperature limits:  
-20°C ÷ +80°C (-4°F ÷ +175°F)  
(*model for high/low temperature upon request*)
- operating times  
(referred to 1 lt. cylinder capacity)  
0,5 sec/lt. for air-lock device ND 1/4"  
(mod. AL/CC 2-3)  
0,12 sec/lt. for air-lock device ND 1/2"  
(mod. AL/CA 2-3)  
0,05 sec/lt. for air-lock device ND 1"
- Pressure switch connections:  
pilot signal : ND 1/8" NPT  
status signal : ND 1/8" NPT

**Switching assembly:**

- model **AL/CC -2-3**, AL 101 series  
connections ND 1/4" NPT F  
(tube diam. 6/8 - 8/10 mm)
- model **AL/CA-2-3**, AL 102 series  
connections ND 1/2" NPT F  
(tube diam. 10/12 - 13/15 mm)
- model **AL/R-2**  
special execution with 3-way auxiliary switching device ND 1/4" connections.

### MATERIALS

**Pneumatic pressure switch:**

- lower and upper body : aluminium
- plug : stainless steel
- calibration spring : steel for springs
- piston : aluminium

**Switching assembly:**

- body : aluminium
- ND 1/4" spool valve : hard oxidized aluminium
- gaskets : Buna N™

## FRANCAIS

### MONTAGE

Le dispositif pressostatique de blocage est monté sur les servo-moteurs pneumatiques lorsqu'on souhaite isoler le dispositif de régulation (positionneur ou distributeur electropneumatique), dans le cas où la pression d'air moteur descend au dessous de la seuil limite de sécurité de fonctionnement.

Le dispositif pressostatique type AL a été conçu pour satisfaire aux différents systèmes de blocage et pour garantir la position spécifique de sécurité de l'actionneur, comme demandé par l'élément de régulation appliqué.

Le dispositif de blocage est formé principalement d'un pressostat pneumatique pourvu d'un réglage de consigne et d'un différentiel fixe d'environ 20 kPa (15 psi) **qui actionne simultanément un ou plusieurs commutateurs synchrones à 3 voies**, selon la fonction demandée.

**Dans le cas aussi d'une diminution graduelle de pression d'air jusqu'à la valeur de consigne, l'intervention du système de commutation est immédiate. Le différentiel évite la commutation continue lorsque la pression air oscille tout près de la valeur de consigne.**

### FONCTIONNEMENT (fig. 1)

Le dispositif pressostatique peut être réglé pour intervenir avec une pression variable de 20 ÷ 93 kPa (15 ÷ 70 psi): **en tournant la vis de consigne (1) dans le sens des aiguilles d'une montre la pression de tarage augmente.**

La figure (1) montre le dispositif dans les conditions de manque d'air.

Quand la pression envoyée dans la connexion A, dépasse la valeur de tarage, le piston (8) s'élève en brisant la charge du ressort (5); la pression passe par l'orifice central de la valve (9) et met en pression le signal d'état qui est connecté à l'extérieur à la commande du group de commutation (23). La commutation met en communication la connexion U avec S isolant la connexion E.

Si la valeur de pression à la connexion A descend en dessous de la valeur de consigne, le piston (8) poussé par le ressort (5) bouche l'orifice centrale de la valve (9) qui se déplace vers le bas. Dans cette position, la valve (9) décharge dans l'atmosphère la pression du signal d'état qui est relié au group de commutation (23). Cette mise à l'atmosphère provoque le retour en position du group de commutation (en manque d'air).

Le retour en commutation met en commutation la connexion U avec E, isolant la connexion S.

Les connexions sont distinguées par les lettres E - S - U.

### APPLICATIONS TYPIQUES

Les schémas pneumatiques en fig. 2 - 3 - 4 montrent les dispositifs de blocage joints aux servomoteurs pneumatiques.

**Le schéma (fig. 2)** montre les deux systèmes typiques de blocage en fin de course, avec tige servomoteur sortie ou rentrée.

**Le schéma (fig. 3)** montre un système de blocage en position, pour cylindre à double ou simple effet.

**Le schéma (fg. 4)** montre le système de blocage en position, coordonné par des circuits logiques extérieurs.

Pour ces types de circuit, sur demande, le dispositif de blocage peut être équipé d'une connexion pour le signal d'état logique identifiant la position du dispositif de commutation.

Ce signal a valeur "0" de pression quand le dispositif de commutation est en position de blocage (valeur de pression à la connexion A inférieure à la valeur de tarage).

Quand le dispositif de comutation est dans la position de fonctionnement normal (valeur de pression à la connexion A supérieure à la valeur de tarage) le signal d'état a une valeur de pression qui correspond à l'alimentation de l'actionneur.

L'emploi de ce signal est limité à la connexion d'éventuels composants statiques (pressostats - lampes pneumatiques - boosters - etc.) qui sont habituellement utilisés pour réaliser des systèmes de réarmement.

NOTE: Pour éviter des retards dans les temps d'intervention on conseille d'installer le compostant auxiliaire près du système de blocage et de le raccorder avec un tuyau de petite capacité (4 x 6 mm).

Pour la réalisation de systèmes de blocage où le rétablissement des conditions de fonctionnement est subordonné à la commande des circuits extérieurs, le dispositif de blocage, sur demande, peut être équipé avec un commutateur auxiliaire.

Sur le schéma (fig. 4), le signal à la connexion A est rétabli par le dérivateur additionnel à 3 voies, qui peut rétablir le dispositif de blocage, avec un signal de réarmement impulsif (touche pneumatique, etc.) à une pression supérieure à la valeur de tarage.

Le temps nécessaire à l'impulsion pour garantir le réarmement, dépend de la capacité et de la distance du raccordement.

Le schéma (fig. 4) est uniquement indicatif et peut être employé aussi pour les systèmes de blocage en fin de course avec des différents circuits.

Lorsqu'on l'utilise pour les centrales thermoélectriques, l'intervention du dispositif de blocage peut être demandée non seulement pour manque d'air d'alimentation, mais aussi par un système logique de sécurité ou de mise en service, ou pour manque d'énergie électrique.

Dans ce cas il suffit de prévoir sur la connexion d'impulsion du dispositif de blocage une électrovanne à 3 voies, indiqué avec \* sur le schéma fig. 3.

## DONNES TECHNIQUES

### CARACTERISTIQUES STANDARD

**Pressostat Pneumatique**

- étendue de tarage: 15÷70 psi (1÷5 bar)  
(pour intervention du dispositif de blocage  
en diminution de la pression air d'alimentation  
(*sur demande autres étendues*))
- pression maximale en entrée 145 psi (10 bar)
- limites de température ambiante standard:  
-20°C ÷ + 80°C  
(- 4°F ÷ +175°F)  
(*sur demande execution basse-haute  
température*)
- temps de transfer  
(pour une capacité de cylindre de 1 lt)
  - 0,5 sec/l pour blocage DN 1/4" (mod. AL/CC-2-3)
  - 0,12 sec/l pour blocage DN 1/2" (mod AL/CA-2-3)
  - 0,05 sec/l pour blocage DN 1"
- raccordements pressostat:  
signal pilote: DN 1/8" NPT  
signal d'état: DN 1/8" NPT

**Groupe de commutation**

- modèle **AL/CC-2-3** série AL 101  
connexions DN 1/4" NPT F  
(diam. tuyauterie 6/8 - 8/10 mm)
- modèle **AL/CA-2-3** série AL 102  
connexions DN 1/2" NPT F  
(diam. tuyauterie 10/12 - 13/15 mm)
- modèle **AL/R-2**  
execution speciale du pressostat  
pneumatique auxiliaire à 3 voies avec  
connexions DN 1/4"

### MATERIAUX

**Pressostat pneumatique**

- demi-corps inférieur et  
supérieur : aluminium
- obturateur : acier inox
- ressort de tarage : acier pour ressorts
- piston : aluminium

**Group de commutation**

- corps : aluminium
- tiroir DN 1/4" : aluminium avec oxidation dure
- joints : Buna N™



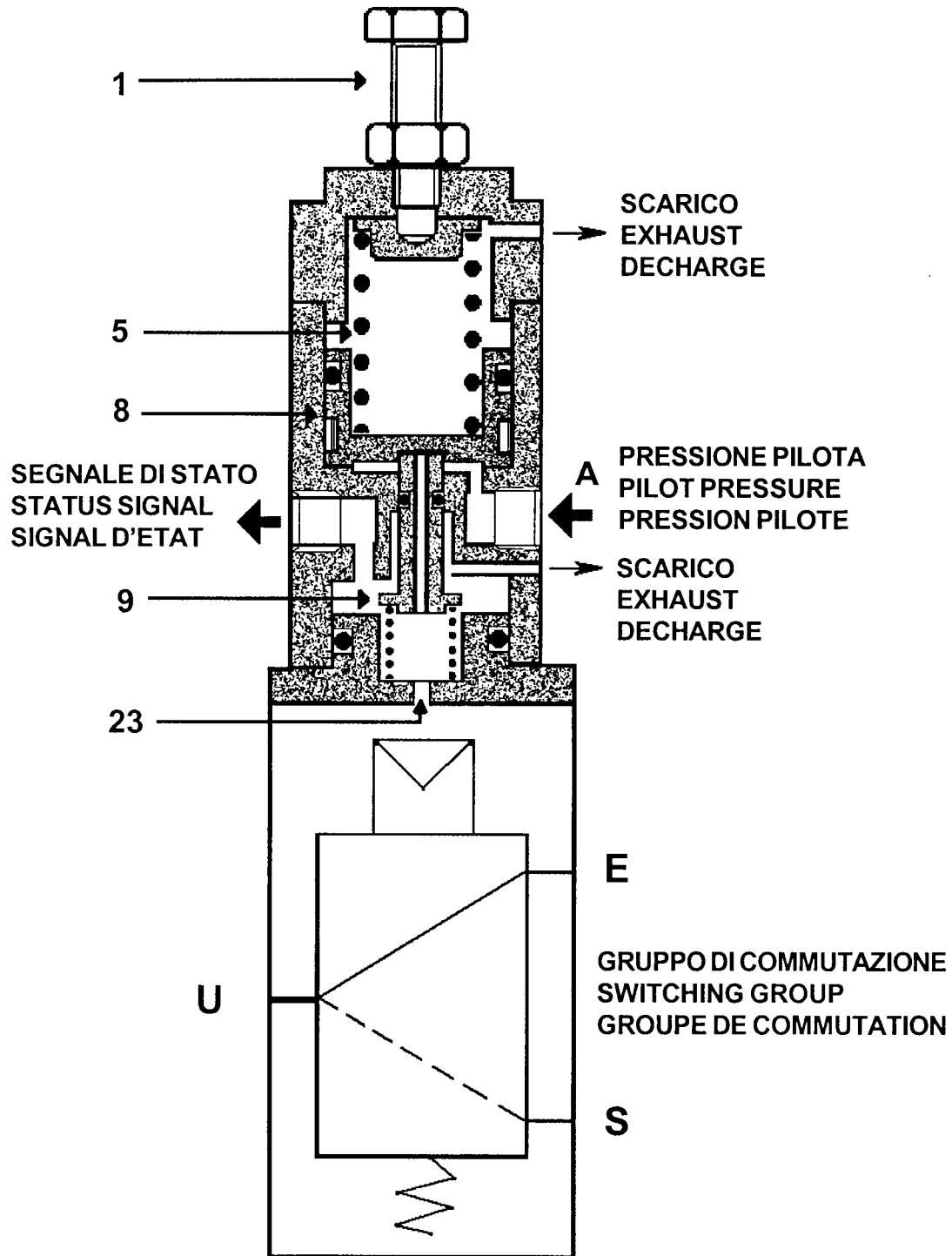


FIG. 1

Schema pn. sistema air-lock in fine corsa per mancanza aria su attuatori pneumatici a doppio effetto  
 Pn. diagram: air-lock system in stroke extremity for air failure on double acting pneumatic actuators  
 Schéma pn. du système de blocage en fin de course pour manque d'air sur servomoteurs pneumatiques à double effet

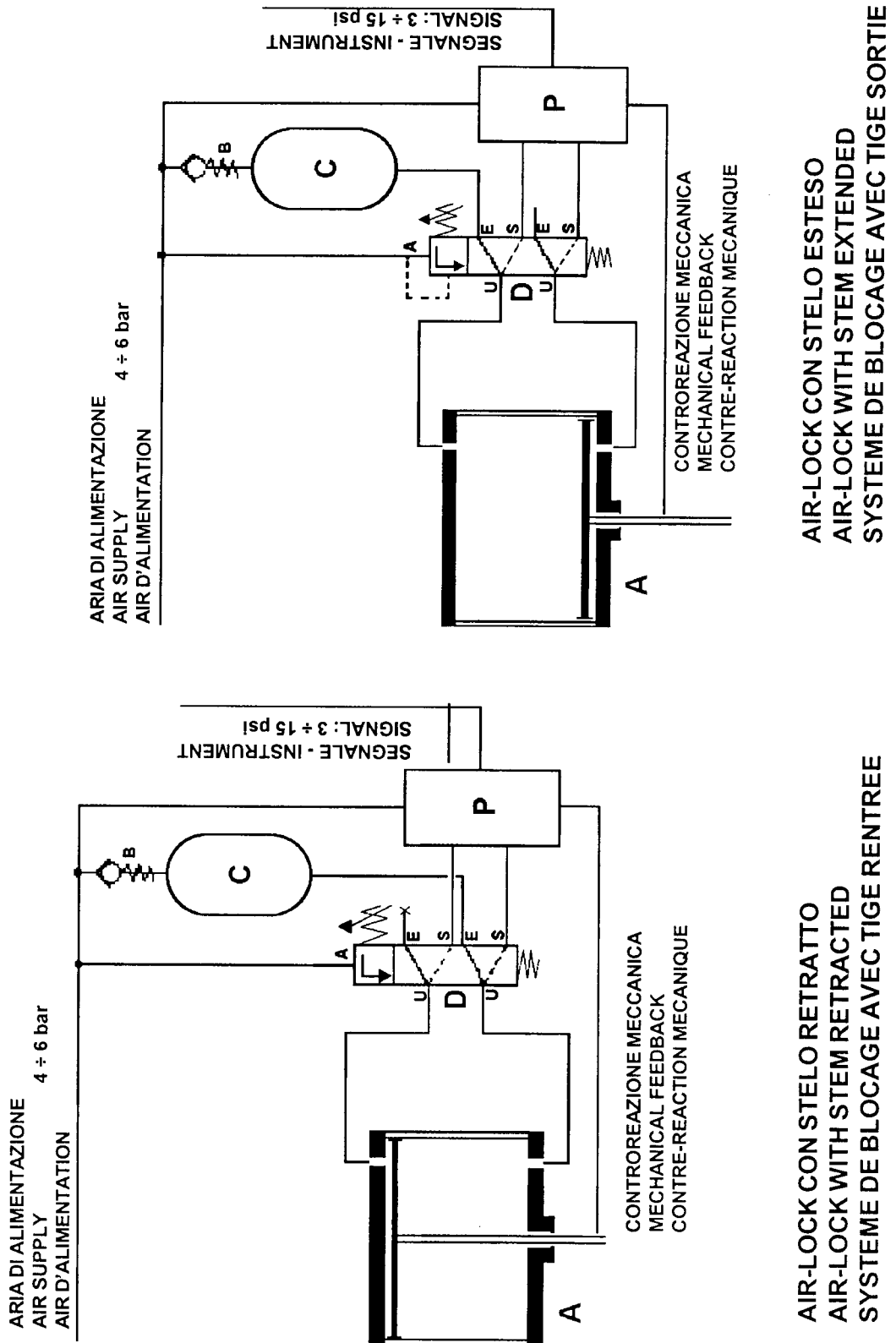
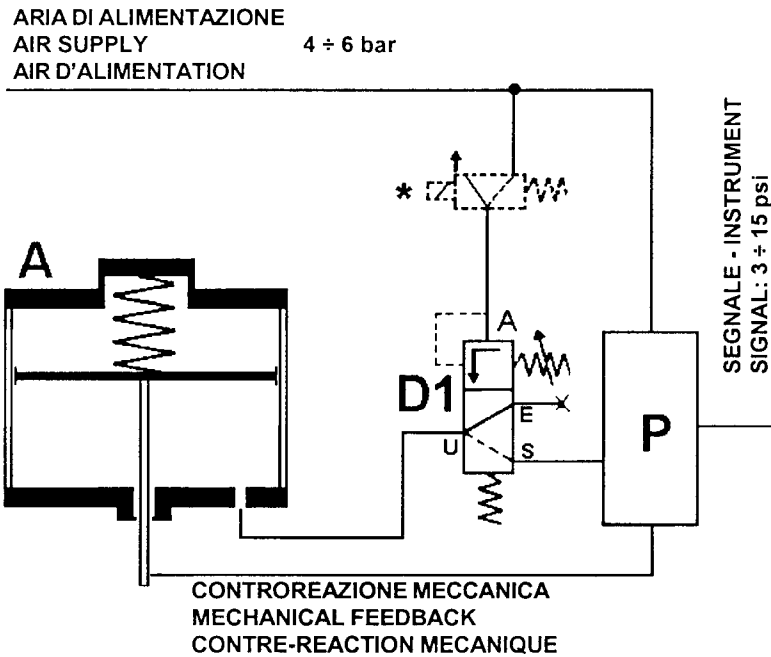


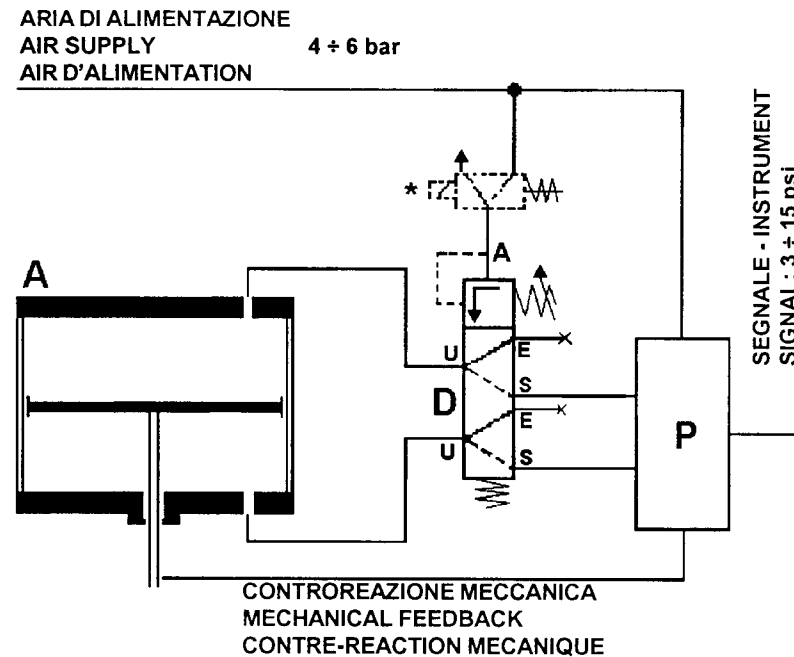
FIG. 2

FIG. 3



**SISTEMA A SEMPLICE EFFETTO  
SINGLE ACTING SYSTEM  
SYSTEME A SIMPLE EFFET**

- A = ATTUATORE PNEUMATICO A DOPPIO EFFETTO
- B = VALVOLA DI NON RITORNO
- C = ACCUMULATORE PNEUMATICO
- D = DISPOSITIVO DI AIR-LOCK
- D1= DISPOSITIVO DI AIR-LOCK A SINGOLO COMMUTATORE
- P = POSIZIONATORE PNEUMATICO
- \* = ELETTROVALVOLA A 3 VIE



**SISTEMA A DOPPIO EFFETTO  
DOUBLE ACTING SYSTEM  
SYSTEME A DOUBLE EFFET**

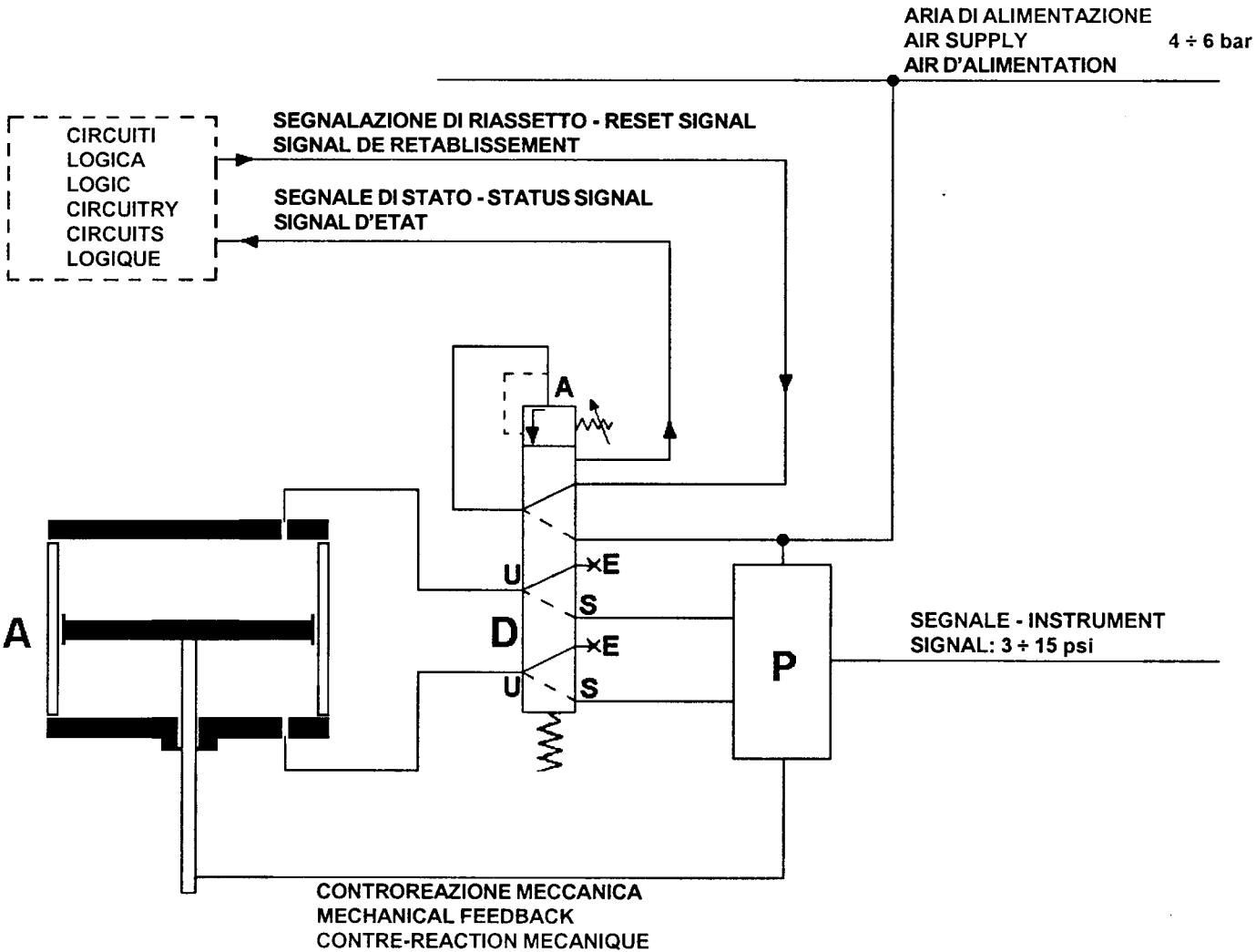
- A = DOUBLE ACTING PNEUMATIC ACTUATOR
- B = CHECK VALVE
- C = PNEUMATIC ACCUMULATOR
- D = AIR-LOCK DEVICE
- D1= AIR-LOCK DEVICE WITH SINGLE SWITCH
- P = PNEUMATIC POSITIONER
- \* = 3-WAY SOLENOID VALVE

- A = SERVOMOTEUR PNEUMATIQUE A DOUBLE EFFET
- B = VALVE D'EQUILIBRAGE
- C = ACCUMULATEUR PNEUMATIQUE
- D = DISPOSITIF DE BLOCAGE
- D1= DISPOSITIF DE BLOCAGE A SIMPLE COMMUTEUR
- P = POSITIONNEUR PNEUMATIQUE
- \* = ELECTROVANNE A 3 VOIES

Schema pn. sistema air-lock in posizione per mancanza aria su attuatori pneumatici  
 Pn. diagram: air-lock system in last position for air failure on pneumatic actuators  
 Schéma pn. du système de blocage en position pour manque d'air sur servomoteurs pneumatiques



FIG. 4



Schema pn. sistema air-lock in posizione con ripristino e segnalazione di intervento di tipo pneumatico  
 Pn. diagram: air-lock system in last position with pn. reset and intervention signal  
 Schéma pn. du système de blocage en position avec rétablissement et signalation  
 d'intervention pneumatique

A = ATTUATORE PN. A DOPPIO EFFETTO  
 D = DISPOSITIVO DI AIR-LOCK CON RIPRISTINO  
 TIPO ALR-2  
 P = POSIZIONATORE PNEUMATICO

A = DOUBLE ACTING PN. ACTUATOR  
 D = AIR-LOCK DEVICE WITH RESET  
 ALR-2 TYPE  
 P = PNEUMATIC POSITIONER

A = SERVOMOTEUR PNEUMATIQUE A DOUBLE EFFET  
 D = DISPOSITIF DE BLOCAGE AVEC RETABLISSEMENT  
 TYPE ALR-2  
 P = POSITIONNEUR PNEUMATIQUE



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