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# **Breakthrough Engineering** for a Better World

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

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

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

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

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

Breakthrough engineering you can count on.

# Expertise in the Life Science sector



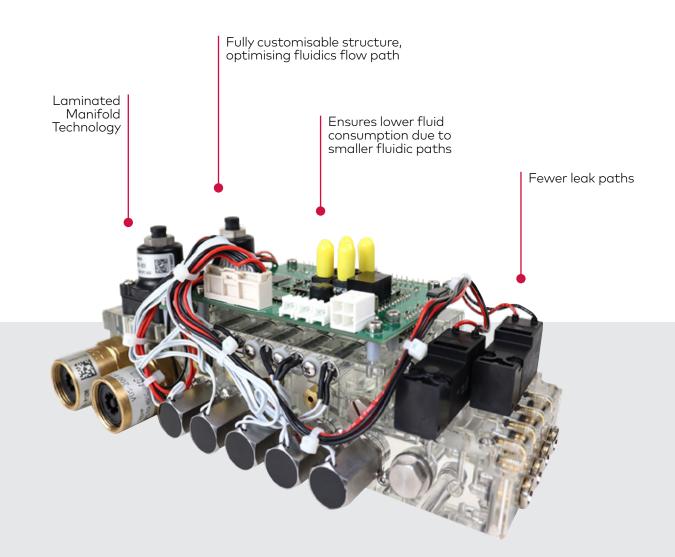
With over thirty years' experience in the life science sector, Norgren is one of the most recognised names in the custom design and manufacture of precision fluidic and motion control components and assemblies for the OEM instrument manufacturer. We are well used to designing for the precise control, repeatability and safety needs of the industry.

Our market-driven product portfolio, designed to meet the demanding performance requirements in medical devices, diagnostic and analytical instrumentation applications, features niche or platform products and technologies, supported by regular new product launches. Specialising in miniature solenoid valve technology, microfluidics, precision liquid handling solutions and analytical instrument solutions, our FAS and Norgren products are renowed in the industry.

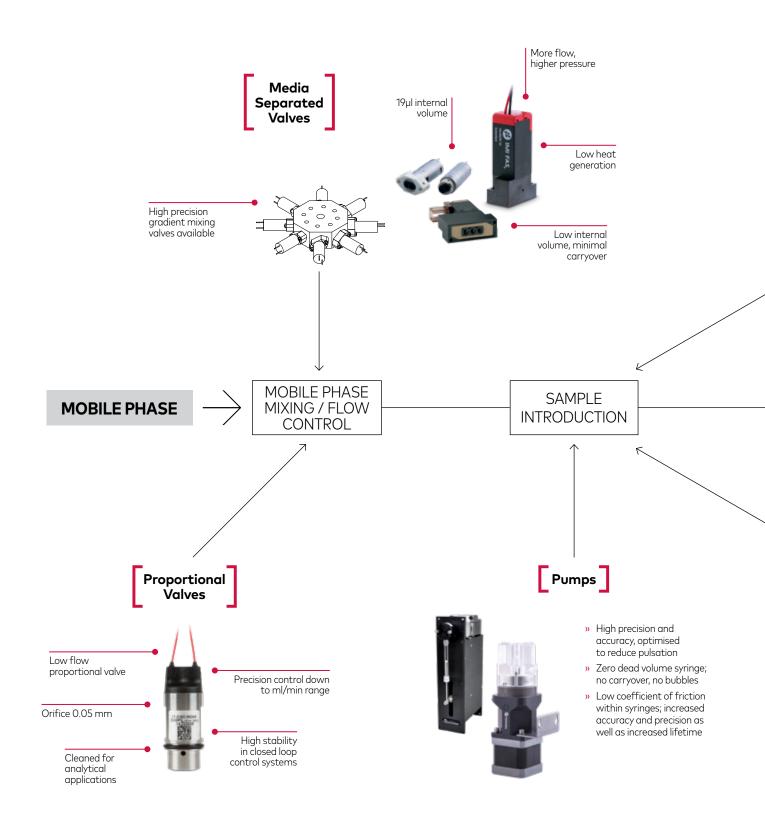
Norgren delivers breakthrough engineering, by reducing the size of OEM devices while enhancing accuracy, throughput and fluid control performance. Our components are designed for optimal 'size to performance' ratio with smaller footprints, higher repeatability and lower operating power.

Our understanding of the market trends, engineering challenges and regulatory standards gives us the capability to provide a complete, OEM-specific, integrated platform that delivers value.

With an established sales and service network in 75 countries, our dedicated life science sector teams connect around the world to ensure continuity of support for leaders in the life science industry.



# **Analytical** Chromatography



### **HPLC** Case Study

It was due to the strong relationship over many years that our customer, a very successful company in the HPLC market, came to us with a project to develop a sample preparation and cleansing system for their new line of UPLC systems.

To fulfil their requirements, we designed a dual syringe pump solution into a single unit. The solution consisted of a smaller volume syringe for aspirating sample into the sample loop, and a higher pressure syringe system for applying cleansing fluid throughout sample preparation and introducing all fluids to the high pressure area of the instrument.

This solution has added to our world-class portfolio of high pressure syringes for this and other high pressure fluid handling technologies.



- » Speciality coatings for inertness and carryover
- » OEM specific



COLUMN

**DETECTION SYSTEM** 

**WASTE** 

#### Sample introduction valves

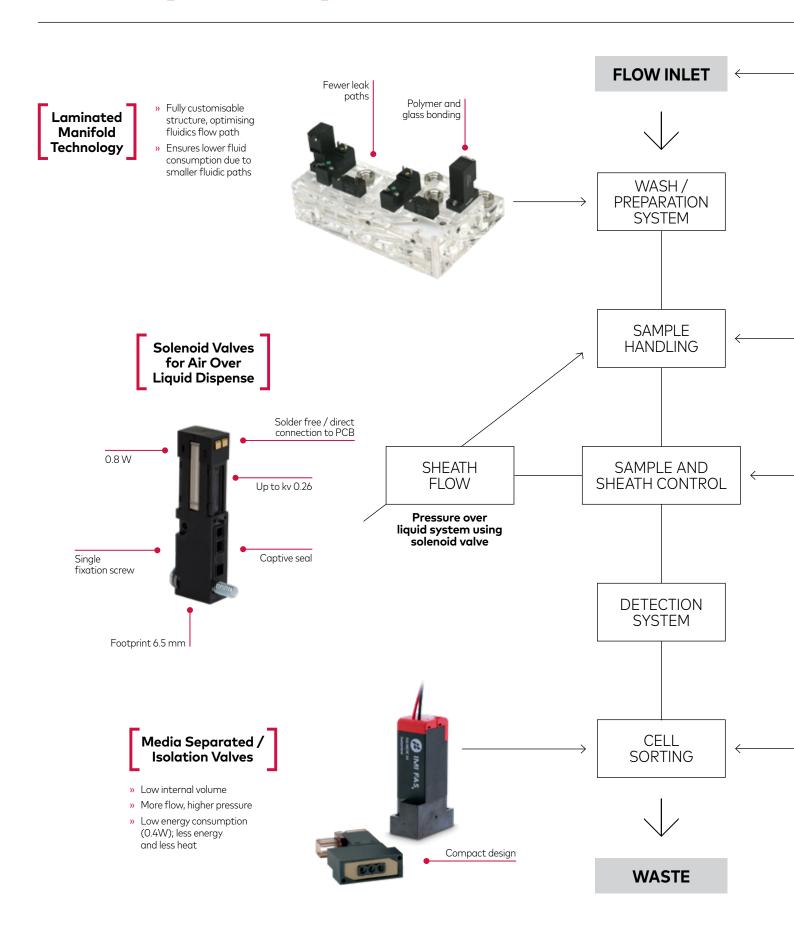
- » Allows simplification of fluidic circuit
- » Real time monitoring of the health of the valve
- » Eliminates cross port leak



Ceramic, PEEK, PTFE and plastic materials available



# Diagnostic Flow Cytometry



#### Custom Liquid Level Switches

Single and multiple point switches available



# Syringe Pumps

» High precision and accuracy, optimised to reduce pulsation

Inline pump available with easy to replace syringe



### Rotary Valve

Allows simplification of fluidic circuit

> Handles up pressure



From 3 up to 12 way valvės availablė

#### **High Flow Media** Separated Valves

» Chemical inertness; handles bleach wash fluids etc.

> Large orifice for bulk fluidics handling



### Flow Cytometry Case Study

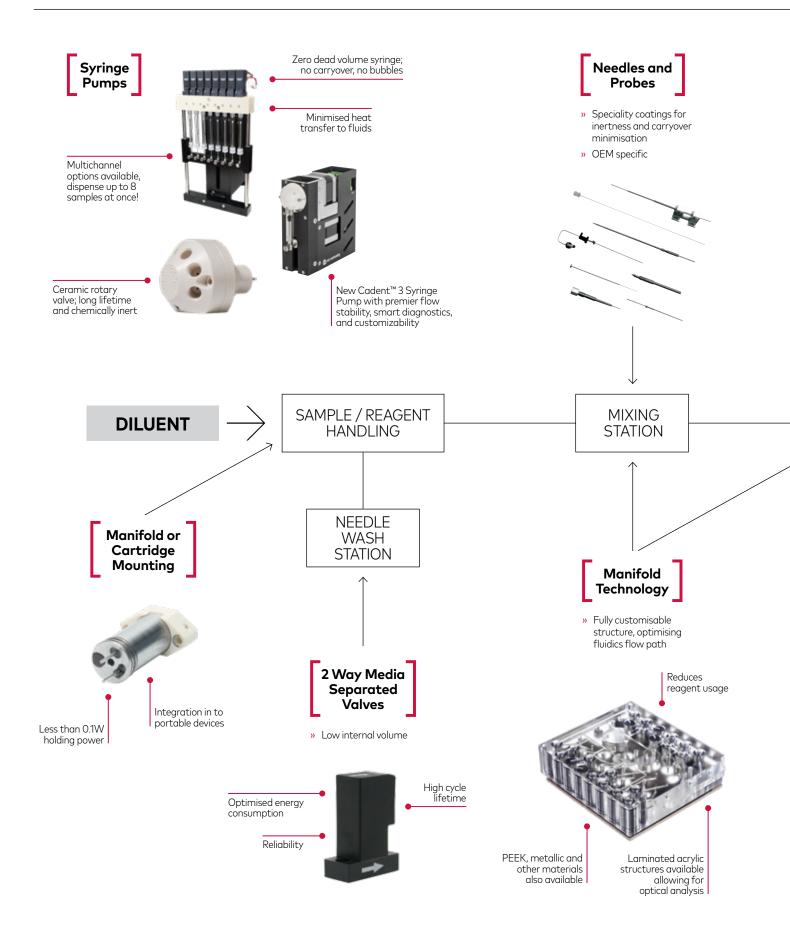
#### A customer of ours decided to develop an area of instrumentation that they had not worked on previously – a Flow Cytometer for food analysis.

Norgren was involved from the very beginning to help them design their fluidic circuit; the key requirement being the subtle introduction of sample into a continuously flowing sheath fluid. After working closely with the customer to gain a deeper understanding of their application needs, we were able to design a solution based on a modification of our current syringe pump range.

By introducing a new electronic control system for the V6 syringe pump, we were able to account for the large range of flow rates required by the instrument. The pump was reconfigured to quickly alter between fast flows to slow dispense at speeds less than 1µl/s, with a lifetime of millions of cycles.



# Diagnostic Immunology / Clinical **Chemistry / Liquid Handling Robotics**



#### 3 Way Isolation **Valves**

- » Low internal volume
- » More flow, higher pressure
- » Low energy consumption (0.4W); less energy and less heat



**DETECTION** INSTRUMENT

**WASTE** 

Custom Level Switch Solutions

» Custom Level Switches or Bottle Assemblies



# **Liquid Handling**

Case Study

Our customer designed a DNA sample handling and preparation system to generate small droplets of PCR oilbased reagent that has been loaded with DNA content. The bubbles are dispensed into a well plate and sent to a digital PCR system for replication.

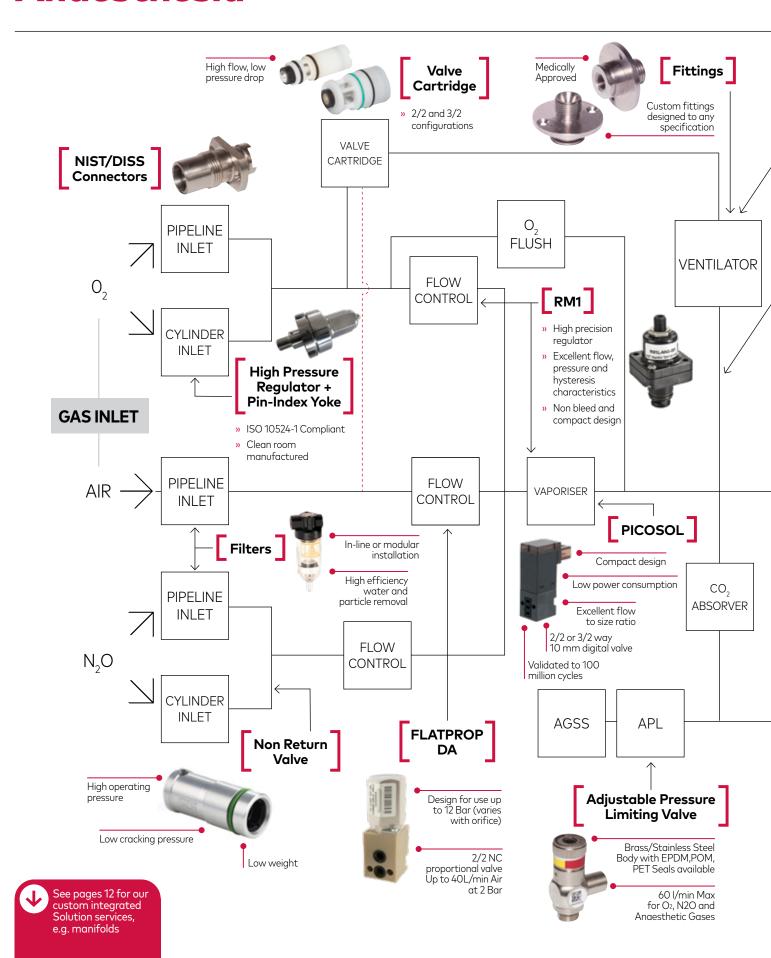
The solution is a unique design that incorporates 11-Chipsol valves, 2-MS valves, a FLATPROP and an array of sensors, fittings and PCBs. All of these components are mounted onto a 5-layer acrylic manifold with two discrete integrated pressure chambers. The unit allows the direct interface of the customer's disposable – the bottle with PCR reagent - into the manifold.

This unit uses an air-over-liquid system, supplying the necessary means to pull the PCR reagent out of the bottle and redirect to a separate dispense head. The dispense head then auto-fills the small well plates that are loaded into the PCR system.

This assembly creates advantage by reducing instrument production time and inventory management, reducing field service warranty claims and improving operational efficiencies.



# **Medical Device Anaesthesia**



# **Anaesthesia**Case Study

A customer of ours wanted to look at anaesthesia machine design from the point of view of the anaesthesiologist. They wanted to build expertise into a machine that had maximum functionality, comfort and control.

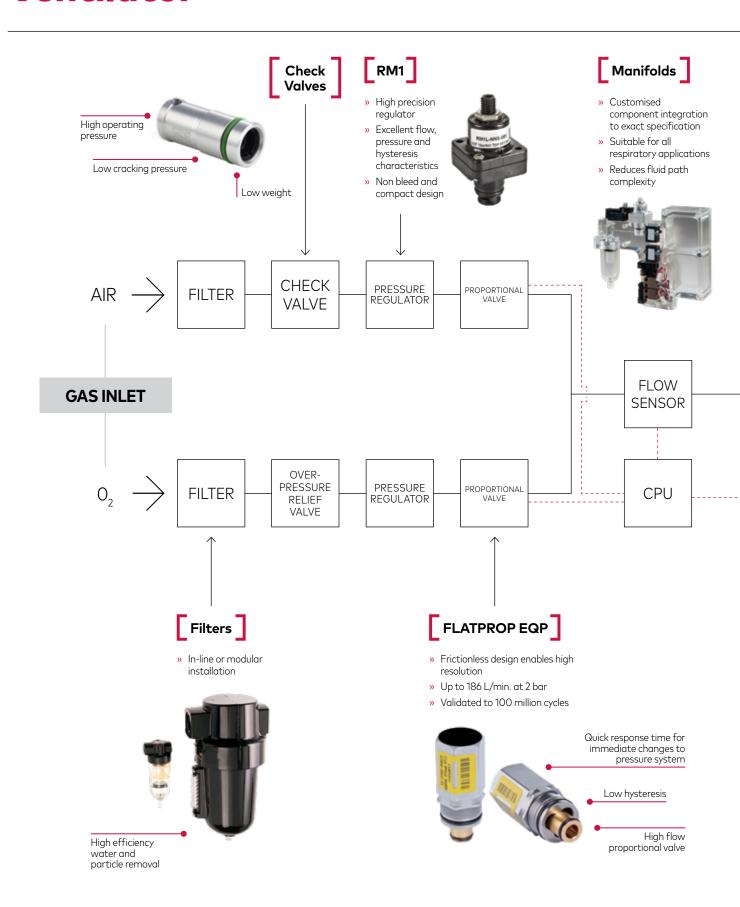
Our expertise in VRA allowed us to rapidly supply 20 unique components from our facilities around the globe and then work in partnership with our customer to create the final design in Europe.

Most parts were derived from standard products but configured, tuned or applied to our customer's highly specific functional requirements. For simpler installation and a smaller footprint, many products were designed for integration into sub-assembly manifolds. Additionally, to reduce waste from discarded anesthesia gas bottles that were not completely exhausted, We suggested a modified pressure regulator that allowed the gases to continue to flow at a lower pressure, maximising gas used.

With the best size to performance ratio for proportional valve technology on the market and capabilities to provide a complete integrated platform. Our experience providing market leading fluidic control technology for the VRA market gives our customers competitive advantage.



# **Medical Device Ventilator**



#### Electronics Closed loop flow Bespoke electronics and pressure for components control available Overpressure **Relief Valve** Customisable cracking pressure and flows » Compact footprint SAFETY **SENSORS** E.G. 0, **VALVES** PICOSOL SENSOR CALIBRATION 10 mm digital valve Low power consumption Compact design 2/2 or 3/2 way**EXPIRATORY** Excellent flow **EXPIRATORY** to size ratio VALVE PILOT VALVE Validated to 100 million cycles CHIPPROP **ATMOSPHERE** Custom designed for respiratory applications 2/2 or 3/2 way 8 mm proportional valve Cartridge valve Very compact design Pilot for exhalation valve

### Integrated Solutions

Our highly experienced engineering and production teams design and manufacture custom manifolds from Aluminum, Brass, Stainless Steel and a wide range of plastics, from Teflon to Acrylics. Our engineers incorporate the latest techniques and technologies to ensure the best design for your application - whether your unique application requires a simple machined manifold or full integration of a complex fluidic circuit in a multi-layered, multichannel manifold.

Typical manifold or integrated solution benefits include:

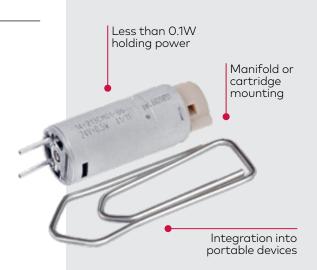
- » Reduce overall solution footprint and weight
- » Eliminate potential leak paths
- » Integrate multiple discrete components such as fittings, valves, pressure regulators, check valves, restrictors, filters, pressure and flow sensors
- » Incorporate complex pneumatic and/or fluidic circuits directly into the manifold
- » Allow for the maximum number of components on a given manifold face (high density of fluid circuits)
- » Consistently maintain the exact fluidic volume between discrete components
- » Eliminate potential dead spaces within the fluidic pathway (elimination of dead/static volumes)
- » Improve reliability, reduce overall costs, and improve operational efficiency



# Media separated valves and manifold solutions

#### FAS 8 mm CHIPSOL MS

- » 2/2 NC media separated solenoid valve
- » Manifold or cartridge mount available
- » Orifice size: 0.8 mm
- » Pressure rating: 0 to 2 Bar (Vacuum version available)
- » Materials: PEEK body, FFPM or EPDM seals
- » Power consumption: 0.5W
- » Virtually no unswept volume



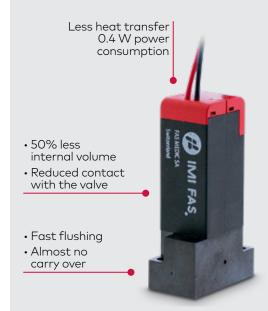
#### FAS 10 mm PICOSOL MS

- » 3/2 media separated solenoid valve
- » Manifold mount
- » Orifice size: 1.2 mm
- » kv: 0.65
- » Pressure rating: -0.95 to 2.2 Bar
- » Materials: PEEK body, FFPM, FPM or EPDM seals
- » Low internal volume
- » Low power consumption
- » Low internal / unswept volume

# Highest flow to size ratio in the industry

#### **FAS 15mm MICROSOL MS-E**

- » 2/2, 3/2 media separated solenoid valve
- » Manifold mount
- » Orifice size: 1.6 mm
- » kv: 0.6
- » Pressure rating: -0.95 to 2.2 Bar
- » Materials: PEEK body, FFPM, FPM or EPDM seals
- » Low internal volume
- » Low power consumption
- » Low internal / unswept volume





#### **Buschjost 82080**

- » 2/2 media separated solenoid valve
- » Orifice size: 3 mm to 8 mm
- » Pressure rating: 0 to 7 Bar
- » Materials: PVDF body, EPDM seal, PTFE bellows
- » Various mounting options available

#### **Custom Level Switches**

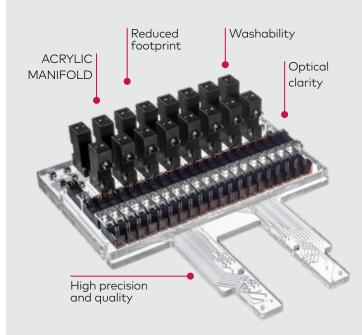
- » Various float options include: Pressure, Temperature, Compatibility, Actuation Points, Mounting, etc.
- » Proven Reed Switch Technology
- » Custom and simple to implement complete bottle & switch solutions

### **Laminated Manifold Technology**

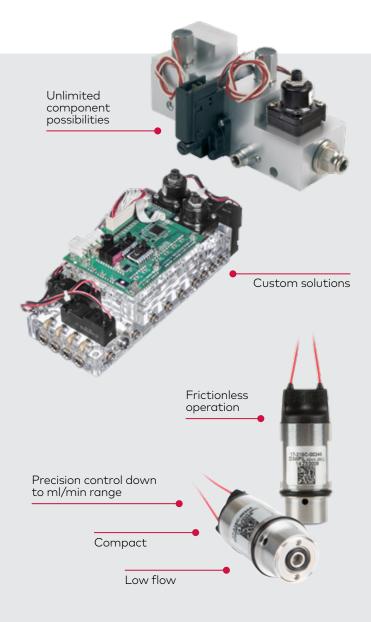
- » Multi-layered designs
- » Custom geometries and volumes
- » Complex three dimensional flow paths
- » Thermal, diffusion and solvent bonded
- » Flame and vapour polishing







# Non-Media Separated Valves and other manifold technology



# » Robust, compact designs

**Manifold Technologies** 

- » Aluminium, stainless steel, brass, engineered plastics
- » Burr-free intersections
- » NPT straight thread and flat bottom ports
- » Uniform channels

#### FAS low flow proportional valves

#### FAS 16 mm FLATPROP DA

- » 2/2 NC proportional valve
- » Suitable for medical applications
- » Up to 401/min Air at 2 Bar
- » Design for use up to 12 Bar (varies with orifice)

#### **FAS 16 mm FASPROP** Low flow proportional valve

- » 2/2 NC proportional valve
- » Suitable for analytical clean applications
- » Materials: body stainless steel, seal FPM, FFPM
- » High precision proportional control down to ml/min range
- Design for use up to 12 Bar (varies with orifice). Orifice sizes down to 0.05 mm.
- » Built-in filter



#### FAS high flow proportional valves

#### FAS 16 mm FLATPROP EQI / EQP

- » 2/2 NC proportional valve pressure compensated
- » From 120 to 186 I/min Oxygen at 2 Bar
- » Pressure rating: 0 to 7 Bar
- » Materials: stainless steel body, FPM or NBR seals
- » Power consumption: 2.5W at 20°C
- » Validated to 100 million cycles
- » Suitable for medical applications

#### FAS on/off cartridge valves

#### FAS 8 mm CHIPSOL

- » 2/2 or 3/2, NC or NO direct acting valve
- » Orifice size: 0.5 mm to 1 mm
- » Pressure rating: 0 to 8 Bar
- » Materials: PPS and stainless steel body, HNBR Seal
- » Power consumption: 0.5W

#### FAS on/off valves

- » Excellent flow to size ratio
- » Low power consumption
- » Validated to 100 million cycles
- » Manifold mount

#### **FAS 6.5mm FLEXISOL**

- » 2/2 or 3/2, NC or NO valve
- » Orifice size: 0.8 and 0.9 mm
- » Flow: up to 3.5 l/min at 1.5 Bar
- » Pressure range: 0 to 2.5 Bar
- » One single screw, direct connection without soldering

#### **FAS 10 mm PICOSOL**

- » 2/2 or 3/2, NC or NO valve
- » Orifice size: 0.6 to 2 mm
- » Flow: 5 to 32 l/min at 2 Bar
- » Pressure rating: 0 to 10 Bar

#### FAS 15 mm MICROSOL MS-E

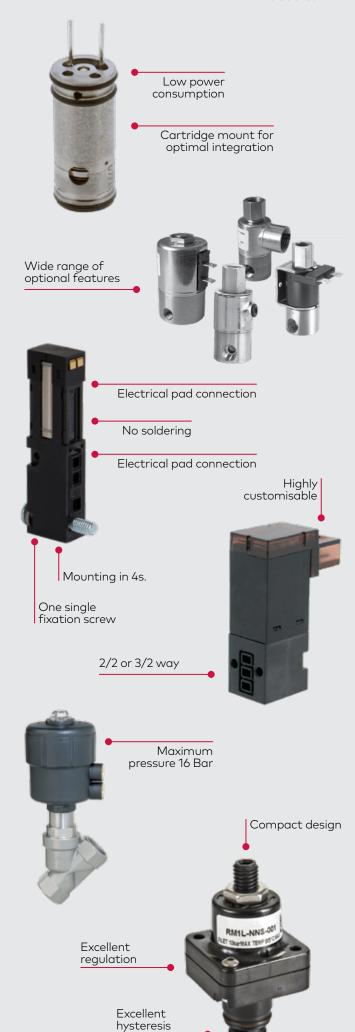
- » 2/2 or 3/2, NC or NO valve
- » Orifice size: up to 3.6 mm
- » Flow: 6 to 120 I/min at 2 Bar
- » Pressure rating: up to 16 Bar

### **Buschjost angle seat valves**

- » 84500 and 84520 series
- » Pressure actuated valves featuring high flow rate and flexibility
- » Suitable for neutral or aggressive gases and liquids

#### **RM1 Pressure Regulator**

- » Cleaned for Oxygen use
- » Maximum inlet pressure: 10 Bar
- » Maximum outlet pressure: 4 Bar
- » Maximum flow: 400l/min
- » Base mounting
- » Excellent hysteresis characteristics



# **Pumps and Accessories**

#### **Syringes**

- » 30 mm and 60 mm stroke lengths
- » 10µl up to 50 ml internal volume
- » Zero dead volume design available
- » Wetted materials: Borosilicate Glass, PTFE and PCTFE (UHMW optional)
- » Fully customisable for various shapes and sizes
- » High pressure syringes available

#### Cadent™ 3

- » 30 mm stroke pump
- » 6k, 12k, or 24k resolutions available
- » 50µl to 5 ml syringe volumes
- » Rotary valves up to 12way in PTFE and PEEK
- » 3/2 solenoid valve option available
- » Flow rate 0.008µL/min up to 500 ml/min
- » Up to 267N pump force

#### Cadent™ 6

- » 60 mm stroke pump
- » 12k, 24k or 48k resolutions available
- » 10µl to 50 ml syringe volumes
- » Ceramic, PEEK and PTFE rotary valves up to 12 way
- » Flow rate 2.8µl/min up to 2.5 ml/min
- » Up to 308N pump force





#### **Multichannel**

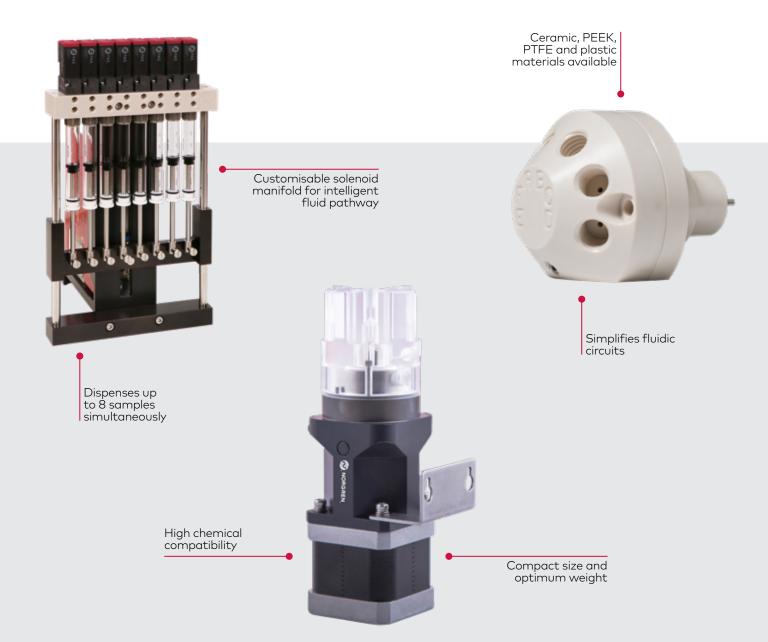
- » 60 mm stroke pump
- » Up to 8 syringes on a single pump
- » 24k or 48k resolutions available
- » 2.5µl to 5 ml syringe volumes
- » 3/2 solenoid valve options available
- » Flow rate 1.25µl/min up to 125 ml/min
- » Up to 667N pump force spread across all channels

#### Inline Pump IP 4000

- » Dispense volume: 100 µl, 500 µl, 1ml
- » Accuracy: ± 0.5% at full dispense
- » Precision: 1% CV @ 2% dispense
- » Compact design
- » High Reliability (2 million life cycle)
- » Operating pressure: 100 psig
- » Seal Wash Option
- » RoHS certified

#### **Rotary Valves**

- » 2 way up to 12 way
- » Distribution, non-distribution and loop valve configurations
- » PTFE, plastic or ceramic material valves
- » Standalone rotary valve driver available



### **Pinch Valves**

#### What Is A Pinch Valve?

A pinch valve is a type of control valve, which uses a pinching effect on a flexible tube to control fluid flow. The pinching (compression) can be accomplished using mechanical clamping mechanisms and can be pneumatically or electrically actuated.

Industry leaders looking for a low-maintenance and more cost-effective solutions for controlling

### Why Use Pinch Valves?

liquids, gases, slurries and powders (incl. corrosive media) in a pipeline are turning to pinch valves over traditional valves (diaphragm valves, ball valves, butterfly valves, needle valves, etc.) Unlike traditional valves, pinch valves feature a straight-through flow, very little pressure drop over the valve, and full shut-off of media in the tube, making it the most practical and efficient solution for various ON/OFF flow control applications.

### Markets & Applications

- » Biotechnology
- » Pharmaceuticals
- » Medical Devices
- » Diagnostics
- » Bioreactors
- » Bioprocessing single use technology
- » Process equipment
- » Food and beverage
- » Filtration, TFF (Tangential Flow Filtration)
- » Dispensing, filling and mixing: Resin, glue, epoxy, adhesive, paint, slurries, and other media
- » Chromatography analyzers
- » Chemical processing equipment

### Advantages of Pinch Valves

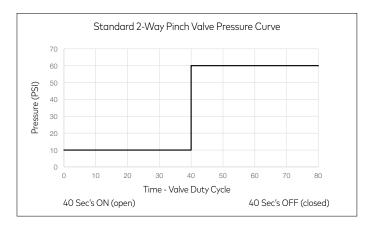
- » Compact, lightweight design
- » Easy cleaning (just throw away the tubing)
- » Simple operation
- » Eliminates media contamination
- » Linear flow
- » Quick tubing change-out
- » Long performance and reliability
- » Easy valve exchange
- » Maximize productivity
- » Reduced valve costs
- » Valve body not affected by corrosive fluids
- » Requires very low maintenance

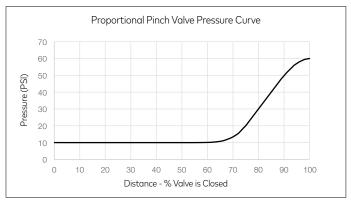


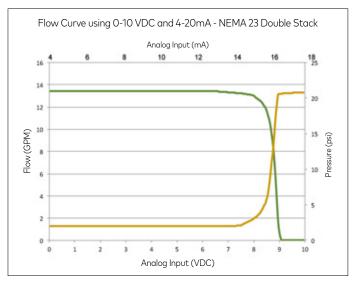
## PE900 Series Proportional Pinch Valve Electric System

### What Is A Pinch Valve?

See below for pressure curves representing 2-way (ON/OFF) control versus proportional control. If you need the option to vary or hold flow or pressure in your system a proportional valve allows you flexibility to adjust the valve opening from full open to closed or anywhere in between.







#### Model PE926 - PPV Electric Flow vs Pressure Curves

Nema 23 Flow - Tube: 1.250 ID, 1.625 OD

Nema 23 Pressure - Tube: 1.250 ID, 1.625 OD



### Features and Benefits

#### **Complete System Features** & Key Specifications:

- » Provides a robust solution for accurate closed loop proportional control and precision fluid management
- » Dependable, compact and cost-effective solution
- » Pinch head designed for wash down and clean rooms
- » Controls high media/fluid pressures up to 75 psig (5.2 barg)
- » Flexible tubing sizes from 0.063" to 1.625" O.D.
- » Recommended Tubing Duorometer up to 75 Shore A
- » Tube Materials: C-Flex, Pharmed, Polyurethane, PVC, Tygon, Pharma, Silicone, Braid Reinforced
- » Pinch Force range from 5 Lbs to 100 Lbs
- » Standard Power: 24 VDC, up to 4 Amps
- » Input Command Signal: 0-10 VDC and 4-20 mA
- » Repeatability  $\leq$  0.1% of actuator stroke (6  $\sigma$  level)
- » Accuracy = as low as 0.00025" per linear position move

#### **Pinch Valve Benefits:**

- » Designed for Bio-Pharma, Bio-Processing, Food and Beverage, Industrial applications where sterility and wash down procedures are needed
- » Offers reliability and performance when working with hard or larger diameter tubing that require stronger pinch forces
- » Provides a robust solution for accurate closed loop proportional control and precision fluid management.
- » Dependable, compact and cost-effective solution
- » Specifically designed for disposable tubing
- » Each model contains an easy snap-in tube slot for quick loading and unloading procedures

#### **Motor/Controller Benefits:**

- » Can run independent or as part of a closed loop system
- » Optimized software for easy set-up and testing
- » RoHS/CE Complaint
- » High resolution encoder feedback
- » DIN rail mountable (Controller Only)
- » Noise Level 50 dbA Maximu



### **VERSAGRIP®** Solenoid Pinch Valves

### Features & Benefits

- » Supports average tubing durometer up to 60 Shore A and 15 psig/1 barg media pressure
- » Compact design with low operational noise
- » Average actuation speeds of 80 milliseconds or less without tube loaded
- » Seals prevent liquid penetration supporting easy cleaning or sterilization procedures
- » 3 million MTBF\* or 18 month warranty\*
- » Optimized performance when used with solenoid controller, utilizing Pulse-Width Modulation (PWM) for power and heat management
- \* MTBF based on 50% duty cycle testing carried out at 20 degrees ambient C using 60 Shore A tubing. Duty cycle is defined as On Time/(On Time + Off Time).



### 900-Series Pneumatic Pinch Valves

### Features & Benefits

- » Support tubing durometer up to 85 Shore A and 75 psig/5.2 barg media pressure
- » Offer reliability and performance when working with larger diameter or hard tubing that requires stronger pinch forces
- » Flexible tubing sizes from 0.094" to 1.625" O.D.
- » Pinched head designed for washdown and clean rooms
- » Offered in Black Anodized Aluminum or 316L Stainless Steel

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

For information on all Norgren companies visit

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