PRECISION FLUIDIC AND MOTION CONTROL FOR THE LIFE SCIENCES

YOU CAN SEE OUR THINKING

ENGINEERING ADVANTAGE
A WORLD LEADER IN MOTION AND FLUID CONTROL TECHNOLOGIES, NORCROS WORKS CLOSELY WITH CUSTOMERS TO GAIN A DEEPER UNDERSTANDING OF THEIR ENGINEERING NEEDS, AND THEN CONNECTS ITS PEOPLE, PRODUCTS AND EXPERTISE TO GIVE THEIR EQUIPMENT AND THEIR BUSINESS A CLEAR ADVANTAGE. WE CALL THIS ENGINEERING ADVANTAGE.

With a sales and service network in 75 countries – as well as manufacturing capability in the USA, Germany, China, UK, Switzerland, Czech Republic, Mexico and Brazil – we have genuine global capability.

We also think local and niche: on focusing our resources on delivering a specific product, solution or service to meet our customers’ needs.

As a responsible business, we’re committed to working practices which contribute positively to the environments in which we work.

We offer:

- **HIGH PERFORMANCE PRODUCTS**
  from high flow proportional valves for respirators, to precision dispense syringe pumps, Norgren has a range of proven and reliable products for the Life Sciences. These can be delivered as discrete components, modified to meet OEM applications, or integrated into manifolds.

- **EXCEPTIONAL LOCAL SERVICE**
  delivered through Key Account Management teams and sector specialists committed to understanding and meeting our customers’ engineering challenges, wherever they are.

- **INNOVATION & TECHNICAL EXCELLENCE**
  through four global technical centres and the experience of specialist engineering teams. We have a portfolio of patented solutions, and are always developing new and cost-effective technologies.
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. Renowned in the industry are Norgren’s brands, FAS, Kloehn and KIP, specialising in miniature solenoid valve technology, microfluidics, precision liquid handling solutions and analytical instrument solutions respectively.

Norgren creates Engineering Advantage 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.
High standards of responsibility are, in our view, compatible with growth and business efficiency. We put particular emphasis on ensuring that our management of social, environmental and economic issues is aligned and integrated with the overall management of the business and we call this ‘responsible business’.

Norgren is part of the international engineering group IMI plc, and our commitment to responsible business starts with The IMI Way, which sets out our core values. Whenever you meet an IMI person you will find someone who:

→ Pursues excellence and delivers results
→ Innovates and provides value to our customers
→ Acts with integrity

The IMI Way is a driver for responsible growth and directly supports our responsible business priorities:

→ Health and Safety
→ Supporting our customers’ responsible business priorities
→ Supply chain risk management
→ Energy efficiency and carbon management
ANALYTICAL GAS CHROMATOGRAPHY

INERT GAS CARRIER → GAS PURIFICATION

SAMPLE INTRODUCTION

SAMPLE SELECTION

LOW FLOW PROPORTIONAL VALVE

Low coefficient of friction within syringes. Increased accuracy and precision as well as increased lifetime.

Syringe Pumps

Frictionless operation

Compact

Dosing in the ml. range

High precision and accuracy, optimised to reduce pulsation

Inline pump available with easy to replace syringe
WE WORKED CLOSELY WITH A CUSTOMER TO DEVELOP A NEW SYRINGE PUMP SOLUTION WHERE THE PRESSURE REQUIREMENT WAS MUCH HIGHER THAN THE STANDARD. COMBINING OUR SYRINGE PUMPS WITH THE NEW HIGH PRESSURE GAS CHROMATOGRAPHY (GC) DIAPHRAGM VALVES, WE WERE ABLE TO SUCCESSFULLY SUPPLY A COMPLETE SOLUTION THAT EXCEEDED THE SAMPLE INTRODUCTION REQUIREMENTS.

We have broadened the range of components we can offer for GC and, by working closely with our customers to gain a deeper understanding of their engineering needs, we are developing new ranges of syringe pumps, proportional flow control valves and rotary valves for GC, MS, Environmental Monitoring and other gas handling analytical applications.

We have broadened the range of components we can offer for gas chromatography.
ANALYTICAL HPLC

MEDIA SEPARATED VALVES

- High precision gradient mixing valves available
- 19µl internal volume
- More flow, higher pressure
- Low internal volume, minimal carryover

SYRINGE PUMPS

- Low coefficient of friction within syringes; increased accuracy and precision as well as increased lifetime
- Tool free maintenance
- Inline pump available with easy to replace syringe
- Zero dead volume syringes; no carryover, no bubbles

SOLVENT PREPARATION

SOLVENT

SAMPLE INTRODUCTION
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.
DIAGNOSTIC FLOW CYTOMETRY

**LAMINATED MANIFOLD TECHNOLOGY**
- Fully customisable structure, optimising fluidics flow path
- Ensures lower fluid consumption due to smaller fluidic paths
- Fewer leak paths

**PROPORTIONAL VALVES FOR PRESSURE OVER LIQUID CONTROL**
- Frictionless design for high control accuracy and precision
- Lowest hysteresis
- Low power consumption (down to 0.5W)
- Quick response time for immediate changes to pressure system
- Validated to 100 million cycles

**PRESSURE OVER LIQUID SYSTEM USING PROPORTIONAL VALVE**

**MEDIA SEPARATED VALVES**
- Low internal volume
- Compact design
- More flow, higher pressure
- Low energy consumption (0.4W), less energy and less heat
- Patented Double Rocker Mechanism

**FLOW INLET**

**WASH/PREPARATION SYSTEM**

**SAMPLE HANDLING**

**SAMPLE AND SHEATH CONTROL**

**DETECTION SYSTEM**

**CELL SORTING**

**WASTE**
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, up to a lifetime of millions of cycles.

We specialise in designing customised solutions.
DIAGNOSTIC IMMUNOLOGY / CLINICAL CHEMISTRY / LIQUID HANDLING ROBOTICS

**Syringe Pumps**

- Zero dead volume syringes; no carryover, no bubbles
- High precision and accuracy
- Inline pump available with easy to replace syringes

**Manifold or Cartridge Mounting**

- Less than 0.1W holding power
- Integration in to portable devices

**Diluent**

**Sample / Reagent Handling**

**Mixing Station**

**Needles and Probes**

- OEM specific
- Speciality coatings for inertness and carryover minimisation

**Needle Wash Station**

**Manifold Technology**

- Fully customisable structure, optimising fluidic flow path
- Ceramic rotary valve; long lifetime and chemically inert
- Reduces reagent usage
- 2 Way Media Separated Valves

- Low internal volume
- High cycle lifetime
- Optimised energy consumption
- Laminated acrylic structures available allowing for optical analysis
LIQUID HANDLING
CASE STUDY

OUR CUSTOMER DESIGNED A DNA SAMPLE HANDLING AND PREPARATION SYSTEM TO GENERATE SMALL DROPLETS OF PCR OIL-BASED 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 Norgren 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
VENTILATOR

AIR → FILTER → CHECK VALVE → PRESSURE REGULATOR → PROPORTIONAL VALVE

GAS INLET

O₂ → FILTER → OVER-PRESSURE RELIEF VALVE → PRESSURE REGULATOR → PROPORTIONAL VALVE

FLOW SENSOR → CPU

HIGH FLOW PROPORTIONAL VALVE

- Quick response time for immediate changes to pressure system
- Low hysteresis
- Frictionless design enables high resolution
- Up to 186 L/min at 2 bar
- Validated to 100 million cycles
- Non bleed and compact design
- High precision regulator
- Excellent flow, pressure and hysteresis characteristics
ANAESTHESIA
CASE STUDY

A CUSTOMER OF OURS WANTED TO LOOK AT ANAESTHESIA MACHINE DESIGN FROM A UNIQUE PERSPECTIVE – THE POINT OF VIEW OF THE ANAESTHESIOLOGIST. THEY WANTED TO BUILD EXPERTISE INTO A MACHINE THAT HAD MAXIMUM FUNCTIONALITY, COMFORT AND CONTROL.

Norgren’s expertise combined together across the globe supplying 20 components from facilities in the U.S. and creating the final design in Europe.

Most parts were derived from standard products but configured, tuned or applied to our customer’s very specific functional specifications. For simpler installation and a smaller footprint, many products were designed for integration into subassembly manifolds. For example, to reduce waste from discarded anesthesia gas bottles that were not completely exhausted, Norgren modified a 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, Norgren’s experience providing market leading valve technology for the ventilator instrument market gives our customers competitive advantage.
MEDIA SEPARATED VALVES AND ACRYLIC MANIFOLD SOLUTIONS

FAS 8MM CHIPSOL MS
  ➔ 2/2 NC media separated solenoid valve
  ➔ Manifold or cartridge mount available
  ➔ Orifice size: 0.8mm
  ➔ 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 10MM PICOSOL MS
  ➔ 3/2 media separated solenoid valve
  ➔ Manifold mount
  ➔ Orifice size: 1.2mm
  ➔ Pressure rating: -0.95 to 2.2 Bar
  ➔ Materials: PEEK body, FFPM, FPM or EPDM seals
  ➔ Low power consumption
  ➔ Low internal / unswept volume

FAS 15MM MICROSOL MS
  ➔ 2/2, 3/2 media separated solenoid valve
  ➔ Manifold mount
  ➔ Orifice size: 1.2mm, 1.6mm
  ➔ Pressure rating: -0.95 to 4 Bar
  ➔ Materials: PEEK body, FFPM, FPM or EPDM seals
  ➔ Low power consumption
  ➔ Low internal / unswept volume
BUSCHJOST 82080

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

LAMINATED MANIFOLD TECHNOLOGY

- Multi-layered designs
- Custom geometries and volumes
- Complex three dimensional flow paths
- Thermal or solvent bonded
- Flame and vapour polishing
MANIFOLD TECHNOLOGIES

- Robust, compact designs
- Aluminium, stainless steel, brass, FPM, PVDF, etc.
- Burr-free intersections
- NPT straight thread and flat bottom ports

FAS LOW FLOW PROPORTIONAL VALVE

FLATPROP DIRECT

- 2/2 NC proportional valve
- Suitable for medical applications
- Up to 40L/min Air at 2 Bar
- Design for use up to 12 Bar (varies with orifice)

FAS NEW GENERATION PROPORTIONAL VALVE

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

FAS HIGH FLOW PROPORTIONAL VALVE

FLATPROP EQI / EQP

- 2/2 NC proportional valve pressure compensated
- Up to 186L/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

NON-MEDIA SEPARATED VALVES AND OTHER MANIFOLD TECHNOLOGY

- Unlimited component possibilities
- Custom solutions
- Dosing in the ml. range
- Up to 186 L/min at 2 Bar
- Frictionless operation
- High resolution
- Built-in filter

- Frictionless design enables high resolution
- High precision
- Flatprop EQP
- Flatprop EQI

- Compact
- Low flow
FAS 8MM CHIPSOL

- 2/2 or 3/2, NC or NO direct acting valve
- Proportional function available for customisation
- Orifice size: 0.5mm to 1mm
- Pressure rating: 0 to 8 Bar
- Materials: PPS and stainless steel body, FPR or HNBR Seal
- Power consumption: 0.6W

SOLENOID VALVES

- Microsol range is highly modular – 15mm
- Picosol 10mm precision miniature solenoid valves
- High flow
- Long life
- Durable products
- Modular in build

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
SYRINGE PUMPS

**SYRINGES**
- 30mm and 60mm stroke lengths
- 10μl up to 50ml 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

**V3**
- 30mm stroke pump
- 6k or 12k resolutions available
- 50μl to 5ml syringe volumes
- Rotary valves up to 6 way
- Flow rate 10μl/min up to 400ml/min
- Up to 267N pump Force

**V6**
- 60mm stroke pump
- 12k, 24k or 48k resolutions available
- 10μl to 50ml syringe volumes
- 3/2 solenoid valve or Ceramic, PEEK, and PTFE rotary valves up to 12 way
- Flow rate 0.25μl/min up to 2500ml/min
- Up to 667N pump force
MULTICHANNEL

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

INLINE

- 30mm stroke syringe. Tool free replacement syringe with removable manifold for easy maintenance
- 5k or 20k half step resolutions available
- 50μl to 1ml syringe volume
- 3/2 solenoid valve option available
- Flow rate 7.5μl/min up to 150ml/min
- Up to 347N pump force
- Self aligning syringe

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