

PRECISION FLUIDIC AND  
MOTION CONTROL FOR  
THE LIFE SCIENCES

YOU CAN SEE  
OUR THINKING

ENGINEERING ADVANTAGE





## CREATING ADVANTAGE WITH PEOPLE, PRODUCTS, INNOVATION AND SERVICE

A WORLD LEADER IN MOTION AND FLUID CONTROL TECHNOLOGIES, NORNGREN 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, NORNGREN 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.

*Fully customisable structure, optimising fluidics flow path*

*Ensures lower fluid consumption due to smaller fluidic paths*

**Laminated  
Manifold  
Technology**

*Fewer leak paths*

# RESPONSIBLE BUSINESS

## THE IMI WAY

WE TAKE OUR RESPONSIBILITIES TO THE ENVIRONMENT AND THE COMMUNITIES IN WHICH WE OPERATE VERY SERIOUSLY. WE BELIEVE THAT THESE RESPONSIBILITIES CAN IMPACT POSITIVELY ON PROFITABILITY, RETURNS TO SHAREHOLDERS, REPUTATION AND GROWTH.

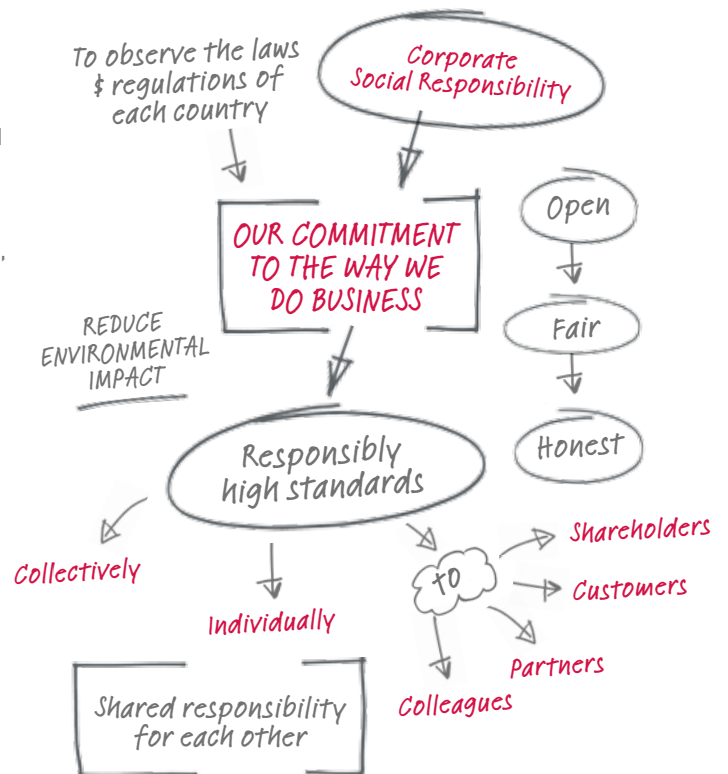
High standards of responsibility are, in our view, compatible with growth and business efficiency. We put particular emphasis on ensuring that our management of social, environmental and economic issues is aligned and integrated with the overall management of the business and we call this 'responsible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

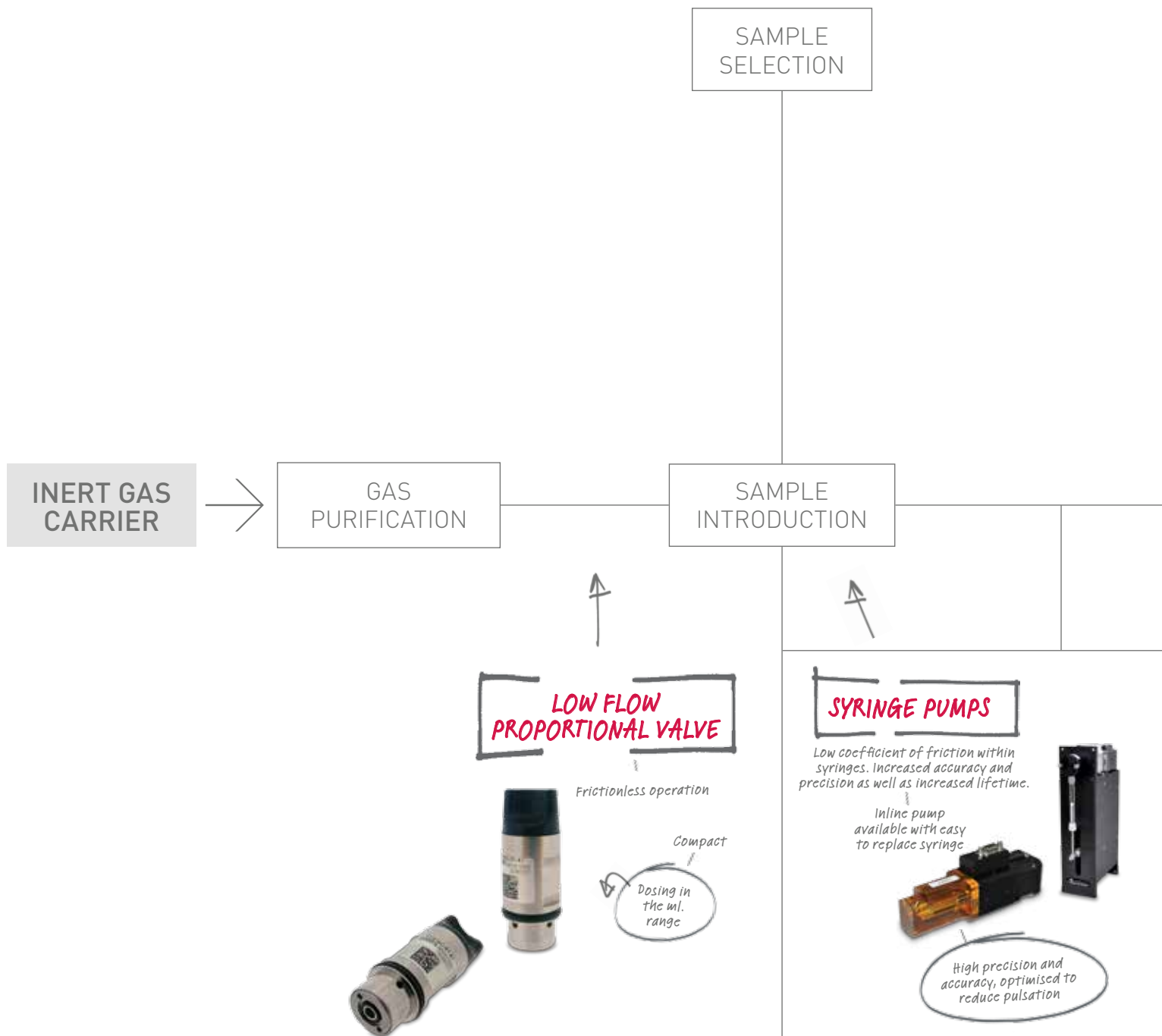




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# ANALYTICAL GAS CHROMATOGRAPHY

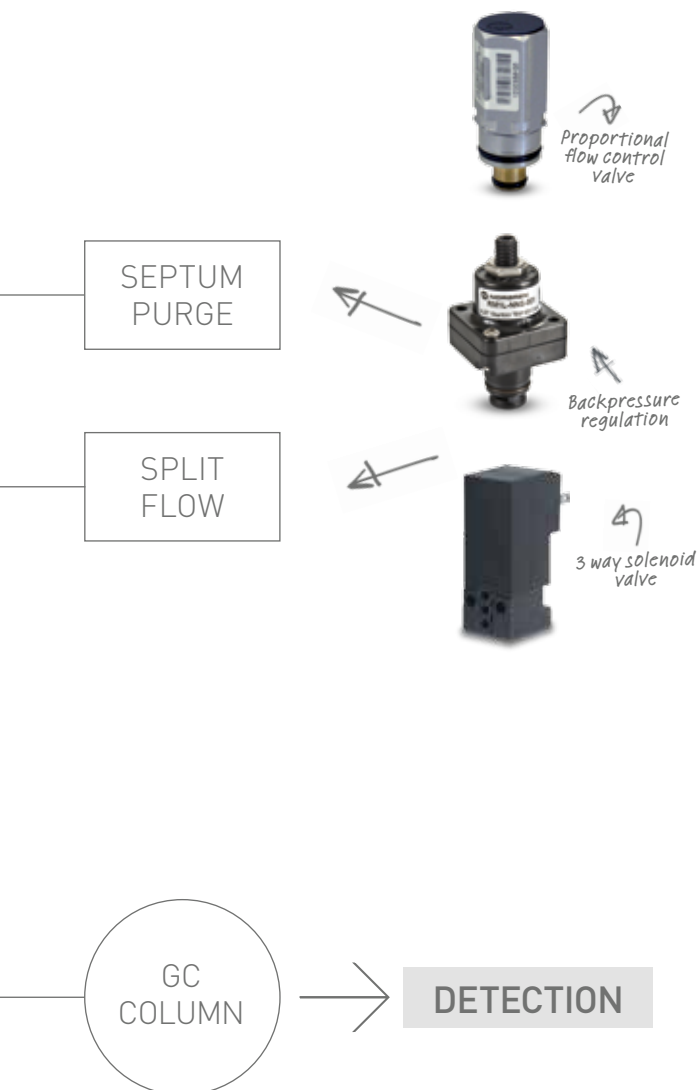


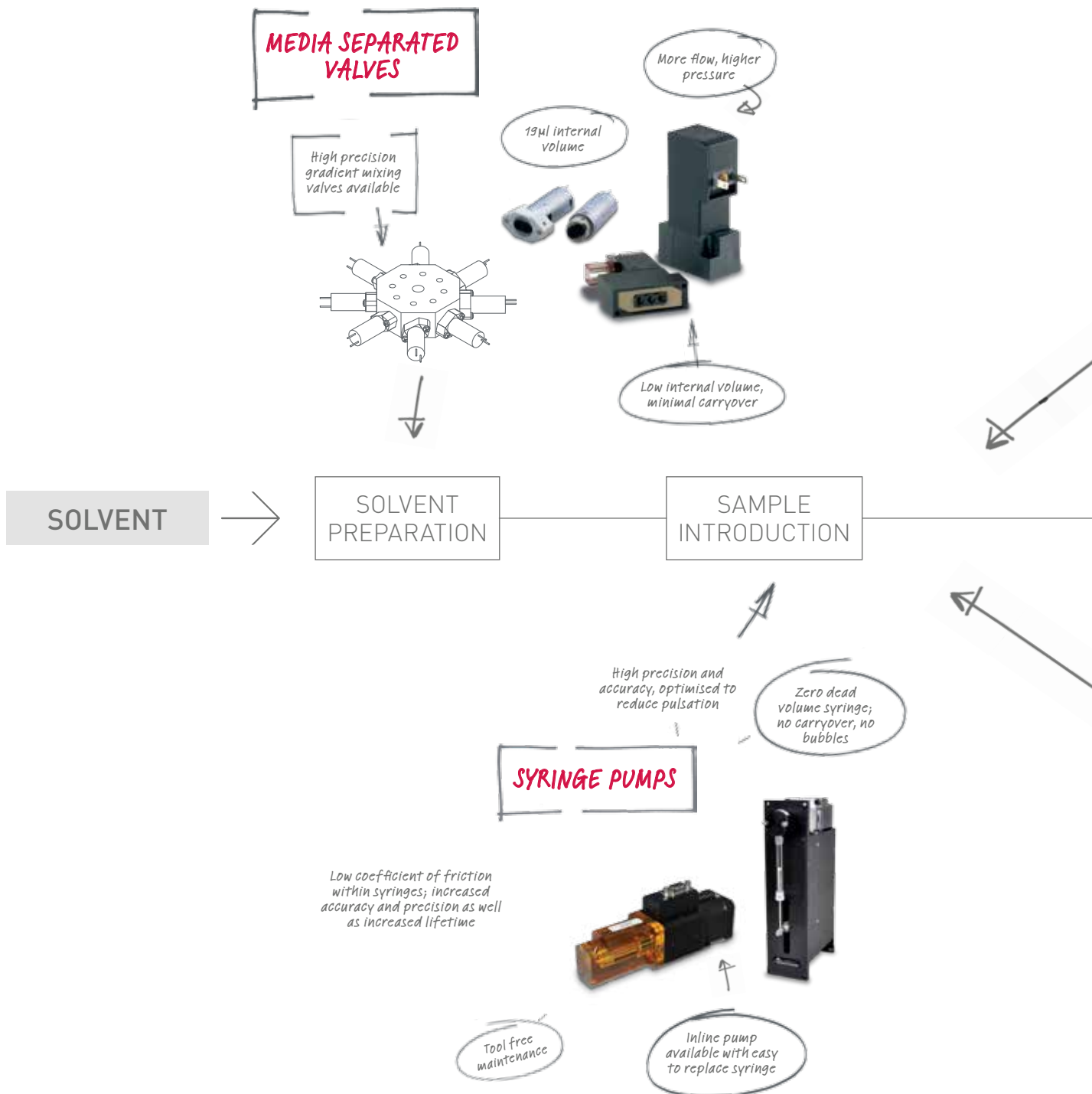
## GAS CHROMATOGRAPHY CASE STUDY

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*







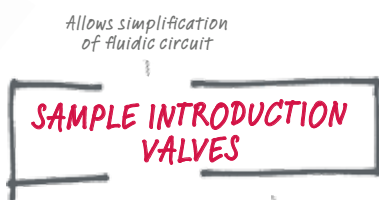
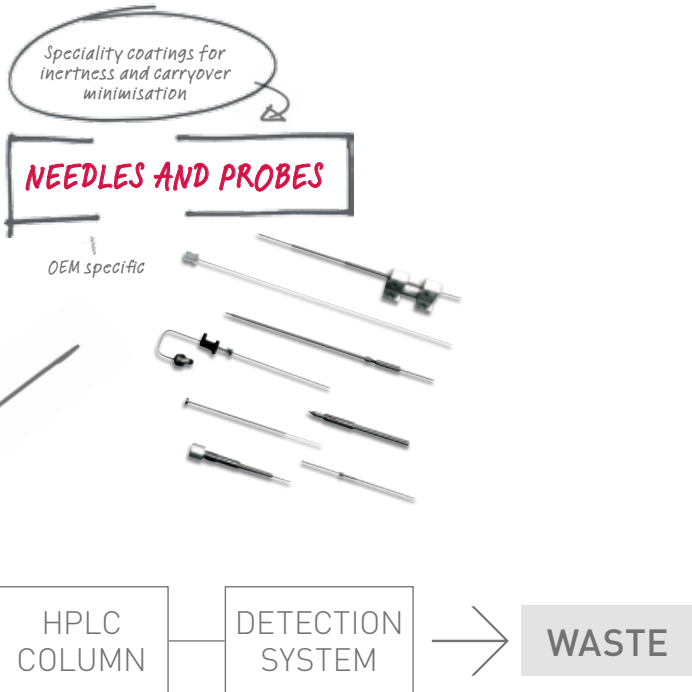
# HPLC CASE STUDY

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.

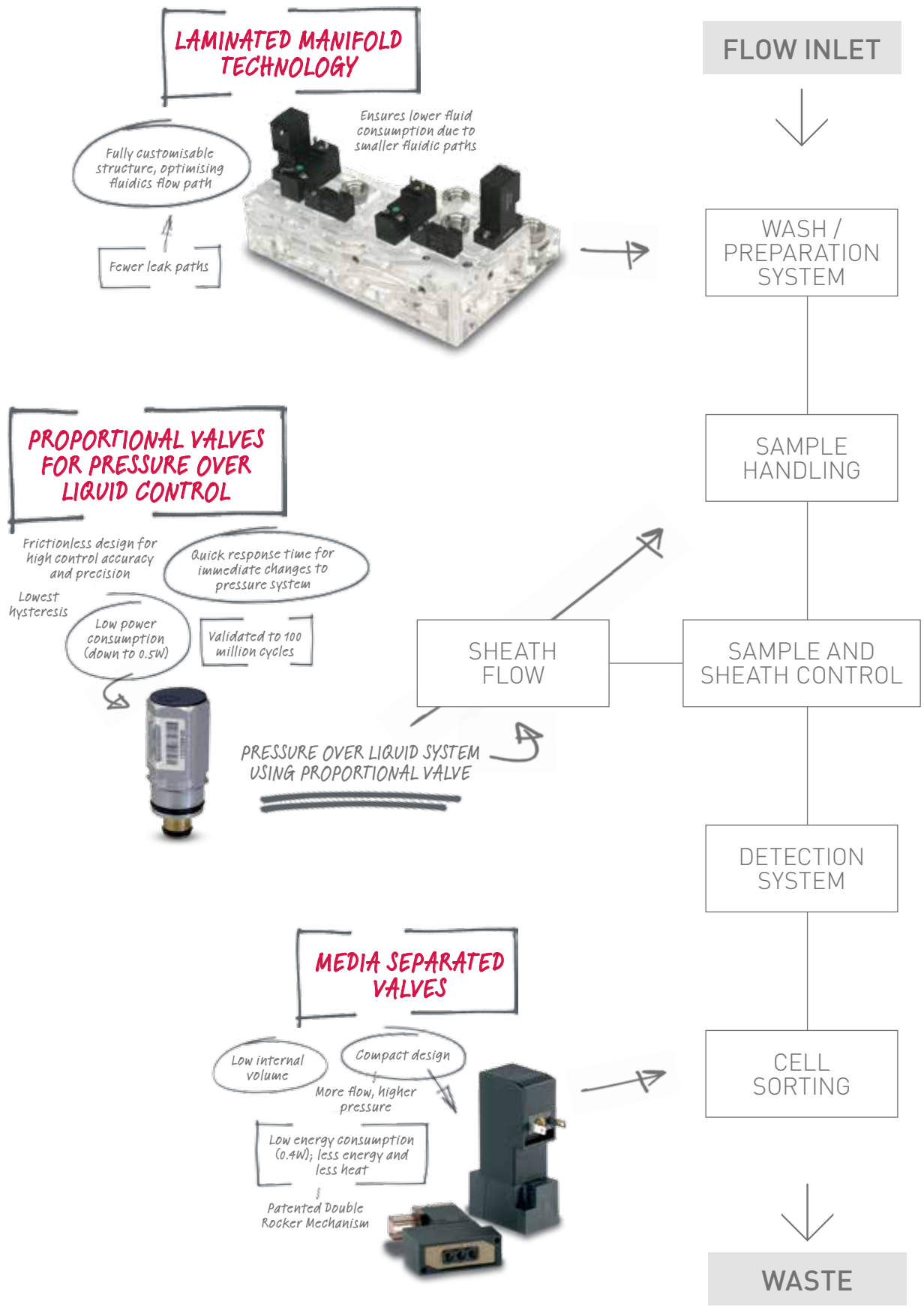
*We work closely with customers to understand their engineering needs*



Eliminates cross port leak

Ceramic, PEEK, PTFE and plastic materials available

# DIAGNOSTIC FLOW CYTOMETRY



## 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.

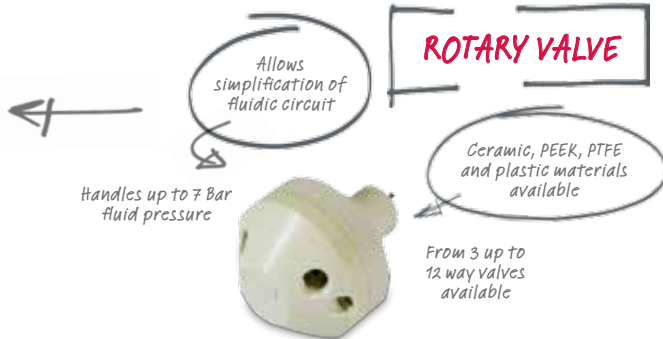
Norgren was involved from the very beginning to help them design their fluidic circuit; the key requirement being the subtle introduction of sample into a continuously flowing sheath fluid. After working closely with the customer to gain a deeper understanding of their application needs, we were able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

### SYRINGE PUMPS



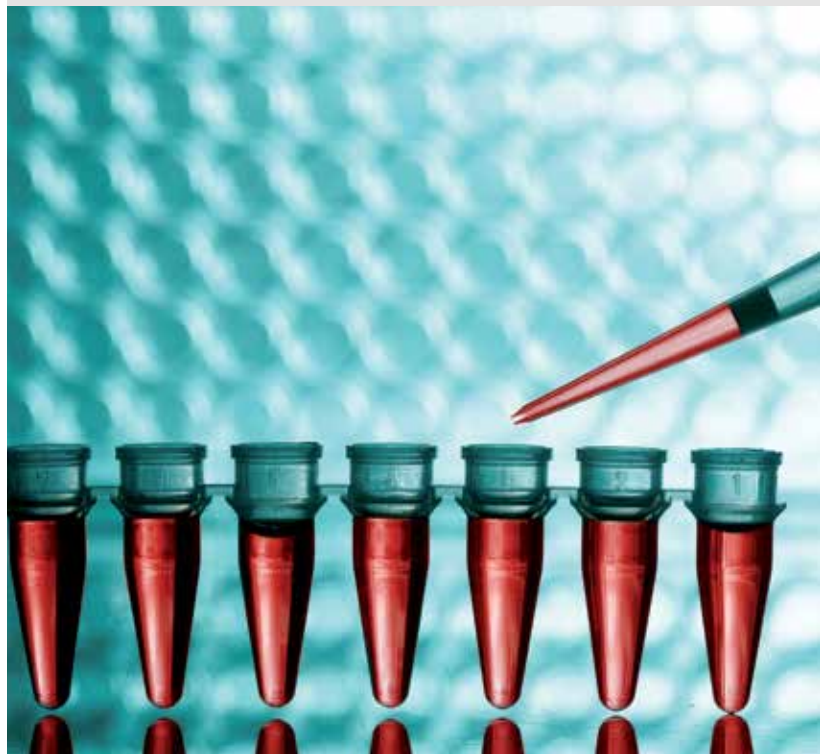
### ROTARY VALVE



### HIGH FLOW MEDIA SEPARATED VALVES



We specialise in designing customised solutions



# DIAGNOSTIC IMMUNOLOGY / CLINICAL CHEMISTRY / LIQUID HANDLING ROBOTICS

## SYRINGE PUMPS

Zero dead volume syringe; no carryover, no bubbles

High precision and accuracy

Multichannel options available, dispense up to 8 samples at once!

Ceramic rotary valve; long lifetime and chemically inert

In-line pump available with easy to replace syringe

Minimised heat transfer to fluids

## NEEDLES AND PROBES

OEM specific

Speciality coatings for inertness and carryover minimisation

DILUENT

SAMPLE / REAGENT HANDLING

MIXING STATION

## MANIFOLD OR CARTRIDGE MOUNTING

Less than 0.1W holding power

Integration in to portable devices

NEEDLE WASH STATION

## 2 WAY MEDIA SEPARATED VALVES

Low internal volume

Reliability

High cycle lifetime

Optimised energy consumption

## MANIFOLD TECHNOLOGY

Reduces reagent usage

Fully customisable structure, optimising fluidics flow path

PEEK, metallic and other materials also available

Laminated acrylic structures available allowing for optical analysis

## LIQUID HANDLING CASE STUDY

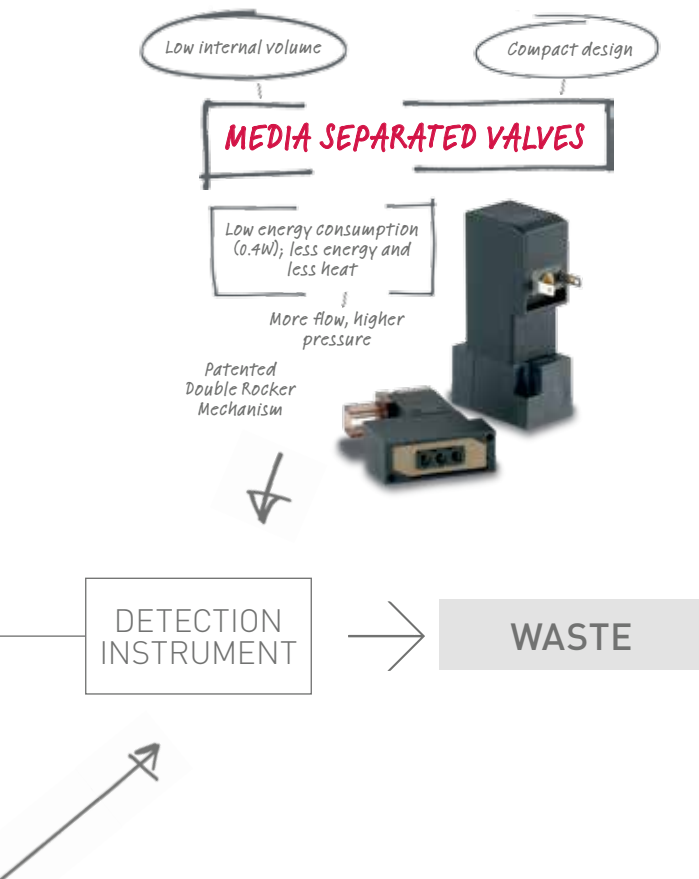
OUR CUSTOMER DESIGNED A DNA SAMPLE HANDLING AND PREPARATION SYSTEM TO GENERATE SMALL DROPLETS OF PCR OIL-BASED REAGENT THAT HAS BEEN LOADED WITH DNA CONTENT. THE BUBBLES ARE DISPENSED INTO A WELL PLATE AND SENT TO A DIGITAL PCR SYSTEM FOR REPLICATION.

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.

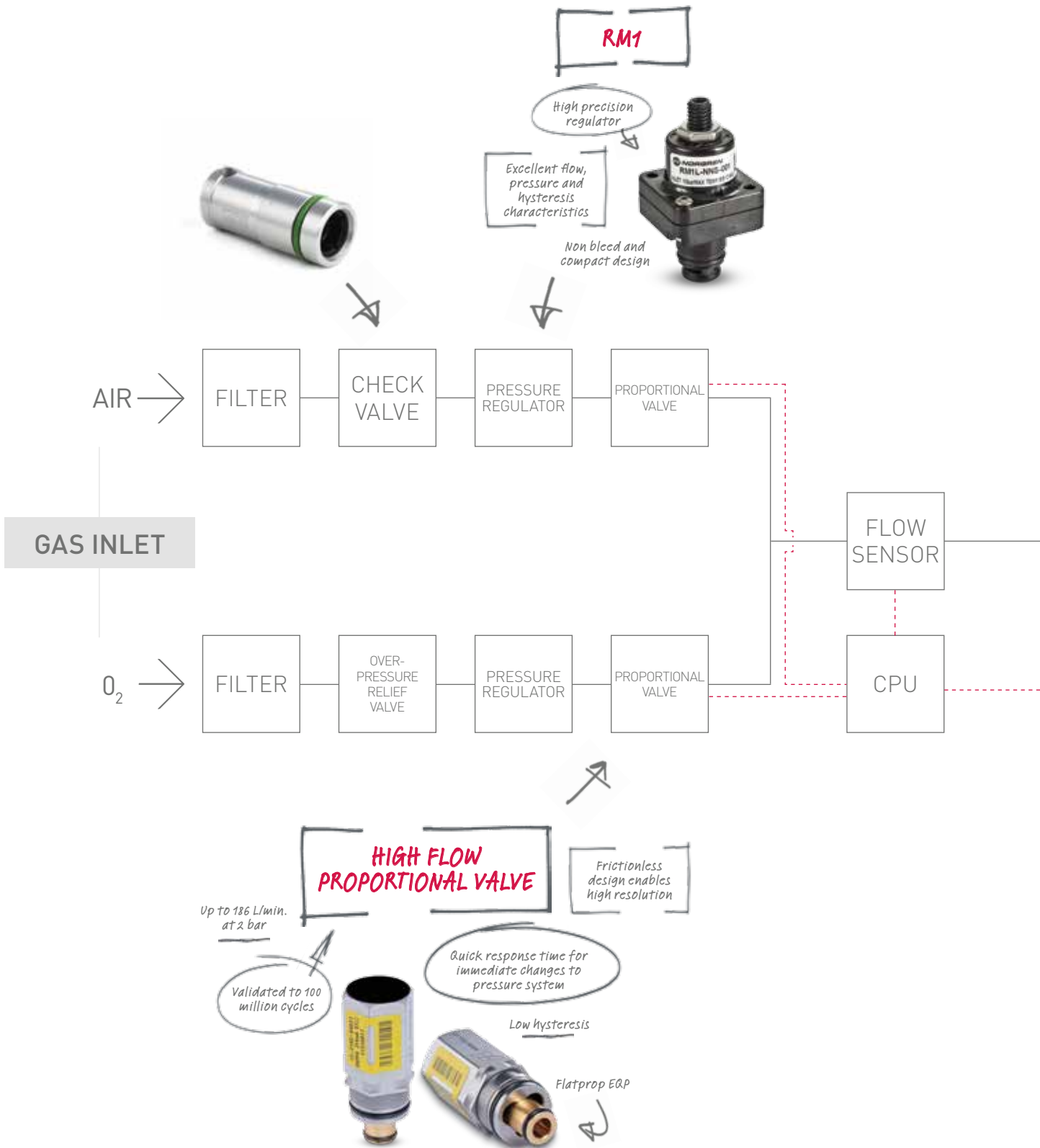
This unit uses an air-over-liquid system, supplying the necessary means to pull the PCR reagent out of the bottle and redirect to a separate dispense head. The dispense head then auto-fills the small well plates that are loaded into the PCR system.

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

*We improve operational efficiency*



# MEDICAL DEVICE VENTILATOR



## ANAESTHESIA CASE STUDY

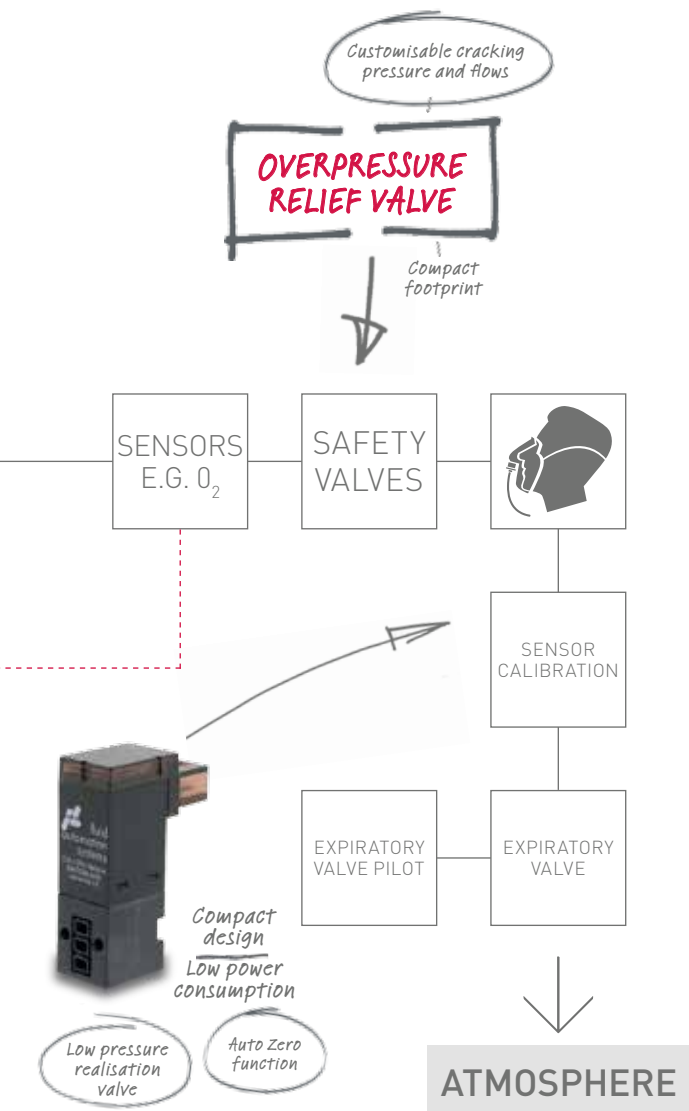
A CUSTOMER OF OURS WANTED TO LOOK AT ANAESTHESIA MACHINE DESIGN FROM A UNIQUE PERSPECTIVE – THE POINT OF VIEW OF THE ANAESTHESIOLOGIST. THEY WANTED TO BUILD EXPERTISE INTO A MACHINE THAT HAD MAXIMUM FUNCTIONALITY, COMFORT AND CONTROL.

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.

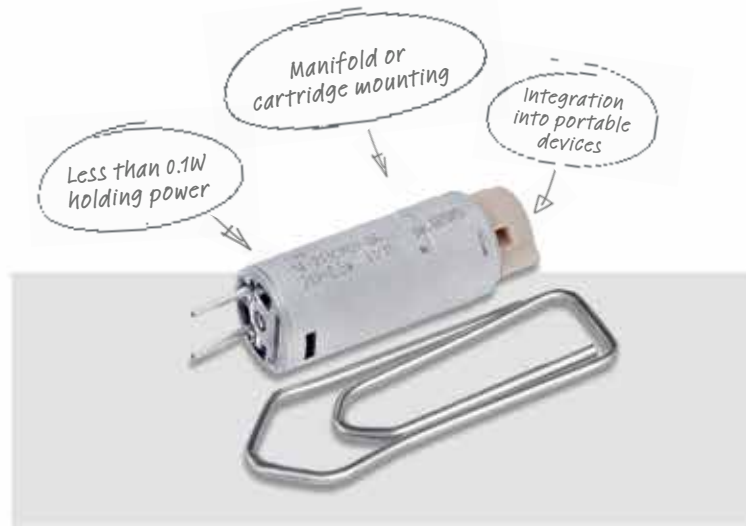
*Market leading valve technology*



# 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



Highest flow to size ratio in the industry



## 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

Low internal volume



High life cycle

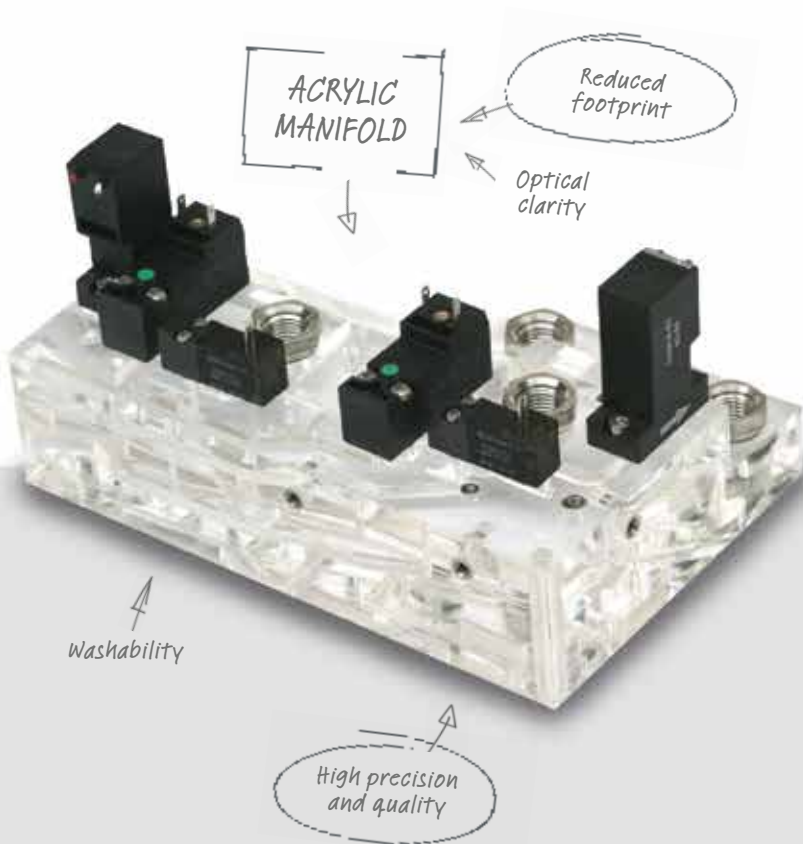
## FAS 15MM MICROSOL MS

- 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

# NON-MEDIA SEPARATED VALVES AND OTHER MANIFOLD TECHNOLOGY

## 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)

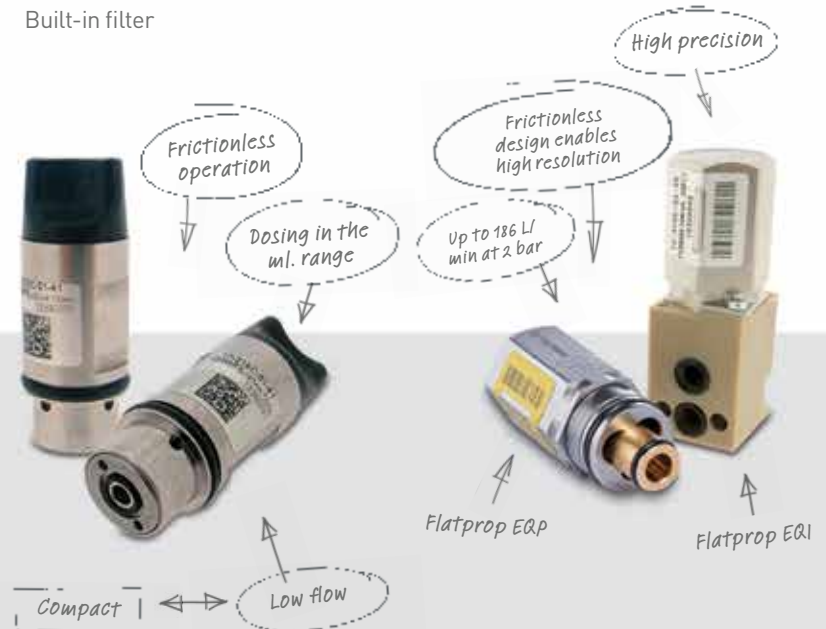
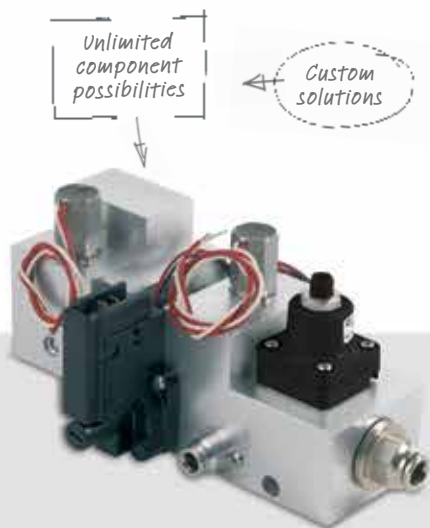
### FAS NEW GENERATION PROPORTIONAL VALVE

- 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



### 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

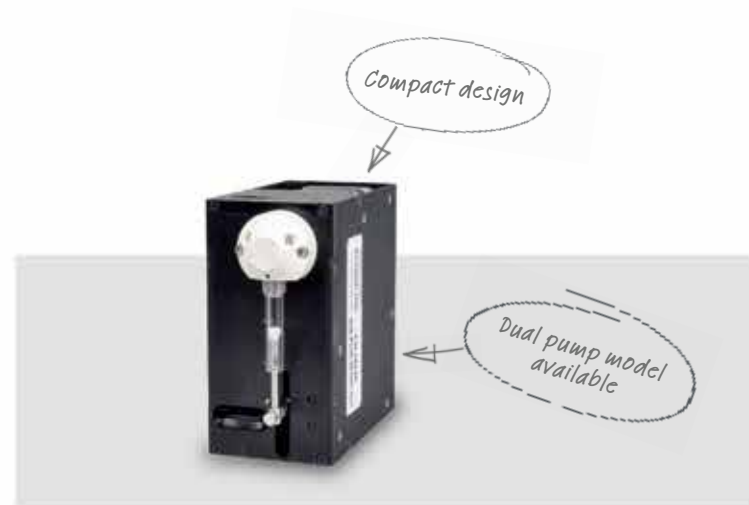
## SYRINGES

- 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



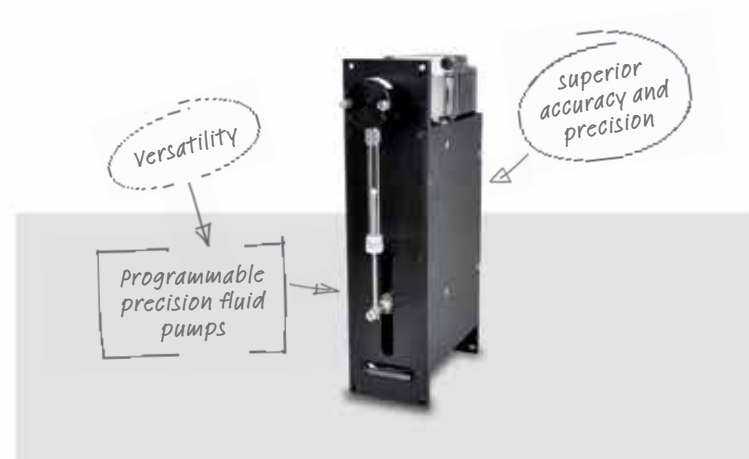
## V3

- 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



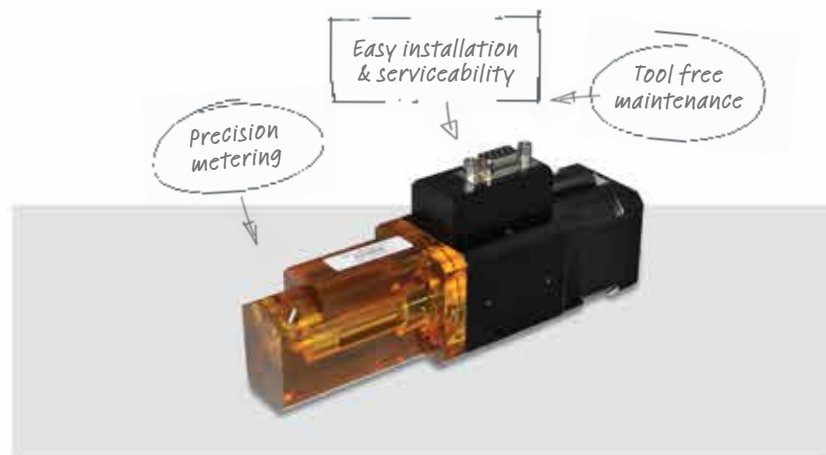
## MULTICHANNEL

- 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



**AUSTRALIA**

Tel: +61 3 9213 0800  
 Fax: +61 3 9213 0890  
 enquiry@norgren.com.au

**AUSTRIA**

Tel: +43 22 36 63 520  
 Fax: +43 22 36 63 520 20  
 enquiry@at.norgren.com

**BELGIUM & LUXEMBOURG**

Tel: +32 2 333 44 11  
 Fax: +32 2 333 44 88  
 enquiry@be.norgren.com

**BRAZIL**

Tel: +55 11 5698 4000  
 Fax: +55 11 5698 4001  
 vendas@norgren.com

**CHINA**

Tel: +86 21 2416 1800  
 Fax: +86 21 2416 1900  
 info@norgren.com.cn

**CROATIA**

Tel: +386 4 5317550  
 Fax: +386 (64) 7000949  
 info@si.norgren.com

**CZECH REPUBLIC & SLOVAKIA**

Tel: +420 465 612 879  
 Fax: +420 465 612 908  
 info@cz.norgren.com

**DENMARK**

Tel: +45 44 91 41 66  
 Fax: +45 44 91 15 60  
 norgren@norgren.dk

**FINLAND**

Tel: +358 95 712 140  
 Fax: +358 95 712 1440  
 arki@norgren.fi

**FRANCE**

Tel: +33 1 60 04 95 95  
 Fax: +33 1 60 43 18 86  
 norgren@norgren.fr

**GERMANY**

Tel: +49 2802 49-0  
 Fax: +49 2802 49356  
 info@norgren.com

**HONG KONG**

Tel: +852 2492 7608  
 Fax: +852 2498 5878  
 enquiry@norgren.com.hk

**HUNGARY**

Tel: +36 1 284 9000  
 Fax: +36 1 284 8980  
 info@norgren.hu

**INDIA**

Tel: +91-120-4089500  
 Fax: +91-120-4089599  
 enquiry@norgren.co.in

**IRELAND**

Tel: +353 1 8300 288  
 Fax: +353 1 8300 082  
 dublin@norgren.com

**ITALY**

Tel: +39 039 60 631  
 Fax: +39 039 60 63 301  
 info@norgrenitalia.it

**JAPAN**

Tel: +81 6 6876 8913  
 Fax: +81 6 6876 8929  
 toiawase@norgren.com

**MALAYSIA**

Tel: +60 3 5121 9255  
 Fax: +60 3 5121 2889  
 mysales@norgren.com

**MEXICO**

Tel: +52 55 1500 64 00  
 Fax: +52 55 1500 64 30  
 neumatica@norgren.com.mx

**NETHERLANDS**

Tel: +31 (0)36 548 6828  
 Fax: +31 (0)36 548 6838  
 enquiry@nl.norgren.com

**NEW ZEALAND**

Tel: +64 9 579 0189  
 Fax: +64 9 526 3398  
 enquiry@norgren.co.nz

**NORWAY**

Tel: +47 22 90 80 80  
 Fax: +47 22 90 80 81  
 norgren@norgren.no

**POLAND**

Tel: +48 22 518 9530  
 Fax: +48 22 518 9531  
 biuro@norgren.pl

**ROMANIA**

Tel: +40 31 425 17 06  
 Fax: +40 31 425 17 08  
 office@norgren.ro

**RUSSIA**

Tel: +7 499 729 56 09  
 Fax: +7 499 729 57 49  
 sales@norgren-imi.ru

**SINGAPORE**

Tel: +65 6862 1811  
 Fax: +65 6862 1917  
 sgpsales@norgren.com

**SLOVENIA**

Tel: +386 4 531 7550  
 Fax: +386 4 531 7555  
 info@si.norgren.com

**SPAIN**

Tel: +34 93 748 9800  
 Fax: +34 93 783 0838  
 norgren@norgren.es

**SWEDEN**

Tel: +46 40 59 51 00  
 Fax: +46 40 49 50 90  
 info@norgren.se

**SWITZERLAND**

Tel: +41 71 973 82 00  
 Fax: +41 71 973 82 01  
 norgren@norgren.ch

**TAIWAN**

Tel: +886 33162673  
 Fax: +886 33162910  
 enquiry@norgren.com.tw

**THAILAND**

Tel: +66 2750 3598/99  
 Fax: +66 2750 3855  
 thsales@norgren.com

**UK**

Tel: +44 1543 265 000  
 Fax: +44 1543 265 827  
 advantage@norgren.com

**USA**

Tel: +1 303 794 2611  
 Fax: +1 303 798 4856  
 enquiry@usa.norgren.com

**SUPPORTED BY  
 DISTRIBUTORS WORLDWIDE**

For information on all  
 Norgren companies visit  
[www.norgren.com](http://www.norgren.com)

**LIFE SCIENCES SPECIALISTS**
**CHINA**

NORGREN  
 8F, Business Building  
 1885 Duhui Road  
 Minhang District  
 Shanghai 201108  
 Tel.: +86 21 2416 1800  
 Fax: +86 21 2416 1900

**FRANCE**

IMI NORGREN SA  
 Parc d'Entreprises Val d'Europe  
 4 Bld, Michael Faraday - SERRIS  
 77716 MARNE LA VALLEE Cedex 4  
 Tel. +33 1 60 04 95 95  
 Fax: +33 1 60 43 18 86

**GERMANY**

FLUID AUTOMATION SYSTEMS GmbH  
 Stuttgarter Str. 120  
 70736 Fellbach  
 Tel.: +49 711 167 860  
 Fax: +49 711 167 8686  
 www.fas.ch

NORGREN GmbH  
 Stuttgarter Str. 120  
 70736 Fellbach  
 Tel.: +49 711 520 999  
 Fax: +49 711 520 9614

**ITALY**

NORGREN SpA  
 Via Trieste 16  
 20059 Vimercate MI  
 Tel.: +390 39 661 21 08  
 Fax: +390 39 626 06 75

**SWITZERLAND**

FLUID AUTOMATION SYSTEMS SA  
 Route de l'Etraz 126  
 1290 Versoix  
 Tel.: +41 22 775 10 00  
 Fax: +41 22 775 10 01  
 www.fas.ch

**UK**

NORGREN Ltd.  
 P.O. Box 22, Eastern Avenue  
 Lichfield  
 Staffordshire WS13 6SB  
 Tel: +44 1543 265000  
 Fax: +44 1543 265811

**USA**

NORGREN KLOEHN, Inc.  
 10000 Banbury Cross Dr.  
 Las Vegas, NV 89144  
 Tel: +1 702 243 7727  
 Fax: +1 702 243 6036  
 www.kloehn.com  
 NORGREN Inc.  
 5400 South Delaware Street Littleton  
 CO 80120  
 Tel.: +1 860 677 0272  
 Fax: +1 860 677 4999



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