



SPECIAL  
EDITION



IMPROVING SAFETY, RELIABILITY  
AND LIFECYCLE COSTS IN THE  
GLOBAL RAIL INDUSTRY

YOU CAN SEE  
OUR THINKING

ENGINEERING ADVANTAGE





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

A WORLD LEADER IN MOTION AND FLUID CONTROL TECHNOLOGIES, NORGRN WORKS CLOSELY WITH YOU TO GAIN A DEEPER UNDERSTANDING OF YOUR ENGINEERING NEEDS. WE CONNECT PEOPLE, PRODUCTS AND EXPERTISE TO GIVE YOUR EQUIPMENT AND BUSINESS WHAT WE CALL ENGINEERING ADVANTAGE.

With a sales and service network in 75 countries – as well as manufacturing capability in China, USA, Germany, UK, Switzerland, Czech Republic, Mexico and Brazil – we have global capability. We think local and niche, focusing resources on delivering a specific product, solution or service to meet your specific need.

We're a responsible business, contributing positively to the environments in which we work. Our products not only set new standards for efficiency, safety and reliability, but also help you reduce air, energy and costs while improving overall performance.

We offer:

- **INNOVATION AND 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
- **HIGH PERFORMANCE PRODUCTS** covering pneumatics, actuators, airline preparation, fittings and valves. We can supply these either singly to meet MRO needs, or combined in powerful customised solutions
- **EXCEPTIONAL SERVICE** delivered through key account management teams and sector specialists committed to understanding and meeting your engineering challenges, wherever you are

### KEEPING THE GLOBAL RAIL SECTOR ON TRACK

Norgren rail products are tried, tested and trusted to perform - and keep on performing - in the most punishing climate and operational extremes. Our exceptional track record of transferring technologies from different sectors enables us to give your vehicles the benefit of innovation, technical excellence and Engineering Advantage. We have the credentials, capability and global reach to deliver an invaluable local service, wherever it's needed.



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# DELIVERING EXPERTISE, SOLUTIONS AND VALUE TO THE RAIL SECTOR

FOR OVER 30 YEARS, NORGREN HAS DELIVERED ROBUST,  
RELIABLE AND BESPOKE SOLUTIONS TO THE RAIL SECTOR.

Our products continue to give millions of miles of reliable service across the world's most challenging environments, from the cold of China and Eastern Europe to Australian outback heat.

With a true understanding of the daily issues faced by rail operators and original equipment manufacturers, we design for the precise needs of the rail industry, at:

- Temperatures ranging from -40°C (-40°F) to +80°C (+176°F)
- Voltage tolerances of +/- 30%
- EN 61373 category 1 class A and B vibration resistance

We talk extensively to maintenance professionals and work closely with rail engineers to ask the questions they ask. That means we can offer customised, practical solutions to the metro, intercity, high-speed, freight and permanent-way rail industries, covering:

- Air preparation equipment
- Brake sub-systems and components
- Coupling control systems
- Door and step systems
- Pantograph control systems
- Water control systems
- Freight control and actuation

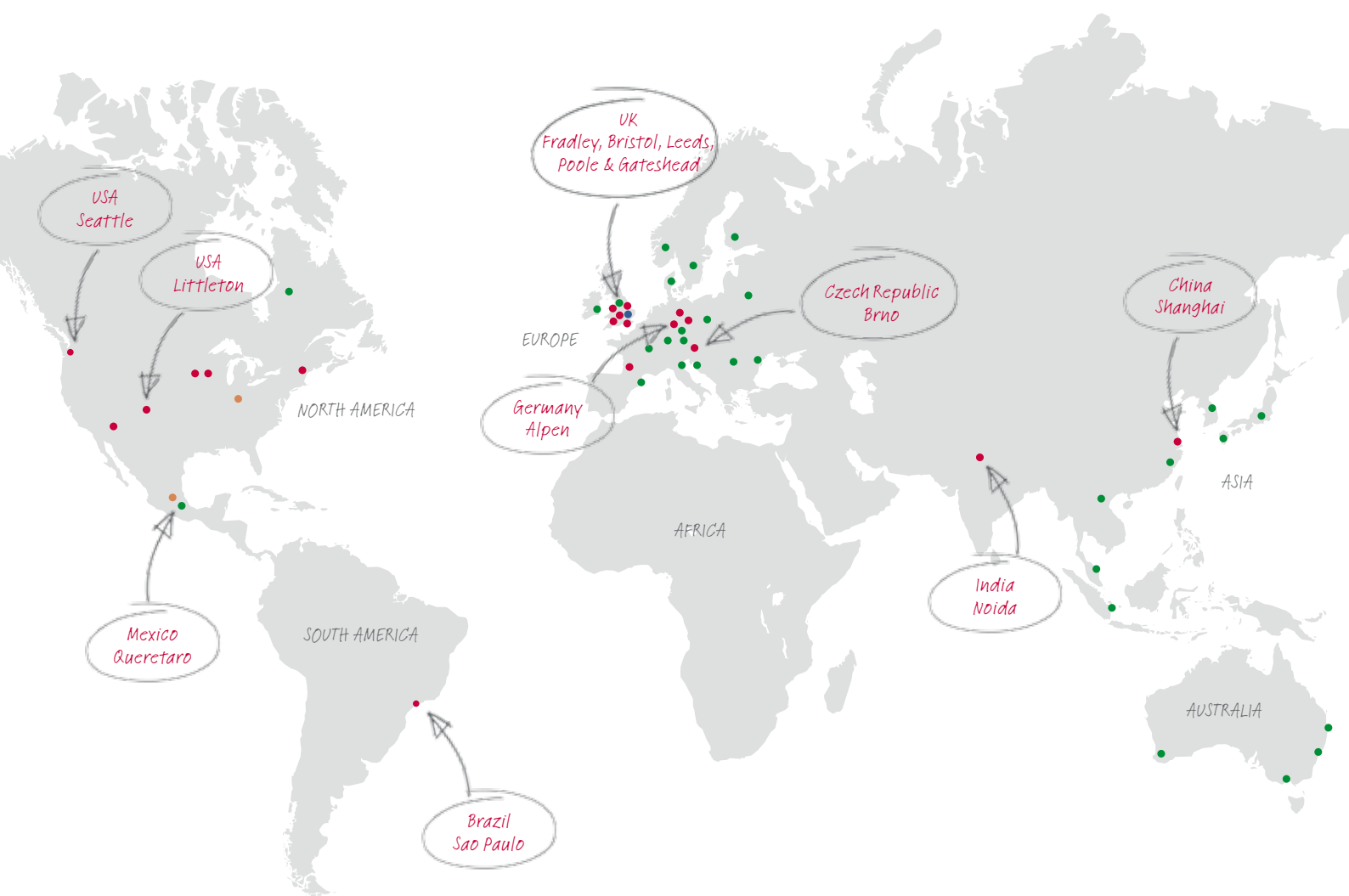
By listening and responding to your specific challenges, we help you make significant improvements and savings in terms of cost of ownership, energy efficiency, reduced maintenance and more.

**THAT'S THE VALUE OF BRINGING NORGREN'S  
ENGINEERING ADVANTAGE TO YOUR RAIL OPERATIONS.**



## A LOCAL SERVICE IN 75 COUNTRIES

WE HELP YOU ACHIEVE YOUR GOALS BY WORKING WITH YOU AS A PARTNER, NOT JUST A SUPPLIER. OUR DEDICATED RAIL TEAM IS CONNECTED WORLDWIDE TO ENSURE CLOSE, CONTINUOUS SUPPORT NO WHAT THE SIZE AND EXTENT OF YOUR ORGANISATION. WE HAVE THE REACH AND CAPABILITY TO WORK ALONGSIDE YOU ON COMPLEX, GLOBAL PROJECTS OR TO SIMPLY OFFER LOCAL SPARE PART SUPPLY.



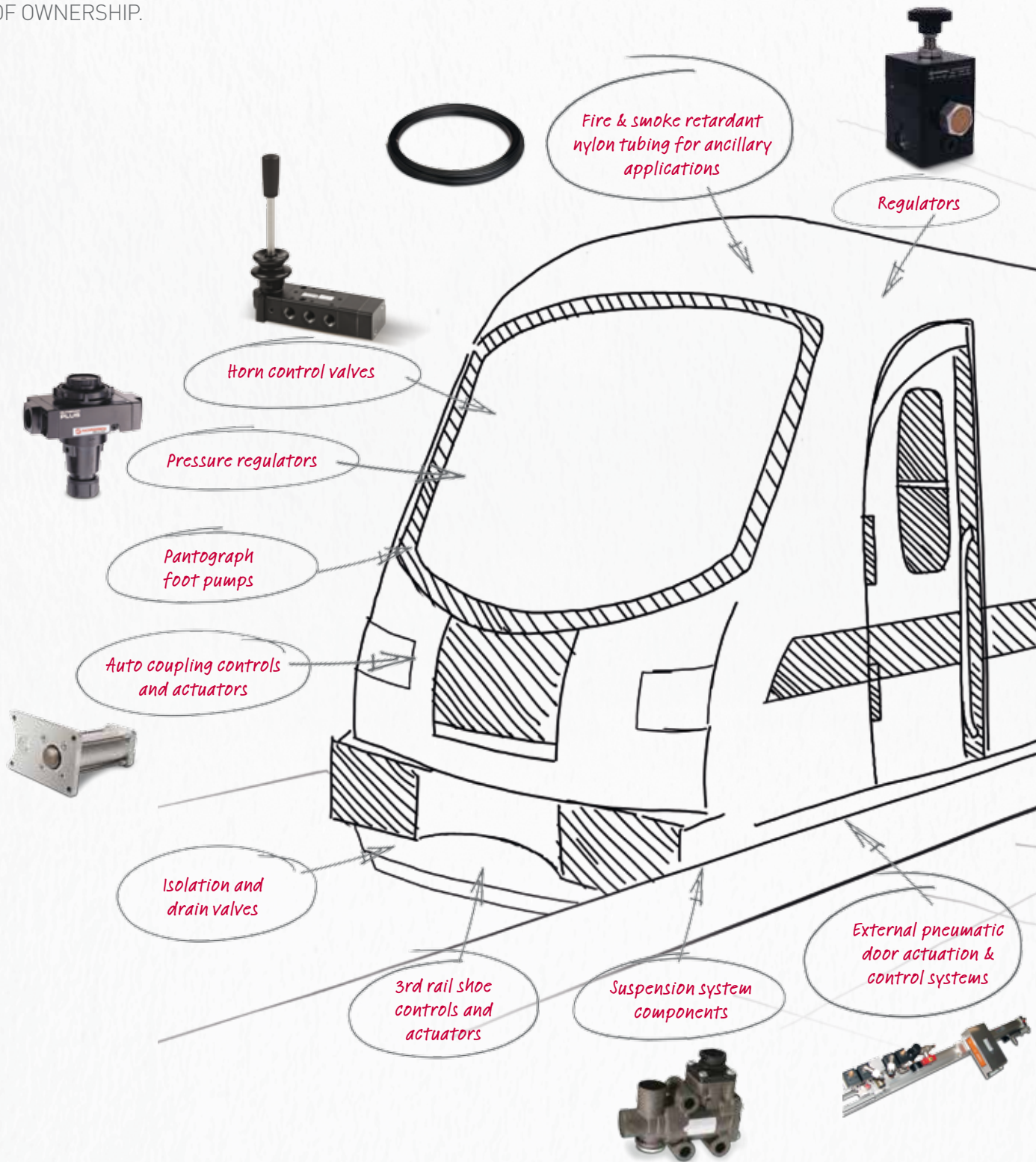
### SALES & SERVICE IN 75 COUNTRIES

- Norgren sales, manufacturing and technical centres
- Norgren sales locations
- Norgren technical centres
- Norgren manufacturing locations

SUPPORTED BY DISTRIBUTORS WORLDWIDE

# URBAN TRANSPORTATION SOLUTIONS

DECADES OF INSIGHT INTO THE CHALLENGING CONDITIONS FACED BY RAIL OPERATORS IN AND AROUND THE CITIES OF THE WORLD, MEAN THE SOLUTIONS WE OFFER ANSWER YOUR PRESSING, PRACTICAL NEED FOR MORE RELIABILITY, BETTER PERFORMANCE AND EFFICIENCY, AND LOWER COST OF OWNERSHIP.



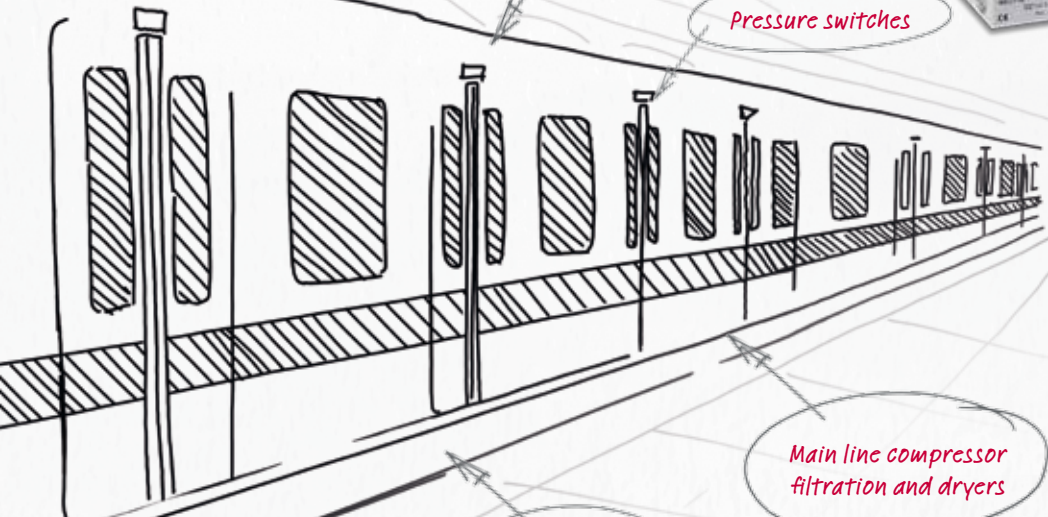


*Pantograph controls and actuators*

*Light weight reusable compression fittings for rigid piping*



*Pressure switches*



*Main line compressor filtration and dryers*

*Brake system valves*

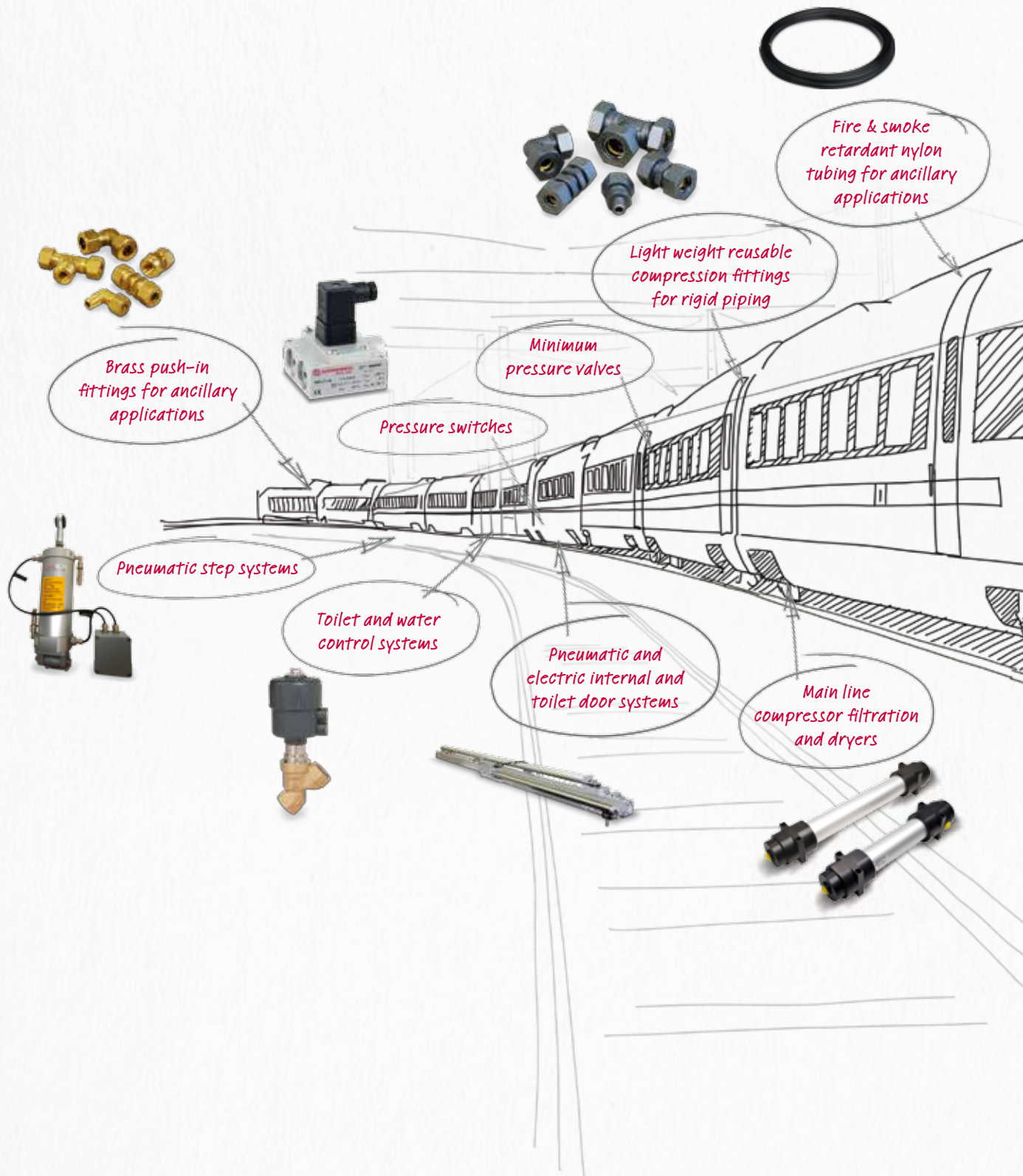


*Brass push-in fittings for ancillary applications*

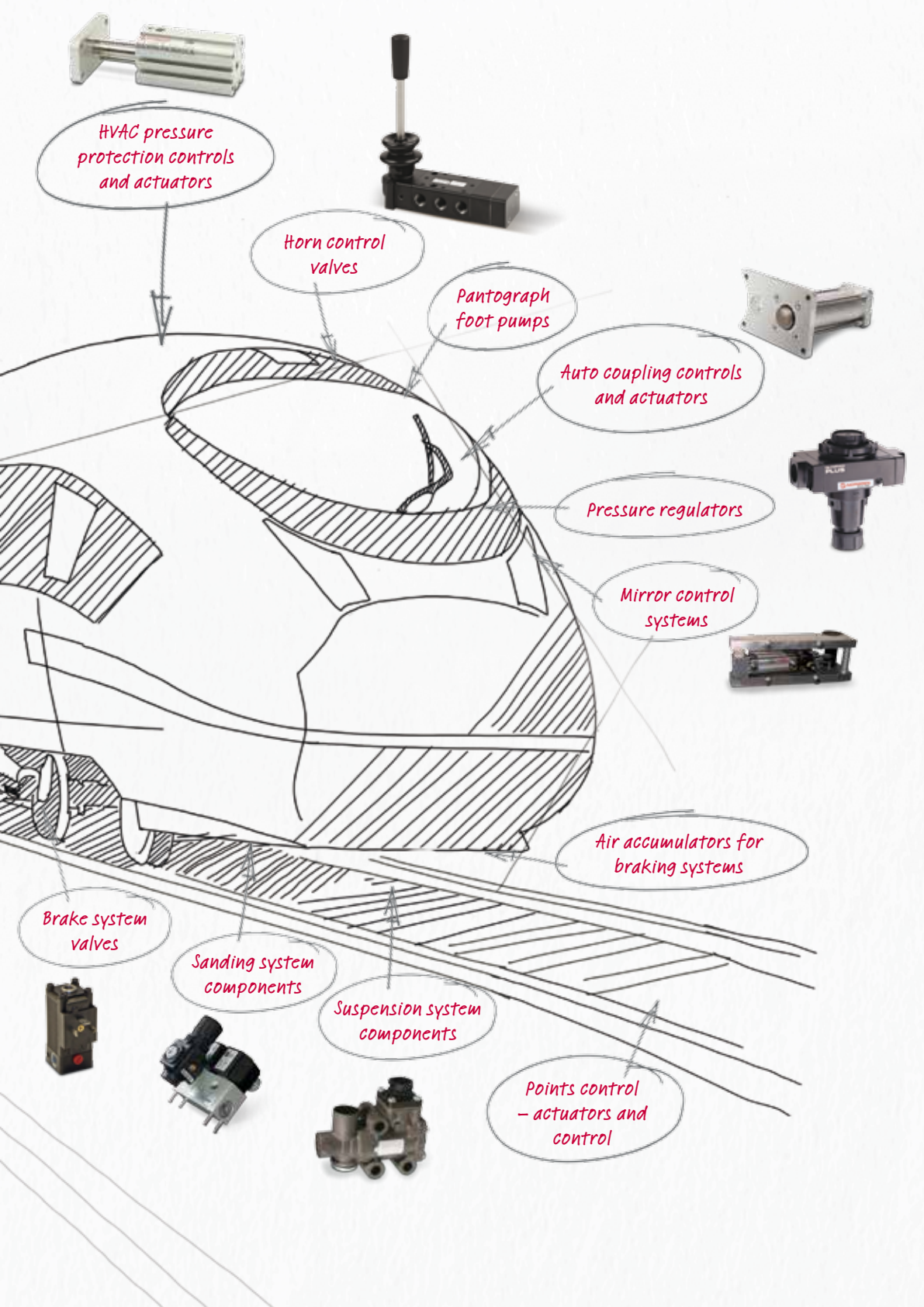


# REGIONAL & HIGH-SPEED TRANSPORTATION SOLUTIONS

EVERY NORGREN PRODUCT IS DESIGNED TO PERFORM  
DEPENDABLY IN ENVIRONMENTAL AND OPERATIONAL  
EXTREMES MEANING LESS REVENUE LOST FROM  
DOWNTIME DUE TO MAINTENANCE.

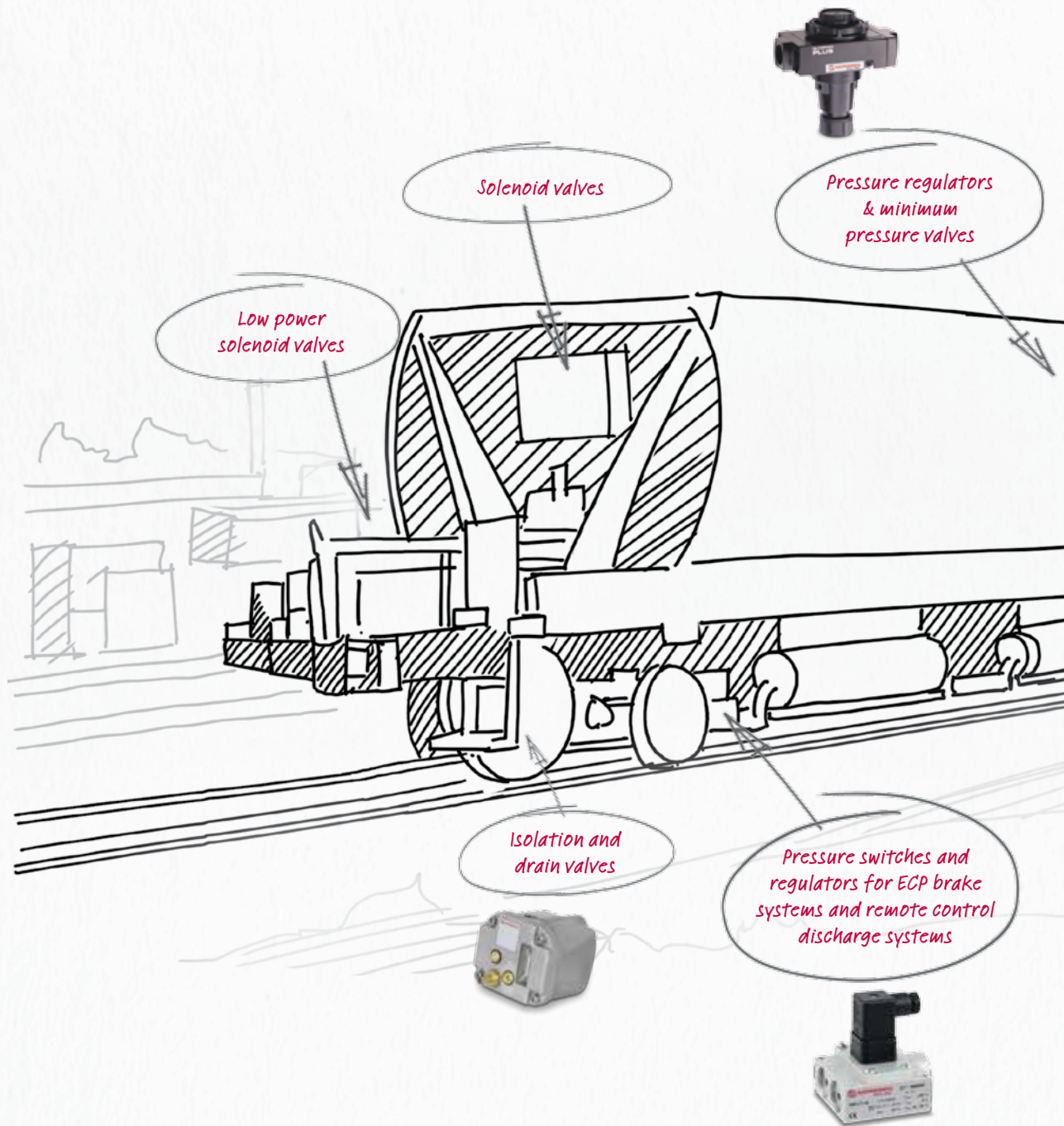


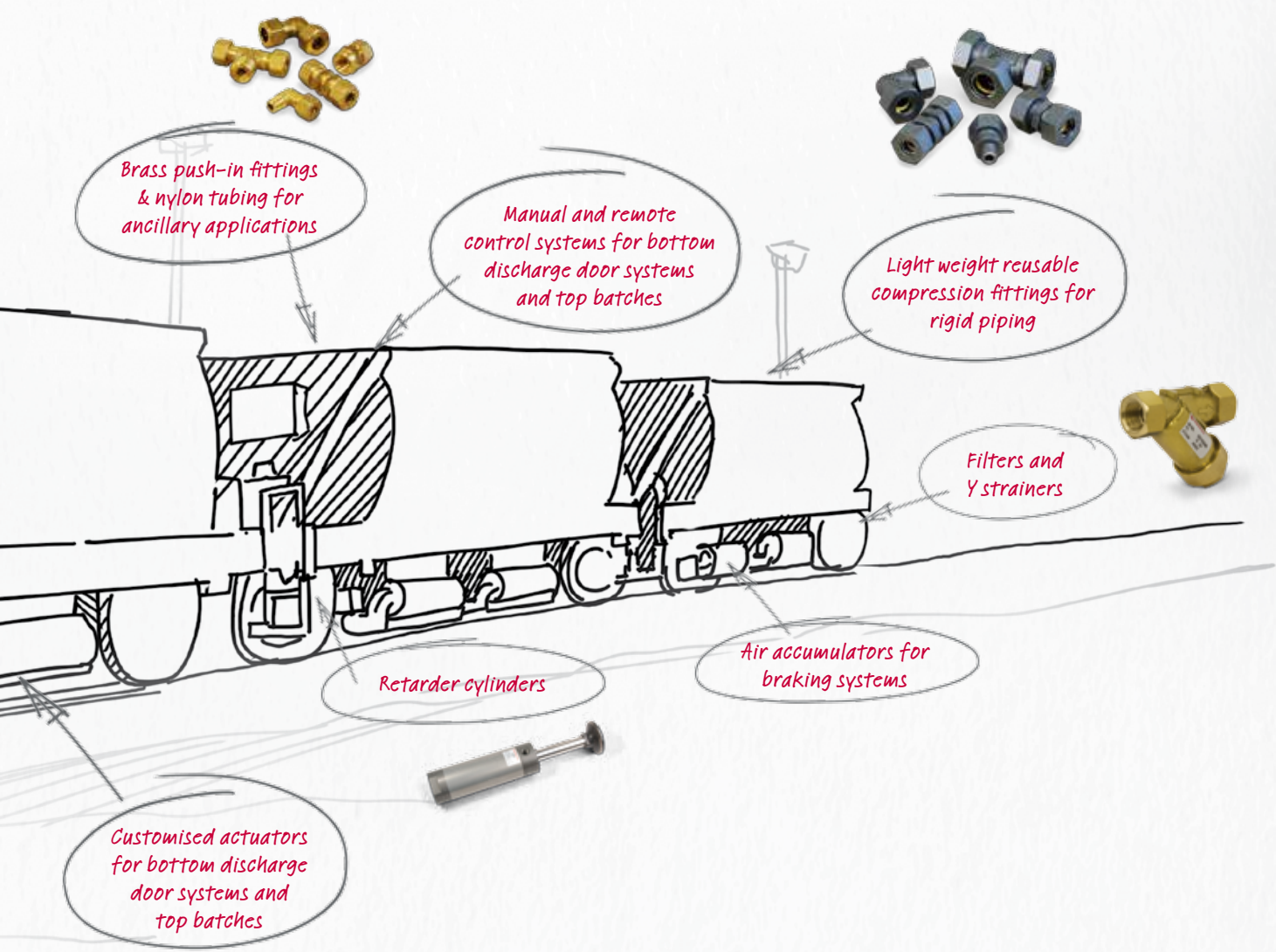




# FREIGHT TRANSPORTATION SOLUTIONS

WORKING IN PARTNERSHIP WITH CUSTOMERS MEANS WE CAN PRODUCE BESPOKE DESIGNS TO SUIT YOUR INDIVIDUAL CHALLENGE – THE SOLUTION YOU GET IS ALWAYS RIGHT FOR YOU.





# SETTING THE STANDARD FOR SAFETY, RELIABILITY AND PERFORMANCE

## GLOBAL TESTING AND VALIDATION

NORGREN FULLY UNDERSTANDS THE CHALLENGES, STANDARDS AND SPECIFICATIONS THAT MATTER TO THE DAILY OPERATIONS OF THE RAIL INDUSTRY. WE ARE WELL USED TO DESIGNING HIGH-QUALITY PRODUCTS WITH CLOSE REGARD TO TEMPERATURE RANGE, VOLTAGE TOLERANCE, VIBRATION RESISTANCE, AND SAFETY REQUIREMENTS.

We work closely with our customers to achieve tailored solutions. During development and testing, the focus is placed on designing products that can withstand anticipated loads and consistently perform their tasks. It is this thorough and detailed testing and validation in accordance with the relevant standards that reduces early failure of components. In addition, a comprehensive valuation under realistic conditions helps avoid high consequential costs caused by failures of components in the end application.

Complete product testing and valuation is done in our state-of-the-art testing centres.

The laboratories have an extensive range of test equipment, operated by a neutral expert team working independently of the development departments. Their experience and expertise enables quick implementation of tests, the design of test programs tailored to the needs of real applications and operating conditions in the various sectors, and a guarantee of the neutrality and accuracy of test results.

We have extensive experience in the field of environmental simulation, with a focus on climate, temperature, temperature shock, corrosion, vibration and mechanical shock.

Prototyping and material laboratories are additional, important resources that contribute to our targeted and rapid product development.

Flow measurement ranges– Ranges: 0.05 l/h to 4000 m<sup>3</sup>/h

Test pressures: Up to 1000 bar

Volumetric flows: Up to →900 m<sup>3</sup>/h

Temperatures: -80°C to +220°C

Frequency: 5 – 3000 Hz

Max. Acceleration: Up to 100 g

Specific tests we undertake for the rail sector include:

- EN 45545
- EN 50155
- EN 50121-3-2
- DIN 5510-2
- EN 61373
- NFPA 130
- EN 60068





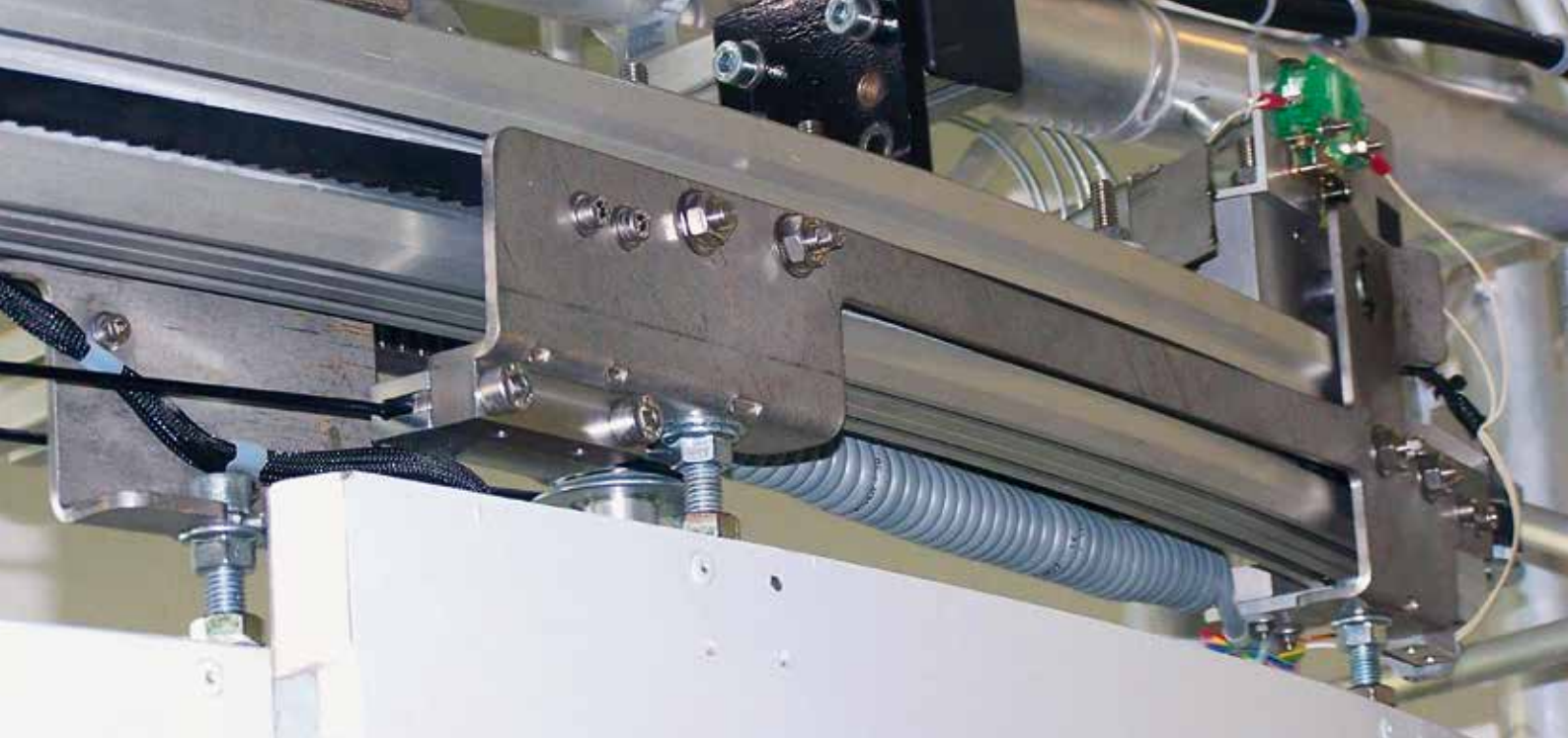
## RAIL DOOR AND STEP SOLUTIONS

### CUSTOMISED DOOR ACTUATION AND CONTROL

NORGREN HAS DELIVERED INNOVATION AND PERFORMANCE TO THE RAIL DOOR MARKET SINCE 1987. WE CURRENTLY HAVE OVER 17,000 INTERIOR DOOR SYSTEMS, AND MORE THAN 24,000 EXTERIOR DOOR ACTUATION AND CONTROL SYSTEMS, INSTALLED ON RAIL CARS ALL OVER THE WORLD - FROM SIEMENS' DESIRO AND ICE FLEETS TO SHANGHAI'S TRANSPERSONAL MAGLEV TRAIN.

#### QUALITY ASSURANCE YOU CAN RELY ON:

- Wide temperature range -40°C to +85°C
- Environment humidity: 95%
- System life time: →40 years
- Shock and Vibration: EN 61373
- Fire and smoke: DIN 5510, NF F16-101, EN 45545
- Voltage: 24 to 110 VDC +/- 30%
- Door closing time: 4 sec
- Door opening time: 2 sec
- EN 60529
- EN 50121-3-2
- IEC 61508
- EN 14752
- EN 50125-1
- EN 50155
- EN 50126
- EN 50128
- EN 50129
- IRIS Certified



## CURVED DOOR SYSTEM HELPS OPERATING COMPANY CONFORM TO LEGISLATION CASE STUDY

A NATIONAL TRAIN OPERATING COMPANY NEEDED TO MODERNISE THEIR EXISTING TOILET DOOR SOLUTION TO ENSURE THEY COMPLIED WITH PRM TSI 2008/164/EC LEGISLATION REGARDING DISABLED ACCESS.

Norgren developed an innovative curved actuation solution that provided synchronised, telescopic door operation, either electronically or pneumatically.

The solution incorporated a locking system and emergency access override, and complied with all standard rail door specifications including obstacle detection.

The result was an increased aperture when the doors were opened, allowing for better wheelchair access, with push-button operation making it easier for disabled passengers.

The application-specific solution fully met the needs of the customer, and ensured compliance with all current and future legislation regarding disabled access.

## EXTERNAL DOOR SYSTEMS:

- Special pneumatic/electric actuation and control systems
- Safe, reliable and secure operation
- Interlocking and feedback drive systems
- Extended cushioning and increased side load stability
- Entrapment protection
- Many years of proven reliability and safety in Metro, EMU and HST applications globally



## INTERNAL DOOR SYSTEMS:

- Special manual, pneumatic & electric actuation, with integrated control system
- Safe, reliable and secure operation
- Interlocking and feedback drive systems
- Fire and smoke compliant
- Entrapment prevention
- Smooth, quiet design, with variable speed drive
- Solutions for new and existing train carriages to reliably fit into the same space as the previous design



## CURVED DOOR SYSTEMS:

- Electric and manual curved actuator system
- Curved guiding profile
- Maximises limited space with telescopic, synchronised opening
- Field serviceable design
- Locking system and emergency access override
- Robust guiding, low maintenance costs and easy replacement
- Meets PRM TSI 2008/164/EC legislative requirements for disabled access



## DOOR CONTROL VALVE SYSTEMS:

- Modular valve assemblies
- Easy replacement of existing systems
- Quick installation and maintenance
- Reduction in downtime
- Custom designs to suit specifications



## RAIL DOOR AND STEP SOLUTIONS

### RETRACTABLE STEP CONTROL

NORGREN PROVIDES DOOR STEP ACTUATION SYSTEMS FOR SOME OF THE WORLD'S LEADING COMPANIES. OUR CUSTOMISED SOLUTIONS, BASED ON SLIDING AND ROTARY ACTUATION, ENSURE COMPLETE RELIABILITY, DURABILITY AND SAFETY.

- Door step actuation for Mainline and High Speed trains
- Special pneumatic cylinder
- Slide and rotary actuation options catered for
- Compact, robust construction
- Optional integrated interlocking function
- Resistant to harsh environments
- Integrated with train framework







## SLIDING STEP SYSTEM GREATLY REDUCES SAFETY RISK ON UNDERGROUND TRAINS CASE STUDY

AN UNDERGROUND TRAIN OPERATOR FACED THE PROBLEM OF AN EXCESSIVE GAP BETWEEN THE TRAIN DOOR AND PLATFORM, WHICH CREATED A SAFETY RISK FOR PASSENGERS. WHAT'S MORE, THE GAP BETWEEN THE DOORS AND PLATFORM WAS NOT CONSISTENT, AND VARIED BETWEEN STATIONS.

The customer therefore required a variable step, which would fit the gap at any station. The solution also needed to fit within a very restricted space beneath the existing door system.

Norgren engineers developed a range of cushioned, telescopic cylinders that could be mounted below the existing door system. By applying a set pressure, this cylinder system would fill the gap between train and platform regardless of the gap width.

Due to the strict envelope size, the Norgren solution used only 50% of the space of a traditional step system. It included all the required standard safety features, such as obstacle detection, and was able to be fully integrated into the existing door control system.

This solution exactly matched the specific needs of the customer and provided a more reliable – and far safer – door step system for train passengers.

# FILTRATION SYSTEMS

## ROBUST AND RELIABLE AIR PREPARATION EQUIPMENT

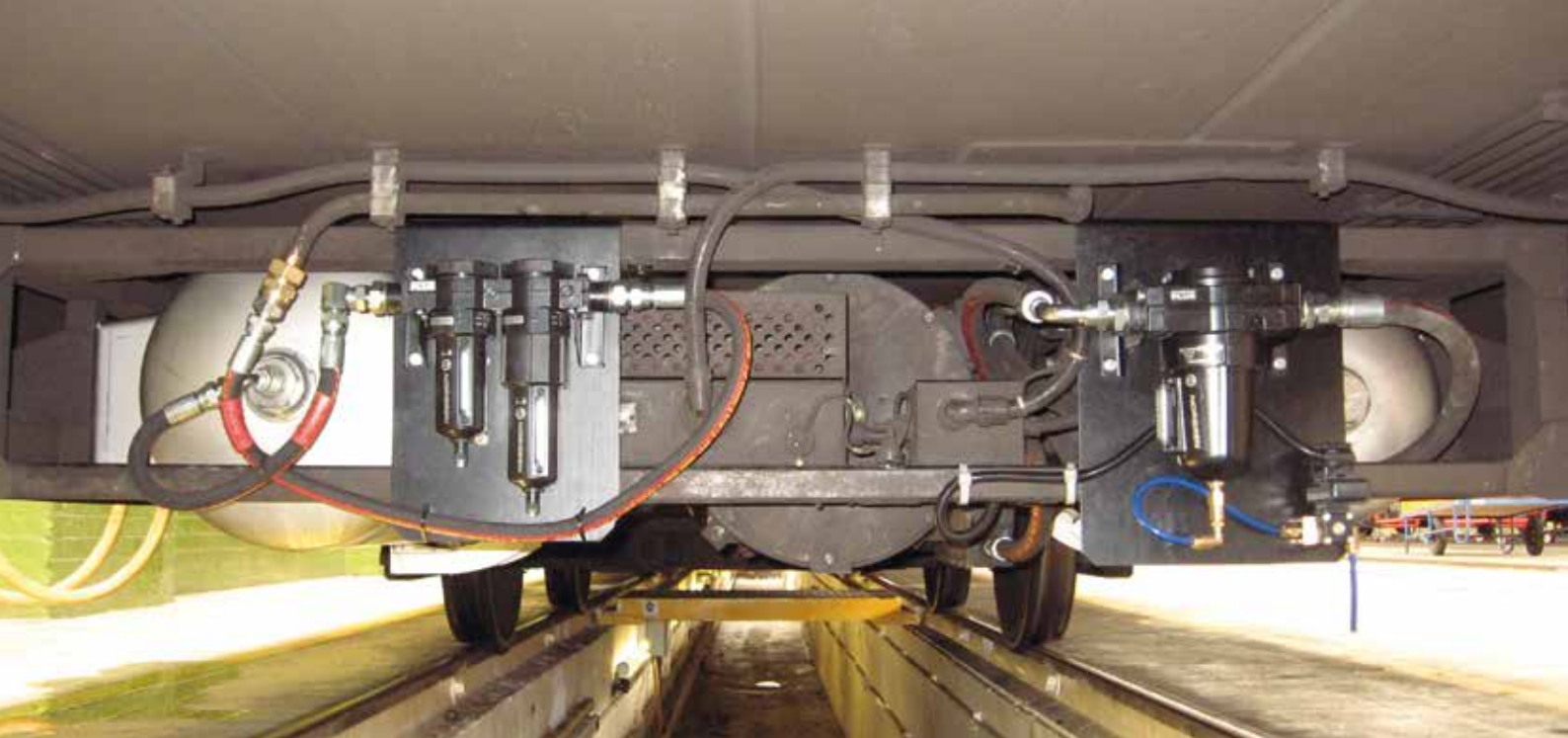
AS THE INVENTOR OF THE AUTOMATIC AIRLINE LUBRICATOR IN 1927, NORGREN HAS A DEEP INSIGHT INTO THE AIR PREPARATION PROBLEMS FACING MANY INDUSTRIES, ESPECIALLY RAIL.

Engine-driven air compressors used on rail vehicles are known to pass significant amounts of oil and carbon deposits into compressed air systems.

Our multi-stage filtration system – now fitted to vehicles throughout the world – has resulted in significant improvements in particulate removal, leading to better durability and reliability, and significant savings for operators on installation and maintenance costs.

- Excellent filtration performance ensures reliability of downstream components and systems
- Modular system
- Pre-assembled package minimises installation time
- Optional visual or electric service life indicator
- Manual or automatic drains for filters and condensate tanks. Automatic units can be electrically or pilot operated
- 40 micron and 5 micron filters for bulk water and solid particulate removal
- Coalescing filter for oil/water aerosol removal and sub micron particulate removal
- Carbon filter for oil vapour removal. Oil and particles removed from downstream – ISO 8573-1
- Easy installation and maintenance
- Cost effective over the full lifecycle





## OIL-FREE COMPRESSED AIR FOR AUXILIARY RAIL SYSTEMS, BRAKES AND DOOR EQUIPMENT CASE STUDY

ROLLING STOCK OWNERS HAVE ENCOUNTERED MAJOR RELIABILITY PROBLEMS WITH THEIR VEHICLES DUE TO THE ENGINE COMPRESSOR CONSTANTLY PASSING OIL FURTHER DOWN THE VEHICLE TO THE SUB SYSTEMS.

The large amounts of oil, carbon and water produced by the engine-driven compressor enter the vehicle system, causing failures that affect a train's reliability and safety.

This reliability problem has a major impact on running costs due to increased maintenance and vehicle system failures, which can range from £25 to £1,000 per minute in out-of-service costs.

In response, Norgren's UK Technical Team, together with a Rail Approval institution, developed a four-stage filtration system to remove the oil and water being carried to the vehicle sub systems.

This system has been proven to be successful and the customer has asked for it to be incorporated into its fleet of 660 vehicles.

Norgren exceeded customer expectations by offering a bespoke solution that met budgetary costs, as well as delivering a short installation time, which resulted in vehicle trials commencing sooner.

The 'oil carry over' solution gives the customer true added value, with extended lifecycle costs, and a payback on investment within one year.

## AMT RAIL DRYERS

COMPRESSED AIR DRYERS WITH PATENTED AMT TECHNOLOGY

NORGREN'S REVOLUTIONARY AIR DRYERS OFFER OUTSTANDING LEVELS OF PERFORMANCE AND RELIABILITY – A STEP CHANGE IN THE USE OF COMPRESSED AIR APPLICATIONS IN THE RAIL SECTOR.

With a life span of six years – significantly more than even the best performing alternatives – Norgren's patented Adsorbent Media Tube (AMT) dryer marks a significant advance over both desiccant and membrane systems, effectively taking their best features while eliminating the flaws.

Vibration resistant and suitable for both horizontal and vertical installation, the result is a 'fit and forget' product which dries better than any current solution. This improves reliability, reduces unplanned downtime and helps drive down the cost of ownership.

### PATENTED TECHNOLOGY FOR IMPROVED PERFORMANCE:

- Service life of up to 18,000 hours (six years)
- Compact and flexible design, horizontally or vertically mounted
- Typical dew point suppression of 40°C
- Superior moisture uptake
- High energy efficiency
- Unaffected by saturation
- Faster regeneration
- Resistant to vibration
- No by-products produced





## NEW TECHNOLOGY KEEPS COMPRESSED AIR DRIER LONGER FOR NEW YORK CITY TRANSIT CASE STUDY

NYC TRANSIT ENGINEERS NOTICED THAT MOISTURE IN COMPRESSED AIR WAS CAUSING MECHANICAL PROBLEMS ON SUBWAY CARS DOWNSTREAM, INCLUDING PREVENTING THE BRAKE TRIP VALVE FROM RESETTING.

They saw the performance of OEM pressure swing dryers on the compressor skids gradually decline – especially during hot, humid New York summers.

As opposed to conventional desiccant beads (which, when water-saturated, cannot be regenerated, causing the dryer to fail), Norgren's AMT dryer uses a polymer to form hollow tubes impervious to moisture.

This design delivers higher moisture uptake and faster purging, without degrading the dryer media, improving both performance and longevity.

Norgren designed a test consisting of a multi-stage filtration system that removes particulate contaminants, liquid water and oil aerosols, as well as the water vapour removed by the AMT dryer.

NYC Transit replaced the conventional pressure swing dryers with these AMT test units on a complete train – three compressor skids – and ran them under normal conditions.

After 12 months of operation in the extreme temperatures and humidity of New York City, test results showed that air leaving the dryers was as dry as when the system was first installed, with no decay or reduction in its water removal capabilities.

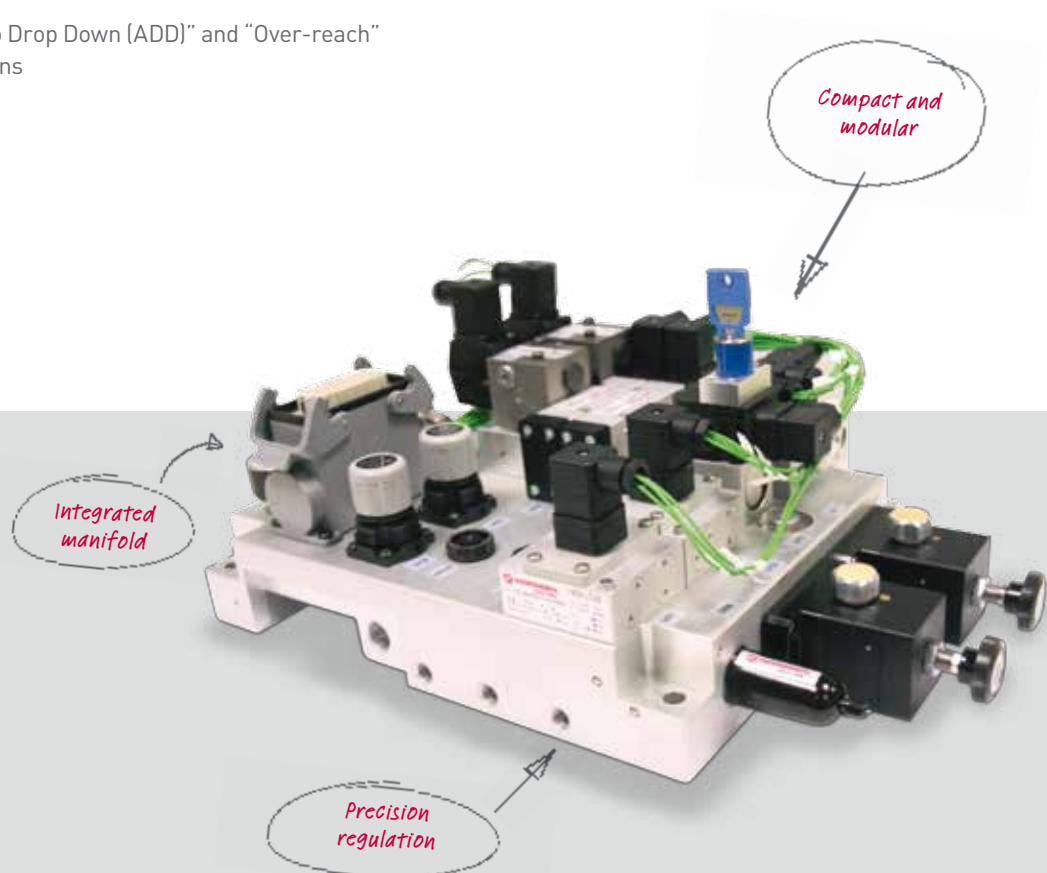
# PANTOGRAPH CONTROL

## PNEUMATIC PANTOGRAPH CONTROL SYSTEMS

WITH HIGH-SPEED TRAINS BECOMING FASTER, PANTOGRAPH SYSTEMS ARE EXPECTED BE MORE RESPONSIVE TO HEIGHT VARIATIONS.

Norgren designs and manufactures pneumatic systems that attach to pantographs, and retract quickly, reliably and accurately from the overhead power cables when required.

- Actuation and control solutions for raising and lowering the pantograph
- Precision regulation or proportional pressure valves used to achieve constant contact
- Use of valves, pressure switches, filters and regulators for control panels
- Compact and modular control solutions
- Ability to work in both high and low temperatures (-40°C to +90°C)
- Tested for 400km/h trains to withstand external elements and constant shock and vibration
- Optional "Auto Drop Down (ADD)" and "Over-reach" control functions





## HIGH FLOW PRECISION REGULATOR FOR PANTOGRAPH SYSTEMS CASE STUDY

PANTOGRAPH SYSTEMS ARE EXPECTED TO WORK HARDER AS TRAIN MANUFACTURERS CONTINUE TO DEVELOP FASTER TRAINS. IF THE PANTOGRAPH IS DETACHED FROM THE WIRE, ARCING CAN OCCUR, REDUCING THE LIFE OF THE WIRE AND CARBON STRIP.

Norgren's LR27H high flow precision regulator is a fast response, high flow precision regulator, which enables the pantograph to respond to the height variations on electric overhead lines.

The pressure regulator is the heart of the pantograph system, as it regulates and maintains the force of the carbon strip onto the overhead wires.

As the wires are mounted between supports, the pantograph needs to extend and retract with the height variations of the wires. The faster the train, the faster the reaction time.

The Norgren solution is small enough to fit within the existing footprint of the pantograph, offering a cost-effective design.

It provides unrivalled performance, with a rapid, quiet and stable operation, temperature range of  $-40^{\circ}\text{C}$  to  $+90^{\circ}\text{C}$ .



## WATER MANAGEMENT

NORGREN CAN CALL ON OVER THREE DECADES OF EXPERIENCE IN SUPPLYING HIGH PERFORMANCE SOLENOID VALVES, EXTERNALLY CONTROLLED VALVES AND COMPLETE SOLUTIONS FOR WATER SYSTEMS ON BOARD RAIL VEHICLES. THIS INCLUDES BUFFET AND RESTAURANT CARS, DRAINAGE AND SEWAGE SYSTEMS, AND TOILET FLUSHING APPLICATIONS.

### BISTRO CARS:

Centralised control of freshwater supply and grey water drainage of catering and restaurant applications

- Customised valves and control systems
- Modular, space-saving design
- Can be integrated with other systems
- Precise and safe control
- Rapid fill and drain designs



### WASTE/GREY WATER:

External outlets of grey water and sewage

- Special 2/2 pilot-operated valve, with pilot solenoid
- Remains pressure-tight even during high pressure peaks in tunnels or parallel to oncoming trains
- Extremely reliable operation, even with contamination
- +/- 30% voltage tolerance and surge suppression eliminate damage from power fluctuations and spikes
- Simple installation
- Optional fully integrated solutions
- High flow for rapid drainage
- Automatic operation replaces labour intensive manual operation



### TOILET CONTROL:

Pneumatic control of toilet flushing system

- Integrated electro-pneumatic control system
- Simplified, low cost design
- Customised control systems and "Plug and Play" designs
- Optional system monitoring, feedback and isolation
- Reduced water consumption
- Single flush and dual flush designs
- Optional CAN interface



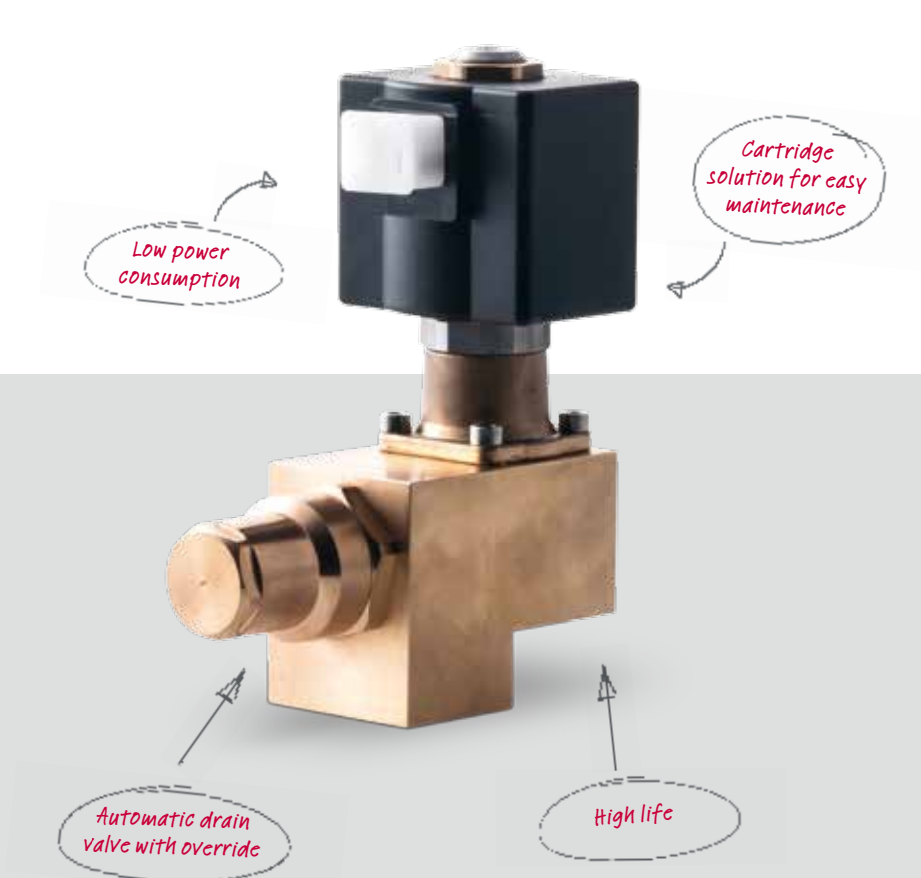


# WATER MANAGEMENT

## FREEZE PROTECTION

NORGREN HAS DESIGNED A VALVE TO PROTECT UPSTREAM PIPING AND COMPONENTS FROM FREEZING WHEN VEHICLES ARE STATIONARY IN LOW TEMPERATURES.

- Automatically drains on-board water systems when the water temperature is close to freezing point
- Designed for endurance in the most demanding conditions (-40°C to +80°C)
- Highly responsive to temperature changes
- Rapidly detects the water temperature, rather than the ambient temperature, for improved accuracy and faster response
- Inlet pressure has no effect on thermal set point
- Low power consumption. No override heating element required
- Very stable temperature set-point (→10 years)
- Easily retro-fitted into existing applications





## NEW VALVE PROVIDES ULTIMATE IN FREEZE PROTECTION CASE STUDY

VARIOUS SYSTEMS ON A PASSENGER TRAIN REQUIRE A WATER SUPPLY, FROM THE BUFFET CAR TO THE CARRIAGE TOILETS. WHEN A TRAIN IS NOT IN SERVICE (OVERNIGHT), WATER LEFT IN THE SYSTEM CAN FREEZE, EITHER DAMAGING THE SYSTEM OR PREVENTING THE TRAIN FROM BEING STARTED.

Components have been developed over the years to automatically drain the water when the train is out of service, if the temperature falls towards zero. But many of these systems are unreliable.

A rail operator had major reliability issues with the current freeze protection system on board their passenger trains. The existing solution was slow to respond to changes in temperature, as well as being unreliable and difficult, and time consuming to maintain.

The Norgren solution combines our expertise with that of TA Heimeier (part of the Indoor Climate division in the IMI Group). More accurate than the existing system, it senses the water temperature, rather than the ambient temperature of the drain port.

It is easy to maintain due to the cartridge design, which can be replaced without disruption to the pipe work. It fits into the existing envelope; performance is independent of pressure variance; and, as no heater is required, it consumes less energy.

Using a rail-proven fluid solenoid valve, the solution ensures a reliable and constant performance over an increased lifetime.

## MIRROR CONTROL

NORGREN HAVE SUPPLIED THE GLOBAL RAIL SECTOR WITH COMPLETE REAR VIEW MIRROR AND CONTROL SYSTEMS FOR MORE THAN 10 YEARS.

FITTED TO BOTH SIDES OF A TRAIN, AND USED TO ALLOW THE DRIVER TO CHECK MOVEMENT OF PASSENGERS IN THE TRAIN STATION, THE MIRROR RETRACTS TO THE TRAIN BODY FOR PROTECTION ONCE THE TRAIN REACHES 20KPH.

### PNEUMATICALLY OPERATED MIRROR:

- Fully adjustable and can be fixed in any position
- Smooth slow opening and closing movement
- Rail temperature and vibration tested
- Bespoke solution to suit individual needs
- Complete system, including the mirror and controls



### PNEUMATIC/ELECTRIC OPERATED MIRROR:

- Pneumatic and electrically retractable mirror, operated from driver's dashboard
- Complete solutions including mirror assembly with mechanism, pneumatic/electric actuation and control



### MIRROR CONTROL POSITIONING:

- Special pneumatic actuator and controls
- Force resistance at high speed
- External speed and cushion adjustment
- Fully integrated design
- Wide temperature range
- Highly reliable operation



## RAIL FITTINGS AND TUBING

RIGOROUSLY TESTED FOR SHOCK AND VIBRATION, EXTREME TEMPERATURES AND SALT SPRAY ENVIRONMENTS – AND USED EXTENSIVELY BY THE WORLD’S LEADING TRAIN BUILDERS AND OPERATORS – NORGREN’S FITTINGS ARE PROVEN IN THE FIELD WITH OVER 30 YEARS’ UNBLEMISHED SERVICE.

Able to replace traditional steel, stainless and brass compression fittings, our fittings and tubing are typically used for main compressed air lines, pantographs, couplings, HVAC, auxiliary systems, door controls and brakes.

Our brass and aluminium fittings come in a variety of shapes, such as straight, elbow, tee, stem adaptor and elbow connector. Special sizes and types are also available to meet your individual needs.

### 82 (A) AND 83 (A) RAIL FITTINGS:

- Quick, simple installation with no special assembly tools or heat required – typical installation time saving: 20%
- For use in areas of vibration
- Low torque assembly settings
- Pre-assembled units
- Can be used again without damage to tube
- Copes with tube misalignment of +/-4°
- Wide range of sizes available from 6mm to 42mm and 1/8” to 1” nominal bore (larger sizes available on request)
- Different pipe material can be used such as stainless steel, brass, copper, aluminium, PU and nylon
- Fittings can be used with seam welded tubing
- Temperature: -45°C to +200°C (Standard seal is suitable for -45°C to +150°C, optional Viton for -30°C to +200°C )
- Testing and Approvals: PED 97/23/EC, Shock & vibration tested to EN 61373, salt spray tested to ISO 9227-06
- Corrosion resistant “AL2” alloy/brass/stainless



### PNEUFIT FITTINGS:

- Suitable for flexible hose
- Suitable for door systems and auxiliary equipment
- Comprehensive range of shapes and sizes
- 4mm to 14mm / 1/8" to 1/2" tube diameters available
- Quick, reliable and safe connection
- Widely used in freight wagon applications



### PUSH-ON FITTINGS:

- Ideal for fluid and vacuum applications
- Comprehensive range of shapes and sizes
- 4mm to 14mm tube diameters available
- Reliable and safe connection



### FLEETFIT FITTINGS:

- Simple tube connection and disconnection – no tools required
- Ease of tube insertion in areas of restricted access
- Internal tube support as standard for greater safety



### TUBING:

- Fire and smoke resistant nylon tubing
- Tube tested and conforming to the following standard:
  - DIN 5510
  - NF F 16-101
  - EN 45545
- Suitable for use with Norgren Fleetfit vehicle fittings



## COUPLING AND NOSE CONES

NORGREN'S SPECIAL CYLINDERS AND CUSTOMISED CONTROL SYSTEMS FOR CARRIAGE COUPLING/ UNCOUPLING ARE SPECIFICALLY DESIGNED TO DELIVER RELIABLE PERFORMANCE, REDUCE COMPLEXITY AND SIZE, AND MEET LOW TEMPERATURE NEEDS.

### PNEUMATIC COMPONENTS IN NOSE CONES:

- Opening and closing actuators
- Special locking actuators including integrated switches and one electrical connector
- Valves or modular control unit including filtration, pressure regulation and manual valves

### PNEUMATIC COMPONENTS ON COUPLINGS:

- Control manifolds and actuation for locking/unlocking function
- Valve control and motion of the electric head
- Valve control of telescopic coupler shank





## NOSE CONE/COUPLING MANIFOLD REDUCES COMPLEXITY AND SIZE, AND MEETS LOW TEMPERATURE REQUIREMENTS

### CASE STUDY

THE NOSE CONES OF HIGH-SPEED TRAINS MUST OPEN FOR COUPLING OR DECOUPLING. A GLOBAL DESIGNER AND MANUFACTURER OF COUPLING SYSTEMS WANTED TO REDUCE THE COMPLEXITY OF THE PNEUMATIC CIRCUITS AND THE NUMBER OF COMPONENTS REQUIRED TO OPEN THE NOSE CONE.

They wanted an integrated pneumatic system that was modular, compact and effective at low temperatures.

Norgren designed a new locking cylinder to move the doors of the nose cover. We combined existing valves, and other proven components on a custom base plate, to create a single manifold assembly that controls the entire nose cone coupling system - no need to source multiple components from various suppliers.

The compact pneumatic platform can be configured to fit into any nose cone design, with the easy-to-install integrated unit eliminating extra wiring and tubing to make installation faster.

This pneumatic assembly operates at  $-40^{\circ}\text{C}$ , meeting a key high-speed rail requirement, and allowing the OEM to standardise offerings across the globe.



## FREIGHT SYSTEMS

NORGREN PROVIDES STANDARD AND CUSTOMISED PRODUCTS THAT ARE PURPOSE-BUILT TO PERFORM IN HEAVY DUTY FREIGHT APPLICATIONS, DELIVERING YEARS OF RELIABLE OPERATION IN THE HARSHTEST ENVIRONMENTS.

Designed for the automated control of freight top hatch and bottom doors, Norgren's pioneering solutions provide safe, efficient filling and unloading. They provide ease of use and welcome flexibility for your rail operation, as well as helping lower the total cost of ownership.

### WAGON DISCHARGE AUTOMATION SYSTEMS:

- Special actuators and control system
- Heavy duty cylinders for discharge door and top hatch operation
- Customised mounting options
- Special purpose control valves
- Air preparation, including filters, 'Y' strainers, check valves, dryers, regulators, isolation valves – drain valves ensure reliable operation
- Improves freight handing efficiency and safety
- Robust and reliable operation
- Lower total cost of ownership



### LATCHING CYLINDERS:

- Able to positively lock a cylinder in the 'in stroke' and 'out stroke' position
- Safely and securely hold loads in place in the event of air pressure loss or failure
- Manual override to allow manual operation if compressed air not available
- Require only a single control valve to fulfil all functions
- Reduced components circuitry, installation time and weight
- Easy to install and maintain
- Suitable for applications including freight wagon top hatch and discharge doors, 'clawlock' points control, pneumatic step control

### SHUTTER CYLINDERS FOR LOCOMOTIVES:

- Control the opening and closing of shutters as part of a temperature control application
- Fits into the existing envelope
- Easy to rebuild
- Proven actuator technology





## FREIGHT SYSTEMS

### FREIGHT TESTING EQUIPMENT

AUTOSCAT IS A SINGLE CAR AIR TESTER THAT CAN BE SIMPLY CARRIED BY ONE PERSON TO THE WAGON THAT NEEDS TO BE TESTED. IT IS CONNECTED TO THE WAGON AND AN AIR SUPPLY, AND SIMPLY BY PRESSING THE START BUTTON, THE TESTS ARE CARRIED OUT AUTOMATICALLY WHILE THE OPERATOR PERFORMS VISUAL CHECKS.

The operator gets a visual indication of test passes or failures on the front of the unit. Once complete, the unit is connected to a PC, the data downloaded, and the information for each test displayed in an easy-to-read report. This allows better understanding and diagnosis of the recorded test information for each wagon.

- Reduce time taken to perform the overall operation
- Reduce downtime costs incurred
- Reduce human error
- Increase daily test output
- Reduce the size of the testing unit
- Increase portability
- Reduce manual handling
- Improve OH&S





## LATCHING CYLINDER PROTECTS AGAINST FAILURE ON FREIGHT WAGON DOOR SYSTEMS

### CASE STUDY

A GLOBAL FREIGHT CAR BUILDER BASED IN CHINA REQUIRED A CONTROL SYSTEM FOR TOP HATCH AND DISCHARGE DOORS TO PROTECT AGAINST THE FAILURE OF THE AIR SUPPLY SYSTEM.

The Norgren solution combines a customised heavy duty cylinder with an integrated latch and manual override to lock the piston of the door cylinder.

The latching cylinder is combined with other heavy duty components as a complete kit – the integrated design helps reduce component circuitry, installation time and weight.



## FINDING PARTS THAT MEET TOUGH RAIL REQUIREMENTS CASE STUDY

THE MECHANICAL ROOM OF A DIESEL-ELECTRIC LOCOMOTIVE CAN GET HOT. TO PREVENT OVERHEATING, LOUVRES ON THE BACK OF THE LOCOMOTIVE OPEN UP WHEN A CERTAIN TEMPERATURE IS REACHED.

The system works fine until the louvre control actuators extend and won't retract. This happens after repeated vibration – a constant problem in rail environments – separates the piston rod from the piston.

Changes in the supply chain were also making it more difficult to find replacement actuators, increasing costs and wait times.

Norgren supplied heavy-duty Railine® actuators with the pistons staked to the rods, so they can't come apart. These actuators meet the same fit, form and function standards as the ones they replace.

Norgren Railine® products are certified to meet EN 61373 Category 1, Class A and B vibration resistance standards, so no additional testing or recertification was required.



## AUXILIARY SYSTEMS

### ISOLATION AND MAIN CIRCUIT BREAKERS:

#### PNEUMATIC COMPONENTS IN MAIN ISOLATORS

- Opening and closing high voltage main isolation contactors
- LPDA & LPRA ISO cylinders used for wide temperature range with minimal leakage
- Valves for  $-40^{\circ}\text{C}$  to  $+65^{\circ}\text{C}$ , with voltage tolerance of  $\pm 30\%$
- Potential to integrate cylinder and valve using special IVAC actuator

#### PNEUMATIC COMPONENTS IN CIRCUIT BREAKERS AND TRIP SWITCHES

- Customised interface solenoid valves for fast, safe response
- Valve is suitable for  $-40^{\circ}\text{C}$  to  $+65^{\circ}\text{C}$  and is based on proven SIL 4 technology for added reliability and safety
- Valve has extremely low leakage, even at  $-40^{\circ}\text{C}$ , and is available in different voltages
- Different interface configurations available on request

### HORN CONTROL:

- Manual, pilot and solenoid operated options
- Double contact safety switch technology for feedback to data logger
- High flow capacity
- Reduced piping and installation time
- No commissioning or adjustment time required
- Robust construction
- $-40^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$  available
- Shock and vibration tested to EN 61373, Category 1, Class A and B



## BALL VALVES:

- Valve can be used as 2/2 only, 2/2 exhaust function, 3/2 full bore options available
- Virtually leak-free design
- Handle can be rotated 180 degrees to suit left and right hand mounting
- Various handle options – Latch, Lock, Tee, Level and combinations
- Can be in-line mounted or panel mounted
- Optional monitoring switches
- Wide temperature range from -40°C to +80°C
- Shock and vibration tested to EN 61373, Category 1, Class A and B
- Pressure; 0...12 bar
- IP65
- Low operating forces
- Robust, reliable and durable solution



## HVAC:

- Prevents pressure shock waves on the ears of passengers in high speed trains
- Customised actuators and solenoid valves close air inlet rapidly when the train passes another or enters a tunnel
- Optional compact unit – with integrated valve, switch, electrical and pneumatic connectors – helps reduce components and assembly
- Very fast reaction unit closing time  $\leftarrow$ 50ms



## SANDING / LUBRICATION:

- Reliable and accurate over a wide temperature range (-40 to +80°C)
- Customised solution with integrated valve technology and pressure control
- Proportional technology available for more accurate and efficient sand distribution
- Resilient against harsh underframe environmental conditions



## SUSPENSION SYSTEMS

RAIL SUSPENSION SYSTEMS ARE A NOTORIOUSLY HARSH ENVIRONMENT. NORGREN'S INNOVATIVE VALVE TECHNOLOGY, BOASTING EXCEPTIONAL RELIABILITY AND SAFETY CREDENTIALS, IS RESILIENT TO EXTREME TEMPERATURES AND DESIGNED FOR EASY INSTALLATION AND MAINTENANCE.

### FROM MECHANICAL TO PROPORTIONAL:

- Lever valves with integrated position sensors
- Proportional control valve technology, for easier suspension setup and levelling during rail car commissioning
- Active filtering to allow air saving
- Platform height control
- Tilting control
- CAN interface
- Position feedback from shock absorber
- Easy replacement of existing shock absorbers
- Highly robust proportional control valve, suitable for underframe mounting and harsh environment
- Rail industry proven
- Cartridge proportional valve can be integrated into customised manifold or customer-specific valve body
- Easy integration into train control system, allowing active tilting and platform height control



## INVESTING IN THE FUTURE

NORGREN IS WELL AWARE OF YOUR RESPONSIBILITY TO SATISFY LEGISLATION WITH REGARD TO SAFETY, RELIABILITY, FUEL EFFICIENCY AND CO<sub>2</sub> REDUCTION. OUR SOLUTIONS NOT ONLY BRING INNOVATION AND TECHNICAL EXCELLENCE TO THE RAIL SECTOR, THEY ALSO ENABLE YOU TO STAY WHOLLY COMPLIANT.

### LEGISLATION:

- Disabled access toilet door systems with curved option
- Fire and smoke compliance to EN 45545 and NFPA 130

### ENVIRONMENT:

- Natural gas conversion kit for diesel engines
- Cryogenic control technology for LNG tenders
- UREA dosing to meet diesel engine exhaust fume legislations

### ENERGY SAVING:

- Waste-heat recovery technology
- Suspension levelling valve exhaust re-usage
- Electrification of pneumatic systems
- AMT dryer technology with heated fibres and purge loss reduction to approx 6%, including over 6 years' maintenance-free service



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