HERION®

Process Control Incorporating

BUSCHJOST®

FAS®

HERION®

Process Fluid Control

Robust, durable and reliable solutions for demanding process applications

IMI

Breakthrough Engineering

CONTENTS

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 industries, Norgren's high-quality solutions are 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, Buschjost, FAS, Herion, Kloehn, Maxseal and Thompson Valves. Supplied either individually or combined into powerful customised solutions to meet customer needs.

Breakthrough engineering you can count on.


Chemical


Energy


Industrial Gases


Water treatment


Marine


Industrial Automation


Food & Beverage

Delivering value to our customers

Our customers are passionate about creating machines to tackle the world's most demanding engineering challenges. Our ideas, our people, our products and our service is all here to help keep our customers' machines – and our world – moving faster, safer and more efficiently.

- Stocked products available for 24 h delivery
- Customised packaging for quick inspection and storage
- EDI connection for easy order processing and status
- Intuitive website and mobile App to help you save time and work more efficiently

Our work with leading national and international companies across many industries means that we talk our customers' language and can bring specialised experience about legislation, standards and specifications.

Safety, reliability and performance

Norgren's products are designed to work effectively in aggressive environments and extreme temperatures and meet international standards such as:

- ATEX
- TÜV
- TR-CU
- INMETRO
- CSA
- CCOE
- KOSHA
- DVGW
- FM AD UL
- NEMA
- ITRI

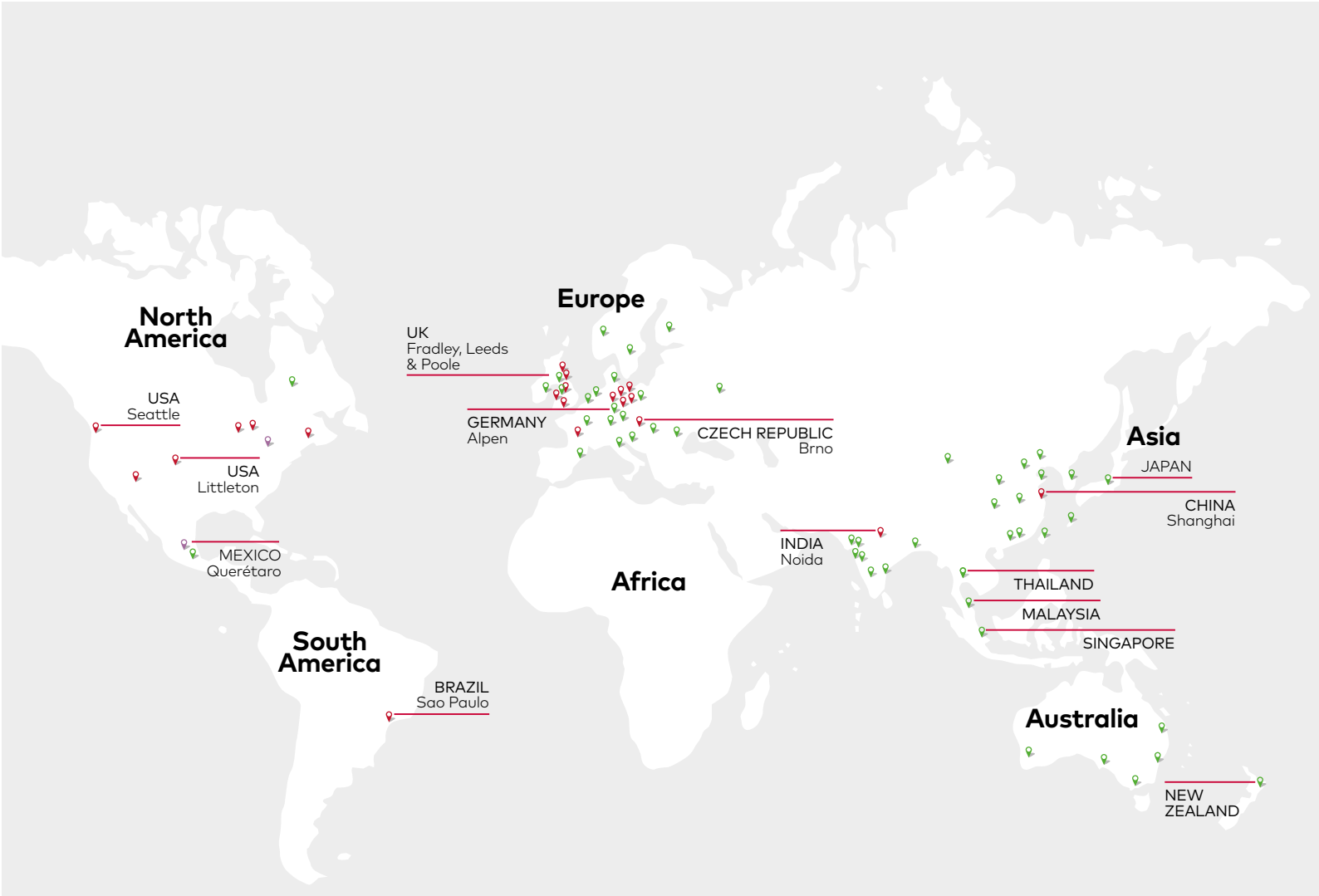
DIN EN 61508
IEC 61508

Our Global Reach

With established manufacturing facilities globally, we have the capability to cope with the most demanding of international projects. With a sales and service network in 50 countries, we have the reach and capability to ensure continuity of supply and local support where it is needed.

Sales & Service in 50 countries

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



Process Fluid Control

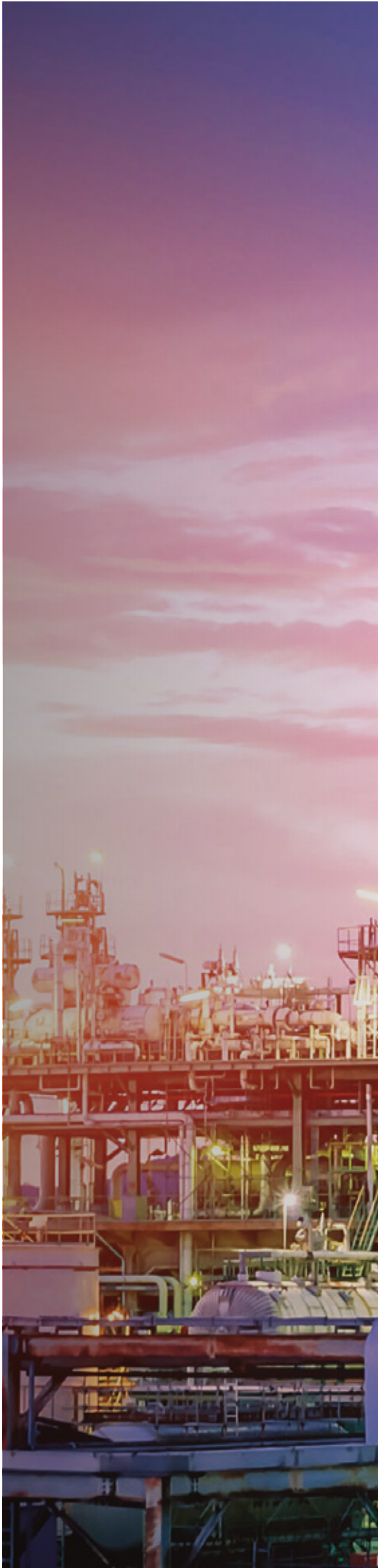
The Process Industry is incredibly diverse. Manufacturers and end users have to carefully balance safety, reliability, legislation as well as performance to ensure plant and process efficiency.

Norgren has been helping customers improve plant reliability and efficiency for over 80 years.

Our market-leading product ranges offer an extensive range of high quality components and complete system solutions to meet the specific requirements of the Process industry. We engineer, manufacture and supply products and systems that are in direct or indirect contact with process media including liquids, gases and solids; and are constantly pushing the boundaries of technology to offer world class products that can increase performance

We work closely with everyone from manufacturers to end users which enable us to provide market leading products that we can adapt to be specific to our customer's individual requirements.

- Deliver market leading fluid control products
- Global network of technical experts. Local support wherever your project or installation is
- Market leading performance for safety and reliability
- Valves specifically designed for reliability and longevity in harsh conditions
- Long experience in key process applications including Cooling, Heating, Washing, Filtration and Drying



Norgren has been helping customers improve plant reliability and efficiency for over 80 years.

Key Process Fluid Control Applications

Cooling

Process cooling is used to remove heat from a process to protect it against overheating or to achieve / maintain a certain temperature. Many cooling applications use water as a medium to absorb heat, because water has a high boiling point and high specific heat. There are many different ways to set up an industrial cooling system: once-through-, closed recirculating and open recirculating cooling system.

Typical cooling applications

- Food processing (tunnel cooling, spiral freezing and blast chambers)
- Moulding & extrusion
- Textile production
- Medical imaging equipment
- Machine tools

Set of cooling towers

Key Products and Solutions

	Product Solution	Use in application
	Proportional valves	Transforming an electrical input into a pneumatic output and controls flow and/or pressure
	Solenoid valves	To operate (open / close) main valves such as ball valves, butterfly valves or damper
	Directional control valves	Control valves in hydraulic auxiliary circuit
	2oo3 hydraulic control units	In the heat transfer process to safely control shut off valves
	Pneumatic high pressure cylinder	Steering of shut off valves in the secondary water circuit
	DLA- motorized control valve	Injection moulding
	Flange valves	Hydraulic oil cooler Roller Mill cooling
	Dome and Spring loaded pressure regulators	Regulation of cooling system Regulation of the launching rocket system Biogas engine
	Dome and Spring loaded back pressure maintaining valves	Regulation of cooling system Regulation of the launching rocket system
	Filters	Regulation of cooling system Regulation of the launching rocket system
	Check valves	Regulation of cooling system Regulation of the launching rocket system
	Globe valves	Regulation of cooling system Regulation of the launching rocket system

Key Process Fluid Control Applications

Heating

Process heating refers to various types of heat transfer techniques using fuel to release heat and a delivery mechanism for transfer of the heat to the process. There are a wide range of fuels used: electricity, natural gas, oil, LPG and coal. Heat can be transferred to the process by flue gases, hot water / steam, by radiation or in air. The main processes driven by heating are physical- and chemical change.

Typical heating applications

- Moulding & Extrusion
- Fuel gas conditioning
- Dew point heating
- Heated paper rolls
- Ammonia Heating

Industry boiler gas burner

Key Products and Solutions

	Product Solution	Use in application
	Proportional valves	Transforming an electrical input into a pneumatic output and controls flow and/ or pressure
	Solenoid valves	To operate (open / close) main valves such as ball valves, butterfly valves or damper Drain condense
	Steam valves	Feed screw Heating plant Surface technologies
	Steam valves	Steam generator
	Dome and Spring loaded pressure regulators	Furnace oxygen Hydrogen and nitrogen injection Frame control of processes Hydrogen commisionning process
	Dome and Spring loaded back pressure maintaining valves	Furnace oxygen Hydrogen and nitrogen injection Frame control of processes Hydrogen commisionning process
	Filters	Frame control of processes
	Check valves	Frame control of processes
	Globe valves	Frame control of processes
	Safety valves	Furnace oxygen Hydrogen and nitrogen injection Frame control of processes Hydrogen commisionning process

Key Process Fluid Control Applications

Washing

Washing is the seperation of undesired layers from surfaces, such as in industrial partial cleaning. Washing processes are classified according to their physical active principle. A distincion is made between blast cleaning, mechanical cleaning, fluidic cleaning, solvent cleaning, chemical cleaning and thermal cleaning. The cleaning process is about preparing a product for the next process step.

Typical washing applications

- Surface preps
- Bottle and Container cleaning
- Vegetable washing machine
- Gantry car washes
- Industrial bin washer machines

Automatic machine for washing glass bottles

Key Products and Solutions

	Product Solution	Use in application
	Proportional valves	Transforming an electrical input into a pneumatic output and controls flow and/or pressure
	Solenoid valves	To operate (open / close) main valves such as ball valves, butterfly valves or damper Drain condense
	Directional control valves	Control valves in hydraulic auxiliary circuit
	Hydraulic tie rod cylinders	Steering of shut off valves in the secondary water circuit
	Piston valves	Ozone generation
	Pilot actuated piston valves	Liquid gas facilities
	Dome and Spring loaded pressure regulators	Regulation systems
	Dome and Spring loaded back pressure maintaining valves	Regulation systems
	Safety valves	Regulation systems

Key Process Fluid Control Applications

Filtration

Filtration is a physical process for the mechanical separation or purification of substances. During the filtration process, the mixture to be separated passes through a filter or repository containing a filter mass. For industrial applications many different filter systems have been developed. In general, a distinction is made between clarification and separation filtration. During the clarification process, a liquid will be purified, whereas in separation filtration the source liquid will be divided into solids and liquid.

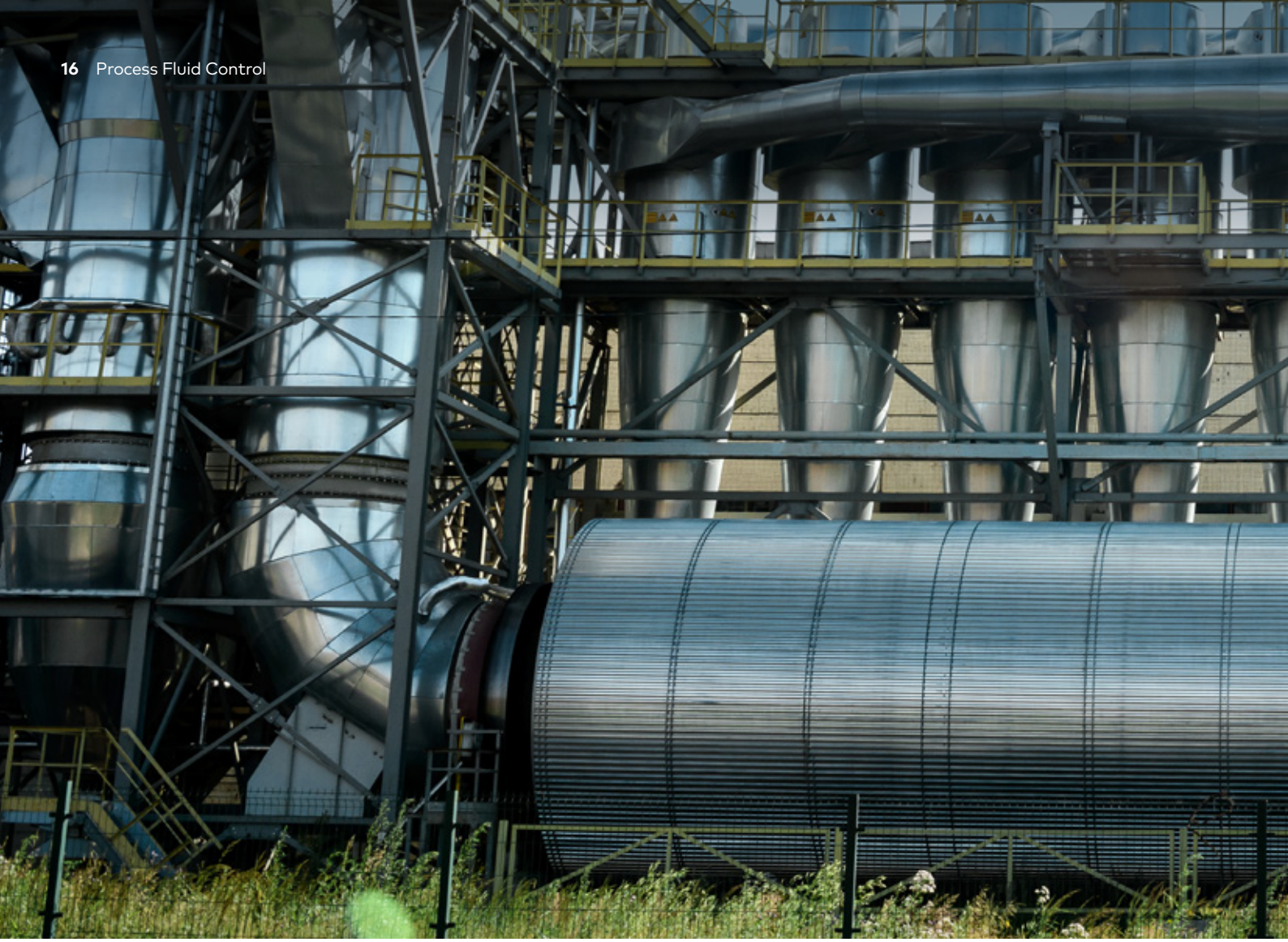
Typical filtration applications

- Ballst water filtration
- Recycling of waste
- Water treatment
- Seawater desalination
- Boiler feed

Reverse osmosis system

Key Products and Solutions

	Product Solution	Use in application
	Proportional valves	Transforming an electrical input into a pneumatic output and controls flow and/or pressure
	Solenoid valves	To operate (Open / Close) main valves such as ball valves, butterfly valves or damper
	Directional control valves	Control valves in hydraulic auxiliary circuit
	Hydraulic tie rod cylinders	Steering of shut off valves in the secondary water circuit
	ASU (Set of products)	PET - Blowing
	Dome regulators	PET - Blowing
	Spring loaded pressure regulators	CO_2 in Food & Beverage processes High pressure system for delivery of pure gas under accurate pressure and flow rate
	Dome and Spring loaded back pressure maintaining valves	CO_2 in Food & Beverage processes High pressure system for delivery of pure gas under accurate pressure and flow rate
	Filters	CO_2 in Food & Beverage processes High pressure system for delivery of pure gas under accurate pressure and flow rate
	Check valves	CO_2 in Food & Beverage processes High pressure system for delivery of pure gas under accurate pressure and flow rate
	Globe valves	CO_2 in Food & Beverage processes High pressure system for delivery of pure gas under accurate pressure and flow rate
	Safety valves	CO_2 in Food & Beverage processes High pressure system for delivery of pure gas under accurate pressure and flow rate
	Dust filter valves	Concrete processing



Key Process Fluid Control Applications

[Drying]

Drying is a process consisting of the removal of a solvent from a solid, semi-solid or liquid. A source of heat and an agent to remove the vapor produced by the process are involved. Some general methods of drying are direct drying (e.g. gas stream), indirect drying (e.g. heating through a hot wall), dielectric drying (radiofrequency or microwaves being absorbed inside the material) and freeze drying.

Typical drying applications

- Compressed air preparation
- Industrial tumble dryer
- Rotary dryer
- Freeze dryer
- Air drying for train brake system

Industrial tumble dryer

Key Products and Solutions

	Product Solution	Use in application
	Solenoid valves	To operate (Open / Close) main valves such as ball valves, butterfly valves or damper
	Valve manifold	Air dryer
	Diaphragm valves	Air dryer
	AMT Dryer	Air dryer

Process Fluid Control Products

Process Valves

These valves have a robust design for use in a wide variety of applications including temperature stability, resistance against aggressive mediums or applications where fluids with high viscosity and contamination have to be controlled.

- High flow rates
- Damped operation
- Clear compact design
- Solenoid interchangeable without tools (Click-on®)
- Particularly suitable for use as water valve in accordance with DIN EN 60730-2-8
- Suitable for vacuum

Process Valves	2/2- way solenoid valves with differential pressure	2/2- way solenoid valves without differential pressure	2/2- way pressure activated angle seat valves	2/2- way pressure activated piston seat valves	2/2- way pressure activated seat valves	3/2- way pressure activated seat valves	2/2- way pressure activated membrane valves
							
Materials	Brass, Stainless Steel, Cast Iron	Brass, Stainless Steel, Cast Iron, Ductile Cast Iron, PPSU, PVDF	Brass, Stainless Steel, Cast Iron, Ductile Cast Iron	Brass, Stainless Steel	Cast Iron, Ductile Cast Iron	Cast Iron, Gun metal	Brass
Connections	Thread, Flange	Thread, Flange	Thread, Flange	Thread	Thread, Flange	Thread, Flange	Thread, Flange
Sizes	G 1/8" ... G 2" 1/8" NPT ... 2" NPT DN 15 ... DN 50	G 1/8" ... G 2" 1/8" NPT ... 2" NPT DN 15 ... DN 100	G 1/2" ... G 2" 1/2" NPT ... 2" NPT	G 1/8" ... G 1/2" 1/8" NPT ... 1/2" NPT	G 1/2" ... G 3" DN 15 ... DN 150	G 1/2" ... G 2" DN 15 ... DN 150	G 1/4" ... G 2" 1/4" NPT ... 1/2" NPT
Operating pressure	0,1 ... 40 bar	0 ... 40 bar	0 ... 16 bar	0 ... 25 bar	0 ... 16 bar	0 ... 10 bar	-0,9 ... 16 bar
Temperature range	-20°C ... 200°C	-20°C ... 200°C	-10°C ... 180°C	-10°C ... 90°C	-10°C ... 180°C	-10°C ... 180°C	-10°C ... 90°C

Valves for Dust Filter Systems

These valves provide an intense pulse of air into the soiled filter element causing dust and loose dirt from the filter to fall to the ground, allowing efficient and inexpensive cleaning.

- One piece diaphragm for longer life
- Simple construction for ease of maintenance
- Solenoid interchangeable without tools (Click-on®), all internal components captive

Valves for Dust Filter Systems	2/2- way pneumatically actuated diaphragm valves	2/2- way solenoid actuated diaphragm valves	Control units	Flex-on® System
				
Materials	Aluminium, Stainless steel	Aluminium, Stainless steel	Polyurethane	Aluminium
Connections	Thread	Thread	/	Hose, Thread, Crimp
Sizes	G 3/4" ... G 3" 3/4" NPT-21/2" NPT	G 3/4" ... G 3" 1" NPT	8 Valves 16 Valves	DN25 - DN65
Operating pressure	0,4 ... 8 bar	0,4 ... 8 bar	/	0,4 ... 8 bar
Temperature range	-20°C ... 85°C	-20°C ... 85°C	/	-20°C ... 85°C

Proportional Valves

Proportional valves or I/P or E/P convertors convert variable or current voltage signal into a proportional output.

- High flow rates
- Fast response
- Excellent accuracy and performance characteristics

Proportional Valves	2/2- way proportional pressure control valves	3/2- way proportional pressure control valves	Intrinsically safe 3/2- way proportional pressure control valves	5/3- way and 3/2- way proportional pressure control valves
				
Materials	Brass, Stainless Steel, Cast Iron	Cast Iron, Ductile Cast Iron	Cast Iron, Gun metal	Brass
Connections	Thread, Flange	Thread, Flange	Thread, Flange	Thread, Flange
Port sizes	G 1/8" ... G 2" 1/8" NPT ... 2" NPT DN 15 ... DN 50	G 1/2" ... G 3" DN 15 ... DN 150	G 1/2" ... G 2" DN 15 ... DN 150	G 1/4" ... G 2" 1/4" NPT ... 1/2" NPT
Medium	Oil free and dry air	Oil free and dry air, Neutral gases	Oil free and dry air	Oil free and dry air
Flow max.	/	1.400 l / min.	300 l / min	1.200 l / min.
Output Pressure	0 ... 10 bar	0...10 bar	0...1 bar	-1...16 bar
Input Signal	4 ... 20 mA 0 ... 10 V	4 ... 20 mA 0 ... 10 V	4 ... 20 mA 0 ... 10 V	4 ... 20 mA 0 ... 10 V, -5 V ... +5V
Protection Class	IP 65	IP 30, IP 65	IP 66	IP 65
Temperature range	-10°C ... 90°C	-40°C ... 85°C	-40°C ... 85°C	5°C ... 60°C

Safety Valves

We offer safety valves to help our Customers fully comply with the requirements of DIN ISO13849-1.

- Protection against accidental operation
- Requires no cyclical monitoring or evaluation system
- Helps you comply to OSHA regulations
- Safety components according to EN574 Class IIIB
- With the appropriate application, performance level "e" (cat. 4) of DIN EN ISO 13849-1
- Easily fitted into existing systems

Safety Valves	Lockout valves with Integral silencer	Self-monitoring safety valves with soft start	Self-monitoring safety valves	Press safety valves	Two-hand control units
					
Materials	Aluminium	Aluminium	Aluminium	Polyurethane	Steel
Sizes	G 1/2" ... G 1"	G 1/2"	G 1/4" ... G 1"	G 1/4" ... G 2"	4 mm PIF
Operation	3/2	3/2	3/2	2 X 2/2, 2 X 3/2, 3/2	3/2
Operating pressure	0 ... 20 bar	2,5 ... 10 bar	2 ... 10 bar	3 ... 10 bar	3 ... 8 bar
Temperature range	-30°C ... 80°C	-10°C ... 60°C	-10°C ... 60°C	-10°C ... 60°C	-5°C ... 40°C

Process Fluid Control Products

Directional Control Valves

Inline valves can be solenoid or pilot operated valves and are often referred as directional control valves. Our range of NAMUR and Inline valves are offered for multiple applications.

- Manual override as standard
- Compact and robust design
- High flow rates
- Low power consumption
- Maintenance-free
- Easily interchangeable solenoid system

Directional Control Valves	Indirect acting solenoid valves	Direct acting solenoid valves	SIL rated indirect acting solenoid valves	SIL rated direct acting solenoid valves
				
Materials	Anodised Aluminium, Brass, Steel, Cast Iron	Brass, Stainless Steel, Cast Iron	Anodised Aluminium, Brass, Stainless Steel	Anodised Aluminium, Stainless Steel, Special Alloy
Port sizes	G 1/4" ... G 2" 1/4" NPT	G 1/2" ... G 4" Flange type	G 1/4" ... G 1/2" 1/4" ... 1/2" NPT	G 1/4" ... G 1/2" 1/4" ... 1/2" NPT
Operation	3/2, 5/2, 5/3	2/2, 3/2	2/2, 3/2, 3/2, 5/2	2/2, 3/2, 5/2
Interfaces	Inline, Namur	Inline	Inline, Namur	Inline, Namur
Operating pressure	1,5 ... 40 bar	0 ... 100 bar	0,2 ... 8 bar	0 ... 414 bar
Operating temperature	-40°C ... 80°C	-40°C ... 90°C	-40°C ... 80°C	-60°C ... 90°C
Protection	IP65, Ex ia, Ex-d, Ex-mb, Ex-md, Ex-me, FM	IP65, Ex-d, Ex-me	IP65, Ex-md, Ex-me, FM	IP68, Ex-d, Ex-md, Ex-me, FM, CSA

Pressure Switches

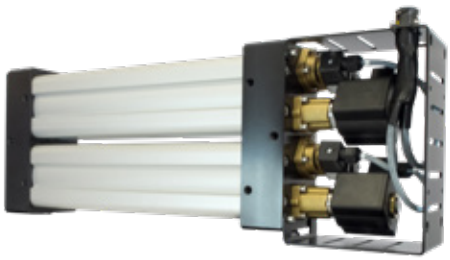
Pressure switches can be used to automatically monitor pressure levels in a pneumatic system or be used for more complex monitoring functions in air, water, hydraulic or any neutral fluid applications.

- High cycle life
- Suitable for a wide variety of pneumatic, allfluid and hydraulic applications
- High accuracy and resolution

Pressure Switches	Electro-mechanical pressure switches	Electronic pressure switches
		
Materials	Aluminium, Diecast Aluminium	Aluminium, Stainless Steel
Sizes	G 1/4" ... G 1/2" 1/2" NPT	G 1/4" 1/4" NPT
Medium	Air, Hydraulic, Allfluid	Air, Hydraulic, Allfluid
Operating pressure	-1 ... 420 bar	-1 ... 800 bar
Temperature range	-55°C ... 85°C	-40°C ... 125°C
Output	ON / OFF	4 ... 20mA, 0 ... 10V

AMT Dryer

Our revolutionary air dryers with patented AMT technology offer outstanding levels of performance and reliability delivering a step change in compressed air applications.



- Twin AMT system for use in high duty applications
- Optional rock guard protects valves
- Service life up to 10 years (30,000 hrs)
- Compact and flexible design which can be mounted horizontally and vertically
- Typical dew point suppression of 40°C

Hydraulic Components

From power packs to large-scale hydraulic units, we can meet even the most complex hydraulic requirements, including one-off models, explosion-proof power packs and multipurpose power packs.

- Integral or external electronics
- Low leakage
- Manual override as standard
- Stable flow characteristics
- Different mounting options
- TÜV type examination certified
- Low power consumption
- Power pack special sizes possible
- Easy retrofit
- 2oo3 block SIL3, TÜV certified, ATEX versions also available

Hydraulic Components	Directional control valves	Pressure valves	Flow control & Check valves	Proportional valves	Safety valves & Press technology	Actuators	Pressure switches	Power packs
								
Function	3/2, 4/2, 4/3	2 & 3- way	Trottle, 2 & 3- way	3/2, 4/2, 4/3	/	Double acting		On request
Connections	Thread, Flange	Thread, Flange	Thread, Flange	Thread, Flange	Thread, Flange	Thread, Flange	Thread	
Sizes	6, 10, 16, 25	6, 10, 25	6, 10, G1/4 - G 1 1/4	6, 10, 16, 25	/	Ø25 ... Ø200 mm	G 1/4"	
Operating pressure	350 bar	315 bar	350 bar	315 bar	315 bar	250 bar	30 bar	
Operating temperature	+70°C	+70°C	+70°C	+70°C	+70°C	-20°C ... 80°C	80°C	

Custom Solutions

Control Cabinets

- Individually designed for your application
- Simplifies installation and commissioning
- Maintenance friendly with enhanced safety and security
- Ideal for arduous environments
- Suitable for ATEX applications

Manifolds

- Simplified system design
- Space saving
- Easy installation
- Reduced leak paths

Control Panels

- Pre-assembled control solutions
- Reduced design and logistics costs
- Reduces inventory holding
- Ready to instal

Custom Products

- Minor modifications through to bespoke design
- Tailored to meet challenging specifications
- Built on high performing pneumatic products

Standard pneumatic cylinders, valves, valve islands and air preparation are also available.

ATEX

In order to apply a single level for health and safety requirements and to overcome barriers of trade within Europe, national regulations for explosion prevention were harmonised in 1975 with the European Frame Directive 76/117/EEC.

The EC-Directive 94/9/EG was valid from 1994 until 2016 and was replaced through the new EU-Directive 2014/34/EU. This Directive is widely known as "ATEX" – which derives from the original working title "ATmosphère EXplosible".

In addition to Directive 2014/34/EU, which is concerned with the requirements of equipment and protective systems another directive – 1999/92/EC exists. This is concerned with the requirements for the erection, installation and operation of systems.

How can explosions occur?

Explosive atmospheres (Ex areas) are prerequisite for an explosion and can be found where a mixture of air, flammable gases, vapours or dusts are being produced, transformed or stored in the presence of oxygen.

Typical sources of Ignition

- Hot Surfaces
- Flames and Hot Gases
- Mechanically Generated Sparks
- Electrically Generated Sparks
- Electro-statically Generated Sparks
- Adiabatic Compression
- Electro-Magnetic Radiation
- Ionising Radiation
- Chemical Reactions
- Ultra-sound
- Flashes

How can an explosion be prevented?

Most important is the prevention of the formation of an explosive atmosphere. If this is not possible, potential sources of ignition must be avoided.

Ignition protection categories

For electrical equipment for use with gases, vapours and mists special design methods are described in comprehensive works standards and are assigned to "ignition protection categories". Several ignition protection categories can be combined in one unit.

The methods of protection with explosive dusts concentrates mainly on the sealing of the housing (IP protection).

Principles and requirements for non-electrical equipment for use in explosive areas are described in the EN 13463-1.

(This standard is only valid until the end of 2019 and is replaced by ISO EN 80079-36.)

Measures that can be taken to reliably exclude potential sources of ignition, depend upon the equipment category required.

In the foreground is usually the consideration of the permissible light metal alloys, electrostatic charge, possible sparks caused by impact or friction and heat due to friction.

Which certificates are required?

A Declaration of Conformity must be provided by the manufacturer for each product. The Declaration of Conformity explains how the manufacturer fulfils all the relevant safety requirements. The CE mark is subsequently attached to the product.

For electrical equipment in Category 1 and 2, an EU Type Examination Certificate issued by a notified body is required. For non electrical equipment an EU Type Examination Certificate is only required for Category 1.

These Declarations of Conformity are also obligatory for non-electrical equipment.

However, if the risk analysis of explosion hazards show that no potential sources of ignition exist, the item does not fall under the ATEX directive in which case a Declaration of Conformity and Ex marking is not required. This may apply to products used in purely pneumatic systems, i.e. for valves, service units, sound absorbers.


-TRANSLATION-

EU – Declaration of Conformity
in accordance with Directive: 2014/34/EU

Equipment: Valve Solenoids
Model series: 46xx

IMI

Referenced normative standards:

Equipment group, Category, Type of protection:

EC-Type Examination Certificate:

EC-Certificate for quality system:

Remark:

Fellbach, May 2016

Norgren GmbH

Engineering Director Continental Europe

i.A.
Authorised Representative
German Region

IMI NORGREN
IMI BUSCHJOST
IMI PAS
IMI HERION
IMI MAXSEAL

Figure 1
EU Declaration of Conformity for valve solenoids


Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin

PTB

EC-TYPE-EXAMINATION CERTIFICATE
(Translation)

(1) EC-type-examination Certificate Number:
PTB 02 ATEX 2085 X

(2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres - Directive 94/9/EC

(3) Equipment: Actuation electro-magnets for solenoid valves, type 46..

(4) Manufacturer: IMI Norgren-Herion Fluidtronic GmbH & Co. KG

(5) Address: Stuttgarter Straße 120; 70736 Fellbach; Germany

(6) This equipment and any acceptable variation thereto are specified in the schedule to this certificate and the documents therein referred to.

(7) The Physikalisch-Technische Bundesanstalt, notified body No. 0102 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive.

The examination and test results are recorded in the confidential report PTB Ex 01-20256 and 02-10167.

(8) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:
EN 50014:1997 + A1 + A2 EN 50018:2000 EN 50019:2000
EN 50028:1987 EN 50281-1-1:1998

(9) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

(10) This EC-type-examination Certificate relates only to the design, examination and tests of the specified equipment in accordance to the Directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate.

(11) The marking of the equipment shall include the following:
II 2 G EEx md IIC T4 or EEx md IIC T5 or EEx md IIC T6 and EEx me II T4 or Ex me II T5 or EEx me II T6 and II 2 D IP 66 T 130 °C

Braunschweig, September 30, 2002

Dr.-Ing. U. Johannsmeier
Regierungsdirektor

sheet 1/15

EC-type-examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt.
In case of dispute, the German text shall prevail.

Physikalisch-Technische Bundesanstalt • Bundesallee 100 • D-38116 Braunschweig

Figure 2
EC-Type examination certificate for a solenoid valve series


ZERTIFIKAT ◆ CERTIFICATE ◆ CERTIFICADO ◆ CERTIFICAT

CERTIFICATE

about the acceptance of the production quality assurance

Certificate number: TPS 14 ATEX Q 678

Product Category: Explosion protected valve solenoids
Equipment-group II, category 2 GD,
Types of protection gases "i", "e", "m" and "d"
Types of protection dusts "t", "i" and "m"

Manufacturer: NORGREN GmbH

Address: Stuttgarter Strasse 120
D-70736 Fellbach

Facility(ies): NORGREN GmbH
Stuttgarter Strasse 120
D-70736 Fellbach

IMI International s.r.o
Evropska 852
CZ-66442 Modřice

TÜV SÜD Product Service GmbH notified body No. 0123 in accordance with Article 9 of the Council Directive 94/9/EC of March 23rd 1994, certifies that the manufacturer maintains a quality assurance for the product, which conforms with Annex VII of the Directive.

This certificate is based upon the Audit Report No. 713039175, issued at 2014-06-26, and is valid until 2017-05-21.

This certificate can be withdrawn if the manufacturer does not longer satisfy the requirements of appendix VII.

The result of the quality assurance re-assessment is part of this certificate.

According to article 10 (1) of the Directive 94/9/EC, the CE-marking shall be followed by the identification number 0123 identifying the notified body, involved in the production control stage.

Office of certification of explosion protection

München, 2014-06-30

U. Jacobs

TÜV SÜD Product Service GmbH · Zertifizierstelle · Ridlerstraße 65 · 80339 München · Germany

TÜV

Figure 3
Certificate for the Quality Assurance System

Prevent explosions with Norgren ATEX approved equipment

As a manufacturer of pneumatic equipment, Norgren offers an extensive range of certified devices in Categories 1, 2 and 3 for use in areas with potentially explosive atmospheres containing gases and dusts:

- Solenoid valves, solenoids (Type of protection Ex m, Ex me, Ex md,Ex d, Ex ia, Ex nA)
- Pressure switches (Type of protection Ex de, Ex nAC)
- Valves, cylinders, (Type of protection Ex c)

Marking of electrical devices in potentially explosive atmospheres

CONDITIONS IN HAZARDOUS AREAS					
FLAMMABLE SUBSTANCES	TEMPORARY BEHAVIOUR OF FLAMMABLE SUBSTANCES IN HAZARDOUS PLACES	SUBDIVISION OF HAZARDOUS PLACES	REQUIRED MARKING FOR INSTALLATION		
			CLASSIFICATION OF HAZARDOUS AREAS	EQUIPMENT CATEGORY	EQUIPMENT PROTECTION LEVEL (EPL)
gases, vapours	is present continuously or for long periods or frequently	zone 0	II	1G	Ga
	is likely to occur in normal operation occasionally	zone 1	II	2G or 1G	Gb or Ga
	is not likely to occur in normal operation but, if it does occur, will persist for a short period only	zone 2	II	3G or 2G or 1G	Gc or Gb or GA
dusts	is present continuously or for long periods or frequently	zone 20	II	1D	Da
	is likely to occur in normal operation occasionally	zone 21	II	2D or 1D	Db or Da
	is not likely to occur in normal operation but, if it does occur, will persist for a short period only	zone 22	II	3D or 2D or 1D	Dc or Db or Da

CE 0123 Ex II 2G Ex ia IIC T6 Gb PTB 07 ATEX 2019 X

TYPE OF PROTECTION	PRINCIPLE OF PROTECTION	APPLICATION	MARKING	MAY BE USED IN ZONE	IEC	CENELEC
general requirements	–	all applications	–	–	IEC 60079-0	EN 60079-0
flameproof enclosure	a propagation of an explosion inside to the outside is excluded	control stations, motors, fuses, switchgear, power electronics	Ex d	1 or 2	IEC 60079-1	EN 60079-1
increased safety	avoidance of arcs, sparks and excessive temperature	installation materials, motors, luminaries	Ex e	1 or 2	IEC 60079-7	EN 60079-7
intrinsic safety	limitation of energy and through that prevention of ignitable sparks	measurement and control, automation technology, sensors, actuators	Ex ia	0, 1 or 2	IEC 60079-11	EN 60079-11
			Ex ib	1 or 2	IEC 60079-11	EN 60079-11
pressurisation	ex-atmosphere can't enter through the overpressure	switch- and control cupboards, analyse-apparatus, computers	Ex p	1 or 2	IEC 60079-2	EN 60079-2
encapsulation	ex-atmosphere can't enter through the potting material	coils of motors or relays, solenoid valves	Ex ma	1 or 2	IEC 60079-18	EN 60079-18
			Ex mb			
oil immersion	ex-atmosphere can't enter through the oil	transformers, relays, control stations, magnetic contactors	Ex o	1 or 2	IEC 60079-6	EN 60079-6
powder filling	an propagation of an ignition inside to the outside is excluded	capacitors, transformers	Ex q	1 or 2	IEC 60079-5	EN 60079-5
non sparking	avoidance of ignitable sparks in normal operation	sensors, solenoids, pressure switches	Ex n	2	IEC 60079-15	EN 60079-15

EXPLOSION GROUP		
MARKING	EXAMPLE	PERMISSIBLE EQUIPMENT GROUP
IIA	propane	IIA or IIB or IIC
IIB	ethylene	IIB or IIC
IIC	hydrogen	IIC

TEMPERATURE CLASS (GASES)			
TEMPERATURE CLASS (GASES)	MAX. SURFACE TEMPERATURE OF THE EQUIPMENT	PERMISSIBLE TEMPERATURE CLASSES OF THE EQUIPMENT	EXAMPLE
T1	450°C	T1 to T6	town gas
T2	300°C	T2 to T6	ethylene
T3	200°C	T3 to T6	gasoline fuels
T4	135°C	T4 to T6	acetaldehyde
T5	100°C	T5 to T6	-
T6	85°C	T6	carbon disulfide

CE 0123 Ex II 2G Ex ia IIC T6 Gb PTB 07 ATEX 2019 X

NOTIFIED BODY FOR THE EQUIPMENT APPROVAL	SHORT NAME	CODE NUMBER	COUNTRY
TÜV NORD CERT GmbH	TÜV	0044	Germany
INSTITUT NATIONAL DE L´ENVIRONNEMENT INDUSTRIEL ET DES RISQUES	INERIS	0080	France
Physikalisch Technische Bundesanstalt	PTB	0102	Germany
TÜV SÜD Product Service GmbH	TPS	0123	Germany
DEKRA EXAM GmbH	BVS	0158	Germany
DEKRA Certification B.V.	DEKRA/KEMA	0344	Netherlands
SIRA CERTIFICATION SERVICE	SIRA	0518	UK
SGS BASEEFA LIMITED	BASEEFA	1180	UK

RESTRICTION FOR USING APPARATUS	
REQUIREMENTS	MARKING
without restriction	–
special condition should be noted	X
Ex-component, which is not intended to be used alone and requires additional certification. CE-Conformity is declared by the manufacturer if the part is fitted into a complete equipment.	U

In dust atmospheres

II 2D Ex tb IIIC T 90°C Db

TYPE OF PROTECTION	MARKING	MAY BE USED IN ZONE	STANDARD
Flameproof enclosures	Ex d	1 or 2	IEC EN 60079-1
Increased safety	Ex e	1 or 2	IEC EN 60079-7
Intrinsic safety	Ex ia	0 or 1 or 2or 20 or 21 or 22	IEC EN 60079-11
	Ex ib	1 or 2 or 21 or 22	
	Ex ic	2 or 22	
Encapsulation	Ex ma	0 or 1 or 2or 20 or 21 or 22	IEC EN 60079-18
	Ex mb	1 or 2 or 21 or 22	
	Ex mc	2 or 22	
„n" type of protection	Ex n	2 or 22	IEC EN 60079-15
Protection by enclosure	Ex ta	20 or 21 or 22	IEC EN 60079-31
	Ex tb	21 or 22	
	Ex tc	22	

Max. surface temperature of the equipment

EXPLOSION GROUP (DUSTS)			Permissible equipment group
MARKING	Type of Dust	Example	
IIIA	combustible flyings	cotton	IIIA or IIIB or IIIC
IIIB	non-conductive dust	grain	IIB or IIIC
IIIC	conductive dust	aluminium dust	IIIC

SIL and IEC 61508 - The international functional safety standard

1. Risk and functional safety

» Safety can be defined as "freedom from unacceptable risk".

» Industrial processes are never completely free of risks. Functional safety can be used to evaluate and reduce residual risk to an acceptable level.

2. Risk assessment

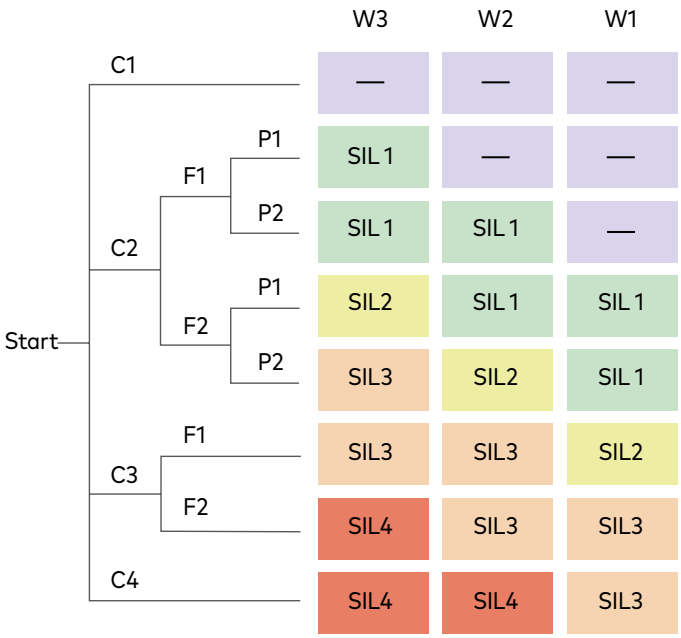
» The risk of an industrial process is evaluated by the plant operator using a risk graph (see picture 1) for example.

» The risk graph rates the possible threat for people and environment and determines the required level of risk reduction.

» This required level of risk reduction is called safety integrity level (SIL). An industrial process with a demand of SIL4 represents the highest hazard level.

Risk-graph and requirement classes according to: IEC 61 508 / 61 511

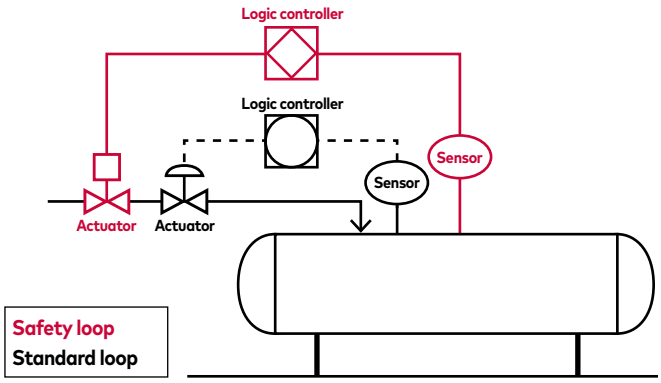
C= Extend of damage
C1: slight injury of a person
C2: severe, irreversible injury of one or several persons
C3: death of several persons
C4: catastrophic implication with many death persons
F= Duration of stay
F1: rarely or more often
F2: frequently up to permanent
P= Hazard prevention
P1: possible under certain conditions
P2: rarely possible
W= Probability with which undesirable incidents happen
W1: very low
W2: low
W3: relatively high
— = No safety requirement



3. Safety instrumented system

- The reduction of the evaluated risk is performed by a safety instrumented system (SIS). The plant manufacturer needs to ensure that all components meet the requirements of the IEC61508 for the respective SIL.
- The SIS needs to be independent from the standard loop and consists of sensor, logic and actuator (see picture 2). Control valves are part of the actuator.
- Norgren developed control valves that are evaluated and certified according to the requirements of the IEC61508.
- These control valves are successfully used in safety instrumented applications since many years.

SIS example: Overfill safety device



4. SIL certification

- All components of the SIS will be evaluated by manufacturer according to the requirements of the IEC 61508 and certified by independent organizations (e.g. TÜV).
- The certification according to SIL covers aspects of systematic and statistical suitability.
- Systematic suitability is proved by a certified product development and quality management process. Potential faults are identified and avoided by FMEAs.
- Statistical suitability is done by confirmation of a low failure probability of the components. This evidence was provided by a long-term test under worst-case conditions and confirmed by field data.
- In the Low Demand Mode (LDM; Safety requirements < 1 operations / year) the probability of failure is stated as Probability of Failure on Demand (PFD). The calculation is based on the failure rate (λ) and the test interval (T).
- In the High Demand Mode (HDM; Safety requirements > 1 operations / year) the probability of failure is stated as Probability of Failure per Hour (PFH). PFH corresponds to the failure rate (λ).
- The achievable level of risk reduction (SIL 1 ... 4) is based on systematic and statistical suitability.
- The control valves developed by Norgren can be used in both LDM and HDM.
- They are certified for service life up to 12 years and meet the requirements for SIL2 as a single-channel design and SIL3 in a multi-channel design of the SIS.

IP-Protection classes International Standard ISO20653 Degrees of protection (IP code)

The international standard ISO20653 describes the degree of protection of electrical equipment against foreign objects, water and access.

The international standard specifies the following:

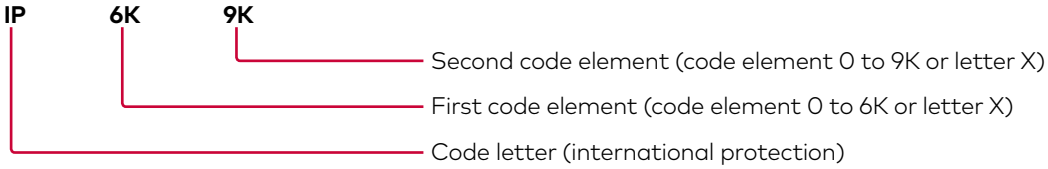
» Designations and definitions of types and degrees of protection provided by enclosures of electrical equipment for the:

- protection of electrical equipment within the enclosure against ingress of foreign objects, including dust (protection against foreign objects)
- protection of persons against access to hazardous parts inside the enclosure (protection against access)
- protection of electrical equipment inside the enclosure against effects due to ingress of water (protection against water)

» Requirements for each degree of protection

» Tests to be carried out in order to confirm that the enclosure complies requirements of the relevant degree of protection

The international standard specifies the following:



(Where no code element is given, the letter "X" shall be substituted.)

The table contains an overview of the IP code elements:

(Extract from the standard)

ELEMENT	IP	MEANING FOR THE PROTECTION OF ELECTRICAL EQUIPMENT	MEANING FOR THE PROTECTION OF PERSONS
First code element	Against foreign objects (including dust):		Against access:
	0	not protected	not protected
	1	with diameter ≥ 50 mm	with back of hand
	2	with diameter ≥ 12,5 mm	with finger
	3	with diameter ≥ 2,5 mm	with tool
	4	with diameter ≥ 1,0 mm	with wire
	5K	dust-protected	with wire
	6K	dust-tight	with wire

ELEMENT	IP	MEANING FOR THE PROTECTION OF ELECTRICAL EQUIPMENT	MEANING FOR THE PROTECTION OF PERSONS
Second code element	Against water:		Not applicable
	0	not protected	
	1	vertical water drips	
	2	water drips (15° inclination)	
	3	water spray	
	4	splash water	
	4K	splash water with increased pressure	
	5	high-velocity water	
	6	strong high-velocity water	
	6K	strong high-velocity water with increased pressure	
	7	temporary immersion	
	8	continuous submersion	
	9K	high-pressure/steam-jet cleaning	

Examples for the use of letters in the IP code:

IP6K9K > protection against dust (dust-tight) and protection against water (high-pressure/steam-jet cleaning)

IPX6 > protection against water (strong high-velocity water)

Lean Manufacturing

Norgren are dedicated to Lean Manufacturing and Continuous Improvement to improve the quality and delivery of our products and customer service by increasing value and reducing waste.

We follow key lean principles to ensure we focus on our customers needs and optimise our products, processes and services to provide the following benefits to our customers:

- Increased manufacturing efficiency
- Reduced unplanned downtime and shutdowns
- Reduced lead times and inventory
- Optimised new product development
- Agile engineering partnerships

Benefits for the customer

- Increase of plant efficiency and life time
- Cost reduction due to less unplanned downtime and shutdowns
- Optimal realization of new product designs — in time, on cost, at quality
- Short reaction- and lead times supporting on time availability of planned and unplanned orders
- Customized transport– and packaging solutions reducing stock receipt time and increase environment protection
- Innovative solutions based on cooperative and agile engineering partnerships