

**Necessary safety requirements  
when using Norgren products****1 General Information**

- Pneumatics has a variety of advantages over other control and driving systems. When being used however, general design guidelines and specific regulations for machines and equipment relating to with pneumatics, (e.g. those complying to DIN 24558, pneumatic equipment) as well as general safety regulations must be complied with.
- When using Norgren products the specifications applicable in each case must be observed, as for example:
  - all necessary Accident Prevention Regulations
  - all the relevant VDI guidelines (in particular VDI 2853 and VDI 3229)
  - all the guidelines, safety regulations and instruction leaflets concerned
  - the relevant DIN standards (e.g. DIN 31000 and DIN 31001)
  - instructions for installation and maintenance for Norgren pneumatic equipment and controls (which are obtainable from Norgren)
  - EG "Machines" guidelines (particular in the area of fluid technology)
  - "General Safety Requirements of Fluid Technology Systems and Components" (CEN Document)
- The products may not be used outside the specified "Technical Parameters" (e.g. pressure and temperature).
- The consequences of a breakdown of a product, e.g., through incorrect operating procedures, ageing or malfunction, should be taken into consideration.
- System designers and the subsequent operators must follow the existing operating guidelines and strictly adhere to the installation and operating instructions.
- System designers must make the end-users aware in the User Instructions that adequate safety measures are to be taken in order to protect people and equipment.
- Norgren must be consulted before using the product with fluids other than those specified, for non-industrial applications, life support systems and other applications outside the published specification list.
- In order to avoid unrestricted movements of equipment components where no displacement limiters are provided, supplementary means must be made available and used.
- Unclean and incorrectly oiled compressed air will shorten the life-span of the pneumatic components.
- Variations in compressed air can lead to irregular functioning of the pneumatic components and hence of the production equipment.
- Improper fitting and improper handling of compressed air appliances can lead to premature failure and can be dangerous.

## 2 Cylinders

- The displacement range of the cylinders, pistons and all the other associated actuations must be safeguarded against to protect equipment. (Recommended guidelines VDI 2853 or DIN 31001)

### 2.1 Single acting cylinders with spring return

- Dismantling of the cylinders should be carried out with the utmost care as the cylinder is pre-stressed by means of the mechanical spring.

### 2.2 Bellow cylinders

- Pneumatic bellow cylinders must not be used outside specified operating parameters.
- To avoid overstretching or excessive movement of the bellows, external stops must be provided.
- A contact-free stroke movement of the bellows with respect to neighbouring components is essential.
- The pneumatic bellow cylinders must not be supplied with compressed air if the edge of the bellows is not completely encapsulated by the end-plates.
- If only two of the four fastening bolts are used, the end-plates must be additionally supported.

### 2.3 Impact cylinders

- Due to the high kinetic energy content in the impact cylinder, precautionary measures must be taken.
- Impact cylinders may only be operated when adequately safeguarded.

## 3 Air valves

- Air valves can have an undefined switching position when switching on equipment. Therefore it is possible that the equipment makes an uncontrolled sudden movement. Care should therefore be taken when switching on equipment.

### 3.1 5/3 wax valves and non-return valves

- When using 5/3-way valves with closed centre position or non-return valves in pneumatic control systems and plants it is to be noted that certain areas of such systems and plants may remain under pressure after they have been shut off and vented. The utmost care should therefore be exercised when carrying out repair work.
- The areas of the system which remain under pressure after being shut off and vented are to be provided with special markings (e.g. "pressure line") in circuit diagrams. It is also highly advisable to provide these circuit diagrams with a special text, e.g.: "WARNING! Due care is to be exercised during repair work to areas marked "pressure line" in this system."

## 4 Air line equipment

- When designing and installing the airfilter appliances make sure that filters are always installed before regulators and lubricators.
- The lubricators of the Olympian series are not suitable for use in "Mistcool" mist coolant systems or lubricating systems for machines (bearings, gears etc.). They are neither suitable as mist lubricators on the output side, nor for operation at full power in reversed flow direction.
- A list of recommended lubricants is available. For certain applications it is, however, more advisable to use only those lubricants which the particular manufacturer produces and specifies for the machines, equipment etc.. Lubricants containing soap or bulk adding agents are not recommended.
- Do not use non-inflammable phosphate-ester-based compressor oils as this causes damage to O-rings, seals and other parts of the Norgren equipment and pneumatics installations.
- Clean the plastic containers of the filters, filter regulators and lubricators with soapy water only. On no account should solvents be used as these destroy the containers.
- Filters designed for manual drainage must be drained regularly, before the fluid reaches the membrane.  
  
To remove the filter element, shut off the compressed air supply (decrease the pressure level in the device - not necessary when a drainage shut-off valve is installed).
- Shut off the compressed air supply prior to replenishing the oil of a micro-mist oiler. It is advisable to install a vent valve up-line of the filter, to enable venting prior to replenishing the oil.



Care should always be taken during installation of pneumatic cylinders and valves to ensure that they are fitted in such a manner that they are protected against dirt, water or other contamination as well against mechanical damage. The environmental temperature for normal cylinders should not exceed 80° C, and the same applies to normal valves. Cylinders fitted with heatresistant seals may be used for temperatures up about 150° C.

### Installation of the cylinders

In order to prevent premature wear of the seals and piston rod bearings, the cylinders must be carefully aligned during installation. It is absolutely imperative that should be no forces acting at right angles to the cylinders axis. A wiper is fitted in the bearing to prevent dirt penetrating into the cylinder. If a cylinder is employed in a dirty environment (cement dust, residues from flame-cutting operations etc.) it is advisable to provide special protection for the piston rod (a bellows sleeve may be used). Every cylinder is authorized for a certain maximum working pressure which may be exceeded. Adjustable cushions are fitted in both ends of the cylinders. When installing a cylinder care should be taken to ensure that the cushions adjusting screws remain easily accessible, so that the cushions can be adjusted at any time to suit the working conditions.

### Installation of valves

Main control valves, i.e. valves which control reversal of cylinders, should be installed as close to the cylinders as possible in order to eliminate unnecessary air consumption. Under no circumstances valves serving as limit switches may be used as stops.

### Routing of pipework

Pipework in the main supply network in the plant should be installed at a slightly inclined angle. Long runs should be alternately inclined downwards and upwards. Any condensate water then collects at the lowest points in the pipework. At such points a pipe should be fitted leading

vertically downwards to a small condensate receiver. The latter should be emptied from time to time. An automatic drain valve will do this automatically if fitted in place of a condensate receiver. Branches leading from the main line

to consumption points should be installed pointing vertically upwards and then curving downwards. Do not use bends of too small radius. Carefully blow out all pipes before installing them, so as to remove any dirt and chips. Do not hemp for making seals! Liquid sealing agents or, still better, sealing tape (Fluflex or Diring) ensure that contamination, such as fibres when hemp is used, does not get into the pipework.

### Maintenance

As a rule Norgren cylinders and valves require hardly any maintenance. All seals (o-rings and packing-rings) are made of synthetic, oil-resistant rubber. However, the condition of the compressed air determines the life of the installation. For this reason the air used should be treated so that it is suitable for the purpose in the interests of long life. Clean air, free of water and containing oil fog, ensures long service life for the equipment. A filter with water separator incorporated in the line removes small particles from the air and separates out water. The condensate

collects in a receiver mounted on the filter and should be drained off from time to time. If an automatic drain valves is mounted on the filter it is absolutely certain that it will not be forgotten to drain off the condensate. The cleaned

air now has to have oil added to it. Every engineer knows that sliding parts have to be lubricated and therefore provides lubrication for bearings and other moving parts. In a cylinder, too, the piston and piston rod slide, and the slides in the valve also move. It is very often not considered necessary to lubricate such parts- and then the penalty is paid in the form of premature wear of packings and bearing. In order to lubricate a pneumatic control system properly a lubricator is installed in the air line; this lubricator saturates the compressed air with a fine fog of oil droplets. These droplets remain suspended in the air and are carried to the lubricating points in the cylinders and valves. The size of lubricator selected depends on the volume of air flowing through the line and NOT on the consumption. One must differentiate between consumption per unit time and rate of flow per unit of time.

### And now an example

Lubricators have a wide flow range, but care must still be taken to match the size of lubricator to air flow, and it is important to distinguish between consumption and air flow. Thus if a circuit consumes 5 cubic feet of air per cycle and this cycle occupies 10 seconds and occurs once every two minutes, the average consumption is 2 ½ cfm but the rate of flow is 30 cfm when calculating the capacity of lubricator required. We recommend the following grades of oil for use in the oilers:

Shell Oil	Tellus C32	Fa. Shell
Aral Oil	Vitam DE32	Fa. Aral
BP Oil	Energol HLP32	Fa. BP
Esso Oil	Nuto H32	Fa. Esso
Mobil Oil	D.T.E. Oil Light	Fa. Mobil Oil

or corresponding oils of other makes.

The micro-lubricators are suitable for oils with a viscosity from 20 to 200 cSt at an operating temperature of 20° C. Lighter oils should not be used, as in most cases an excess of lubrication.

In terms of the Machinery Directive 2006/42/EC, the Norgren device is a component.

It is neither a machine nor an incomplete machine according to the Machinery Directive 2006/42/EC.

A CE marking is not permitted. The optionally available CE mark on individual components are allowed in accordance with the Directive, as e.g. CE marking on solenoids within the purpose of the Low Voltage Directive 2006/95/EC

The component is to be used in the aforementioned technical limitations. These have been established in coordination with the client and sent in a proposal by Norgren. If the offer is not contradicted, it is the case on behalf of the basis for the design, production and delivery of the component. The putting into service of machinery within the meaning of this Directive can relate only to the use of the machinery itself for its intended purpose or for a purpose which can reasonably be foreseen.

Assuming that the present component is installed in a machine, commissioning of the machine is prohibited until it was determined that the machine corresponds to the EC Machinery Directive 2006/42/EC. Commissioning is prohibited until the conformity has been found on the machine operator side in accordance with EU Directive 2009/104/EC and the are national occupational health and safety regulations were observed. In Germany this is including the Employment Law (ArbSchG).

A manual is not created. The technical data for the individual devices given in technical datasheets are valid as well as the boundaries of the component are described in the "Technical data sheet". The interfaces are defined in the "Technical data sheet".



We draw your attention to the "Operating Instructions for fluidic Assemblies" and the Norgren "Safety Requirement" concerning to the Operating manual.



The safety instructions must be observed by all persons who work on pressure devices. Additionally, it will be necessary to observe the accident prevention regulations valid in the operator's country and at the place of installation together with the approved rules of engineering practice concerning correct safety and work procedures.

All persons carrying out the installation, commissioning, maintenance or repair of pressure devices on the operator's premises must have read and understood these instructions for installation and operation.

The instructions should be permanently available at the place of installation.

## Warning

These products are intended for use in industrial compressed air systems only. Do not use these products where pressures and temperatures can exceed those listed under 'Technical Data'.

Before using these products with fluids other than those specified, for non-industrial applications, life-support systems, or other applications not within published specifications, consult **NORGREN**.

Through misuse, age, or malfunction, components used in fluid power systems can fail in various modes.

The system designer is warned to consider the failure modes of all component parts used in fluid power systems and to provide adequate safeguards to prevent personal injury or damage to equipment in the event of such failure.

**System designers must provide a warning to end users in the system instructional manual if protection against a failure mode cannot be adequately provided.**

System designers and end users are cautioned to review specific warnings found in instruction sheets packed and shipped with these products.

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**1 General****1.1 Preliminary notes**

Norgren pressure devices are precision products of high quality.  
All procedures from design through manufacture to final inspection are subject to the strict criteria of our quality control.

**1.2 Scope**

These "General Operating Instructions" solely refer to Norgren GmbH pressure devices. Pressure devices are identified by specification plates, manufacturer information, or by inscriptions on pressure parts. Pressure devices in this sense are cases, piping, maintenance equipment, valves, pneumatic drives as well as control cabinets, control panels, and valve groups.

**2 Basic safety information****2.1 Information in the operating instructions**

This manual contains the most essential information for operating pressure devices safely.  
The safety instructions must be observed by all persons working on the pressure devices. The regulations concerning accident prevention in the country of their use and place of their installation as well as the recognised rules for safe and professional operation apply.

**2.2 Obligation of the operator**

The operator is obligated to only permit persons to work on the pressure devices who are familiar with the essential regulations on work safety and accident prevention and who have permanent access to these regulations.

Each person must have read and understood the operating instructions.



Assembly, start-up, maintenance and repair are only to be performed by qualified persons with appropriate training and practical experience in the operation of electrical and pneumatic equipment and its associated systems.

Training in the function is required.

All safety and hazard instructions are to be kept in legible condition at all times and be available to operating staff at any time.

**2.3 Obligation of the staff**

All persons assigned to installing, operating and maintaining pressure devices must be familiar with the contents of the operating instructions and must have understood them. The regulations for work safety and accident prevention are to be observed.

## 2.4 Hazards in working with pressure devices

In comparison to other control and drive systems, pneumatics offer many advantages. In operation, however, general guidelines must be observed according to DIN 24558 (Pneumatic Equipment) and specific regulations for machines and equipment associated with pneumatics as well as general safety regulations.

Please refer to the Norgren safety information as well as the operating instructions and data sheets of individual components.

## 2.5 Intended use

To function safely, pressure devices should be used within their operating limits so that operating pressure, operating temperature, flow rate, admissible fluids and other relevant operating conditions are observed.

With preinstalled pressure devices the parts lists, illustrations and terminal diagrams that concern the function must be observed.

Inspection and maintenance work must be carried out as prescribed.

## 2.6 Warranty and liability

The Norgren "General Sales and Delivery Conditions" apply.

These are made available to our customers from the time of signing the contract at the latest.

## 2.7 Machine control

No program changes should be made.

Only trained staff are permitted to operate the controls.

## 2.8 Pressure energy hazards

Before activating the pressure device verify that no persons are endangered by the start-up of the pressure device.



System sections and pressure pipes that can be opened should be checked for pressure before beginning any operations and should be deaerated if necessary.

Flexible tubing should be examined and replaced at legally defined intervals even if no visible safety defects can be established.

## 2.9 Electrical energy hazards

Work on electrical components, display and control units as well as actuation solenoids may only be performed by a qualified electrician.

Electrical equipment of the units should be examined regularly.

Loose connections and damaged cables must be replaced immediately.

Switching cabinets or electrical (sub-)assemblies must be kept locked at all times.

Access is only permitted for authorised personnel with a key or tool.

## 3 Storage and transport

The products are carefully checked at the manufacturer and released to the carrier in perfect condition.

Examine the goods for visible defects and, if necessary, insist on registering a corresponding indication on the delivery form.

Inform the carrier without delay and have an evaluation carried out by an expert. The manufacturer cannot be held responsible for damage during transport.

All parts must be stored in temperate spaces, properly packaged, free of dust, dry and safely enclosed.

Only use suitable packaging.

Never use solvent-containing cleaning agents.



#### **4 Technical data**

For all technical data please refer to the product-specific data sheets.

#### **5 Installation, assembly, start-up**

Before installation the details on the device's specification plates should be compared with the operating conditions provided in order to assure intended operation.



Pressure devices should only be secured via the fixing holes or mounting eyes intended for the purpose.

For installation, maintenance or repairs, the corresponding Ex directives, in particular EN 60079-14 and EN 50281-1-2, should be observed.

In addition, electrical installation should only be performed in compliance with relevant national regulations (VDE 0100 in Germany) by an qualified electrician or a person supervised by the former.

Before start-up it must be ensured

- that all components are in perfect condition, that the air pressure hoses and cables are attached correctly to their screw connections and
- that the screwed pipe fittings are tightened,
- that pressure lines are arranged free of kinks and strain,
- that electrical connections follow the corresponding terminal diagram,
- that no person can be injured by the movements of the unit whenever compressed air and electrical current are supplied
- and that no damage to unit components can result.

#### **6 Maintenance and repair**

The operating staff and users of pressure devices or systems have to be informed of the shutdown before commencing any work.



For all maintenance, inspection and repair work the associated equipment is to be completely disconnected and the main switch secured against unintentional restart.



Before commencing maintenance and repairs it must be ensured that compressed air lines and devices are deaerated.  
Stop valves must be closed.



It must be ensured that during maintenance and repairs an unintentional inflow of compressed air is prevented.  
The compressed air supply must be safely turned off.



All operating fluids for controlling the pressure devices or equipment that are connected upstream or downstream such as compressed air and hydraulics must be secured against unintentional rises in pressure.



Loosened and replaced tubes and piping as well as electrical connections must be checked for correct seating.