Assembly instructions for hydraulic cylinders according to Annex VI Machinery Directive 2006/42/EC

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When assembling the partly completed machinery

(Product designation) Hydraulic cylinder, **(type designation)** see labelling, **(year of manufacture)** see labelling,

the following conditions must be met so that it can be properly assembled with other parts to form a complete machine without jeopardising the safety and health of persons:

1. General information

- Requirements and measures based on DIN EN ISO 4413 (General rules and safety requirements for hydraulic systems and their components). The relevant safety regulations must be observed during use. In particular, measures must be taken to ensure that no danger to persons or property can arise in the event of a defect. If there are indications that the Schema-Hydraulik product or its components are not working properly, it must be taken out of operation immediately and secured against unauthorised use.

1.1 Safety instructions for the use of hydraulic cylinders

- They are always intended for installation in a machine or partly completed machine in accordance with Machinery Directive 2006/42/EC.
- Installation and commissioning may only be carried out properly by instructed and trained persons.
- Installation may only be carried out by trained specialists. Sharp edges, sharp corners or similar may pose a risk to persons. Personal protective equipment must always be worn.
- Inadequate operational protective measures or ignorance and/or carelessness may result in personal injury, property damage and environmental damage.
- The movements of the piston rod can cause injuries. Potential crushing and clamping points must therefore be avoided by the operator, if possible by design

1.2 Intended use

- Hydraulic cylinders in a wide variety of designs are used to generate a linear movement using hydraulic energy. Any other use or use beyond this is considered improper and is therefore not permitted.
- The hydraulic cylinder may only be used for its intended purpose within the specified limits. Please observe any notes on the drawing applicable to the product or on the data sheet applicable to the product.
- Hydraulic cylinders must not be used as a structural element or with a rotating piston rod unless this is expressly permitted in the specific product documentation.

2. Information on safe assembly / disassembly

2.1 Accessibility and installation position

- The system must be designed and constructed in such a way that hydraulic cylinders and attachments that require adjustment or maintenance are arranged in such a way that they are easily accessible and can be safely adjusted and maintained. Particular attention must be paid to bleeding and replacing the hydraulic cylinder.
- The user should take measures to minimise the loss of fluid when removing or completely dismantling the hydraulic cylinder. The surface must be designed in such a way that any leaking hydraulic oil can be collected and not released into the environment.

Caution: There is a risk of slipping if hydraulic oil is leaking.

2.2. Permissible load direction

- Hydraulic cylinders are actuating elements and not guide elements.
- Loading of the piston rod by lateral forces must be avoided.
- The user must ensure that the hydraulic cylinder is preferably mounted so that the load acts axially on the longitudi nal axis of the cylinder

3. Installation / Commissioning

- It must be ensured that
  - all components attached to or connected to the hydraulic cylinder are fastened in such a way that they resist loosening due to shocks or vibrations during operation.
  - Pressure fluctuations and pressure peaks are avoided by taking suitable measures to prevent the rated pressures from being exceeded due to differences in piston surface area.
  - The material and surface treatment of piston rods and other components on the cylinder are selected to minimise wear, corrosion and foreseeable damage caused by impact.
- The hydraulic supply lines and pipe connections must be checked regularly by the user and replaced if necessary. Screw connections should only be loosened when depressurised.
- The surface of the hydraulic cylinder and the attached components can reach temperatures that can cause burns.
- The operating temperature range must not exceed the specified limit values up to which the system and all compo nents can be used safely.
- The bolts or screws used for fastening and fixing parts on the machine must at least withstand the cylinder forces generated.
- In general, the safety requirements of the entire system must always be taken into account. These have priority over those of the installed systems and parts, should there b e any overlaps.
- If applicable, safety regulations and factory specifications must also be observed.
- There is an increased risk potential for machines that are currently under construction and are being put into operation for the first time. Important protective devices are often not yet in place or not yet activated. Similarly, protective devices are not always effective during maintenance and repair work

3.1 Checks before and during operation

- The user is obliged to carry out a regular visual inspection for the following before and during operation:
  - visible leakage
  - Abraded areas
  - loose components
  - Noise development
  - loose screw connections
- The user must constantly subject the hydraulic system to a combination of inspection and testing to ensure that
  - the system and its components correspond to the system description
  - the connections of the components in the system correspond to the circuit diagram
  - the system, including all safety components, is functioning properly and
  - no measurable, unintended leakage - other than a quantity of liquid insufficient to form a drop - occurs after the system has been pressurised to either the maximum operating pressure or the pressure specified by the manufacturer

3.2 Commissioning

Before commissioning the system, it is essential to ensure that

- all hydraulic lines are fully connected.
- the specified maximum pressure is not exceeded, even during pressure peaks. Furthermore, the special instructions on our drawings, data sheets, calculations and order confirmations regarding piston speed, temperature range, buckling load of the piston rod, etc. must be observed.
- the correct oil has been filled in.
- Before intervening in the hydraulic circuit, always ensure that the hydraulic system is switched off, secured against being switched on again and depressurised (be careful with pressure accumulators).

3.3 Venting

Safety instructions:

Filling the lines and consumers, especially hydraulic cylinders, requires the utmost care. The main hazards here are

- sudden machine movement

- Rapid or jerky movement due to air in the cylinders and/or in the hydraulic system
- Compressed air that acts as an energy store
- Oil spraying out due to inadequately fitted screw connections

The correct procedure for safely bleeding a system depends on various factors. The best possible procedure can often only be determined on site. The experience of specialised personnel is essential her

3.3.1 Venting a cylinder

- Cylinders must be vented before commissioning.
- Proper venting can only be achieved if the venting points are located at the highest points of the cylinder.
- venting is carried out by several empty strokes without load.

Various venting options may be available, depending on the cylinder design. Venting can be carried out by opening or loosening the venting
- venting screws provided for this purpose or
- The cylinder must be installed with the base or rod connection fittings.
- The cylinder may have to be installed filled with oil.

If this is not possible:
- If bleed screws are present, open them approx. 2 turns until only bubble-free oil escapes from the gap. Then retighten the screw to the required tightening torque.
- If no bleed screws have been fitted, bleeding must be carried out via the connection fittings on the base and rod side, as described above.

If there is still air in the cylinder, this process must be repeated until the air has been bled without any problems. Then allow the cylinder to extend and retract 3-5 times while idling at low pressure.

Caution:
- After bleeding the system, there will inevitably be air in the oil (formation of bubbles or foam). Switch off the hydraulic pump and only switch it on again when the air has been removed from the oil. This may take some time.
- Collect any leaking hydraulic oil.
- Protect persons wearing personal protective equipment from escaping oi

4. Operating condition

The hydraulic cylinders produced by Schema Hydraulik GmbH are designed for operation with mineral oil-based hydraulic fluids DIN 51524 Part 2. Depending on the operating temperature, the viscosity range should be between ISO VG 22 and 68. The sealing elements are suitable for operating temperatures from -20°C to +80°C. Other pressurised fluids can be used if appropriate sealing elements are installed and appropriate materials are used. In such cases, however, consultation with Schema Hydraulik GmbH is required.
During operation, the permissible pressure and the permissible operating temperature must be observed. In addition, the maximum permissible piston speeds for the seals used must not be exceeded.
The purity of the medium has a major influence on the service life of the cylinder. We therefore recommend reliable filtration of the pressure medium.
We recommend adhering to the purity classes (21/18/15) for hydraulic fluids in accordance with ISO 4406. The cleanliness class is based on the most sensitive component in the system. In addition, the proper overall condition of the pressure medium must be checked.

5. Storage recommendation

Requirements for the storage room:
- Dry and dust-free
- Free from corrosives and vapours

For storage longer than 6 months:
- Fill hydraulic cylinders with preservative oil and seal.