Operating Instructions

(incl. assembly instructions according to EC Machinery Directive 2006/42/EC, Annex VI for partly completed machinery)

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Attention:

This translation is only for support and is not an official manual. Only the German manual is an official document.

CE

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1. Important general Information

According to the EC Machinery Directive 2006/42/EC, hydraulic cylinders are incomplete machines that are not ready for use and intended exclusively for installation in a machine or system.

The incomplete machine may only be put into operation after it has been clearly established that the machine or system into which the incomplete machine is to be installed complies with the provisions of Directive 2006/42/EC on machinery and that the EC declaration of conformity has been issued in accordance with Annex II A.

The operating instructions serve to provide information and prevent hazards during the installation of the hydraulic cylinders in the machine, as well as provide information and guidance for transport, storage, and maintenance of the hydraulic cylinders. Only by strictly following the instructions can accidents and property damage be avoided and a tension-free operation of the hydraulic cylinders be ensured.

All persons who work on and with hydraulic cylinders must have the instructions available during their work and must observe the information and instructions relevant to them.

1.1 Responsibilities

1.1.1 Responsibilities of the Machine Manufacturer

This operating manual does not replace the operating manual to be prepared by the machine manufacturer, which regulates behaviour during operation to prevent accidents, protect health and the environment. It serves only as a basis for the preparation of the operating manual for the entire machine.

All operator-relevant information in this operating manual must be reasonable integrated into the operating manual for the entire machine.

1.2 Legal Notices

Any warranty will be voided in the event of damage resulting from non-intended use or failure to non-compliance with the conditions described in this operating manual.

1.3 Documentation

The currently valid sectional drawings and spare parts lists as well as the supplier documentation in the appendix is to be be considered as documentation.

1.4 Service Address

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1.5 Warning Notices

Warning symbol	Description
	Indicates an immediately impending danger that will result in death or serious injury if not avoided.
	Indicates a potentially hazardous situation that will result in death or serious injury if not avoided.
	Indicates a potentially hazardous situation that will result in minor or moderate injury if not avoided.
	Indicates a potentially hazardous situation that will result in property or environmental damage if not avoided.

2. General Information

Before commissioning the hydraulic cylinders, the following instructions must be observed. For special cylinders, please refer to the installation drawings for additional information.

3. Safety Instruction

A hydraulic cylinder is designed to move loads. Please observe the following requirements.

3.1 General Requirements

	Installation must be carried out by a specialist.
	The operating pressure must be protected against exceeding the permissible operating pressures by a pressure relief valve.
	Improper use may result in crushing hazard between rod eye and cylinder head or when swiveling movable hydraulic cylinders.
	Always ensure the highest level of cleanliness.
	Welded or hot-formed pipes must be pickled, metallized, flushed and oiled.
	DIN 24346 / ISO 4913 for hydraulic safety of machines must be observed.
	For double-acting cylinders, the possible pressure increase must be checked.
	The hydraulic cylinder may only be operated in technically flawless condition.
	The intended use, performance data and operating conditions must not be modified.
	The hydraulic cylinder may only be operated with the permissible parameters.
	Hydraulic cylinders are designed as actuating elements and must never be used as structural elements in an application.

3.2 Requirements for Personnel

	Installation, commissioning, and inspection of the hydraulic cylinder must only be carried out by specialists with sufficient hydraulic expertise. A specialist is defined as someone who → has relevant vocational training and experience, as well as knowledge of the function and structure of hydraulic components. → is capable of reading and fully understanding technical specifications such as circuit diagrams and drawing documents. → is able to identify potential hazards. → is able to take necessary measures to eliminate hazards.
	Repairs may only be carried out by the manufacturer or by personnel authorized by the manufacturer.

4. Intended Use

4.1 Hydraulic Cylinder and Pressure Intensifier

4.1.1 Intended Use

	The hydraulic cylinder is to be used exclusively to generate linear movement through hydraulic energy.
	The pressure intensifier is to be used exclusively to generate a secondary pressure through hydraulic energy.
	The hydraulic cylinder or pressure intensifier is to be used exclusively for installation in a machine or incomplete machine in accordance with the Directive 2006/42/EC on machinery.
	The hydraulic cylinder or pressure intensifier is to be used only within the specified limits.
	The instructions in the product documentation are to be followed.

4.1.2 Improper Use

	Do not use the hydraulic cylinder → as a structural element, e.g., as a guiding element → with a rotating piston rod → Exception: The corresponding use is explicitly permitted in the special product documentation.

5. Function

5.1 Hydraulic cylinder and Pressure Intensifier

Hydraulic cylinders are available in various designs and are intended for generating linear movement through hydraulic energy. Hydraulic cylinders are intended solely for industrial use and are designed to be incorporated or assembled with complete or incomplete machines or equipment.

Pressure intensifiers are used to generate a secondary pressure in a pressure chamber that is acted upon by the extending piston rod of a hydraulic cylinder. A pressure increase factor is obtained through the area ratio.

6. Transport

	Please pay attention to the following points when transporting ACONA-Hydraulik products: → Transport ACONA-Hydraulik products in their original packaging. → Clearly label hoses and hose connections. → Close unprotected openings (such as connections) properly during transport. → Protect threads during transport. → Protect functional surfaces (such as valve mounting surfaces) during transport. → After receiving the ACONA-Hydraulik product, immediately check external threads and functional surfaces for damage.

6.1 Transport with Lifting Equipment

	It is strictly prohibited for people to be underneath suspended loads.
	Danger to life from breakage of the transport eyelet due to weight overload. → Ensure that lifting with transport eyes on the ACONA-Hydraulik product is only carried out properly by trained professionals.
	Maintenance intervals for lifting equipment must be observed. Used load hooks and lifting equipment must be externally checked for material defects before use. Load hooks and lifting equipment must be designed to handle the load and used by trained professionals. The maximum load must not be exceeded.
	Lifting equipment must be attached to the hydraulic cylinder in such a way that the cylinder is not damaged.
	Damage to equipment may occur due to the force of the lifting equipment on attachments (connection plates, piping, etc.) during lifting. → Attach lifting equipment (load chains, lifting straps) to the ACONA-Hydraulik product in such a way that they are exposed during lifting, i.e. not leaning against attachments.

6.2 Lifting with Transport Eyes on the Hydraulic Cylinder

	Attach suitable transport eyes to the closures in the withdrawal thread (axial) or transport thread (radial).
	Use oil connections for transport screw if necessary.
	Attach suitable lifting equipment (load chains, lifting straps) to transport eyes on the ACONA-Hydraulik product.

6.3 Lifting with Lifting Straps (if no Transport Eyes are available)

	Attach two equally long lifting straps to both ends of the hydraulic cylinder tube using by using loops.
	The permissible load capacity of the lifting straps as well as maintenance intervals must be observed.
	Ensure that the cylinder is not lifted on attached components such as mounting plates, oil pipes, or sensors

7. Conservation und Storage

	After the initial opening of any sealed cylinder compartment upon delivery, the complete responsibility of ensuring further conservation falls on the operator. Moisture entry into the system must be prevented under all circumstances.
	Hydraulic cylinders must be stored, even for short periods of time, in a closed space that is dry, free of dust as well as corrosive substances and fumes. Upon request, a factory-level conservation can be carried out for safe and/or extended storage. Oil filling is recommended.
	Hydraulic cylinders must be secured before storage, so that movement without external influences is not possible.
	External surfaces that are not painted must be appropriately conserved during storage.
	For storage longer than 6 months, hydraulic cylinders should be stored with oil filling (conservation oil). After the respective storage time of 6 months, rotate the cylinder 180° around the cylinder axis.
	If the storage time does not exceed 12 months, the hydraulic cylinders can be filled with the fluid intended for use as a pressure medium. Exceptions are non-flammable liquids, which are not allowed for conservation over extended periods.
	The piston rod thread and the free end of the piston rod as well as the joint bearings should be lubricated with a corrosion-protective grease for long-term storage. Oil companies offer appropriate products for protection against rust and corrosion.
	Hydraulic cylinders must be properly sealed before storage. Improper storage can result in oil leakage, which can cause the following hazards: → Environmental pollution → Fire hazard due to leaked oil → Slip hazard
	Regular visual inspection of the cylinders for oil leakage is necessary.
	Cylinders must be protected from permanent exposure to sunlight.
	Connections must be sealed airtight.

8. Installation and Assembly

	Before commissioning, the hydraulic cylinder must be vented. → Ensure that the vent screws are located at the highest point of the cylinder. → Ensure that the cylinder chamber in question is under low pressure (approximately 20 to 50 bar). → Open the vent screw by approximately one to two turns. → The vent screw is designed to allow air and oil to escape without completely removing it. → When bubble-free oil emerges from the gap: • Tighten the screw. • Follow the tightening torque. → If there is still air in the cylinder: • Repeat the venting process until there is no more air in the cylinder. → After complete deaeration: • Run the cylinder slowly three to five times in idle mode under low pressure.
	The pipe or hose system must be flushed with the operating medium before connecting the hydraulic cylinder. → Place flush plates as close as possible to the consumer (e.g., hydraulic cylinder, valves). → Connect P and T lines. Ensure that consumers are not filled during flushing.
	The mounting screws must be tightened by specialist personnel according to the drawing.
	The connection of all hydraulic lines and valves must be carried out by a specialist according to the appropriate instructions. The installation of the hydraulic cylinder must follow the hydraulic circuit diagram.
	The valves used must be tested before assembly.
	The transport lock prevents unintentional extension of the piston rod. It must be properly installed or removed.

To prevent dirt from entering, the closure plugs of the connections must be removed only immediately before connecting the piping.

The hydraulic cylinder must be mounted without tension. Without further instructions, all hydraulic cylinders are generally to be operated without transverse forces. If a transverse force load cannot be excluded in proper operation, this must be explicitly communicated to the manufacturer with all other technically relevant information.

The technical specifications of the hydraulic cylinder explicitly state the load capacity for transverse forces. It is not permissible to use the product in a manner other than intended.

9. Commissioning

	Danger of life due to excess operating pressure. → The pressure in the hydraulic cylinder must not exceed the specified maximum pressure.
	Completely remove the preservatives. → Ensure that sealing elements are not bonded by preservatives.
	Use hydraulic oils according to our oil recommendations. → All ACONA-Hydraulik cylinders are suitable for HLP mineral oils according to DIN 51524. → Further information can be found in our oil recommendation. Other pressure fluids on request. → The maximum temperatures recommended by the manufacturer of the pressure fluids must not be exceeded. → Reliable filtration increases the service life of hydraulic cylinders. Operation with unfiltered oil is not permitted. Please note the recommendations for the maximum permissible degree of contamination of the pressure fluid. According to ISO 4406, this is 19/16/13 for hydraulic cylinders.
	Depending on the cylinder type, the hydraulic cylinder is equipped with or without adjustable end position damping. The end position damping can be adjusted after loosening the lock nut on the throttle check valve. Please note that the end position damping can only be effective if the stroke is fully utilized. Adjust hydraulic cylinders or pressure intensifiers with adjustable end position damping as follows: → To increase damping: • Turn the adjusting screw to the right. • Secure the adjusting screw with a lock nut. → → To reduce damping effect: • Turn the adjusting screw to the left. • Secure the adjusting screw with a lock nut.
	Installed valves are pre-adjusted at the factory and may only be changed by a specialist.
	The connection assignment for displacement transducers and inductive proximity switches can be found in the respective data sheet.

10. Operation

The following instructions must be observed for the operation of our hydraulic cylinders.

	If not specified otherwise, the following operating conditions must be observed: → Operation with hydraulic oils according to DIN 51524 with ISO VG 32 to VG 68 → Use in moderate climatic zones → Use in covered areas → Relative humidity < 70% → Ambient temperature -15 °C to +80 °C → Operating temperatures for sealing elements: -15 °C to +80 °C If other media (e.g. water, water emulsions, non-flammable liquids, or others) are used or different ambient or operating temperatures are expected: → Consult with ACONA-Hydraulik for the use of hydraulic cylinders or pressure intensifiers under the changed operating conditions.
	Recommended cleanliness classes according to ISO 4406: → For hydraulic cylinders or pressure intensifiers with normal sealing elements (cylinders with a sealing ring and scraper): cleanliness class 19/16/13.
	To ensure safe long-term operation of the hydraulic cylinders, the entire system must be flushed and the medium must be filtered according to specifications. If the cylinders fail due to unauthorized foreign particles in the system, the warranty provided by ACONA-Hydraulik is void.
	The hydraulic cylinder must be visually inspected for material failure and leaks regularly when installed. Sealing elements must be replaced before the end of their service life.

10.1 Potentially hazardous Areas

	Persons under suspended loads are generally prohibited.
	If possible, take appropriate design measures to avoid burns.
	Potential crushing and clamping points on the operator side are to be protected, if possible, by fixed separating protective devices.
	Secure danger zones with safety guard.
	Perform separating protective devices in accordance with the requirements of EN ISO 14120.

10.2 Unexpected Start

	Prevent malfunctions or unexpected start-up due to control or circuit failure through appropriate hardware.
	Ensure controlled restart in case of defective output of the system controller or system control.
	Ensure that the system controller or system control returns to the initial position and waits for release in the event of unexpected start-up.

10.3 Uncontrolled Movement or Blockage of the Piston Rod

	Take appropriate measures to prevent uncontrolled, jerky movements or blockage of the piston rod in case of faulty regulation or control.
	Take appropriate measures to prevent uncontrolled movements or faulty feedback in case of breakage of control lines from sensors or valves.
	Ensure that all outputs are free of tension in case of power failure.

10.4 Emergency Stop

	Take appropriate measures in the emergency stop system of the hydraulic system to prevent hazards from the hydraulic cylinder.

10.5 Compressive Strength

	Pressure peaks above the design pressure lead to destruction of the hydraulic cylinder or at least a reduction in fatigue life, depending on the magnitude of the pressure increase. The operator of the hydraulic cylinder monitors and documents the operating pressure and compliance with the maximum permissible pressure. Any pressure increase above the maximum permissible pressure will immediately invalidate the warranty.
	Design all parts of the hydraulic system and hydraulic cylinder or pressure intensifier to withstand pressures that are → higher than the maximum operating pressure of the hydraulic system or component. → exceed the rated pressure of the hydraulic system or component.
	Ensure that pressure surges and pressure fluctuations do not cause hazards.

10.6 Pressure Loss/Pressure Fluctuations

	Ensure that pressure loss or critical pressure drop does not pose a hazard to people or damage the machine.
	Avoid pressure fluctuations that lead to exceeding the rated pressures through appropriate measures.

10.7 Fastenings

	Design the fastenings of the hydraulic cylinder or pressure intensifier so that → excessive deformation of the hydraulic cylinder or pressure intensifier due to compressive or tensile loads is minimized. → introduction of lateral or bending loads is excluded. • If lateral loads cannot be avoided, this must be coordinated with ACONA-Hydraulik, and their maximum permissible values must be available. Exceeding these values is not permitted. → the maximum permissible lateral forces act on the piston rod. → the piston rod is guided parallel to the cylinder axis. → the load acts axially on the axis of the piston rod of the cylinder.
	Design fastening surfaces in such a way that twisting of the hydraulic cylinder or pressure intensifier in the installed state is avoided.

	Mount fixing screws for hydraulic cylinders or pressure intensifiers and attachments in such a way that they can withstand all foreseeable forces.
	Ensure that mounting screws can withstand tilting moment.
	Consider the maximum expected loads and pressure peaks.
	If the hydraulic cylinder or pressure intensifier is used as an end stop, design the mounting parts in such a way that they can safely withstand all occurring loads.
	Avoid clamping the hydraulic cylinder or pressure intensifier through mounting surfaces.
	Consider pressure and temperature expansions.
	In case of articulated assembly requiring constant external lubrication, minimize swivel speeds.

10.8 Attachment Parts, End Stops

	Securely fasten all components attached to or connected with the hydraulic cylinder or pressure intensifier to prevent loosening due to shocks or vibrations during operation.
	Prevent the loosening of adjustable external or internal stroke end stops through constructive measures.
	When using internal end damping: → Consider the effects of mass deceleration in design and operation.

10.9 Buckling Resistance

	Ensure buckling resistance of the hydraulic cylinder for each stroke position.

10.10 Accessibility

	Ensure that hydraulic cylinders or pressure intensifiers and attachments are easily accessible for maintenance and adjustment purposes and that safe adjustment and maintenance is possible.
	Consider adjusting the damping devices and complete replacement of the hydraulic cylinder or pressure intensifier.

10.11 Wear, Corrosion, Damage

	Protect piston rods against foreseeable damage (e.g., notches, scratches, corrosion).

10.12 Noise Emissions

	Minimize noise emissions through appropriate measures.
	Consider air, body, and fluid noise.

11. Maintenance

	If the guide and/or bottom are screwed with nuts, they should be tightened with torque after about 100 operating hours according to the instructions.
	Hydraulic cylinders are generally maintenance-free. Pay attention to lubrication of bearing points such as pivot and articulated bearings and pivot pins.
	Check for tightness at shorter intervals.
	Movement seals are wearing parts. If the internal or external leakage reaches an unacceptable level, we recommend replacing the seals (always replace all seals) or sending the hydraulic cylinders to our factory, where the entire hydraulic cylinder is inspected during seal replacement.
	Depending on usage, but at least once a year: → Check hydraulic cylinders and pressure intensifiers for damage. → Check hydraulic cylinders and pressure intensifiers for wear. → Replace damaged or worn components.
	Removing all connections between the hydraulic cylinder and hydraulic lines as well as disassembling the valves must be done by a specialist according to proper instructions.
	Repairs may only be carried out by the manufacturer or authorized personnel. The pressure of the cylinder must be checked before disassembly.

12. Disposal

	The disassembly of the hydraulic cylinder and hydraulic pipes as well as the disassembly of the valves must be carried out by a specialist according to proper instructions.
	Ensure that the cylinder is depressurized: Before starting disassembly, the hydraulic cylinder must be completely depressurized.
	Removal and disposal of hydraulic fluid: The hydraulic fluid must be properly collected and disposed of.
	Disposal of metal and plastic parts: Proper disposal of cleaned and separated materials.

13. Replacement Parts

Sealing sets and other spare parts can be clearly identified using our article number or the stamped ACONA-Hydraulik number. This can be found near the cylinder base or cylinder head.