Hart Engineering Corporation

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Item	Revision	Description	Status	Date Sent	Date Returned
11372-02	0	Positive Displacement Blower O&M Manual	Eng	04/19/2022	
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Additional Notes:

Status Codes
1-APP – No Exceptions Taken
2-ANR – Make Corrections Noted
3-R&R – Revise and Resubmit
4-REJ – Rejected
5-IPO – For Information Purposes Only
6-NRR – Not Required for Review
ENG – Submitted to Engineer

Sincerely,
Hart Engineering Corporation

_____ DATE: 04/19/2022

OPERATING INSTRUCTIONS

POSITIVE DISPLACEMENT BLOWER
DELTA BLOWER

Read the instructions prior to performing any task!
Keep for future reference!

G4-006 R

Translation of the original operating instructions
Material no.:2000020148
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Series: : GM 3 S - GM 150 S
GB

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Table of contents

1 General Information

1.1 Information about these instructions

These instructions allow for the safe and efficient handling of this machine. These instructions are an integral part of the machine and must be kept in the immediate vicinity of the machine so that they are accessible to personnel at all times. Keep these instructions in a safe place for future reference.

Personnel must read these instructions carefully and have understood them before beginning work. A fundamental requirement for working safely is compliance with all specified safety notes and guidelines in these instructions.

In addition, the local occupational health and general safety regulations apply to the machine's range of applications.

The diagrams in these instructions serve to provide the user with a basic understanding and may deviate somewhat from the actual design.

The following is a list of additional documents which supplement this instruction manual:

Declaration of Conformity	CE MRL 1012-... EAC PED Safety valve
Installation drawing	
Diagram	
Wiring diagram	
Instruction manual Drive motor	See list in appendix
Instruction manual AERZEN Safety Valve	G4-002...

1.2 Explanation of symbols

Safety instructions

Safety instructions in this manual are illustrated using symbols. The safety instructions are organised into signalling words which designate the level of danger posed.

DANGER!
This combination of symbol and signalling word points to an imminently dangerous situation that could be fatal or lead to serious injury if it is not avoided.

WARNING!
This combination of symbol and signalling word points to a potentially dangerous situation that could be fatal or lead to serious injury if it is not avoided.

CAUTION!
This combination of symbol and signalling word points to a potentially dangerous situation that could lead to minor injuries if it is not avoided.

NOTICE!
This combination of symbol and signalling word points to a potentially dangerous situation that could lead to material damage if it is not avoided.

ENVIRONMENT!
This combination of symbol and signalling word points to a potential risk for the environment.

Safety instructions as part of operating guidelines

Safety instructions may relate to certain individual operating guidelines. These safety instructions are integrated into the operating guidelines themselves so as to simplify the task of reading while carrying out work. The signalling words mentioned above are used.

Example:

1. Loosen screw.
2. **CAUTION!**
   Pinch hazard on the cover!

   Close cover carefully.
3. Tighten screw.

Tips and recommendations

This symbol draws attention to useful tips and recommendations as well as information about efficient and trouble-free operation.

Special safety instructions

To draw attention to exceptional hazards, the following symbols are used as part of the safety instructions:

Warning signs	Type of danger
	Warning – automatic start-up.
	Warning – hand injuries.
	Warning – high-voltage.
	Warning – explosive substances.
	Warning – flammable substances.
	Warning – hot surface.
	Warning – danger zone.

Additional designations

To draw attention to operating guidelines, events, listings, references and other elements in this manual, the following designations are used:

Designation	Explanation
1., 2., 3. ...	Step-by-step operating guidelines
	References to sections of this manual and to relevant documentation
■	Lists without a designated sequence

Designation	Explanation
[push-button]	Control elements (e.g. push-buttons, switches), display elements (e.g. signal lamps)
„Display“	Screen elements (e.g. buttons, allocation of function keys)

1.3 Copyright protection

1.4 Addresses

1.4.1 Manufacturer

Tab. 1: Manufacturer

Address	Aerzener Maschinenfabrik GmbH Reherweg 28 31855 Aerzen Germany
Telephone	+49 (0) 51 54 81-0
Fax	+49 (0) 51 54 81-9191
e-mail	info@aerzener.de
Internet	www.aerzen.com

1.4.2 Customer service

Our customer service staff are on hand to provide you with technical information:

Tab. 2: After sales service/service contact

Address	Aerzener Maschinenfabrik GmbH Reherweg 28 31855 Aerzen Germany
Service hotline	+49 171 3 51 18 34
E-mail	info@aerzener.de
Internet	www.aerzen.com

In addition, we are always interested in receiving information and feedback pertaining to machine use that could be useful in helping us improve our products.

2 Safety

This section gives an overview of all important safety aspects relevant to the protection of persons and to safe and fault-free operation. Further task-based safety instructions are contained in the section on the individual phases of the machine's service life.

Non-compliance with the handling and safety instructions provided in this instruction manual can lead to serious hazards.

The following section outlines the residual risks and hazards during the service life of the product that may arise as a result of non-compliance with safety instructions or disabling of safety equipment.

In order to reduce health and safety risks and to avoid dangerous situations, the safety instructions and warnings in this instruction manual must be observed.

2.1 Residual risks and fundamental risks

The following chapter states the general residual risks that have been established on the basis of a risk analysis.

- Compliance with these safety instructions and the safety instructions in the main chapters reduces the risk of personal injury, property damage and environmental harm and prevents dangerous situations.

2.1.1 Electrical hazards

Electric current

DANGER!

Risk of fatal injury from electric current!

Coming into contact with live parts poses an immediate and potentially fatal risk of an electric shock. Damage to insulation or individual components can prove fatal.

- Work on the electrical system should only be carried out by qualified electrical personnel.
- If the power supply's insulation is damaged, switch off the machine immediately and have the damage repaired.
- Before starting to work on active parts of the electrical systems and operating equipment, ensure that the machine is completely disconnected from any power source and remains so for the for the duration of the work.

  When doing this observe the following 5 safety rules:
  - Disconnect the machine completely.
  - Secure the machine against restarting.
  - Confirm that the machine is completely disconnected from any power source.
  - Ground and short-circuit the unit.
  - Cover or shut off adjacent live parts.
- Never bypass or deactivate fuses.
- When changing fuses, comply with the correct specified amperage.
- Keep moisture away from live parts. Moisture can cause the machine to short-circuit.

Stored charges

DANGER!

There is a risk of fatal injury from stored charges!

Electrical charges can be stored in electronic components and maintained even after the deactivation and disconnection of the electric power supply. Coming into contact with these components can lead to fatal injuries.

- Observe all applicable safety rules.
- Before performing any work on the listed components, disconnect them completely from the power supply.
- Observe a waiting period of 15 minutes under all circumstances! This will allow the internal capacitors to discharge.
- Measure to ensure there is no live voltage!

Operating faults caused by short-circuiting

WARNING!

Risk of injury from operating faults!

If the electrical system short circuits this can render the entire system inoperable. Operating faults can lead to serious injuries.

- Connect the machine's earthing connections and acoustic hood to the local equipotential bonding rail.
- Install a fault-current circuit breaker in order to prevent sparks and contact voltage in the event of a fault.
- After all work on the machine has been carried out, ensure that the earthing connection and equipotential bonding are connected correctly.

2.1.2 Hazards associated with the acoustic hood

Within the acoustic hood

DANGER!

Risk of injury if the acoustic hood is open during operation!

By opening the acoustic hood while the machine is in operation, there is a risk of direct contact with sources of danger, e.g. hot surfaces or rotating or moving components.

– Never open the acoustic hood while the machine is in operation or in stand-by mode.
– Never walk on or reach into the acoustic hood while the machine is in operation or in stand-by mode.
– Always lock the acoustic hood with the key provided and keep it locked.
– Only allow authorised personnel access to the key.

Falling parts

CAUTION!

Risk of injury from unsecured parts of the acoustic hood!

Unsecured parts of the acoustic hood can lead to injuries if they fall from the machine.

– Secure loose elements against falling.
– Always wear protective gear.
– Have a second person help you.

Air flow at the air outlet

CAUTION!

Risk of injury from the strong air flow at the air outlet of the acoustic hood!

Strong air flows at the air outlet on the acoustic hood can suck in dirt particles from the environment and disperse them.

– Avoid standing in the direct vicinity of the air flow.
– Wear safety glasses and a safety mask.

Noise

WARNING!

Risk of injury from noise!

The noise level present at the installation area can cause hearing damage. The magnitude of the noise level is dependent on operating data, among other factors.

- Never undertake measures to bypass or deactivate sound insulation.
- Wear hearing protection while working.
- Only stand in the high-noise-level area if it is absolutely necessary.

Risk of falling

CAUTION!

Risk of injury from standing on the roof elements!

Standing on the roof elements of the acoustic hood carries with it a risk of injury from the potential collapse of the roof elements. Persons could fall into the internal area of the machine.

- Never stand on the roof elements of the acoustic hood.
- Never exert force on the roof elements of the acoustic hood.

Spark-generating work

WARNING!

Risk of fire, injury and material damage from spark-generating work in the immediate vicinity of the machine!

Welding or cutting work on the machine or in the immediate vicinity of the machine can cause fire to break out. This can result in material damage or personal injury.

Sparks and incandescent or flammable objects could be sucked in through the supply air openings on the acoustic hood or through the intake silencer. Sparks may be fanned by the fan of the acoustic hood. The insulation material could begin to smoulder.

- Avoid allowing sparks to fly in the direction of the machine.
- Never carry out work that generates sparks while the machine is in operation.

Risk of fire and injury

WARNING!

Risk of fire from easily-flammable materials that are sucked into the machine!

Easily-flammable material, fluids or gases can be sucked into the machine and cause it to catch fire. This can lead to serious or fatal injuries.

- Never allow flammable materials to be sucked into the machine.
- In case of emergencies, have extinguishing agents (fire blanket, fire extinguisher, fire-extinguishing powder for fire classes A, B and C) at hand.
- Immediately report suspicious materials, liquids or gases to the responsible persons.
- In the event of fire, stop your work immediately and make an emergency call.

Use of non-original belts

WARNING!

Risk of fire and injury from using non-original belts!

If, for a number of possible reasons, the machine is running sluggishly or is blocked, the belts may slip if non-original belts are being used. This results in strong heat generation which may lead to a fire.

- Only use original belts from the machine manufacturer.
- Adhere to the designated belt type, as only this type will have the required characteristics.
- Never select and use random belts.
- Activate motor overload protection and observe the setting values.

2.1.3 Risks of machines with belt guard

Lärm

WARNING!

Risk of injury from noise!

The noise level present at the installation area can cause severe hearing damage. The magnitude of the noise level is dependent on operating data, among other factors.

- Never undertake measures to bypass or deactivate sound insulation.
- Wear hearing protection while working.
- Only stand in the high-noise-level area if it is absolutely necessary.

Spark-generating work

WARNING!

Risk of fire, injury and material damage from spark-generating work in the immediate vicinity of the machine!

Welding or cutting work on the machine or in the immediate vicinity of the machine can cause fire to break out.

Sparks and incandescent or flammable objects could be sucked in through the intake silencer. The air flow can fan flames leading to the formation of smouldering objects. The insulation material could begin to smoulder.

- Avoid allowing sparks to fly in the direction of the machine.
- Never carry out work that generates sparks while the machine is in operation.

Risk of fire and injury

WARNING!

Risk of fire from easily-flammable materials that are sucked into the machine!

Easily-flammable material, fluids or gases can be sucked into the machine and cause it to catch fire. This can lead to serious or fatal injuries.

- Never allow flammable materials to be sucked into the machine.
- In case of emergencies, have extinguishing agents (fire blanket, fire extinguisher, fire-extinguishing powder for fire classes A, B and C) at hand.
- Immediately report suspicious materials, liquids or gases to the responsible persons.
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Use of non-original belts

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If, for a number of possible reasons, the machine is running sluggishly or is blocked, the belts may slip if non-original belts are being used. This results in strong heat generation which may lead to a fire.

- Only use original belts from the machine manufacturer.
- Adhere to the designated belt type, as only this type will have the required characteristics.
- Never select and use random belts.
- Activate motor overload protection and observe the setting values.

2.1.4 Hazards at the installation site and operating site

Securing the machine against restarting

DANGER!

An unauthorised or unregulated restart can have fatal consequences.

An unauthorised or unregulated restart of the machine can lead to serious or fatal injuries. There may be people located in the hazard area. Activating the energy supply and starting the machine could result in those people being fatally injured.

- Prevent the machine from restarting by:
  - disconnecting the electrical power supply
  - activating the EMERGENCY STOP function.
  - operating the main circuit breaker and disconnecting the machine from the power source.
  - attaching a padlock to the main circuit breaker.
  - ensuring that the machine is completely de-energised and disconnected from the power source.
  - displaying a sign on the machine that prohibits a machine start.
  - displaying a sign on the control centre that prohibits a machine start.
- Before restarting, ensure that safety devices are installed and functioning correctly and that there are no potential hazards to the safety of any persons.

Water contact with live components

DANGER!

Risk of fatal injury from water contact with live components!

Risk of fatal injury from cleaning work using water in the vicinity of live components.

Water spray may enter electrical and electronic components.

- Do not use water.
- Proceed carefully when performing cleaning work. Water must not come into contact with live components.
- Water spray must not enter electrical and electronic components.
- Never clean voltage-carrying areas with a high-pressure jet.

Unexpected start-up

WARNING!

Risk of injury or personal shock if the machine starts suddenly!

For example, a superordinate control system could send a start command to the machine so that it starts operating.

- Shut down the machine for all work and secure it against restarting.
- If running the machine from a control room, take precautions to prevent a restart there as well.
- You must be prepared for the machine to start at any time.

Sharp edges and corners

CAUTION!

Risk of injury from sharp edges and corners!

Sharp edges and corners can cause excoriations and cuts to the skin.

- If working in the vicinity of sharp edges and corners, proceed with caution.
- If in doubt, wear protective gloves.

Intake components

WARNING!

Risk of injury from intake components!

Intake side silencers suck in ambient air with great force at their inlets.

- During operation, never place body parts or objects in front of the inlet of the silencer.
- Maintain a safe distance from intake components.

Sudden gas emission

CAUTION!

Risk of injury from sudden gas emission!

Components such as safety valves and start unloading devices may open suddenly during operation and emit hot compressed gas. Dust particles may be blown around.

- Never attempt to look inside the blow-off opening.
- Wear safety glasses when in the immediate vicinity of these components.
- Never close the blow-off opening.
- Always keep the blow-off opening clean.

Vibrations

WARNING!

Risk of injury from vibrations!

Vibrations may, in the long term, lead to injuries and chronic damage to personal health. The vibration source is decoupled from the surrounding environment by means of a vibration damper.

- Do not deactivate the vibration damper.
- Avoid coming into contact with vibrating areas.

Build-up of fluids

CAUTION!

Risk of injury from slipping as a result of a build-up of fluids!

Slipping on fluids that have built up on the floor area may lead to a fall. A fall may result in injury.

- Immediately remove built-up fluids with a suitable medium.
- Wear non-slip safety shoes.
- Place a warning notice and mandatory sign on or in the vicinity of any area where there could be a build-up of fluids on the floor area.

2.1.5 Mechanical hazards

Rotating components

WARNING!

Risk of injury from rotating components!

Rotating components may cause serious injury.

- During operation never reach into or perform work on rotating components.
- Never open covers during operation.
- Observe the run down time: before opening covers, make sure that no components are still moving.
- When in a hazard area, wear tight-fitting protective work clothing with low tensile strength.

Fan

WARNING!

Risk of injury from rotating components of the fan!

Rotating components of the fan can cause serious injuries due to their high revolution speed.

- Prior to any work, switch off the machine and secure it against restarting.
- Observe the run down time.
- Before opening covers, check that no components are still moving.
- Never open covers or maintenance covers and work on the fan during operation.
- The blade wheel must not be accessible during operation.

Risk of crushing and shearing injuries

WARNING!

Risk of crushing and shearing injuries from the hinged motor support!

Moving or adjusting the hinged motor support can lead to a risk of injury.

- When transporting the machine, always have the hinged motor support fixed in place.
- Never step or reach into the swivelling range of the hinged motor support.

2.1.6 Thermal hazards

Hot surfaces

WARNING!

Risk of injury from hot surfaces!

Component surfaces may become very hot during operation. Skin contact with hot surfaces causes serious burns.

– For all work performed in the vicinity of hot surfaces, always wear protective work clothing and protective gloves.
– Before beginning any work, ensure that all surfaces have cooled down to ambient temperature.

Hot media

WARNING!

There is a risk of injury from the sudden emission of hot media from the shut-off valve, e.g. a safety valve.

The emission of hot media may lead to scalding.

– Never stand in the immediate vicinity of the outlet vent.
– Never attempt to look inside the outlet vent.
– Never close or cover the outlet vent.

2.1.7 Risks from pressurised components

Pressurised components

WARNING!

Risk of injury from compressed conveyed materials!

When disassembling pressurised components, or in the case of a fault in a pressurised component such as pipes, containers, hoses or valves, hot conveying material can escape with a strong gas flow. This can result in serious injury.

– Before beginning work, fully relieve pressurised components of pressure.
– Check that components are not pressurised.
– Replace malfunctioning components immediately.
– Only disassemble pressurised components when they are not under pressure.

Noise during disassembly

CAUTION!

Risk of injury from noise during the disassembly of pressurised gas pipes!

When disassembling pressurised components such as pipes, containers, hoses or valves, hot conveying material is released, resulting in noise. This can cause hearing damage.

- Before beginning work, fully relieve pressurised components of pressure.
- Check that components are not pressurised.
- Only disassemble pressurised components when they are not under pressure.

2.1.8 Hazards due to hazardous substances

Hazardous substances

WARNING!

Risk of poisoning from hazardous substances! Risk of skin irritation and allergic reactions!

Substances such as lubricants and cleaning agents contain hazardous ingredients. These may lead to serious poisoning, irritation or allergic reactions.

- Observe the safety data sheets.
- Avoid shaking these substances and avoid mist formation.
- If inhalation occurs, bring the affected person out into fresh air immediately. Seek medical help.
- If a substance is swallowed, seek medical help immediately. The mouth must be rinsed out thoroughly with water.
- Avoid contact with the skin and eyes:

  Before working with these substances, apply suitable hand protection cream.

  Wear plastic or rubber protective gloves.
- Remove any dirt from the workspace properly and in an environmentally-friendly way.

  Lubricants and cleaning agents must not enter the sewerage system or soil.
- When working with these substances do not eat, drink or smoke.

Hazardous dust

WARNING!

Risk of injury from rising dust!

Dust deposits may rise during machine operation.

Inhaling this dust may, in the long term, lead to lung damage or other health problems.

– Avoid the hazardous area.
– Wear light respiratory protection for any work in the hazard area.

2.1.9 Risks from flammable substances

Fire hazard

WARNING!

Fire hazard from spark-generating work and ignition sources in the immediate vicinity of the machine!

Easily-flammable substances, fluids or gases may catch fire and cause serious or fatal injury.

– Take measures to protect against the build-up of steam in deep-lying or closed areas.
– Take measures to protect against electrostatic pressure charging.
– Do not smoke in the hazard area or in the direct vicinity of the machine.
– Do not use naked lights, fire or ignition sources of any kind.
– Immediately report suspicious materials, liquids or gases to the responsible persons.
– Have extinguishing agents (fire-extinguishing powder) for fire classes A, B and C at hand.
– In the event of fire, stop work immediately. Leave the hazard area until it is safe to return and notify the fire brigade.

Improper fire protection

WARNING!

There is a risk of injury and material damage from limited or improper fire protection!

If, in the event of fire, the fire extinguisher is not operational or not suited to the specific class of fire, there is a risk of serious or fatal injury and considerable material damage.

- Ensure that only suitable fire extinguishers (fire-extinguishing powder for fire classes A, B and C) are at hand.
- Inspect fire extinguishers every 2 years to ensure they are functioning correctly.
- Refill fire extinguishers after each use.
- Only use extinguishing agents and replacement parts that correspond to the recognised model specified on the fire extinguisher.
- In case of use, observe the safety and operating instructions on the fire extinguisher.

2.2 Intended use

Fig. 1: Correct use

The **positive displacement blower** machine is intended for conveying and compressing air and non-flammable gases.

The **positive displacement blower** machine is intended for operation with non-flammable gases in a non-explosive atmosphere.

The **positive displacement blower** machine has been designed and constructed solely for its “intended use” in the industrial field, as described here.

Observe and comply with the job-based operating data and operational limits!

This intended use also includes compliance with all information in this instruction manual.

Any application that deviates from the intended use, or any other type of non-standard application, is considered misuse.

Operating data that deviates from the standard must be agreed with AERZEN.

2.3 Foreseeable misuse

Serious injury

DANGER!

Danger in case of misuse! Dangerous situations could occur that may lead to fatal or serious injury!

- Never disregard the instructions for “intended use”.
- Never operate the machine in an operating area other than that intended.
- Never convey gases that are not listed in the order confirmation and the technical data.
- Never disregard the following information on misuse.

Serious material damage

NOTICE!

Danger in case of misuse! Dangerous situations could occur that may lead to serious machine damage!

- Never disregard the instructions for “intended use”.
- Never operate the machine in an operating area other than that intended.
- Never convey gases that are not listed in the order confirmation and the technical data.
- Never disregard the following information on misuse.

Misuse

Fig. 2: Prohibited use

The machine is not intended for:

- Conveying media in solid, liquid or powder form.
- Conveying caustic media.
- Conveying corrosive media.
- Conveying flammable or poisonous gases, vapours or mists.
- Alteration, retrofitting or modification of the overall design or of individual equipment parts, with the aim of altering the field of application or scope of use.

Further examples of misuse

The following application ranges or operations and uses are considered improper and must be avoided!

- **Operation:**
  - outside the scope of intended use
  - outside the scope of the intended operating data
  - with gases other than those originally intended
  - with the machine operating in the incorrect direction of rotation
  - in a potentially explosive atmosphere
  - with closed flange connections
  - with missing or damaged components
  - without a correctly connected control system, fault transmitter, EMERGENCY STOP function
  - without any or with damaged protective equipment
  - with contaminated intake filter or starting strainer
  - without sufficient ventilation of the room
  - activation while coming to a stop or when rotating backwards
  - pole changing to a lower rotational speed before the drive motor has come to a standstill.
  - non-compliance with maintenance intervals
  - exceeding the maximum oil level
  - ensuring the system pressure provided by the customer by means of AERZEN safety valves
  - using AERZEN safety valves as a safety-oriented component in the system line
- **Operation without:**
  - intake filter
  - safety valve
  - intake silencer
  - oil
- **Applications:**
  - using the machine to “purge” blockages in the conveying pipes. for exceeding the maximum permissible discharge pressure.
  - using the safety valve to adjust operating data
- **Installation:**
  - Installation on inclined, sloped or lamellar surfaces
  - Installation outdoors without due consideration of particular protective measures for avoiding the effects of weather conditions
  - Attachment of transportation equipment to the acoustic hood
  - Open flames or spark formation in the immediate vicinity of the machine

2.4 Responsibility of the operator

Owner

The owner is the person who either operates the machine themselves, for commercial or business purposes, or who assigns the use of the machine to a third party. During operation, the owner holds legal responsibility pertaining to the product, for the protection of the user, personnel and third parties.

Operator's obligations

The machine is used for commercial purposes. The operator of the machine is thus subject to the applicable legal obligations for occupational safety.

Alongside the safety instructions in this manual, the safety, occupational and environmental regulations relevant to the field of application for the machine must also be complied with.

The operator is obligated to:

- Inform themselves about the applicable occupational protection regulations. As part of a hazard assessment, the operator must also establish the hazards that could result from special working conditions at the machine location. They must implement these for the operation of the machine in the form of operating instructions. The necessary safety data sheets can be obtained from the relevant manufacturer.
- During the entire service life of the machine, check that the operating instructions created by the manufacturer correspond to the current status of the applicable regulations. If necessary, adjust the operating instructions accordingly.
- Clearly structure and specify the responsibilities for installation, operation, fault rectification, maintenance and cleaning.
- Ensure that all persons who come into contact with the machine have read and understood these instructions. In addition, the operator must regularly provide personnel training and inform personnel of the related hazards.
- Provide personnel with the necessary protective equipment and communicate to them that wearing this protective equipment is compulsory.

In addition, the operator is responsible for ensuring that the machine is in perfect technical condition.

For this reason, the following applies:

- The maintenance intervals described in this instruction manual must be complied with.
- All safety devices must be regularly inspected to ensure they are in good working order.

Additional obligations of the owner

The owner must ensure that the following requirements are complied with and put into practice:

- The machine is only operated in its original delivered condition. In cases where the operator adds his own fittings or makes modifications, the manufacturer's declaration of conformity is rendered void.
- Any working behaviour that jeopardises the safety of the machine is prohibited.
- The machine must always be kept in a technically-perfect and operationally-safe condition. Replace damaged or non-operational components immediately. If in doubt, be sure to contact the manufacturer or the responsible contact person.
- Do not operate the machine if the protective equipment has been disassembled or disabled.
- Observe all warnings and notices displayed on the machine and make sure they are readable. You must replace loose or illegible signs. Ask the manufacturer for replacements.
- Install the separately provided components listed in the scope of delivery onto the machine and incorporate these into the overall safety concept.
- Do not disassemble or incorrectly fit any electrical, mechanical or hydraulic connections.
- For protection against potential damage caused by lightning, make sure a suitable earthing system is in place.
- If the conveyed medium tends to form condensate, the condensate must be bled off (e.g. using discharge tanks, residual gas pipes or by briefly opening the lower condensation holes).
- Separate dusty material before it enters the machine. Material that collects in the conveying chamber or on the rotors presents a particular danger for the working safety of the machine.

Operator's obligations at the installation site

The owner must ensure that the following requirements are complied with and put into practice:

- Machine use only in a stable three-phase power supply. Voltage fluctuations/drops beyond the tolerance level may cause serious damage to the drive system.
- Motor overload protection muss be active.
- For system variants without a main circuit breaker featuring an EMERGENCY STOP function, the safety circuit of the machine should be incorporated into the EMERGENCY STOP concept for the overall system. Ensure the accessibility of additional EMERGENCY STOP switches in the vicinity of the machine.

  The machine must be equipped with one or more EMERGENCY STOP command devices for the purposes of operation.

  The EMERGENCY STOP function must be available and operational at all times, independent of the operating mode.
- It must not be possible for a powered-down machine to start automatically.

- For the purposes of operation, the machine must be equipped with a command device that shuts down the machine in dangerous situations.
  In dangerous situations, the power supply to the motor must be cut off.
  If this is not possible, the “standstill” operating condition must be monitored and maintained.
- Avoid electrostatic charges. Connect an equipotential bonding.
- For accidents and emergencies, incorporate emergency measures for the machine into the overall operational emergency measures. Integrate these measures into the evacuation and rescue plan and the fire warning plan.
- The owner must ensure compliance with the maximum permissible system pressure by means of safety valves provided by the customer. This is to be done independently of the safety valves used by AERZEN!
- In emergency situations, the owner must ensure sufficient relief for the system.

2.5 Replacement parts

Use of incorrect replacement parts

CAUTION!

Safety risk from using incorrect replacement parts!

Incorrect, defective or unsuitable replacement parts or copies of original components may endanger personal safety and lead to damage, faults or total failure.

– Only use the manufacturer’s original replacement parts or parts approved by the manufacturer.
– If in doubt, always contact the manufacturer.

Purchase replacement parts from an authorised dealer or directly from the manufacturer.

For contact information, see Customer service *on page 12*.

Replacement parts

Replacement parts that have not been supplied by AERZEN have not been tested or approved. They do not correspond to the original components. The use of such products can potentially have an effect on the default design characteristics of the systems. The manufacturer assumes no liability for damage resulting from the use of non-original components.

2.6 Requirements for personnel

2.6.1 Qualifications

The various tasks described in this manual are associated with a variety of requirements in terms of the qualifications of the persons responsible for carrying out these tasks.

Insufficient qualifications

WARNING!

Risk if persons are not sufficiently qualified!

Insufficiently qualified persons are unable to gauge the risks presented by the use of the machine and put themselves, and others, at risk of serious or fatal injury.

- Only allow work to be carried out by suitably qualified persons.
- Observe the information on qualifications in this manual.
- Keep insufficiently qualified persons away from the operating range of the machine.

For the purposes of all work with this machine, only allow persons who are expected to carry out their work reliably to do so. Persons whose reaction times have been impaired, e.g. through drug or alcohol consumption or medication, are not be permitted to work.

The follow section of this manual states the qualification requirements for persons carrying out the various tasks:

Authorised electricians
Authorised electricians, on the basis of their field-specific training, expertise, experience and knowledge of the relevant standards and requirements, are able to carry out their work on electrical systems safely while independently recognising and avoiding hazards.

Authorised electricians are specially trained for the environment in which they work and are familiar with the relevant standards and requirements.

Authorised electricians with additional qualifications
Authorised electricians have the additional qualifications needed for working in the field of frequency converters and EMC. Authorised electricians are familiar with the relevant standards and requirements.

Written documentation acts as proof of a completed safety instructional course and evidence of the necessary additional knowledge.

Due to their additional qualifications, these authorised electricians are able to carry out work on electrical systems with frequency converters and can independently recognise and avoid possible hazards. The additional skills that constitute this qualification should be taught through regular practical application.

Manufacturer's customer service division
Certain work may only be performed by the customer service division of the manufacturer. On the basis of its special, field-specific training, expertise and experience, the customer service division is up to the task of performing highly-skilled work.

The customer service division is a competent point of contact for all stages of the machine's service life. It is able to perform all work on the machine with the highest efficiency.

Service personnel
Service personnel are able to carry out their work on the basis of their field-specific training, expertise, experience and knowledge of the relevant standards and requirements. They recognise hazards independently and avoid risks.

Service personnel in particular possess practical experience and extensive field-specific expertise for the following activities:

- Transport
- Assembly/installation
- Commissioning
- Maintenance
- Fault rectification
- Disassembly

Depending on the designated job, additional qualifications are required:

- Operation and handling of compressors
- Parameterisation of compressors
- Optimisation work within the permissible operating data range

Trained persons
A trained person has been expressly instructed and, if necessary, trained on site by the responsible management about the tasks delegated to them and the risks that are posed by improper behaviour. A trained person has been instructed regarding the necessary protective equipment and protective measures. They are in a position to work cautiously and to recognise hazards and react accordingly. The trained person may not interfere with the handling and operation of the machine.

Depending on the designated job, the person must have the following expertise:

- Transport and handling of packaged units.
- Ability to perform visual inspections of the machine.

User
The machine user is trained by the system operator in terms of operation, maintenance work and basic fault rectification. They are informed of possible operational hazards and improper behaviour. Tasks that go beyond those for which the machine user is trained or instructed may only be carried out if these tasks are listed in this instruction manual and the operator has expressly designated these tasks to the user.

2.6.2 Unauthorised personnel

Unauthorised personnel in the installation area

WARNING!

Risk of fatal injury for unauthorised persons in the installation area!

Unauthorised persons who do not fulfil the requirements described here, are not familiar with the hazards in the installation area. Therefore, unauthorised persons are at risk of serious or fatal injury.

- Keep unauthorised persons away from the installation area.
- If in doubt, instruct such persons to leave the installation area.
- Stop all work as long as unauthorised persons are in the installation area.

2.6.3 Training

The operator must regularly provide safety training for personnel. For tracking purposes, a training report must be drafted with the following mandatory content:

- Date of training
- Name of the training participant
- Content of the training
- Name of the training instructor
- Signatures of the participant and instructor

Date	Name	Type of training	Training provided by	Signatures

2.7 Personal protective equipment

Personal protective equipment is used to protect people from adverse effects on safety and health when at work.

Personnel, when working near or with the machine, must wear the personal protective equipment described separately in the individual sections of this manual.

Description of personal protective equipment

The following is a description of the personal protective equipment:

Hearing protection (7010-M003)
Hearing protection serves to protect against hearing damage from noise.

Industrial hard hat (7010-M014)
Industrial hard hats protect the head against falling or stray objects and loads and from collisions against stationary objects.

Light respiratory protection (7010-M016)
Light respiratory protection protects against harmful dusts.

Protective gloves
Protective gloves protect hands from friction, abrasion, puncture hazards or more serious injuries and from contact with hot surfaces.

They are oil-resistant and protect hands from coming into contact with lubricants.

Protective work clothing (7010-M010)
Protective work clothing is tight-fitting work clothing with minimal tensile strength, tight sleeves and without protruding parts.

Safety goggles (7010-M004)
Safety goggles serve to protect the eyes against flying particles and splashing liquids.

Safety shoes (7010-M008)
Safety shoes protect feet from being crushed, from falling objects and from slipping on slippery surfaces.

2.8 Safety devices

Function of the safety devices

WARNING!
Risk of fatal injury from non-functioning safety devices!
Non-functioning or deactivated safety devices may cause serious or fatal injury.

- Before beginning work, check that all safety devices are functioning correctly and are correctly installed.
- Never deactivate or bypass safety devices.
- Ensure that all safety devices are accessible at all times.

2.8.1 EMERGENCY STOP function

The EMERGENCY STOP function serves, in cases where there is a hazard or when one is averting a hazard, to bring the machine quickly to a safe stop (standstill).

Depending on the customer's specifications, machine variants are available with or without a power circuit breaker system.

Depending on the model, the machine:

- may not feature a control system
- may not feature an EMERGENCY STOP function

Before operating the machine:

Check whether the EMERGENCY STOP function is in place and installed.

It must function perfectly.

EMERGENCY STOP command device

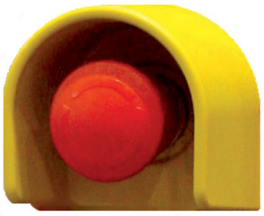


Fig. 3: Example of an EMERGENCY STOP command device

An EMERGENCY STOP command device includes a special command unit which is connected to the control system.

The EMERGENCY STOP function allows for the machine to be shut down safely and immediately in case of a potential or existing hazard.

The power supply to all turning components is interrupted immediately when the EMERGENCY STOP function is activated.

It is also possible to install additional EMERGENCY STOP command devices.

Without a power circuit breaker system

- For this variant, an EMERGENCY STOP command device is not installed on the machine at the factory.
- The machine is delivered without an EMERGENCY STOP apparatus.
- The owner must provide a power circuit breaker system with electrical overload protection, an On/Off command unit and an EMERGENCY STOP function.
- Activate Stop Category 0.
- Detail the performance data of the electrical installation in accordance with the operating data of the motor. Take into consideration the necessary data, for example: Voltage, current, frequency.
- The connection to the power supply is made using the installed and delivered power cabinet.
- The lines running to the power supply are fed directly to the electric motor and are connected inside a terminal box.
- Feed the connection lead through the cable conduit to the terminal box.
- Protect the motor against overheating.
- A main circuit breaker must be installed.

With a power circuit breaker system

- Depending on the model, an EMERGENCY STOP command device is installed at the factory in the power circuit breaker system.
  - If the factory-installed power circuit breaker system does not feature an EMERGENCY STOP command device, this must be provided by the operator.

    Activate Stop Category 0.
  - If the factory-installed power circuit breaker system does feature an EMERGENCY STOP command device, Stop Category 0 is performed.
- A main circuit breaker must be installed if it is not part of the power circuit breaker system.
- The power supply is connected at the power cabinet.
- Observe the wiring diagram!

Notes on installation by the operator

The EMERGENCY STOP device must:

- be installed and integrated into the safety line of the system controller.
- be clearly recognisable, highly visible and quickly accessible.
- shut down dangerous operation quickly without causing any additional risks.
- if necessary, trigger specific safety measures or authorise the triggering of safety measures.
- be installed in such a way that the machine user can activate it immediately in an emergency.
- be designed in such a way that, in cases where there is an interruption in the power supply or the power supply is activated after an interruption, no situations can occur in which there is a threat of personal injury or material damage.
- supplement other protective measures without acting as a substitute for them.

Requirements for installation by the operator

The EMERGENCY STOP function must be available and operational at all times, independent of the operating mode.

The EMERGENCY STOP facility must not require the entire machine to be voltage-free. In situations where a risk is detected, it must be possible for the user to stop the machine in order to protect against a hazard. For the purposes of a controlled shut-down, electrical voltage may be necessary. The electrical system is still under voltage.

If several EMERGENCY STOP devices are in place, all of these devices must be able to shut down the machine.

The EMERGENCY STOP function must, after being triggered, remain effective until authorisation is given for a restart.

It must not be possible to attempt to block the EMERGENCY STOP device without a “stop” command being issued.

Ensure that it is only be possible to release the EMERGENCY STOP device by means of authorised activation.

This authorisation must not cause the machine to start operating again automatically but rather it should make a machine restart possible.

2.8.2 Motor mount with lifting device

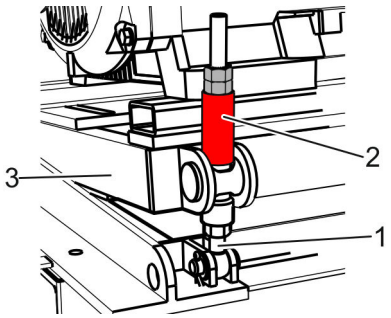


Fig. 4: Motor mount

Depending on the weight of the motor, there are two lifting devices.

The motor mount (2) serves to protect against mechanical hazards.

- The motor mount holds the hinged motor support in place during transport and assembly. It prevents uncontrolled movement of the hinged motor support.
- When operating the machine, the motor mount must be released and positioned accordingly.

2.8.3 Motor mount without lifting device

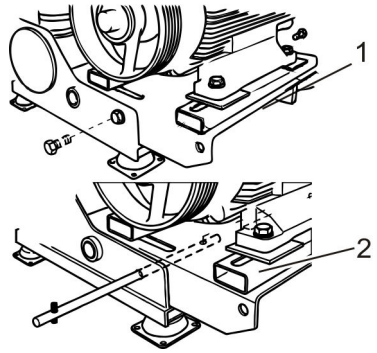


Fig. 5: Motor mount

1 DN50
2 DN80

The motor mount serves to protect against mechanical hazards.

- The motor mount holds the motor hinge in place during transport and assembly. It prevents uncontrolled movement of the hinged motor support.
- When operating the machine, the motor mount must be released and positioned accordingly.

2.8.4 Acoustic hood

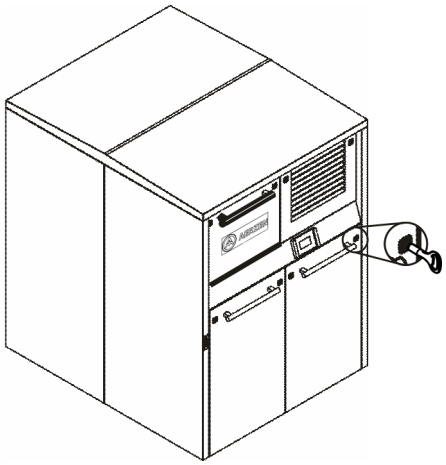


Fig. 6: Front view (example)

The acoustic hood serves to protect against mechanical and thermal hazards.

- The acoustic hood is an essential safety component of the product.
- The elements of the acoustic hood must be locked with the correct key during operation and in stand-by mode.
- Operation with an open acoustic hood is not permissible.
- The locking key for the acoustic hood is a component of the overall safety concept. Access to the key must only be possible for personnel who have been briefed in the safe operation of the machine and the contents of the instruction manual.

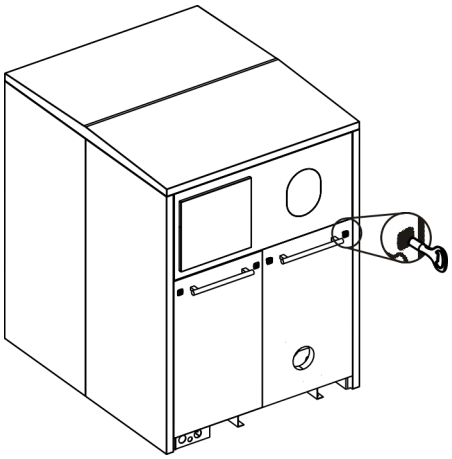


Fig. 7: Rear view (example)

2.8.5 Belt guard

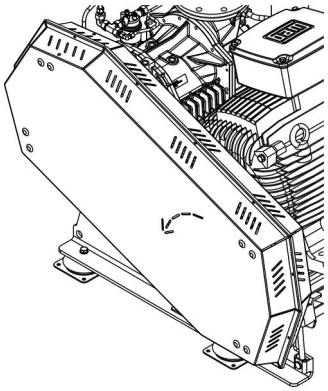


Fig. 8: Belt guard

The belt guard serves to protect against rotating components.

- A belt guard is always used in machines without an acoustic hood. It serves to protect against rotating components.

2.8.6 Cover of the sheave

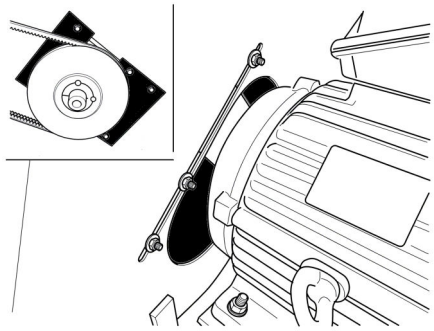


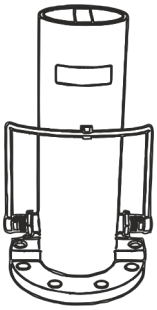
Fig. 9: Cover

The cover serves to protect against rotating components.

- The belt guard features two plastic covers.
- These serve to protect the rotating sheaves and prevent persons from reaching directly into the belt drive.

2.8.7 Safety valve

AERZEN safety valve



The safety valve is set at the factory.

If the set value is exceeded, the valve opens and releases excess conveyed material into the atmosphere.

Fig. 10: Safety valve

2.9 Safety classification

The following symbols and notices are displayed on the machine. They relate to the immediate vicinity in which they are located.

Unreadable signage

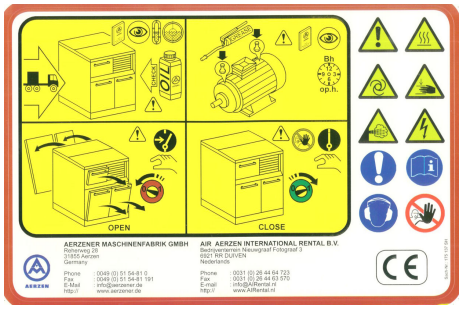
WARNING!

There is a risk from unreadable signage!

There is a risk of injury resulting from dirty or illegible signs. It may be impossible to recognise hazards and to follow the necessary operating information.

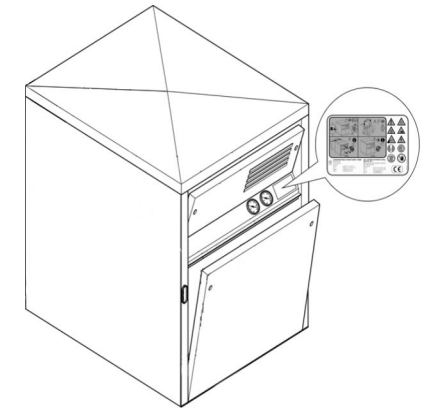
– Keep all safety, warning and operating information in a thoroughly readable condition.
– Replace damaged signs or stickers immediately.

Safety symbols and warning signs



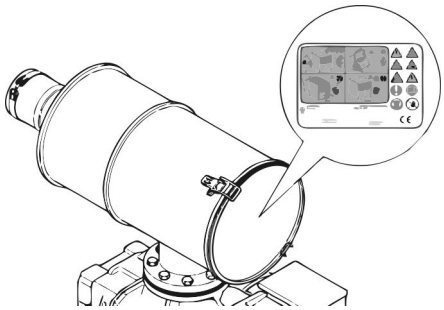
The layout of warning signs involves a set of stickers affixed to the machine. This includes the warning, instruction and prohibition signs. Furthermore, signs relating to lubricants and their handling are only visible when the acoustic hood is closed.

Fig. 11: Layout of warning signs



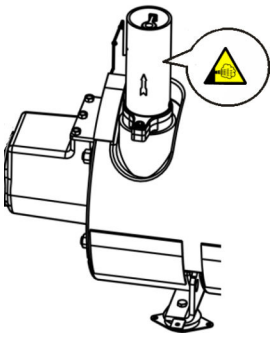
Placement of the sticker set on the acoustic hood.

Fig. 12: Position on the acoustic hood



Placement of the sticker set on the intake silencer.

Fig. 13: Position on the belt guard model



Warning sign on the AERZEN safety valve.

Fig. 14: Position on the AERZEN safety valve

Access for unauthorised persons forbidden

Only persons given authorisation by the owner may enter the hazard area.

Electrical voltage

Only qualified electrical personnel may work in the signposted working area.

Unauthorised persons are not permitted to enter the signposted working area or open the signposted cabinet.

Automatic start-up

The sudden start-up of operational machines in the rest position is possible at any time.

Take heed of the stand-by mode! A sudden start is possible.

Hot surfaces

Hot surfaces, such as hot machine parts or system parts, containers or materials - but also hot liquids - are not always noticeable. Do not touch them without protective gloves.

Hand injuries

Keep hands away from areas that carry this warning sign.

There is a risk that hands could be crushed, trapped or injured in some other way.

Gas emission

Risk from sudden gas emission.

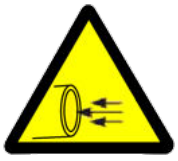
The opening of the safety valve results in the emission of gas and accompanying noise emissions. There is a risk of hearing damage, injuries to eyes or injuries to skin.

Pressure in the piping

Pipelines may be placed under pressure.

Before carrying out disassembly work, deactivate the pressure in the pipelines.

Draw-in of gas



Pipelines can suck in large volumes of air in the immediate vicinity of the intake openings.

Avoid the air-intake area. Shut down the machine before undertaking any activities in this area.

2.10 Instruction signs

Wear hearing protection

In areas where this symbol is displayed there is a risk of hearing damage. Therefore, wear hearing protection when in these areas.

Information on wearing hearing protection	
< 80 dB(A)	Hearing protection is not prescribed as mandatory but should be worn as a matter of personal responsibility.
80 to 85 dB(A)	Hearing protection is recommended
> 85 dB(A)	**Hearing protection must be worn**

Observe the instruction manual

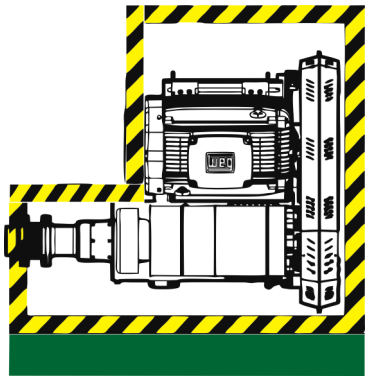
Only use the labelled machine once you have read the instruction manual.

2.11 Hazard area and controls area and/or display area

Hazard area
Controls and/or display area

The hazard area is located in the marked zone (in the acoustic hood interior zone). It is not permitted to open acoustic hood elements and protective covers during operation. Opening is permissible only for maintenance work or for troubleshooting and provided all safety precautions are observed. The controls and/or display area is the position marked in green (example).

Fig. 15: Hazard area and controls and/or display area (view from above)



Hazard area
Operating and/or display area

The hazard area is located in the marked zone. The opening of the protective cover is not permissible. The operating and/or display area is the position marked in green (example).

Fig. 16: Hazard area and operating and/or display area (top-down view)

2.12 Securing the machine against restarting

Sudden restart

DANGER!

An unauthorised or unregulated restart can have fatal consequences.

An unauthorised or unregulated restart of the machine can lead to serious or fatal injuries. There may be people located in the hazard area. Activating the energy supply and starting the machine could result in those people being fatally injured.

- Prevent the machine from restarting by:
  - disconnecting the electrical power supply
  - activating the EMERGENCY STOP function.
  - operating the main circuit breaker and disconnecting the machine from the power source.
  - attaching a padlock to the main circuit breaker.
  - ensuring that the machine is completely de-energised and disconnected from the power source.
  - displaying a sign on the machine that prohibits a machine start.
  - displaying a sign on the control centre that prohibits a machine start.
- Before restarting, ensure that safety devices are installed and functioning correctly and that there are no potential hazards to the safety of any persons.

EMERGENCY STOP button (option)

1. Press the EMERGENCY STOP button.
   ⇨ The power supply is shut off.
2. Activate the main circuit breaker.
   ⇨ The machine is free of current.
3. Attach a padlock to the main circuit breaker.
4. Ensure that the machine is completely de-energised and disconnected from the power source.
5. Inform supervisory personnel of work in the hazard area.

6. Place a sign on the machine and (where applicable) control centre that notifies persons of the work being carried out in the hazard area and forbids activation of the machine. The sign must contain the following information:
   - Shut-down on:
   - Shut-down at:
   - Shut-down by:
   - Important: Do not switch on!
   - Important: Only switch on the machine once it has been ensured that there is no risk to personal safety.

EMERGENCY STOP feature (operator-installed)

The particular approach to preventing a restart is dependent on the operator-installed EMERGENCY STOP feature.

1. Secure the machine against restarting in accordance with the operator's instructions.
2. Follow the instructions of the responsible supervisory personnel.
3. Once all work has been completed, check that there is no risk to personal safety.
4. All safety devices and protective equipment must be installed and fully functional.

2.13 Environmental protection

Environmentally hazardous materials

ENVIRONMENT!

Improper handling of environmentally hazardous materials presents a threat to the environment!

Incorrect handling of environmentally hazardous materials, particularly in the case of improper disposal, can cause considerable damage to the environment.

– Always observe the information below on the handling of environmentally hazardous materials and their disposal.
– If environmentally hazardous materials are inadvertently released into the environment, take appropriate action immediately. If in doubt, inform the responsible local authority about the damage and seek advice on taking appropriate measures.

The following environmentally hazardous materials are used:

Lubricants

Lubricants such as greases and oils contain poisonous substances. They must not be released into the environment. Disposal must be carried out by a certified waste management company.

Batteries of the control system

Batteries contain poisonous heavy metals. They require special waste treatment and must be deposited at local collection points or disposed of by specialist companies.

Electronics

Electrical and electronic components may contain poisonous material. These components must be collected separately and deposited at local collection points or disposed of by specialist companies.

Anti-corrosion agents

Anti-corrosion agents may contain poisonous substances. They must not be released into the environment. Disposal must be carried out by a certified waste management company.

3 Design and operation

3.1 Operating modes

On-site operation

Operation of the machine is carried out directly on site.

Remote operation

Operation of the machine is carried out via control station.

Automatic operation

Automatic operation of the machine is carried out by sensors or a system switch.

Load operation

Load operation is the operating mode in which the machine processes the specified operating data.

3.2 Application ranges

3.2.1 Operating information for pneumatic conveyance

Pneumatic conveyance

When the machine is being used for the purposes of pneumatic conveyance, pressure surges must not occur when switching between different delivery lines.

Pressure surges can be prevented by making the switching process for the intake-side and discharge-side valves take at least five seconds. This pre-accelerates the gas column in the pipework. The gas can no longer accelerate suddenly. This prevents damage to the machine.

The distance between the switchover valve and the intake-side flange must be at least 10 x DN. DN = nominal diameter of the pipework.

This safety note applies to both positive pressure operation and vacuum operation.

3.2.2 Operating information for air-separation systems

Air-separation systems

When the machine is being used in air-separation systems with alternating air-separation columns, pressure surges must not occur when switching between different delivery lines.

Pressure surges can be prevented by making the switching process for the intake-side and discharge-side valves take at least five seconds. This pre-accelerates the gas column in the pipework. The gas can no longer accelerate suddenly. This prevents damage to the machine.

The distance between the switchover valve and the intake-side flange must be at least 10 x DN. DN = nominal diameter of the pipework.

This safety note applies to both positive pressure operation and vacuum operation.

3.2.3 Description of assemblies

For the purposes of explaining its functionality, the machine is divided into several assemblies. Each assembly consists of a number of components which, combined, perform a specific machine function. One assembly can consist of sub-assemblies and additional components.

3.2.3.1 Intake side

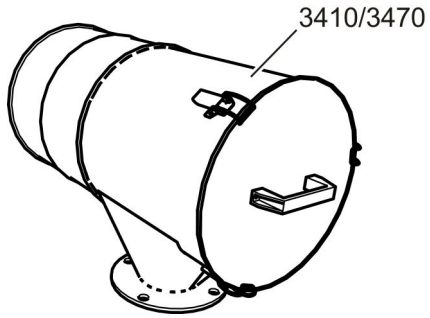


Fig. 17: Intake side

3410 Intake silencer, housing
3470 Intake silencer, filter element

The intake side assembly comprises the components of the conveying system's intake side. The intake side assembly includes all components located upstream of the machine stage gas inlet. The medium to be conveyed is drawn into the machine stage by these components. An intake silencer serves to reduce noise emissions. A filter ensures clean intake gas.

3.2.3.2 Machine stage

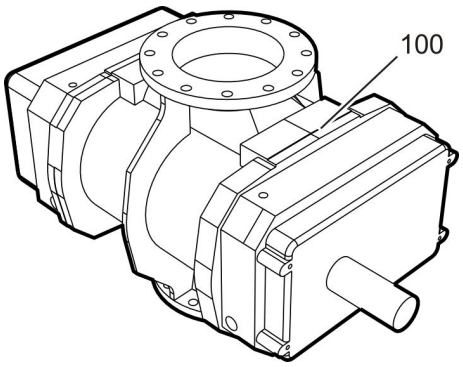
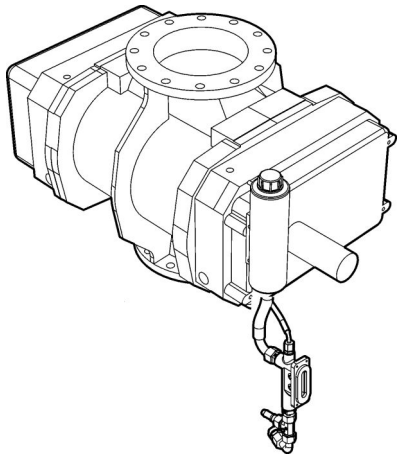


Fig. 18: Machine stage

100 Machine stage

The machine stage is the core of the machine and includes all components for gas compression. The gas compression process takes place in the machine stage.

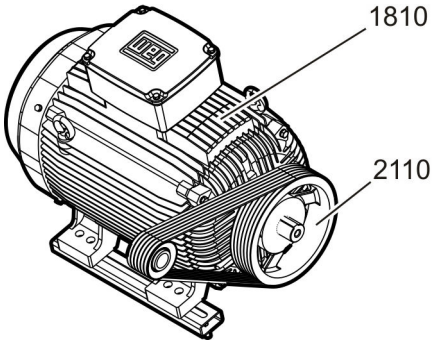
3.2.3.3 Oil system



The oil system contains all components necessary for providing lube oil to the machine stage.

Fig. 19: Oil system

3.2.3.4 Drive system

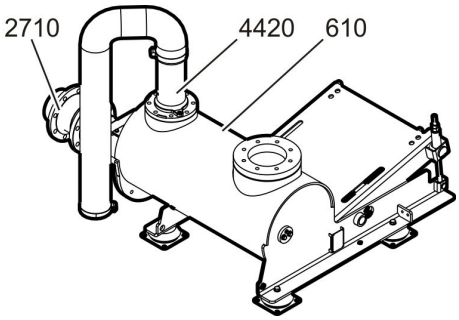


1810 Motor
2110 Belt drive

The drive system comprises the drive motor and the drive elements, e.g. the belts and sheaves. The drive system provides a high revolution speed for the rotational motion of the machine stage.

Fig. 20: Drive system

3.2.3.5 Discharge side



610 Base support
4420 Safety valve
2710 Flexible pipe connection

The discharge-side assembly represents the components of the discharge-side conveying system. The discharge-side assembly includes all components fitted downstream from the machine stage gas outlet. All components are pressurised during operation and have hot surfaces. A discharge silencer serves to reduce noise emissions.

Fig. 21: Discharge side with base support

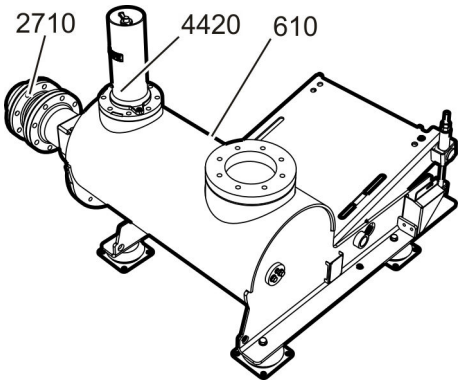


Fig. 22: Discharge side with base support

610 Base support
4420 Safety valve
2710 Flexible pipe connection

The discharge-side assembly represents the components of the discharge-side conveying system. The discharge-side assembly includes all components fitted downstream from the machine stage gas outlet. All components are pressurised during operation and have hot surfaces. A discharge silencer serves to reduce noise emissions.

3.3 Control elements (optional)

3.3.1 Factory-installed control element

Factory-installed control element

Observe the AERtronic instruction manual.

The AERtronic instruction manual is included with the product.

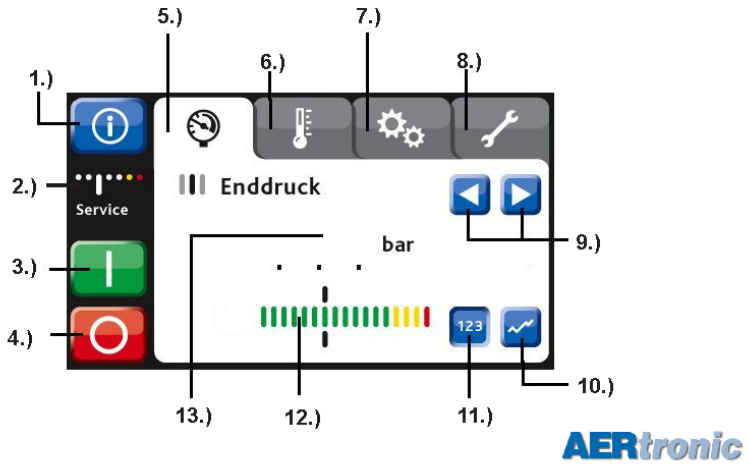


Fig. 23: Operator interface

1 Information menu
2 Service display
3 Local/LOCATION/START
4 Local/LOCATION/STOP
5 Pressure ranges register
6 Temperature ranges register
7 Additional operating parameters register
8 Service and setup register
9 Selection buttons of the given display menu within a register
10 Graphic representation
11 Numerical representation
12 Bar graph display
13 Measurement value display

3.3.2 Customer-installed control element

Customer-installed control element

Depending on the machine model and version - with or without a corresponding controller - the control elements are not part of the scope of delivery. The installation and design of the control elements is then the responsibility of the customer.

3.4 Accessories

The accessories are the total collection of components belonging to the machine or to the supplementary equipment.

3.4.1 Drive motor

Motor connection requirements

The cable and lead sheathing must be resistant to the normal wear expected due to the movement of the hinged motor support and the effects of contaminants in the atmosphere.

General requirements

- Fine-core cable is recommended for the connecting leads.
- The connecting hardware must be suitable for the cross-section and type of the connecting leads.
- Cables, leads and connection points must not be subjected to excessive bending and tensile forces. Install the connecting cable via a stayed cable bridge (not provided) to prevent the terminal box being subjected to forces or stress.
- Install cables and leads in such a way that they cannot sustain any external damage.
- Avoid contact with the machine, excessive friction and excessive radiant heat.
- The connecting cable must be resistant to light movements, e.g. the changes in the rotational speed of the motor.

General requirements

- Fine-core cable is recommended for the connecting leads.
- The connecting hardware must be suitable for the cross-section and type of the connecting leads.
- It may be necessary to remove the intake console and the acoustic hood cover to connect the motor, depending on the size and output of the machine.
- Cables, leads and connection points must not be subjected to excessive bending and tensile forces. Install the connecting cable via a stayed cable bridge (not provided) to prevent the terminal box being subjected to forces or stress.
- Install cables and leads in such a way that they cannot sustain any external damage.
- Avoid contact with the machine, excessive friction and excessive radiant heat.
- The connecting cable must be resistant to light movements, e.g. the changes in the rotational speed of the motor.

Requirements for the electricity network

NOTICE!

There is a risk of material damage from voltage fluctuations/drops!

Voltage fluctuations/voltage drops beyond the tolerance interval may lead to serious damage to the drive system.

Requirements for operating rotary piston machines with electric induction motors in a three-phase AC supply system:

– Use suitable protective equipment that will shut down the motor and safeguard it against an automatic restart in the event of impermissible electrical operating data.
– Connect the motor voltage and control voltage to a stable common three-phase network to ensure that the power contactor is no longer latched in the event of a power failure.
– Observe the voltage and frequency limits. *Chapter 11.9.1 „Voltage fluctuations“ on page 189*

Connection

- Only authorised electricians may perform the connection.
- Authorised electricians must observe all applicable regulations when connecting the drive motor.
- Observe the tightening torques of the terminal screws.
- Secure all connections against inadvertent release or loosening.
- Ensure that the nominal electrical data is complied with during operation.

Control circuit types

- Star-delta connection
- Pole changing
- Speed control using frequency converter
- Direct start

Permissible starting frequency

up to 160 kW	6 starts per hour
from 200 kW	3 cold starts or 2 warm starts per hour

Refer to the instruction manual provided by the drive motor manufacturer for further specifications and information.

3.4.1.1 Factory installation of the drive motor

Factory installation

Observe the information on the rating plate and in the drive motor instruction manual.

Refer to the drive motor instruction manual for electrical operating data, maintenance intervals and suitable lubricants.

3.4.2 AERtronic

AERtronic

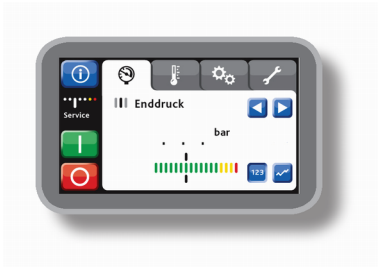


Fig. 24: AERtronic Display

The AERtronic is used as a control device and as a display and monitoring device.

The control device is fitted with a colour graphics display with a touch-screen interface.

When starting for the first time, these settings can be changed.

Other handling and operation of the controller is defined on the display; the user is guided through the menu by prompts in a structured manner.

The control device includes all the functions necessary for start and shut-down procedures and displays the operating parameters and prompts.

Observe the instruction manual for the purposes of commissioning and operation!

AERZEN reserves the right to change, expand or improve the hardware and software of this product as required. This does not include any obligation to update units already shipped.

3.4.3 Instrumentation

The instrumentation consists of several assemblies.

- Pressure and temperature sensors in conjunction with the AERZEN AERtronic control system.
- Switches for pressure and temperature in conjunction with display instruments.

Shut-down locking

- The shut-down devices are set at the factory.
- All shut-downs must be self-locking. Once the shut-down has been given clearance, the machine must not be able to start automatically.
- Prior to a restart, the cause of the malfunction must be determined and eliminated. Start-up must then be performed manually.

NOTICE!
The switching points of the switches/sensors are fixed and must not be changed.

Pressure and temperature switches

If intake pressure, discharge pressure or discharge temperature switches are used to safeguard the machine, the drive motor must be switched off when the limit switch is triggered.

Contacts open → Drive motor off.

Pressure switch (optional)

It is also possible to use an additional pressure switch. A calibrated gauge is used to adjust the switching limit point. The scale on the switch only serves as a guide.

3.4.4 Frequency converter

Description

Observe the frequency converter manufacturer's instruction manual!

NOTICE!

- If the electric motor is driven by frequency converters, we strongly recommend using an motor throttle and power choke. These are specifically designed for the frequency converter and filter dangerous harmonics from the drive current. This prevents damage to the motor winding. The electromagnetic compatibility of the system is also improved. Reactions of the frequency converter in the current are reduced.
- The maximum current limit of the motor must not be exceeded. Observe the information on the motor's rating plate.
- To prevent operational faults the function "Interception circuit" must not be parameterised in the control of the frequency converter. When the frequency converter is switched off, a restart should only be possible after a complete shut-down of the machine.
- The machine must shutdown without braking. The activation of a brake ramp or quick stop is not permissible.

For machine use, observe the following

- Take into account the electrical and mechanical properties of the drive motor.
- Set the fixed minimal frequency. This frequency must never fall below the fixed minimum during operation.
- The maximum frequency is to be set by taking into account the maximum rotational speed of the motor and the maximum machine speed.
- The run-up time of the drive motor from standstill up to minimum speed can be 3-6 seconds.
- The frequency converter must be designed with a constant load torque for operation with a working machine.
- Never exceed maximum or drop below minimum speed thresholds.
- When exceeding the value, e.g. due to excessively long cables, frequency converter type etc. a motor throttle or motor filter coil that matches the frequency converter is to be used.

NOTICE!

Not using the motor throttle or motor filter can lead to damage of the motor isolation and a motor breakdown.

- The highest admissible voltage increase speed of the motor is 1,200 V/µs.
- The rotational changeover speed must not exceed 1 Hz per second during operation.
- Minimum frequency = 20 Hz // maximum frequency = 50 Hz results in a control time of 30 seconds.

Pole changing

For a motor speed changeover from a high to a low speed, the drive motor must have reached zero rotational speed each time.

Changeover from a low to a high speed can take place directly and instantaneously.

3.4.5 Machine terminal box

Terminal box

The machine's terminal box contains the electrical and electronic components that are not located directly on the machine (e.g. sensors).

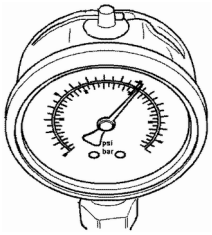
It contains terminals for connecting electrical and electronic components to the external power supply.

When the terminal box is closed, it is impossible to come into direct contact with live components, either accidentally or deliberately.

Since it contains internal components carrying dangerous voltage, the terminal box is locked. It can only be opened using special tools (terminal box key, triangular/square wrench).

3.4.6 Discharge pressure gauge

Positive pressure mode



The gauge displays the discharge pressure of the compressed gas.

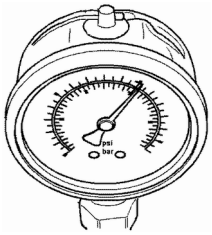
It is a display instrument without a switching function.

The gauge is connected on the discharge side.

Fig. 25: Pressure gauge

3.4.7 Nitrogen gauge

Nitrogen mode



The gauge is used when conveying nitrogen.

The gauge displays the pressure in the inlet pipe.

It is a display instrument without a switching function.

The gauge is connected on the intake side.

Fig. 26: Pressure gauge

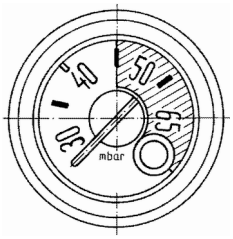
3.4.8 Maintenance indicator

Positive pressure mode

The maintenance indicator shows the dirt levels in the intake filter.

The maintenance requirements of the intake filter depend on the dirt levels of the medium taken in.

Replace the filter element when the following display values are reached and no later:



At -45 mbar (red display field), replace the intake filter.

After the filter has been changed, reset the pointer to its initial position by “pressing” the reset button.

Fig. 27: Version a)

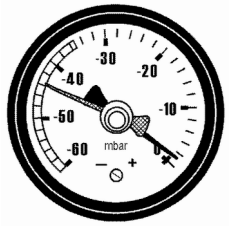


Fig. 28: Version b)

When the level of contamination increases, the red trailing pointer will be pulled over with the black pointer and stay at the maximum intake pressure.

Replace the filter element when the trailing pointer reaches the red area of the scale.

Once the filter has been replaced, reposition the trailing pointer between 0 and -10 mbar.

3.4.9 Intake silencer

Intake silencer

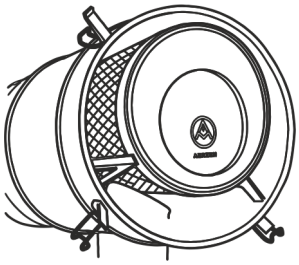


Fig. 29: Open intake silencer with filter

The intake silencer contains the intake filter. The intake filter prevents harmful particulate matter entering the conveying chamber of the machine.

The intake filter corresponds to filter class G4.

NOTICE!

Risk of machine damage! Never operate the machine without the intake filter.

Machine damage caused by the intake filter

NOTICE!

There is a risk of machine damage from the use of contaminated, damaged or non-original intake filters!

Heavily contaminated or damaged intake filters reduce performance. They affect functionality and may cause machine failure. Copies and reproductions of intake filters do not have the necessary properties.

- Inspect for damage.
- Comply with maintenance intervals.
- Only use original replacement parts.

3.4.10 Discharge silencer

Discharge silencer

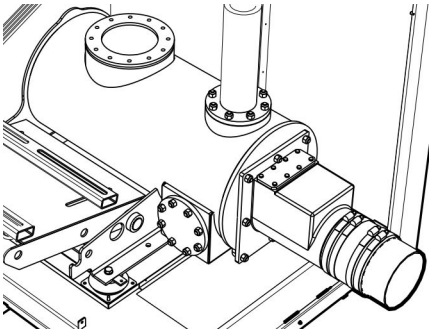


Fig. 30: Discharge silencer

The base support serves as the base for the whole bodywork of the machine. The base support also acts as a discharge silencer. The discharge silencer is an absorbtion-agent-free component. The acoustic energy inside the discharge silencer is reduced by means of air deflection.

3.4.11 AERZEN safety valve

AERZEN safety valve

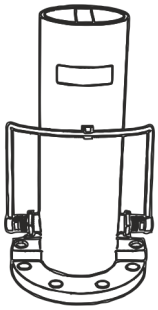


Fig. 31: Safety valve

Note the instruction manual for the safety valves. It is included with the product.

The safety valve is used for the conveyance of air.

The safety valve is set at the factory.

If the set value is exceeded, the safety valve opens and releases excess conveyed material into the atmosphere.

The safety valve is NOT a control component and is not to be used as such.

The safety valve can be used up to a temperature of 200°C.

NOTICE!

Risk of premature wear and failure!

The safety valve is not intended for controlling the operating data!

Disabling the safety valve, e.g. by setting a higher opening pressure, can cause serious material damage.

The outlet of the safety valve must not be made narrower or closed. Keep the cross-section unobstructed!

3.4.12 Start unloading device for DN80 to DN400

Start unloading device

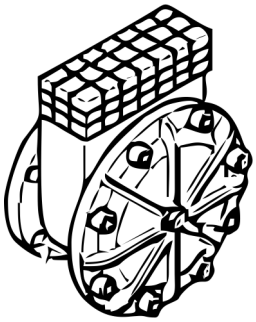


Fig. 32: DN 80 to DN 400

NOTICE!

Risk of premature wear and tear and breakdown! The start unloading device is not intended for controlling the operating data!

The use of the start unloading device as a controller for operating data leads to premature wear and tear and breakdown!

The start unloading device can be used in machines that are run by an electric motor with a “star-delta connection”.

This allows for a relieved start-up against existing mains pressure.

In the case of drives with pole-changing motors, it is also possible to use a start unloading device with a solenoid valve.

This provides a relieved start-up at higher speeds.

After a correct set-up, the start unloading device operates maintenance-free.

The start unloading device is not necessary for drives with frequency converters.

3.4.13 Start unloading device for DN50 to DN80

Start unloading device

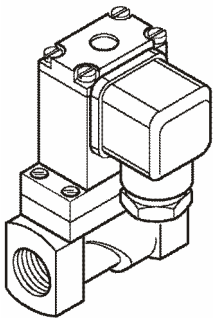


Fig. 33: DN 50 to DN 80

NOTICE!

Risk of premature wear and tear and breakdown! The start unloading device is not intended for controlling the operating data!

A solenoid valve offers the possibility of relieved start-up for DN 50 to DN 80 (“star-delta connection”). The valve closes if voltage is present.

The valve may only close after the switch from “star to delta”.

For pole changing: in “star-double-star starting”, the solenoid valve is to be switched so that it opens before the high-speed operation and closes after ramping up.

The start unloading device is not necessary for drives with frequency converters.

3.4.14 Belt drive

Belt drive

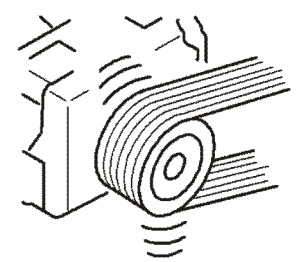


Fig. 34: Belt drive

The sheaves are mostly fitted and aligned in the factory.

The sheave for the machine stage is fitted to the drive shaft. The position and orientation of this sheave therefore affects the alignment of the drive motor pulley.

Check the alignment:

- Before first commissioning
- According to the maintenance plan
- After replacing the pulley(s)

The maximum permitted sheave offset is 0.5 mm.

It is extremely important that only original replacement parts be used for the purposes of belt-pulley operation!

Only use replacement and wear parts that are recommended and approved by AERZEN!

Original replacement parts

NOTICE!

Risk of material damage!

Pulleys must only come from one manufacturer and from one production batch.

– Otherwise varying belt tensions can occur which can result in uneven running and premature wear.
– As a result of a risk of snapping, the sheaves must be suitable for the peripheral speed encountered!

3.4.15 Acoustic hood

Acoustic hood

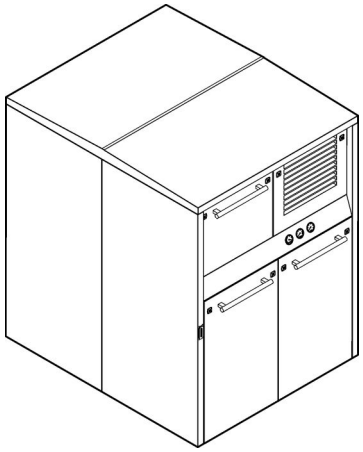


Fig. 35: Acoustic hood, version diagram

The acoustic hood serves to reduce noise and acts as a guard.

The acoustic hood is a component designed for product safety with lockable door elements.

Always keep the acoustic hood closed during operation.

The key must only be accessible for authorised personnel.

An earthing strap or threaded hole is located on the outer edge of the floor tray.

Lock

Operation with an open acoustic hood is not permissible!

- *Always lock the elements of the acoustic hood with the key provided.*
- *The key must only be accessible for authorised personnel.*

Fan

The acoustic hood is ventilated by a fan.

The fan is connected at the factory. The fan must be activated in parallel with a machine start.

Intake from a pipeline

The acoustic hood makes intake-side machine suction possible from the system pipeline.

The pipeline is guided through the acoustic hood to the machine through prefabricated openings.

The following steps must be complied with: *Chapter 5.3 „Alignment and dowelling“ on page 90*

Acoustic hood heater

NOTICE!

There is a risk of material damage from low ambient temperatures!

If there are temperatures of below –10 °C in the surrounding area, provide an acoustic hood heater!

This prevents damage to the machine by heating up the housing and preheating the lube oil and medium to be conveyed.

3.5 Required tools

The following tools are required:

Auxiliary materials, tools
e.g. receptacle for oil, drain hose, cleaning cloth.

Conveyor rails
The conveyor rails must be made of steel. They act as slide-in modules in the forklift tunnel of the acoustic hood. The cables are pulled by the conveyor rails and joined above the machine using the lifting beams.

Drills
Drills for making fastening holes.

Electric drill
Electric drill, e.g. for drilling fixing holes.

General measurement tools and equipment
For example a steel ruler, plumb line, folding yardstick, spirit level.

General tools
For example various screwdrivers, a combination key, socket driver set, Allen key set, hammer.

Lifting beams
Transverse truss required for crane transport for absorbing cable force.

Lifting equipment
For lifting loads, e.g. ropes, belt anchorages, shackles, eyebolts with nuts.

Locking key
The locking key is a component of the overall safety concept. This must be stored safely and should only be made accessible to trained personnel. It is intended for the proper opening and closing of the acoustic hood elements.

Oil funnel
The oil funnel is used for the precise filling of lubricant oil.

Ratchet wrench
The ratchet wrench is used to adjust the hinged motor support fastener.

Test pump
The test pump is used to simulate system pressure in the measurement lines during commissioning. This allows for the operation of the pressure switch or the pressure sensors to be checked.

Tools for authorised electricians
Basic electrical engineering equipment, e.g. multimeter, voltage detector, insulated tools.

Transport equipment

For transporting packaged units and the machine, e.g. with lift trucks, forklifts.

4 Transport, packaging and storage

4.1 Transport

4.1.1 Safety instructions

Improper transport

WARNING!

Risk of injury from improper transport!

Improper transport may result in personal injury.

- Proceed with caution upon delivery, when unloading the machine and during in-house transport.
- Observe the symbols and information on the packaging.
- Only use the intended anchorage points.
- Observe the centre of gravity.
- Attach lifting equipment accordingly and hang the load so that it is balanced.
- Do not remove the packaging until just before installation of the machine.

Industrial trucks

WARNING!

There is a risk of fatal injury from industrial trucks!

Transport with industrial trucks can result in objects and other loads falling accidentally and causing serious or fatal injury. There is also the risk of the driver failing to see persons and running them over.

- Industrial trucks should only be operated by trained drivers (e.g. forklift drivers).
- Only walk past an industrial truck if the driver has signalled that he has recognised the person in his path.
- Only use approved industrial trucks with sufficient load carrying capacity.
- Never transport materials over persons or the areas in which persons are located.

Suspended loads

WARNING!

Lethal danger from suspended loads!

During lifting work, loads may swing out and fall. This can result in serious or fatal injury.

- Never walk under or into the range of a suspended load.
- Move loads under supervision only.
- Observe lifting points.
- Ensure that the lifting slings are fitted securely.
- Do not hang lifting equipment on protruding machine parts or on the lugs of attached components.
- Only use approved hoists, load handling equipment and lifting slings with sufficient load carrying capacity.
- Do not use damaged load handling equipment such as chains, ropes or pulleys.
- Do not lay load handling equipment across sharp edges or corners and do not tie or twist them.
- Set down the load when leaving the work area.

Disregard for the machine's centre of gravity

WARNING!

There is a risk of the unit toppling and falling over if there is disregard for the machine's centre of gravity!

If the machine's centre of gravity is disregarded, the packaged unit may topple and cause life-threatening injury.

- Observe the centre of gravity.
- Observe the packaging information on the machine's centre of gravity.
- Attach lifting equipment in such a way that it is located above the centre of gravity.
- Raise the load carefully and ensure that it does not topple. If necessary, change the position of the lifting equipment.

Risk of slipping

CAUTION!

Risk of injury due to slipping on the packaging foil!

The packaging foil features a slippery surface that can cause persons to slip on it. Moisture, creases, edges and tension straps on the packaging foil entail a risk of slipping or stumbling. The packaging foil is not suitable for supporting weight. A fall may result in injury.

– Never stand on the packaging foil.
– Never lean on the packaging foil or use it for support.

Requirements for personnel

Requirements for transport:

Transport of packaged units

Personnel:
- Trained persons

Transport of unpacked machines

Personnel:
- Service personnel

Requirements for personnel

When checking storage criteria, you require the following:

Personnel:
- Service personnel

When checking and applying preservation, you require the following:

Personnel:
- Service personnel

Protective equipment

Requirements for transport:

Protective equipment:
- Protective work clothing (7010-M010)
- Safety shoes (7010-M008)
- Protective gloves

Protective equipment

Preservation requires:

Protective equipment:
- Protective work clothing (7010-M010)
- Safety shoes (7010-M008)
- Protective gloves
- Light respiratory protection (7010-M016)

Special tools

Requirements for transport:

NOTICE!
Risk of damage to the machine! Chains, steel cables and similar equipment are not suitable lifting equipment.

Special tool:
- Lifting equipment
- Transport equipment

Special tool:
- Lifting beams
- Locking key
- Conveyor rails

Dimensions of the conveyor rails

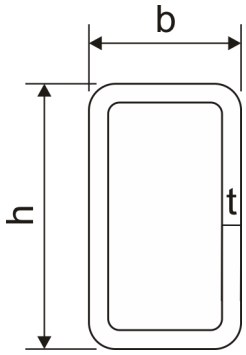


Fig. 36: Rectangular hollow profile

Nominal diameter Discharge nozzles	Profile dimensions H x W x D (mm)	Profile length (mm)
DN 50	80 x 60 x min. 4	950
DN 80	80 x 60 x min. 4	1285
DN 100	100 x 80 x min. 4	1870
DN 125	100 x 80 x min. 4	1870
DN 150	120 x 80 x min. 6	2520
DN 200	120 x 80 x min. 6	2520
DN 250	120 x 80 x min. 8	2750
DN 300	120 x 80 x min. 10	3350
Material: S 235 JR		

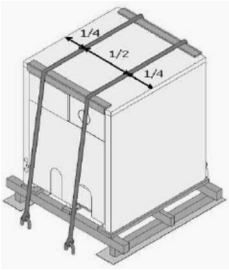
The profile length must be at least 150 mm longer than the dimensions of the acoustic hood.

4.1.2 Type of delivery

4.1.2.1 Delivery of the machine

The machine is shipped using a freight forwarder. In accordance with the given requirements the machine is sealed in foil and may be additionally packed in wood.

Transport on a truck



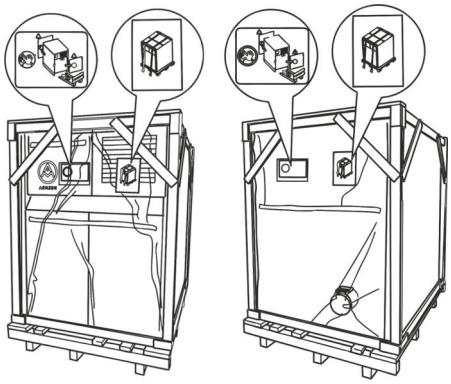
1. Strap the packaged unit to the truck in accordance with the diagram.
2. Always use appropriate edge protection to avoid damage to the package.

Fig. 37: Transport on a truck

4.1.3 Packaging

4.1.3.1 Symbole auf der Verpackung

Symbols on the packaging



The following symbols are displayed on the packaging. Always observe these symbols during transport.

Fig. 38: Symbols on the front/rear side

Explanations

Centre of gravity

1. Displays the centre of gravity and weight of the machine.

   Observe the location of the centre of gravity for lifting work and transport.

Fig. 39: Centre of gravity

Forklift lifting points

2. Only lift transport items at the lifting points marked with this symbol.

Fig. 40: Forklift lifting points

Transport on a truck

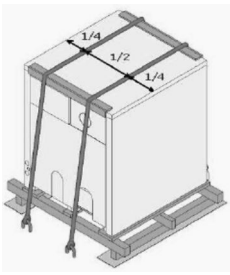


Fig. 41: Transport on a truck

3. Lash the package to the truck as shown in the diagram.
4. Always use appropriate edge protection to avoid damage to the package.

Explanations

Comply with the order (pos.1-pos.3) of the work stages.

Transport without a palette

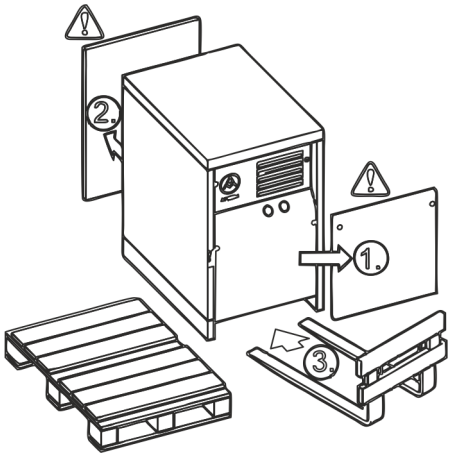


Fig. 42: Transport without a palette

1. Open the operating side of the acoustic hood (pos.1).
2. Open the rear side of the acoustic hood (pos.2).
3. Separate the machine from the transport pallet by removing the fastening screws.
4. Drive the fork of the forklift under the machine (pos.3).

WARNING!
Risk of injury if the machine topples or falls!
Observe the machine's centre of gravity.

5. Determine the machine's centre of gravity by raising it carefully.
6. Transport the machine so that it is balanced. The machine must not lean to one side.
7. Remove the lifting equipment at the installation site.

4.1.3.2 Handling packaging

Handling packaging

The individual packaged items are packed in accordance with the anticipated transport conditions. In as far as it is possible, environmentally-friendly materials are used for the packaging.

The packaging is intended to protect individual components from transport damage, corrosion and other forms of damage. For this reason, do not destroy the packaging and only remove it shortly before assembly.

Only remove packaging for transport to the installation site if it has been expressly permitted.

Removing packaging

Packaging material made of solid wood (e.g. wooden pallets, wooden crates) comply with the IPPC standard. It is re-usable. When disposing of the material, national and local requirements must be complied with.

From the machine/system components

1. **CAUTION!**
   Risk of injury from rough packaging material and protruding nails!

   Remove packaging material.
2. Detach the packing foil and remove it.
3. Separate the machine/system component from the transport pallet by removing the fastening screws.
4. **ENVIRONMENT!**
   Packaging material is valuable. It can be used several times or processed and then re-used. Improper disposal of packaging material can present a risk to the environment.
5. Sort packaging according to the material used and dispose of it properly. *Chapter 10.3 „Disposal“ on page 170*

From the machine/system components

1. Detach the packing foil and remove it.
2. Separate the machine/system component from the transport pallet by removing the fastening screws.
3. **ENVIRONMENT!**
   Packaging material is valuable. It can be used several times or processed and then re-used. Improper disposal of packaging material can present a risk to the environment.
4. Sort packaging according to the material used and dispose of it properly. *Chapter 10.3 „Disposal“ on page 170*

4.1.4 Transport inspection

Completeness

Checking for completeness
Check the goods for completeness immediately after delivery. Register missing parts and contact the manufacturer.

Check the delivery for completeness on the basis of the packing slip.

- The packing slip is provided with the product.

Transport damage

Transport damage
Register transport damage claims as soon as damage is discovered. Compensation claims for damage are only valid within the applicable claim periods.

Inspect the delivery immediately for transport damage.

In case of perceptible external damage, proceed as follows:

- Do not accept the delivery or only accept it under certain conditions.
- Note the scope of the damage in the transport documents or on the delivery docket provided by the carrier.
- Register the claim.

4.1.5 Transport of packaged units

4.1.5.1 Transport using industrial vehicles

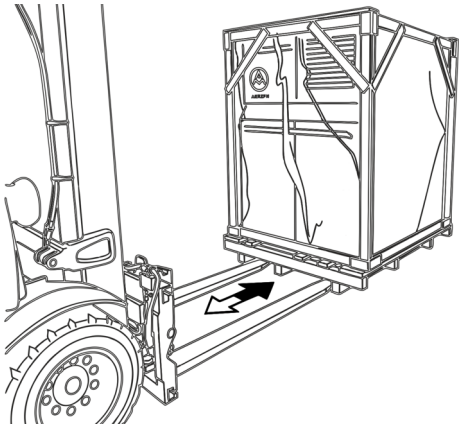


Fig. 43: Transporting packages

1. **NOTICE!**
   Risk of toppling loads! Packages may only be transported using lifting equipment that reaches under the machine and fits into the transport pallet fully.
2. Insert the equipment into the provided opening in the transport pallet.
3. Take into account the centre of gravity! See the labelling on the packaging.
4. **DANGER!**
   Risk of fatal injury from toppling components!

   Determine the package's centre of gravity by raising it carefully.
5. Transport the machine so that it is balanced. The package must not lean to one side.

4.1.5.2 Transport using a crane

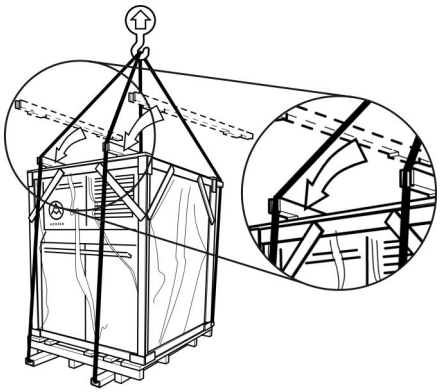


Fig. 44: Transport of packaged units

1. Guide the conveyor rails through the openings of the transport pallet.
2. Place the lifting beams onto the acoustic hood. Span width at least 150 mm larger than the dimensions of the acoustic hood.
3. Guide lifting equipment, such as cables or straps, through the conveyor rails and join them above the machine using the lifting beams.
4. Take into account the centre of gravity! See the labelling on the packaging.
5. **DANGER!**
   Risk of fatal injury from toppling components!

   Determine the packaged unit's centre of gravity by raising it carefully.

6. Transport the machine so that it is balanced. The packaged unit must not lean to one side.

4.1.5.3 Transport using industrial vehicles

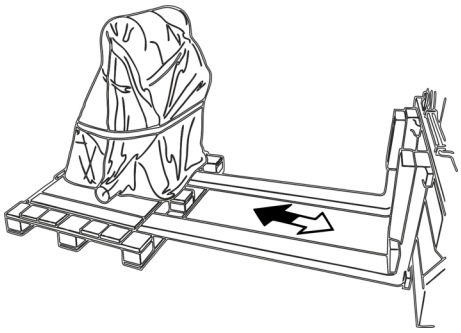


Fig. 45: Transporting packages

1. **NOTICE!**
   Risk of toppling loads! Packages may only be transported using lifting equipment that reaches under the machine and fits into the transport pallet fully.
2. Insert the equipment into the provided opening in the transport pallet.
3. Take into account the centre of gravity! See the labelling on the packaging.
4. **DANGER!**
   Risk of fatal injury from toppling components!

   Determine the package's centre of gravity by raising it carefully.
5. Transport the machine so that it is balanced. The package must not lean to one side.

4.1.5.4 Transport using a crane

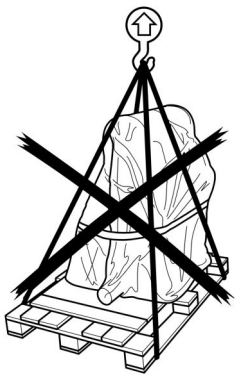


Fig. 46: Transport of packaged units

DANGER!
Risk of fatal injury from toppling components!

NOTICE!
Risk of damage to the machine from lifting equipment such as cables or straps.

Transport of the packaged unit with a crane is not permissible! The transport pallet is not designed for crane transport.

4.1.6 Transport to the installation site

4.1.6.1 Transport using industrial vehicles

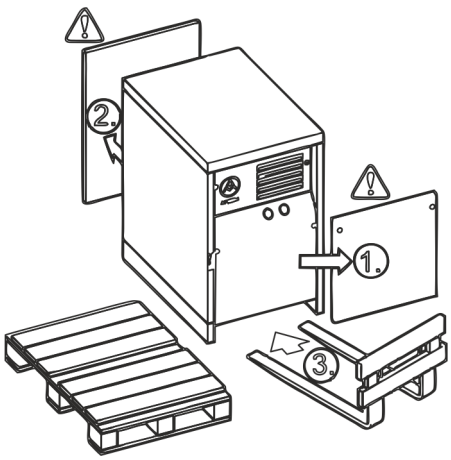


Fig. 47: Transport with acoustic hood

1. Completely remove packaging material.
2. Open the operating side of the acoustic hood (pos.1).
3. Open the rear side of the acoustic hood (pos.2).
4. Separate the machine from the transport pallet by removing the fastening screws.
5. Drive the transport fork under the machine (pos.3).
6. Take into account the centre of gravity! See the labelling on the packaging.
7. **DANGER!**
   Risk of fatal injury from toppling components!

   Determine the machine's centre of gravity by raising it carefully.
8. Transport the machine so that it is balanced. The machine must not lean to one side.
9. Remove the lifting equipment at the installation site.

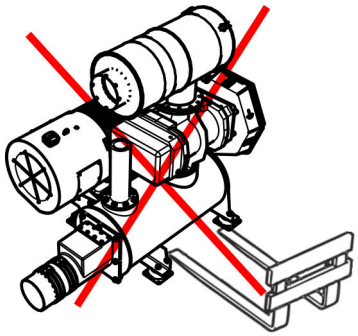


Fig. 48: Transport without an acoustic hood

DANGER!
Risk of fatal injury from toppling components!

Transport of the machine using an industrial vehicle is not permissible!

4.1.6.2 Transport using a crane

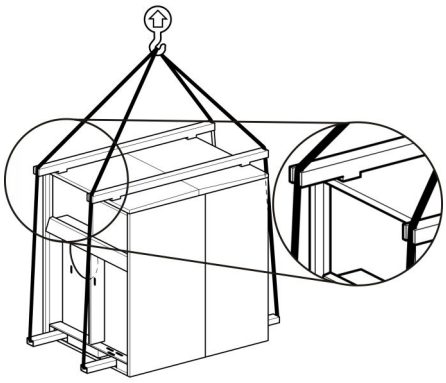


Fig. 49: Transport to the installation site

1. Completely remove packaging material.
2. Remove the front and rear elements of the acoustic hood and store them safely.
3. Guide the conveyor rails through the openings of the forklift tunnel.
4. Place the lifting beams onto the acoustic hood. The span width must be at least 150 mm greater than the dimensions of the acoustic hood.
5. Guide lifting equipment, such as cables or straps, through the conveyor rails and join them above the machine using the lifting beams.
6. Separate the machine from the transport pallet by removing the fastening screws.
7. Take into account the centre of gravity! See the labelling on the packaging.
8. **DANGER!**
   Risk of fatal injury from toppling components!

   Determine the machine's centre of gravity by raising it carefully.
9. Transport the machine so that it is balanced. The machine must not lean to one side.
10. Remove the lifting equipment at the installation site.

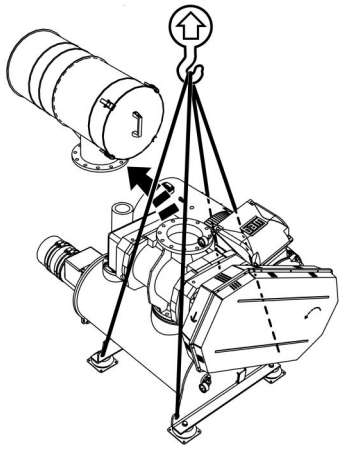


Fig. 50: Transport to the installation site

1. Completely remove packaging material.
2. Separate the machine from the transport pallet by removing the fastening screws.
3. **NOTICE!**
   Risk of machine damage from an unclean workspace!

   Dismantle the intake silencer on the flange joint.
4. **NOTICE!**
   Risk of damage from the force exerted by lifting equipment on accessory components!

   Only transport the machine with the hinged motor support fixed in place.
5. Attach the lifting equipment carefully to the fixing device.

6. Take into account the centre of gravity! See the labelling on the packaging.

7. 

DANGER!
Risk of fatal injury from toppling components!

Determine the machine's centre of gravity by raising it carefully.

8. Transport the machine so that it is balanced. The machine must not lean to one side.

9. Remove the lifting equipment at the installation site.

10. Mount the intake silencer.

4.2 Storage and preservation

4.2.1 Storage

Storage notes

Store packages under the following conditions:

- Keep flange connections closed. Avoid entry of foreign substances.
- Do not store outdoors.
- Store in a dry and dust-free place.
- Do not expose it to any aggressive media.
- Protect the packaged unit from exposure to the sun.
- Avoid mechanical vibrations.
- Avoid extreme temperature fluctuations.
- Avoid adverse water effects.
- Storage temperature: -10 to +40 °C
- Relative humidity: maximum 80%
- If a vibration-free storage area is not available, move the movable components by two to three rotations every six to eight weeks.

NOTICE!
Risk of corrosion!

To avoid potential damage, an inspection of the overall extent of supply should be undertaken by the manufacturer every 2 years.

There may be information on the packaged unit regarding storage that goes beyond the requirements listed here. Comply with this information.

Storage information for periods of over 12 months

Additional measures:

- Packaging with VPI paper
- Sealed in PVC foil

Storage information for periods of over 12 months in a tropical climate

Additional measures:

- Drying agent (VPI power in a bag) inside the packaging
- Packaging with VPI paper
- Sealed in PVC foil

Storage in air-conditioned rooms with minimum humidity has a positive influence on corrosion protection.

Packaging during storage

- Inspect the general condition of the packaging regularly. Immediately rectify damage to the packaging. If necessary, refresh or replace the preservation material. *„Carrying out preservation treatment“ on page 85*
- After opening the packaging:
  - Inspect uncoated parts for sufficient corrosion protection.
  - Protect against humidity and damaging environmental influences.
  - Do not remove sealing flaps from the connection openings.
- Replace the drying agent regularly in accordance with climate conditions.

NOTICE!
Risk of corrosion! Customised packaging is required for tropical climate zones and in the case of special customer requirements.

Damaged packaging

NOTICE!
Risk of corrosion! As a result of damaged packaging, moisture and damaging environmental influences could directly affect the product.

Measures in the case of damaged packaging:

- Immediately rectify damage to the packaging. If necessary, refresh or replace the preservation material.
- Dry the machine, if necessary.
- Check the drying agent and replace it if necessary.
- Repair or replace the packaging.

4.2.2 Preservation

Preservation

Factory preservation protects the product for a certain time period in accordance with the relevant storage and packaging information.

Factory preservation/standard		
Conveying chamber	BIO-CHEM food tech oil	biodegradable, does not contaminate groundwater
Oil chamber	Mobil SHC 626	operating lubricant oil
Shelf-life	up to 12 months	with compliance with storage conditions
Repeat	after 12 months	
Extended shelf-life (no standard)	more than 12 months	only with suitable long-term preservation and packaging

Preservation from assembly to commissioning		
Treat the conveying chamber and move the rotors by 2 to 3 rotations.	more than 6 weeks of non-use	Avoiding damage caused by corrosion and downtime

Preservation after periods of non-use		
Preservation of conveying chamber, oil chamber	More than 6 months	Special preservation measures are required

Carrying out preservation treatment

Preservation measures:

1. Open the packaging. Check the machine for good accessibility.
2. **WARNING!**
   Risk of poisoning from inhaling oil vapour!

   Preservation treatment of the conveying chamber:

   Spray suitable preservative oil over the intake nozzle at the machine stage.

   NOTICE!
   Risk of filter damage!

   Do not spray preservative oil into the intake filter. Never treat filter elements with preservative oil!
3. **WARNING!**
   Risk of poisoning from inhaling oil vapour!

   Preservation treatment of the oil chamber:

   Spray suitable preservative oil into the machine stage through the oil fill opening and oil drain opening.

   ⇨ Let excess preservative oil flow out of the oil drain opening.
4. Seal the oil fill opening and oil drain.
5. **WARNING!**
   Risk of poisoning from inhaling oil vapour!

   Treat the outer, uncoated surfaces with suitable preservative oil.
6. Check the sealing flaps.
7. Check and restore the packaging.

5 Set-up and installation

5.1 Safety instructions

Improper set-up and installation

WARNING!

Risk of injury from improper set-up and installation!

Improper set-up and installation can result in serious personal injury or material damage.

- Before beginning any work, ensure there is sufficient space for installation.
- Keep the workspace tidy and clean.
- Only use commercially-available tools or, if necessary, special tools.

  Unsuitable or damaged tools may cause injury!
- Secure components against falling during installation work.
- Install components correctly.
- Comply with the specified screw-tightening torques.

Electrical system

DANGER!

Risk of fatal injury from electric current!

There is a risk of fatal injury from touching live components. Live electrical components may make uncontrolled movements and cause extremely serious, or even fatal injury.

- Before beginning work, switch off the electric power supply and secure it against restarting.

Electrostatic charges

WARNING!

Risk of injury from electrostatic charges!

The belt drive may generate electrostatic charges.

- Before first commissioning put in place equipotential bonding.
- Only use electrically-conductive belts.

Requirements for personnel

Requirements for set-up and installation:

Set-up and installation of electrical components

Personnel: ■ Authorised electricians

Set-up and installation of mechanical components

Personnel: ■ Service personnel

Protective equipment

Requirements for set-up and installation:

Protective equipment:
- ■ Protective work clothing (7010-M010)
- ■ Safety shoes (7010-M008)
- ■ Protective gloves
- ■ Safety goggles (7010-M004)
- ■ Industrial hard hat (7010-M014)

Special tools

Requirements for set-up and installation:

Special tool:
- ■ Tools for authorised electricians
- ■ Electric drill
- ■ Drills
- ■ General tools
- ■ General measurement tools and equipment

Special tool: ■ Locking key

5.2 Requirements for the installation site

Ground properties

Inspect the ground properties. These should be as follows:

- stable
- level
- free of vibrations
- without any incline
- without holes

NOTICE!
Risk of deformation of the acoustic hood substructure! Do not install or mount the machine on “hollow” or lamellar foundations.

Subsurface requirements for the cement floor.
The cement floor should have a recommended compressive strength of 30—40 N/mm².

Flatness tolerance according to DIN 18202						
	Distance between measuring points in (m)					
	0.1	1	4	10	>15	/
Dimension tolerance in (mm)	2	4	10	12	15	/

Angular tolerance according to DIN 18202						
	Distance between measuring points in (m)					
	up to 1	over 1 up to 3	over 3 up to 6	over 6 up to 15	over 15 up to 30	over 30
Dimension tolerance in (mm)	± 6	± 8	± 12	±16	± 20	± 30

Surroundings

- Ensure there is a suitable fresh air supply.
- Avoid heat accumulation.

NOTICE!
Risk of corrosion! There must not be any excessive levels of dust, acids, steam or explosive or flammable gases at the installation site!

Installation without acoustic hood

The machine is only suitable for indoor installation.

Installation site

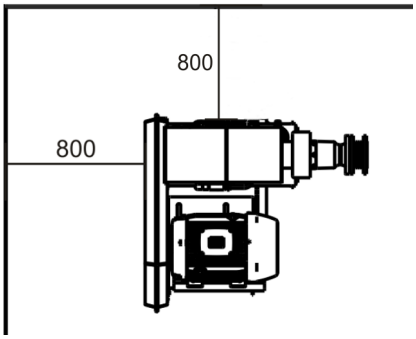


Fig. 51: Installation dimensions

- Comply with the overall dimensions for maintenance work. Observe the installation drawing.
- Provide measures for sound insulation.
- Take the following precautionary measures:
  - If possible, switch off the machine before entering the operating area. Otherwise wear hearing protection.
  - Provide appropriate signage at the installation site.
  - The installation site must only be accessible for trained persons.
  - Choose an installation site where the duration of time persons spend in the immediate vicinity of the machine is extremely limited.

Installation with acoustic hood

The machine is suitable for indoor and outdoor installation.

Installation site

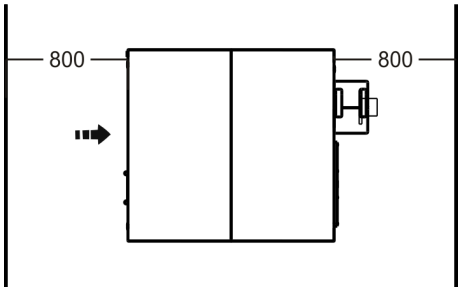


Fig. 52: Installation dimensions

- Comply with the overall dimensions for maintenance work. Also consult the installation drawing.
- Take the following precautionary measures:
  - If possible, switch off the machine before entering the operating area.
  - Otherwise wear hearing protection.
  - Only trained persons must be able to access the installation site.
  - Provide appropriate signage at the installation site.
  - Choose an installation site where the duration of time persons spend in the immediate vicinity of the machine is extremely limited.

5.3 Alignment and dowelling

Models with acoustic hoods

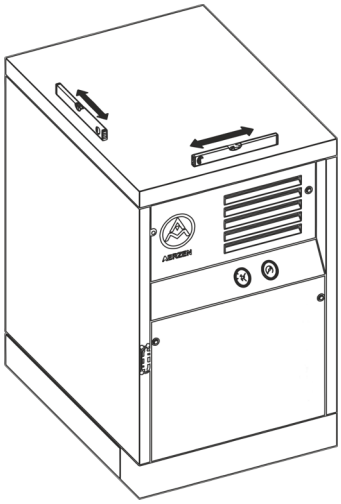


Fig. 53: Spirit level alignment

1. Carefully align the machine.
2. Position it so that it is balanced.

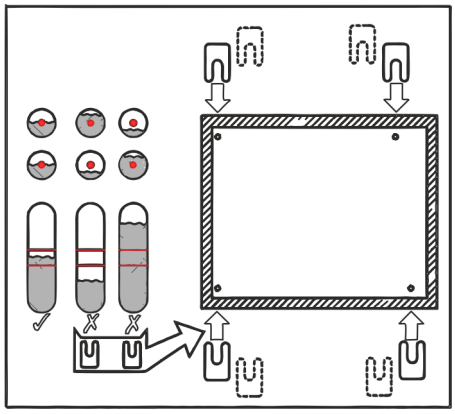


Fig. 54: Shim alignment

3.

NOTICE!

Risk of irreversible machine failure! Installing a machine at an angle can, as a result of an undefined oil level, lead to a total machine loss.

Observe the level and angle tolerances.

If necessary, use the intended shims on the bolting surfaces.

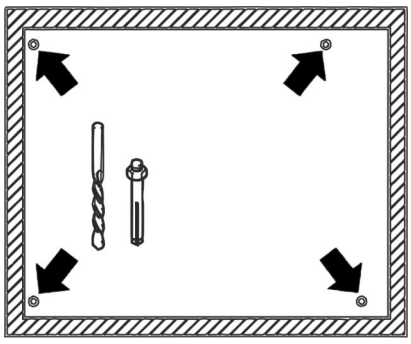


Fig. 55: Fastening points

4. Recommendation: drill and dowel four mounting holes and screw the machine into these.

Use of the Bondal sheet

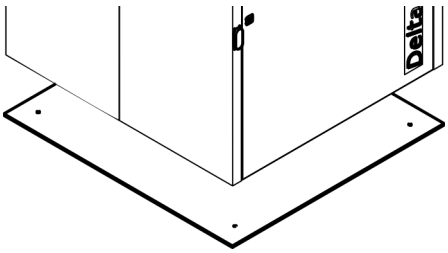


Fig. 56: Installing the machine

1. *Note the bores of the Bondal sheet and the machine's fastening points!*

   Position the machine on the Bondal sheet.

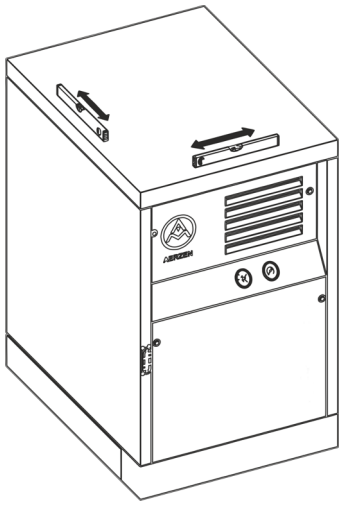


Fig. 57: Spirit level alignment

2. Put the machine in a horizontal position.

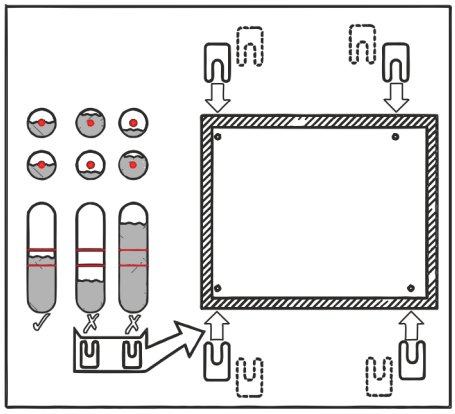


Fig. 58: Shim alignment

3. **NOTICE!**
   Risk of irreversible machine failure! Installing a machine at an angle can, as a result of an undefined oil level, lead to a total machine loss.

   Observe the level and angle tolerances.

   If necessary, use the intended shims on the bolting surfaces.

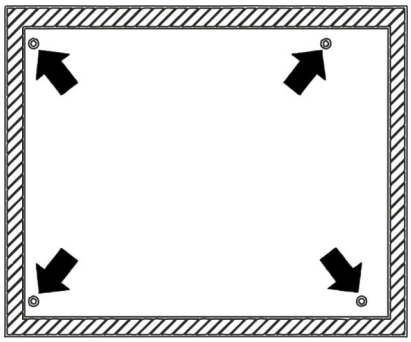


Fig. 59: Fastening points

4. Screw the machine and Bondal sheet together on the open steel structure at four fastening points.

Models without acoustic hoods

1. Carefully align the machine.
2. Position it so that it is balanced.
3.

> **NOTICE!**
> Risk of irreversible machine failure! Installing a machine at an angle can, as a result of an undefined oil level, lead to a total machine loss. Observe the level and angle tolerances.

If necessary, use the intended shims on the bolting surfaces.

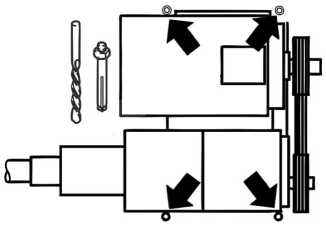


Fig. 60: Fastening points

4. A single bolt per machine foot is sufficient.

Drilling, dowelling and screwing tight the mounting holes

5.4 Connecting the system pipeline

System pipeline

> **NOTICE!**
> Risk of machine damage! The connected pipeline must not exert forces or moments that affect the machine.
>
> Secure and fasten the system pipeline.

> *Observe the labelling and dimensions on the installation drawing.*

Preparation of the model with acoustic hoods

1. If necessary: “break” the perforated sheets on the rear side of the acoustic hood.
2. Cut an opening into the foam material. The opening should be the size of the pipeline diameter.
3. Guide the service pipe through the opening and attach it.
4. Cover and seal the opening using shims.

Bushing connection/2 clamps

1. Remove the sealing cover from the connection openings.

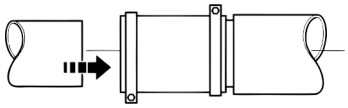


Fig. 61: 2 clamps

2. Connect the system pipeline.
   ⇨ Make sure that the clamps are offset by 180° to one another.

Bushing connection/4 clamps

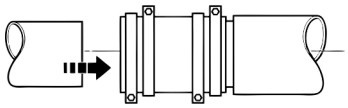


Fig. 62: 4 clamps

3. Connect the system pipeline.
   ⇨ Make sure that the clamps are offset by 180° to one another.

Connection of a compensator

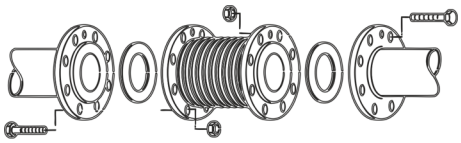


Fig. 63: Connection of a compensator

4. Connect the system pipeline.
5. Close off the pipeline duct using a shim.

5.5 Connecting the drive motor

5.5.1 Preparing the connection

Preparation of the acoustic hood

1. Note the instructions from the chapter “Set-up and function"!
   ↳ *Chapter 3.4.1 „Drive motor“ on page 56*
2. **DANGER!**
   Risk of fatal injury in the case of incorrect electrical connection data!

   Compare the electrical connection data of the drive motor with those of the owner’s grid.
3. Shut down the power from the owner-side grid.

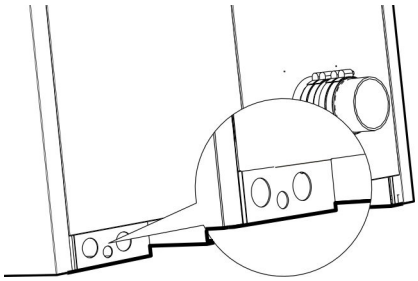


Fig. 64: Position on the acoustic hood

4. Observe the cable routing on the installation drawing!

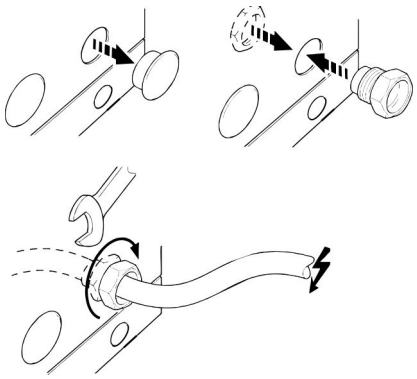


Fig. 65: Preparation

5. Prepare the cable feedthroughs.

6. **DANGER!**
Risk of fatal injury from electric current!

Check that there is no live current in the connection cable.

7. Lay the connection cable through the cable feedthroughs.

5.5.2 Routing cables

Laying the connection cable

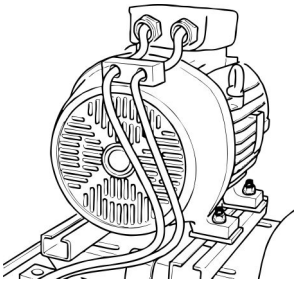


Fig. 66: Cable laying alignment

1. Route the connection cable in accordance with the installation drawing.

2. **NOTICE!**
Risk of damage! The minimum bending radius must not be undershot!

Observe the bending radii.

Bending radius of the connection cable = 15 x cable sheath diameter

5.5.3 Connecting the drive motor

Connecting the drive motor

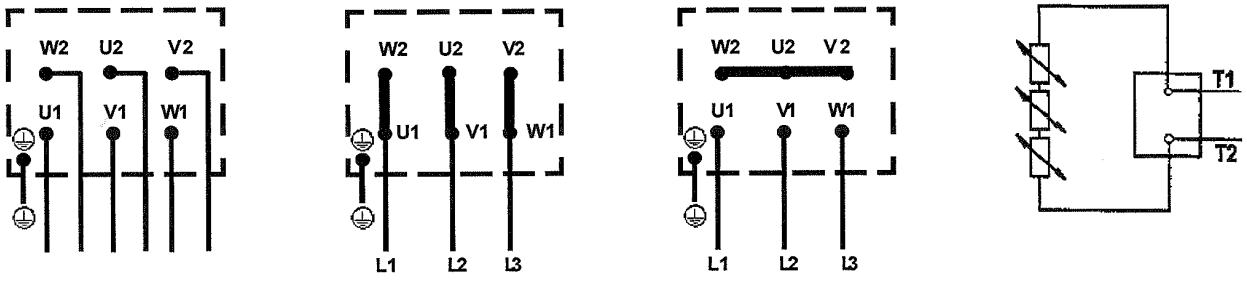


Fig. 67: Connection layout

Star-delta connection	Delta connection	Star connection	Thermal winding shield

1. Open the motor terminal box.
2. Check the alignment of the terminal box.
   ⇨ The terminal box must be aligned with openings for the cable feedthroughs facing in the direction of the motor fan.
3. Attach a screwed cable gland to the terminal box.
4. Guide the motor cable through the screwed cable gland.
5. Connect the cable connections with the motor terminals correctly, in accordance with the connection layout.
6. Close the terminal box.
7. Ensure that the connection cable is not damaged by the movement of the hinged motor support.

5.6 Connecting the drive motor

5.6.1 Preparing the connection

Preparation of the belt guard

1. Note the instructions from the chapter “Set-up and function"!
   Chapter 3.4.1 „Drive motor“ on page 56.
2. **DANGER!**
   Risk of fatal injury in the case of incorrect electrical connection data!

   Compare the electrical connection data of the drive motor with those of the grid operator.

3. Shut down the power from the owner-side grid.

4. **DANGER!**
Risk of fatal injury from electric current!

Check that there is no live current in the connection cable.

5.6.2 Routing cables

Laying the connection cable

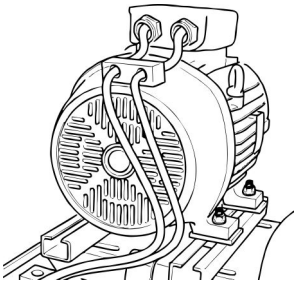


Fig. 68: Routing cables

1. Route the connection cable in accordance with the installation drawing.

2. **NOTICE!**
Risk of damage! The minimum bending radius must not be undershot!

Observe the bending radii.

Bending radius of the connection cable = 15 x cable sheath diameter

5.6.3 Connecting the drive motor

Connecting the drive motor

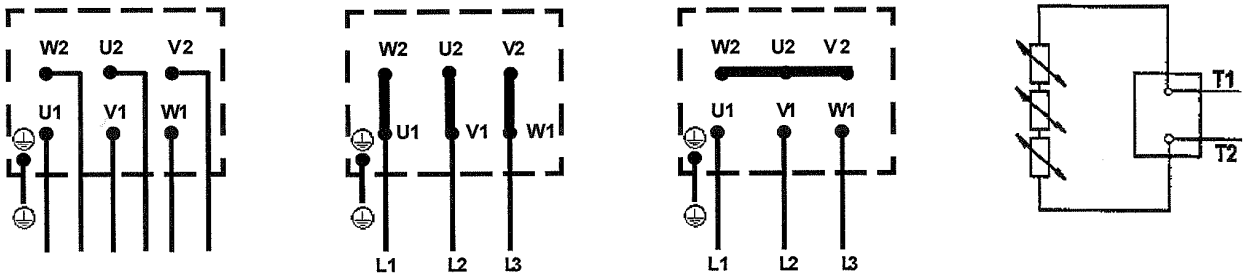


Fig. 69: Connection layout

Star-delta connection	Delta connection	Star connection	Thermal winding shield

1. Open the motor terminal box.
2. Check the alignment of the terminal box.
   ⇨ The terminal box must be aligned with openings for the cable feedthroughs facing in the direction of the motor fan.
3. Attach a screwed cable gland to the terminal box.
4. Guide the motor cable through the screwed cable gland.
5. Connect the cable connections with the motor terminals correctly, in accordance with the connection layout.
6. Close the terminal box.
7. Ensure that the connection cable is not damaged by the movement of the hinged motor support.

5.7 Connecting the machine's terminal strip

Machine terminal strip

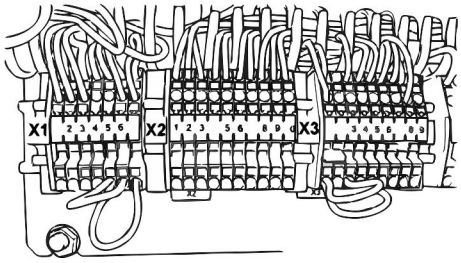


Fig. 70: Terminal strip connections

1. Open the terminal box.
2. Observe the wiring scheme.

   The wiring scheme can be found in the terminal box or in the product documentation.
3. **DANGER!**
   Risk of fatal injury from electric current!

   Check that there is no live current in the connection cable.
4. *Connection layout according to the AERZEN wiring scheme!*

   Guide the external connecting cable to the terminal box.
5. Guide the connecting cable correctly through the cable entry (dummy cover) to the terminals.
6. The cable entry (dummy cover) can be equipped on site with screwed cable glands.
7. Close the terminal box properly.

5.8 Connecting the earthing

Connecting the earthing

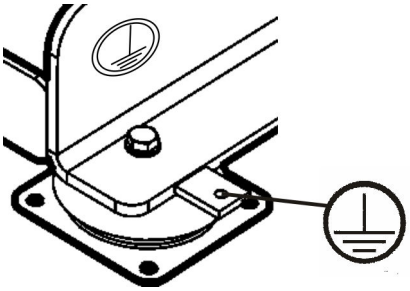


Fig. 71: Example connection

1. *The exact position of these connections can be found in the installation drawing.*

   Earth the machine using the connections provided.
2. Observe the cross-sections of the earthing strap! *Chapter 11.9.2 „Earthing strap cross-section “ on page 190*.
3. Beware of uncovered metal contact surfaces.
4. Screw the contacts together tightly.

5.9 Connecting the earthing

Connecting the earthing

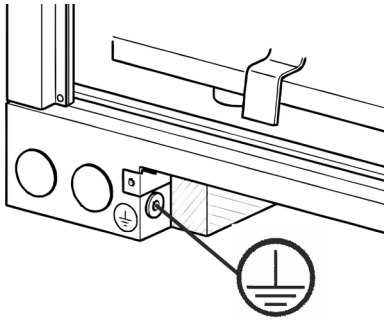


Fig. 72: Example connection

1. *The exact position of these connections can be found in the installation drawing.*

   Earth the machine using the connections provided.
2. Observe the cross-sections of the earthing strap! *Chapter 11.9.2 „Earthing strap cross-section “ on page 190*.
3. Beware of uncovered metal contact surfaces.
4. Screw the contacts together tightly.

5.10 Laying the insulation mat

Laying the insulation mat

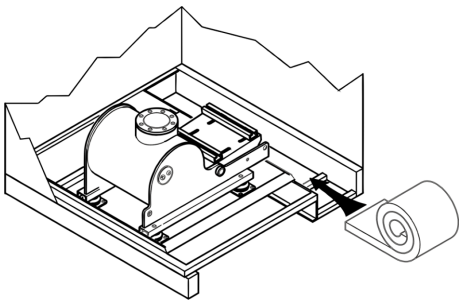


Fig. 73: Laying of the insulation mat

- Depending on the scope of delivery, the insulation mat is delivered separately.
- Lay the insulation mat in the exhaust duct of the acoustic hood.

6 First commissioning

6.1 Safety instructions

Improper first commissioning

WARNING!

Risk of injury from improper first commissioning!

Improper first commissioning may lead to serious injury and considerable material damage.

– Before first commissioning, ensure that all installation work has been carried out and completed in accordance with the information and notes in this instruction manual.
– Before first commissioning, ensure that there are no persons in the hazard area.

Requirements for personnel

Requirements for first commissioning:

First commissioning of electrical components

Personnel:
- Authorised electricians

First commissioning the frequency converter:

Personnel:
- Authorised electricians with additional qualifications

First commissioning of mechanical components

Personnel:
- Service personnel

Protective equipment

Requirements for first commissioning:

Protective equipment:
- Protective work clothing (7010-M010)
- Safety shoes (7010-M008)
- Hearing protection (7010-M003)
- Protective gloves
- Safety goggles (7010-M004)
- Industrial hard hat (7010-M014)

Special tools

Requirements for initial commissioning:

Special tool:
- Oil funnel
- Test pump
- General tools
- General measurement tools and equipment
- Tools for authorised electricians

Special tool:
- Ratchet wrench

Special tool:
- Locking key

6.2 Preparation for initial commissioning

Preparation

1. Check that the machine has been correctly installed. See requirements at the installation site *Chapter 5.2 „Requirements for the installation site“ on page 88*.
2. Check that the packaging has been fully removed.
3. Check that all seals and covers on the piping connections have been removed.
4. Check that the piping connections are clean. Remove any dirt, dust or foreign matter from the intake area.
5. Ensure that the cross-sections of the inlet and exhaust air openings on the acoustic hood are unobstructed.

Venting and purging the installation site

6. *Take the ambient temperature into consideration. Chapter 11.4 „Technical performance data“ on page 177*

   Ensure adequate ventilation and air extraction at the installation site.

Take noise protection into consideration.

7. *Natural vibrations and sound emissions may be induced in piping and foundations!*

   Prevent natural vibrations and sound emission using suitable measures, e.g. insulation.

Ventilating the pressure gauge

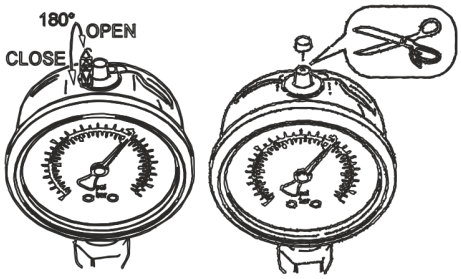


Fig. 74: Ventilating the pressure gauge

8. Prepare the pressure gauge in line with its specific design.

- Cut off the rubber connections on the upper section.
- Turn the bleeder flap to “OPEN”.

Adjusting the maintenance indicator (a)

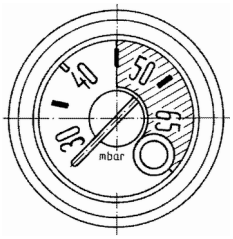


Fig. 75: Version a)

9. Set to zero.

- Press the front reset button and set the pointer to the zero position.

Adjusting the maintenance indicator (b)

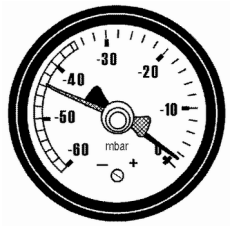


Fig. 76: Version b)

10. Set to zero.

- Remove the plugs on the front.
- Adjust the set screw using a screwdriver.
- Observe the “+” and “-” markings.
- Position the red trailing pointer between 0 and - 10 mbar.

Aligning the sheaves

11. Check the alignment of the sheaves.

- The maximum permitted sheave offset is 0.5 mm.

Connecting the piping

12. Connect the depressurised system pipelines.

Removing the sealing plugs

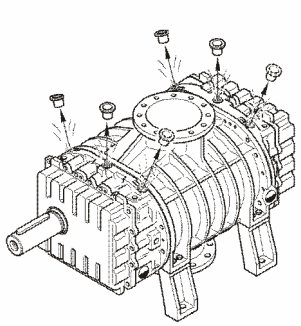


Fig. 77: Layout example

13. Remove the sealing plugs from the balancing holes.

The sealing plugs may be coated in machine paint as part of the manufacturing process.

The number of sealing plugs varies depending on the machine type!

Depending on the design, they may already have been removed before shipping.

NOTICE!

Risk of damage if sealing plugs are not removed!

If sealing plugs are not removed, there is a risk that the machine will start to leak oil. Lube oil could enter the conveying chamber.

No lube oil

Fig. 78: Do not fill with oil

14.

NOTICE!

Risk of damage! Lube oil must not enter these bore holes!

These bore holes are solely intended to discharge leaking gases.

Checking the acoustic hood fan

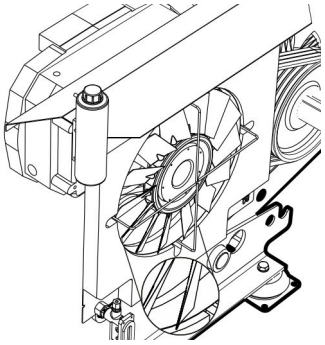


Fig. 79: Fan cover

15. Check the fan wheel is running smoothly without coming into contact with other components.

If necessary, adjust the cover plate.

Positioning and connecting the frequency converter

16. *Observe the manufacturer's instruction manual!*

Position and install the frequency converter.

- Connect as per the specifications of the manufacturer.
- Note the description of the frequency converter assembly. *Chapter 3.4.4 „Frequency converter“ on page 59*

Checking the EMERGENCY STOP function

17. Check whether the EMERGENCY STOP function is in place and installed.

- Check for correct operation.
- Enter the test result in the test book.

Preparing the hinged motor support

Handling *without* lifting device

Disassembling the transport safety lock

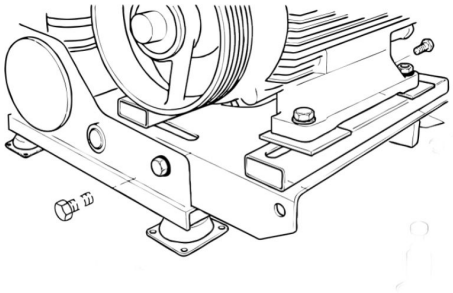


Fig. 80: Example: DN50

Disassembling the transport safety lock

1. Remove the safety screws for transport.

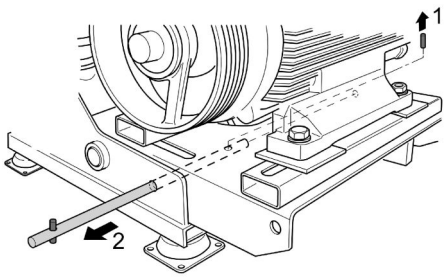


Fig. 81: Example: DN80

2.
- 1.) Remove the split pin.
- 2.) Disassemble the safety rod for transport.

⇨ The safety rod later acts as an aid for supporting the hinged motor support.

Preparing the hinged motor support

Handling *with* lifting device

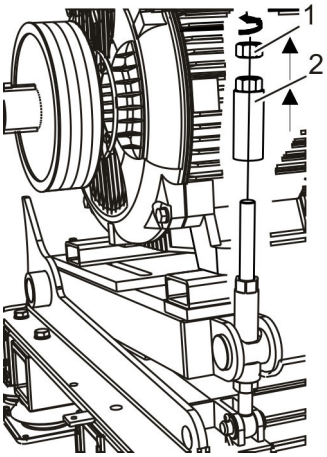


Fig. 82: Hinged motor support preparation

→ Remove the counternut (pos.1) and locking sleeve (pos.2).

6.3 Performing first commissioning

6.3.1 Filling oil, version with oil system

1. → Open the maintenance elements of the acoustic hood.

Filling with lube oil

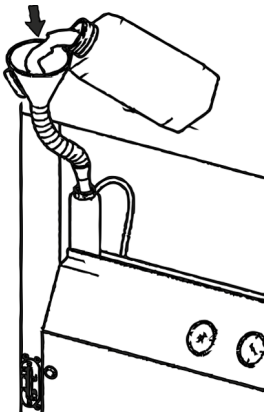


Fig. 83: Model with oil system

2. →

When working with operating materials such as lube oil, always wear personal protective equipment.

ENVIRONMENT!
Risks to the environment due to incorrect handling of lubricants!

Fill with lube oil. *Chapter 8.3.1 „First filling of lube oil“ on page 132*

Checking the oil level on the acoustic hood

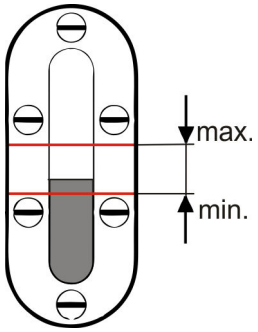


Fig. 84: Acoustic hood oil level display

3. Check the lube oil level on the acoustic hood's oil level display. Correct if necessary.

Checking the oil level on the machine stage

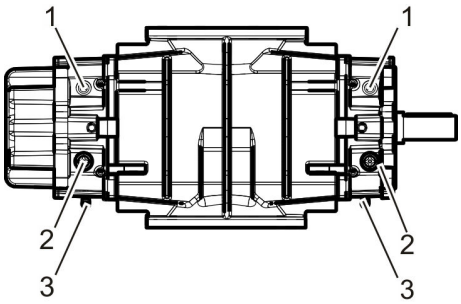


Fig. 85: Oil level display (machine stage)

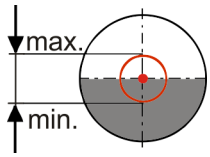


Fig. 86: Oil level display (pos.2)

4. Check the lube oil level on the machine stage's oil level displays (pos.2). Correct if necessary.

6.3.2 Filling oil, version without oil system

Filling with lube oil

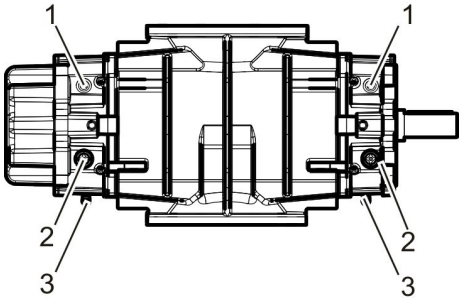


Fig. 87: GM 3S–GM 80L

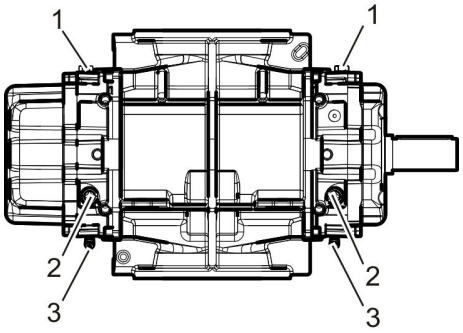


Fig. 88: GM 90L–GM 150S

1. *When working with operating materials such as lube oil, always wear personal protective equipment.*

ENVIRONMENT!
Risks to the environment due to incorrect handling of lubricants!

Loosen the RED-marked blanking plug (pos.1). Fill with lube oil. *Chapter 8.3.1 „First filling of lube oil“ on page 132*

Checking the oil level

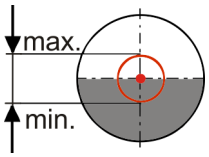


Fig. 89: Oil level display (pos.2)

2. Check the lube oil level. Correct if necessary.

6.3.3 Establishing an electrical connection

Establishing an electrical connection

1. **DANGER!**
Risk of fatal injury from electric current!

Supply electrical components with electricity.

Chapter 5.5 „Connecting the drive motor“ on page 93

2. Connect and activate motor overload protection. *Chapter 11.9.3 „ Motor overload protection“ on page 190*

3. Observe the permissible starting frequency of the drive motor *Chapter 3.4.1 „Drive motor“ on page 56*.

Checking direction of rotation, models with acoustic hood

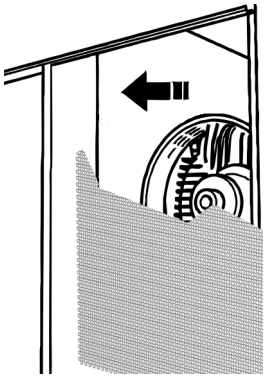


Fig. 90: Motor direction of rotation

4.

WARNING!
Risk of injury from rotating components!

NOTICE!
Risk of machine damage from incorrect direction of rotation!

Check the direction of rotation **without belts** in place.

- If in place, remove the perforated plate cover of the drive motor's sheave.
- Observe the sign with direction of rotation on the machine stage and on the drive motor.
- Start the drive motor briefly (approx. 1–2 seconds).
- Viewed towards the front of the drive shaft, the drive motor turns anti-clockwise.
  - Direction of rotation is correct = continue initial commissioning.
- From the viewing position, the drive motor turns right in front of the drive shaft.
  - Direction of rotation is incorrect = correct the electrical connection.
- Where applicable, attach the perforated plate cover of the drive motor.

Checking the direction of rotation/ model without acoustic hood

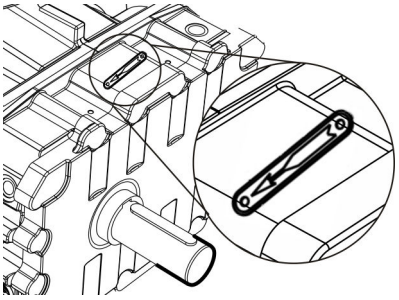


Fig. 91: Direction of rotation

5.

WARNING!
Risk of injury from rotating components!

NOTICE!
Risk of machine damage from incorrect direction of rotation!

Check the direction of rotation **without belts** in place.

- Remove the cover from the belt guard.
- Observe the sign with direction of rotation on the machine stage.
- Start the drive motor briefly (approx. 1–2 seconds).
- Viewed towards the front of the drive shaft, the drive motor turns anti-clockwise.
  - Direction of rotation is correct = continue initial commissioning.
- From the viewing position, the drive motor turns right in front of the drive shaft.
  - Direction of rotation is incorrect = correct the electrical connection.
- Mount the cover of the belt guard.

Disconnecting the electrical power supply

6.

WARNING!
Risk of injury from an automatic start-up!

Deactivate the machine and secure it against restarting.

6.3.4 Handling the hinged motor support *with* lifting device

Fitting the belt

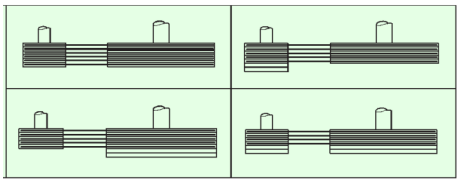


Fig. 92: Permissible belt layout

1.

WARNING!
Risk of injury from moving or rotating components!

Observe and comply with the permissible groove layout.

Loosening the self-locking nut

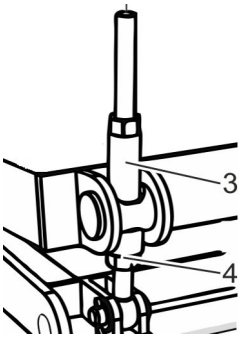


Fig. 93: Loosening the self-locking nut

2.

NOTICE!
Prevention of wear and tear on belts.

Screw the self-locking nut (pos.4) all the way downwards.

⇨ The hinged motor support can be adjusted to the correct position.

Pre-tensioning belts

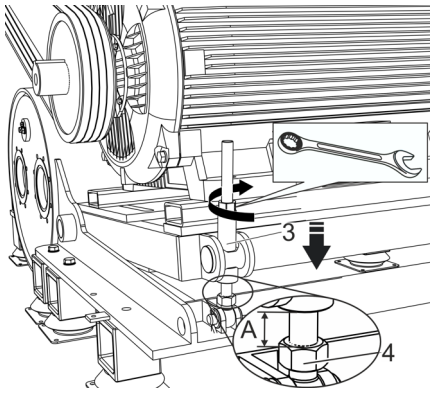


Fig. 94: Pre-tensioning belts

3.

CAUTION!
Risk of injury from tensioning components!

Turn guide bushing (pos.3) clockwise with the ratchet wrench until the belts are pre-tensioned.

⇨ The hinged motor support is partly held by the belt drive and rests lightly on the guide bushing (pos.3).

Adjusting the guide bushing

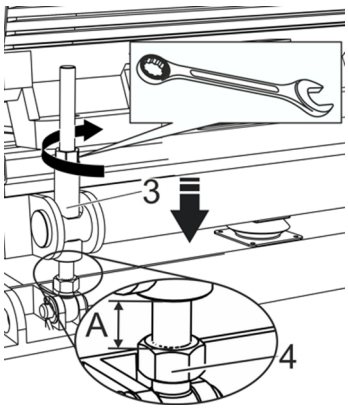


Fig. 95: Adjusting the guide bushing

4. Set gauge A.

- Set self-locking nut (pos.4) to gauge A. Turn guide bushing (pos.3) using the ratchet wrench on to the self-locking nut (pos.4).

DN/discharge side	Gauge A in mm
80	20
100	25
125	30
150	35
200	40
250	45
300	50
Delta Blower G5	

Tensioning the belts

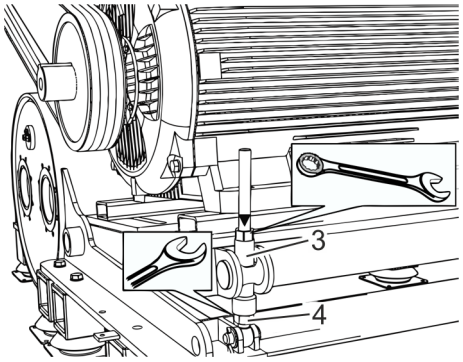


Fig. 96: Tensioning the belts

5. ▶

CAUTION!
Risk of injury from moving and rotating components!

Tension the belts.

- Secure the guide bushing (pos.3) with the self-locking nut (pos.4).
- The hinged motor support is supported entirely by the belt drive.

6.3.5 Handling the hinged motor support *without* lifting device

Raising the hinged motor support of the DN50

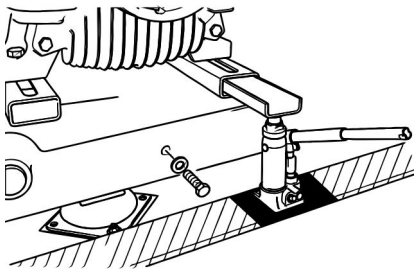


Fig. 97: Example: DN50

1. ▶ Insert the lifting bracket in the motor's attachment rail.

NOTICE!
Only use hydraulic lifts on solid, level ground.

Position the hydraulic lift securely.

2. ▶

WARNING!
Risk of shearing and crushing from moving loads!

Slowly raise the hinged motor support by pumping the hydraulic lift.

3. ▶

WARNING!
Risk of injury from the hydraulic lift tipping up or slipping!

Raise the hinged motor support in small steps and always support it with timbers! This prevents the sudden downward movement of the hinged motor support if the hydraulic lift tips up or slips.

Raising the hinged motor support of the DN80

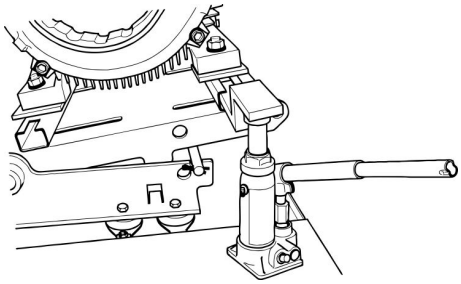


Fig. 98: Example: DN80

4. Insert the lifting bracket in the motor's attachment rail.

NOTICE!
Only use hydraulic lifts on solid, level ground.

Position the hydraulic lift securely.

5.

WARNING!
Risk of shearing and crushing from moving loads!

Slowly raise the hinged motor support by pumping the hydraulic lift.

6.

WARNING!
Risk of injury from the hydraulic lift tipping up or slipping!

Raise the hinged motor support in small steps. While doing so, use the transport safety rod to brace the hinged motor support in the recess of the base support. This prevents the sudden downward movement of the hinged motor support if the hydraulic lift tips up or slips.

7. Raise the hinged motor support until the belts can be fitted.

Fitting the belt

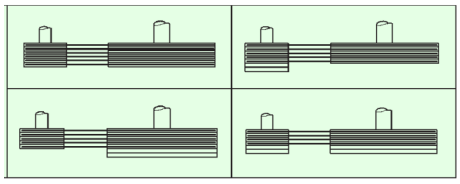


Fig. 99: Permissible belt layout

8.

CAUTION!
Risk of injury from tensioning components!

Fit the belt. Observe and comply with the permissible groove layout.

Tensioning the belts

9.

WARNING!
Risk of injury from tensioning, moving or rotating components!

Release the hydraulic lift carefully and slowly.

⇨ The hinged motor support is lowered.

If released too quickly, the hinged motor support drops suddenly.

The belts are tautened by the weight of the motor.

10. Completely remove the hydraulic lift and other auxiliary equipment and store them safely for future maintenance purposes.

11. **NOTICE!**
Risk of damage to the belt drive! The hinged motor support must not rest on the base support, the transport safety lock or similar equipment.

Completely remove the hydraulic lift, transport safety lock and other auxiliary equipment and store them safely for future maintenance purposes.

6.3.6 Carrying out a test run

Checking the oil level

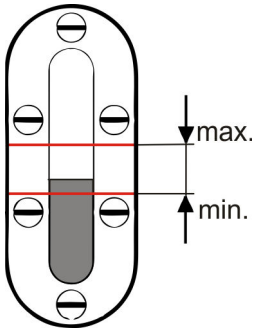


Fig. 100: Oil level display

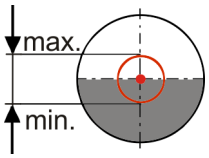


Fig. 101: Oil level display

1. Check the lube oil level on the oil level displays.

The lube oil level remains steady at a point between the min. and max. markings on the oil level display.
The oil level is OK.

The lube oil level does not remain steady at a point between the min. and max. markings on the oil level display.
Correct the machine's alignment. Observe the filling quantities.

2. **CAUTION!**
Risk of injury from moving components!

Carry out a test run of the belt drive and check that it is operating correctly.

Characteristics:

- quiet, smooth operation
- even load
- no excessive vibrations
- no whistling noises
- no increased wear

Checking the protective cover/ models without acoustic hood

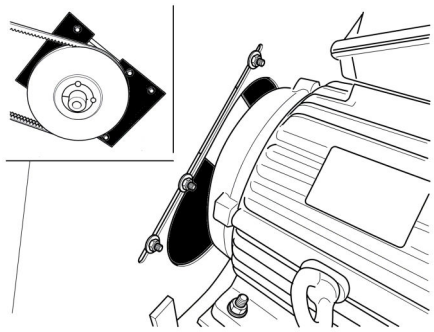


Fig. 102: Protective cover

3. Check the spacing of the pre-mounted protective cover for the motor drive shaft.
   - The protective cover should be at a distance of approx. 10 mm from the motor drive shaft.
   - By loosening the fastening screws, the protective cover can be moved.
   - Check the protective cover for firm seating and, if necessary, tighten it.

Adjusting the protective cover/ models without acoustic hood

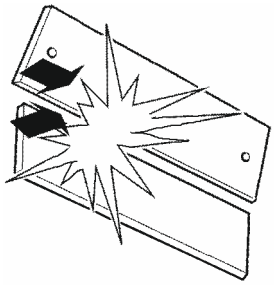


Fig. 103: Adjusting the protective cover

4. If the protective cover is supplied separately, adjust the cover plates accordingly. The cover plates can be snapped off at the required length.

Assembling and adjusting the protective cover/models without acoustic hood

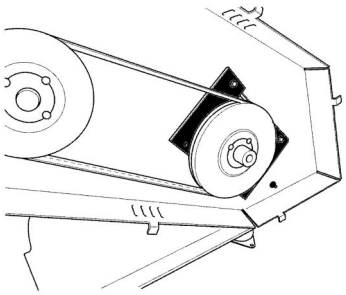


Fig. 104: Assembly/adjusting

5. **WARNING!**
Risk of injury from rotating components!

Assemble the protective cover after tensioning the belts.

- The protective cover should be at a distance of approx. 10 mm from the motor drive shaft.
- Operation is only permissible with the covers installed.

Closing the acoustic hood

6. Close the maintenance element of the acoustic hood.

Connecting the power supply

7. **WARNING!**
Risk of injury from electric current!

Supply electrical components with electricity.

Inspecting shut-downs

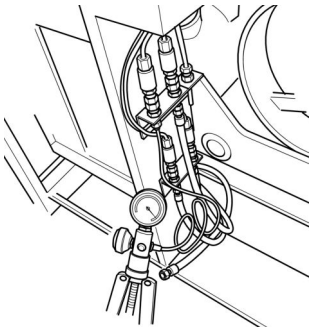


Fig. 105: Test pump

8. Check the correct operation of all pressure switches/pressure sensors that can trigger a shut-down.

- Connect the test pump to the corresponding measurement line.
- Simulate the tripping pressure.
- Check to see whether the shut-down process is triggered.
- Remove the measurement line from the test pump.
- Fit the measurement line to the measuring point on the machine.

Opening the system line

9. Open valves on the system side.

Checking the safety valve

10. Check the safety valve for correct operation.

Starting briefly

11.

WARNING!
Risk of injury from rotating components!

WARNING!
Risk of injury from pressurised components!

Do not loosen or remove any blanking plugs or pipe connections.

Switch on the drive motor.

- After approx. 20 seconds, switch it off.
- Make sure the machine coasts down smoothly.

Checking the frequency converter for correct operation

12.

DANGER!
Risk of fatal injury from electric current and residual energy when performing any work on frequency converters!

See also the assembly description for frequency converters. *Chapter 3.4.4 „Frequency converter“ on page 59*

Starting the drive motor

13.

WARNING!
Risk of injury from rotating components!

As long as there are no malfunctions: Restart the drive motor.

- Check the EMERGENCY STOP function.
- Check the machine’s protective equipment.

Checking after the first commissioning

14.

WARNING!
Risk of injury from pulling or opening pressurised pipes with lubricating oil.

Perform the following checks:

Chapter 6.4 „Performing checks after first commissioning“ on page 117

Acoustic hood protection

15.

WARNING!
Risk of injury if protective equipment is not present.

Correctly close the elements of the acoustic hood.

- Store the acoustic hood key safely.
- Only allow access for authorised personnel.

Belt protection

16.

WARNING!
Risk of injury if protective equipment is not present.

Mount the belt protection cover.

Operational readiness

If there are no malfunctions, the machine is ready for operation.

After the first few operating hours, preservative oil may gather in the parting faces as a result of the machine warming up.

6.4 Performing checks after first commissioning

Inspection	After the first 3 op. hrs	After the first 25 op. hrs
Screw connections	check after the machine has cooled down, re-tighten if necessary	
Safety valve	check for correct operation	
Oil level	check, correct if necessary	check, correct if necessary
Alignment of sheaves		check, correct if necessary
Condition of the belts		check, change if necessary, establish cause
Control system, fault transmitter, pressure and temperature sensors	check for correct operation	
Motor overload protection	connected and active	
Accumulation of preservative oil		check, remove if necessary
op. hrs = operating hours		

7 Operation

7.1 Safety instructions

Improper operation

WARNING!

Risk of injury from improper operation!

Improper operation may lead to serious injury and considerable material damage.

- Carry out all activities in accordance with the information and notes in this instruction manual.
- Before beginning work, observe the following:
  - Ensure that all covers and safety devices are installed and operating correctly.
  - Ensure that there are no persons in the hazard area.
- Never deactivate or bypass safety devices during operation.

An open acoustic hood

WARNING!

Risk of injury from operation with an open acoustic hood!

Open acoustic hoods may lead to dangerous situations and cause injury during machine operation.

- Always keep the acoustic hood closed during operation.

Adjusting valves

DANGER!

Risk of injury when adjusting valves!

When the machine is running and an attempt is made to adjust a valve, body parts may be injured by rotating components. Take into account the stand-by mode and/or automatic start-up

Only make adjustments if:

- The machine is not running.
- The machine is secured against a restart.

Risk of explosion and fire

DANGER!

Risk of explosion and fire from ignition hazards!

Avoid allowing ignition hazards (open flames, flying sparks, weld spatter) into the vicinity of the machine. Sparks and incandescent or flammable objects could be sucked in through the supply air openings on the acoustic hood or through the intake silencer. The fan may ignite the mixture, causing an explosion or fire.

– Avoid ignition hazards.
– Never carry out work that generates sparks while the machine is in operation.
– Ventilate the installation site properly.

Requirements for personnel

Requirements for operation:

Using the machine

Personnel:
- User

Adjusting valves

Personnel:
- User
- Authorised electricians

Protective equipment

Requirements for operation:

Protective equipment:
- Protective work clothing (7010-M010)
- Safety shoes (7010-M008)
- Hearing protection (7010-M003)

Special tools

Adjusting the valves requires:

Special tool:
- General tools

Special tool:
- Locking key

7.2 Shut-down in case of emergency

In hazardous situations, the movements of components must be stopped as quickly as possible and the electric power supply must be shut off.

Shut-down in case of emergency

In an emergency, proceed as follows:

1. Activate the EMERGENCY STOP immediately.
2. Inform the responsible staff.
3. Switch off the main circuit breaker and secure it against restarting.
4. Assign qualified personnel the task of rectifying the fault.
5.

WARNING!
An unauthorised or unregulated restart can have fatal consequences.

Before commissioning, ensure that all safety devices are installed and operational.

7.3 Switching on

Operating modes

Depending on the operating mode, the machine can be switched on in the following ways:

If possible, start up the machine without load!

Observe the control circuit types!

When starting and stopping the drive motor, observe all of the machine's protective measures. Power take-offs must be actuated by a potential-free contact or be actuated directly. The start-up of the power take-offs runs in parallel to the drive motor.

AERtronic

The starting and stopping of the drive motor must be carried out by AERtronic. A potential-free contact is already in place.

7.3.1 Local control mode

On-site manual operation

DANGER!
Risk of injury if protective equipment is missing!

Manually activate the starter switch on the machine on site.

⇨ The machine starts and comes on stream.

7.3.2 Remote operation

Via remote station

DANGER!
Risk of fatal injury if protective equipment is missing!

WARNING!
Risk of injury if the machine starts suddenly!

Activate the starter switch in the remote station.

⇨ The machine is started remotely and comes on stream.

Remote station with AERtronic

- Remotely via potential-free contact
- Remotely via MODBUS RTU
- Remotely via PROFIBUS DP

7.3.3 Automatic operation

Automatic activation

DANGER!
Risk of fatal injury if protective equipment is missing!

WARNING!
Risk of injury if the machine starts suddenly!

The starting command is carried out by sensors or a system switch.

⇨ The machine starts automatically and comes on stream.

7.4 Displaying operating parameters

AERtronic (optional)

A detailed explanation is contained in the separate operating manual AS-002.

Fig. 106: AERtronic display

Analogue instruments (optional)

Depending on their design, analogue instruments display the given operating data, e.g. discharge pressure, discharge temperature, oil pressure.

Control system (optional)

Depending on the customer's control system, additional operating parameters can be recorded and displayed.

7.5 Decommissioning

Decommissioning means the shut-down of a machine for a longer period.

Measures

1. Switch off the machine properly and secure it against an unintentional start.
2. Disconnect fuses.
3. Close the shut-off valves of the delivery lines.
4. Put the machine in a depressurised state.
5. Prevent condensate from entering the machine.
6. For a downtime of over six weeks: preserve the conveying chamber.

Avoiding damage caused by down-time and corrosion

For a downtime of over six weeks
Preserve the conveying chamber. „*Preservation*“ *on page 84*
Move the rotors every six weeks by 2-3 rotations.

7.6 Measures for recommissioning

7.6.1 Commissioning after adjustment works

After adjustments

Carry out work stages *Chapter 7.7.2 „Commissioning after adjustments“ on page 125*.

7.6.2 Commissioning after maintenance work

After maintenance

Carry out work stages *Chapter 8.5 „Commissioning after maintenance“ on page 160*.

7.6.3 Commissioning after fault rectification

After fault rectification

Carry out work stages *Chapter 9.5 „Commissioning after fault rectification“ on page 166*.

7.7 Adjusting valves

DANGER!
Risk of injury when adjusting valves or equipment!

Preparation/models with acoustic hood

1. Agree adjustments with the responsible staff at the location.
2. Switch off the machine.
3. Activate the EMERGENCY STOP function.
4. Switch off the main circuit breaker and secure it against restarting.
5. Ensure there is no live current.
6. Open the maintenance elements.

Preparation/models without acoustic hood

1. Agree adjustments with the responsible staff at the location.
2. Switch off the machine.
3. Activate the EMERGENCY STOP function.
4. Switch off the main circuit breaker and secure it against restarting.
5. Ensure there is no live current.
6. Disassemble the belt guard.

7.7.1 Adjusting the start unloading device

DN 80 to DN 400

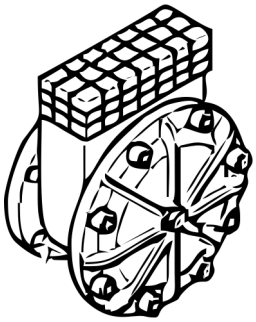


Fig. 107: Start unloading device

The start unloading device is preset with a maximum closing time at the factory. An adjustment is only necessary if the start unloading device does not close or the closing time is too long.

Chapter 11.10.3 „Start unloading device DN 80 to DN 400“ on page 191

Settings with star-delta starting

The start unloading device closes fully after:

- *the switch from star to delta.*
- *the nominal speed is reached.*

The closing procedure can be both heard and seen (on the gauge for discharge pressure).

Setting the closing time

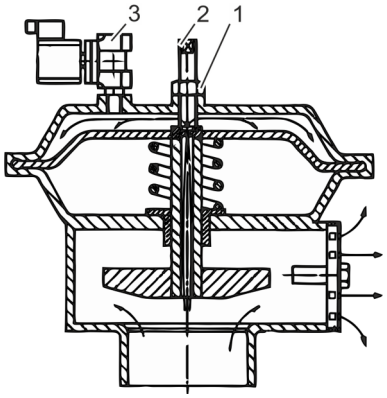


Fig. 108: Start unloading positions

1. Open the maintenance elements.
2. Loosen counternut (pos.1)
3. Move the spindle (pos.2) clockwise.
   ⇨ The closing time is reduced.
4. Move the spindle (pos.2) anti-clockwise.
   ⇨ The closing time is extended.
5. Set the closing time.
6. Tighten counternut (pos.1).
7. Mount all protective hardware and covers.
8. Close the maintenance elements.
9. **NOTICE!**
   Risk of damage! Observe the starting frequency of the drive motor!

   Start the machine.
10. Check the closing time.

11. If the closing time is in the permissible adjustment range:
    ⇨ adjustments are complete.
12. If the closing time is not in the permissible adjustment range:
    ⇨ repeat the adjustment steps.

Settings for pole changing

Set start unloading device to a lower speed in accordance with star-delta starting.

The closing time in the lower speed range must be set as long as possible, so that an acceptably long closing time is still available for the upper speed range.

If this is not possible, then an additional solenoid valve is used.

The solenoid valve (pos.3) keeps the start unloading device open to the atmosphere when ramping up to “high-speed” mode directly.

Reasons for the above:

- The differences in conveyed amounts are too large.
- High-speed operation is started from low-speed operation in “star-double-star starting“.

The solenoid valve (pos.3) keeps the start unloading device open to the atmosphere during star-double-star starting.

The solenoid valve closes after ramping up.

7.7.2 Commissioning after adjustments

Commissioning

1. Inform the responsible on-site person about the result of the work carried out and agree commissioning steps with that person.
2. Check all previously loosened screw connections for tightness.
3. Ensure that there are no persons in the hazard area.
4. Re-attach all safety hardware.
5. Remove all used tools, materials and other equipment from the workspace.
6. Release the safety on the main circuit breaker and activate it.
7. Release the EMERGENCY STOP function.
   ⇨ Start operation in accordance with the instructions in the “Operation” chapter. *Chapter 7.3 „Switching on“ on page 120*
8. Inform the responsible on-site person about the result of the work carried out.

8 Maintenance

8.1 Safety instructions

Improperly performed maintenance work

WARNING!

Risk of injury from improperly performed maintenance work!

Improperly performed maintenance may lead to serious injury and material damage.

- Only perform maintenance work when the machine has been switched off.
- Secure the machine against a restart.
- Allow the machine to cool down to the ambient temperature.
- Before beginning work, ensure that there is sufficient space for installation work.
- Keep the workspace tidy and clean.
- Only perform maintenance work with suitable tools.
- Ensure removed components are re-installed correctly.
- Re-install all fastening elements and observe the screw tightening torques.

Securing the machine against restarting

WARNING!

An unauthorised or unregulated restart can have fatal consequences.

An unauthorised or unregulated restart of the machine can lead to serious or fatal injuries. There may be people located in the hazard area.

- Before beginning work, switch off the energy supply and secure it against restarting.

Electrical system

DANGER!

Risk of fatal injury from electric current!

There is a risk of fatal injury from touching live components. Live electrical components may make uncontrolled movements and cause extremely serious injury.

- Before beginning work, switch off the electric power supply and secure it against restarting.

Rotating or moving components

WARNING!

Risk of injury from rotating or moving components!

Rotating or moving components can cause serious injuries.

- Never touch rotating or moving components.
- Never reach into the clamping area of the belts, for example.
- Keep a safe distance from rotating or moving components.
- Wear tight-fitting protective work clothing with low tensile strength within the hazard area.

Hot operating materials

WARNING!

Risk of injury from hot operating materials!

Operating materials may reach high temperatures during operation. Skin contact with hot operating materials causes serious burns.

- For all work performed with hot operating materials, always wear protective work clothing and protective gloves.
- Before any work with operating materials, check whether they are hot. If necessary, allow them to cool down to ambient temperature.

Requirements for personnel

The maintenance work described here may only be performed by the designated personnel. The personnel entrusted with the respective maintenance tasks are listed in the maintenance plan.

For the preparation of the maintenance plan, the following is necessary:

Personnel:
- Authorised electricians
- Service personnel

For cleaning after maintenance, the following is necessary:

Personnel:
- User

Commissioning after maintenance requires:

Personnel:
- Authorised electricians
- Service personnel

Protective equipment

For maintenance, the following is necessary:

Protective equipment:
- Protective work clothing (7010-M010)
- Safety shoes (7010-M008)
- Protective gloves
- Safety goggles (7010-M004)
- Industrial hard hat (7010-M014)

Special tools

For maintenance, the following is necessary:

Special tool:
- Oil funnel
- General tools
- General measurement tools and equipment
- Auxiliary materials, tools

Special tool:
- Ratchet wrench

Special tool:
- Locking key

8.2 Maintenance plan

The following section describes the maintenance work that is required for optimal and fault-free operation of the machine.

If regular inspections reveal an increased level of abrasion, reduce the necessary maintenance intervals in accordance with the actual signs of wear and tear. For questions on maintenance work and intervals contact the manufacturer. Contact information ↬ *Chapter 1.4 „Addresses“ on page 11*

8.2.1 Maintenance schedule for normal operation

Interval	Maintenance work	Personnel
After the first 500 op. hrs	Change the lube oil. *(Not when using Delta Lube 06!)* ↳ *Chapter 8.3.5 „Changing lube oil“ on page 144* For a gas-tight shaft seal, change the grease. ↳ *Chapter 8.3.4 „Replacing the grease on gas-tight drive shafts“ on page 143*	Service personnel
Weekly	Check the intake filter for contamination. (display unit, max. permissible - 45 mbar)	User
	Check the oil level. ↳ *Chapter 8.3.2 „Checking the oil level“ on page 135* If necessary, correct it. ↳ *Chapter 8.3.3 „Correcting the oil level“ on page 137*	User
	If the maximum value (- 45 mbar) is exceeded, change the intake filter. ↳ *Chapter 8.3.6 „Replacing the intake filter“ on page 150*	Service personnel
	Check the belt guard is fixed in place securely, undamaged and free of dirt. ↳ *Chapter 8.3.15 „Checking the belt guard“ on page 159* Remove any dirt from the outer belt guard.	User
	If it is insufficiently stable or damaged, contact customer service.	Manufacturer’s customer service division
Relubrication intervals for the drive motor	Observe the instruction manual and signage of the drive motor!	Service personnel
After every 4,000 op. hrs or 6 months	Check and clean the inlet and exhaust air openings on the acoustic hood. ↳ *Chapter 8.3.14 „Checking the inlet and exhaust air openings of the acoustic hood“ on page 158* Check that the acoustic hood fan is operating correctly. ↳ *Chapter 8.3.14 „Checking the inlet and exhaust air openings of the acoustic hood“ on page 158*	Service personnel
	Check that the safety valve is operating correctly and clean it. ↳ *Chapter 8.3.11 „Checking the AERZEN safety valve“ on page 156*	Service personnel
	Check the condition of the belts. If necessary, replace them. ↳ *Chapter 8.3.9 „Replacing belts, version with lifting device“ on page 152* Check the condition of the belts. If necessary, replace them. ↳ *Chapter 8.3.10 „Replacing belts, version without lifting device “ on page 154* Inspect the sheaves for unusual wear and tear or obvious damage. Inspect for alignment and stability. ↳ *Chapter 8.3.7 „Checking the sheaves“ on page 151* Replace the lube oil at a discharge temperature of over 140°C. *(Not when using Delta Lube 06!)* ↳ *Chapter 8.3.5 „Changing lube oil“ on page 144*	Service personnel

Interval	Maintenance work	Personnel
After every 4,000 op. hrs or 6 months	When using AERZEN special rotary piston oil with a gas-tight shaft seal, replace the grease at a discharge temperature of over 140 °C. ↳ *Chapter 8.3.4 „Replacing the grease on gas-tight drive shafts“ on page 143*	
	Replace grease when using lube oil with an ISO VG 220 viscosity class in conjunction with a gas-tight shaft seal. ↳ *Chapter 8.3.4 „Replacing the grease on gas-tight drive shafts“ on page 143*	
	If necessary, replace the sheaves.	Manufacturer’s customer service division
After every 8,000 op. hours or every 12 months	Lube oil: Change Delta Lube 06: only for pressure differentials > 800 mbar ↳ *Chapter 8.3.5 „Changing lube oil“ on page 144*	Service personnel
	When using a gas-tight shaft seal, change the grease. ↳ *Chapter 8.3.4 „Replacing the grease on gas-tight drive shafts“ on page 143*	Service personnel
	Change the lube oil. *(Not when using Delta Lube 06!)* ↳ *Chapter 8.3.5 „Changing lube oil“ on page 144*	Service personnel
	Replace the intake filter. ↳ *Chapter 8.3.6 „Replacing the intake filter“ on page 150*	Service personnel
	Check the control system for correct operation.	Manufacturer’s customer service division
After every 16,000 op. hrs or every 2 years	Replace the belts. ↳ *Chapter 8.3.9 „Replacing belts, version with lifting device“ on page 152*	Service personnel
	Replace the belts. ↳ *Chapter 8.3.10 „Replacing belts, version without lifting device “ on page 154*	
	Check the alignment of the sheaves. Correct if necessary. ↳ *Chapter 8.3.7 „Checking the sheaves“ on page 151*	
	Check non-return flap for wear and tightness. Replace if necessary. ↳ *Chapter 8.3.12 „Checking the non-return flap“ on page 157*	
	Check the flexible pipe connections on the discharge and intake sides for leaks. Replace if necessary. ↳ *Chapter 8.3.16 „Checking pipelines for leaks“ on page 159*	
	Lube oil: Replace DELTA LUBE 06. ↳ *Chapter 8.3.5 „Changing lube oil“ on page 144*	
After every 20,000 op. hrs or every 3 years	Check hose lines for tightness. Replace if necessary. Recommendation: replace hose lines every 6 years.	Service personnel
	Recommended main inspection/maintenance. Check and replace spare parts and wear parts. Entire machine check.	Manufacturer’s customer service division

op. hrs = operating hours

8.3 Maintenance work

Preparation

1. Agree maintenance work with the responsible staff at the location.
2. Switch off the machine.
3. Activate the EMERGENCY STOP function.
4. Switch off the main circuit breaker and secure it against restarting.
5. Observe the warning signs on the machine!
6. **DANGER!**
   Risk of injury from electric current!

   Ensure there is no live current.
7. **DANGER!**
   Risk of injury during maintenance work!

   Open the maintenance elements.
8. **DANGER!**
   Risk of injury during maintenance work!

   Open the belt guard cover.

8.3.1 First filling of lube oil

8.3.1.1 Model *with* oil system

Filling with lube oil

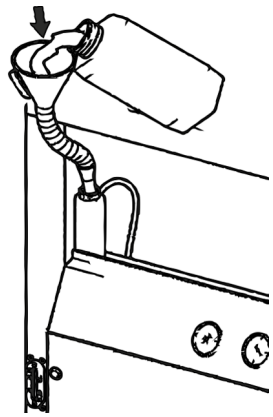


Fig. 109: Filling with lube oil

1. Check the drain valve for firm seating.
2. Check that the sealing cap of the drain valve is firmly in place.
3. Open the oil container.
4. Ensure that the ventilation pipe in the oil filling container is unobstructed.
5.

CAUTION!
Risk of skin irritation from lube oil!

ENVIRONMENT!
Risks to the environment due to incorrect handling of lubricants!

Observe the oil quantity *Chapter 11.7.4 „Lubricant quantities“ on page 187* and specification *Chapter 11.7.1 „Lube oil specifications“ on page 182*.

First, fill 3/4 of the listed quantity of oil.

6. Wait 5-10 minutes. The lube oil continues to flow.
   ⇨ The oil level regulates itself in the oil system and in the oil chambers.
7. Check the oil level.

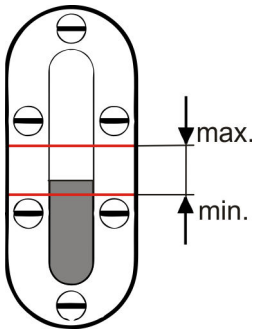


Fig. 110: Acoustic hood sight glass

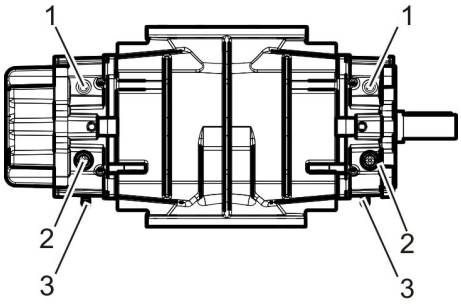


Fig. 111: Machine stage sight glasses

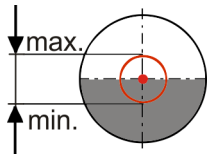


Fig. 112: Oil level display (pos.2)

8. Check the lube oil level on the machine stage's oil level displays (pos.2). Correct if necessary.

9. Fill the rest of the lube oil up to the mark on the acoustic hood's sight glass. Observe the run down time of the lube oil.

⇨ The oil level is correct when it is between min. and max.

10. Close the oil filling container.

11.

ENVIRONMENT!
Risk of environmental damage from incorrect storage of lube oil!

Clean the workspace thoroughly.

Dispose of the lube oil residue in an environmentally friendly way.

Clean all auxiliary equipment.

8.3.1.2 Model *without* oil system

Filling with lube oil

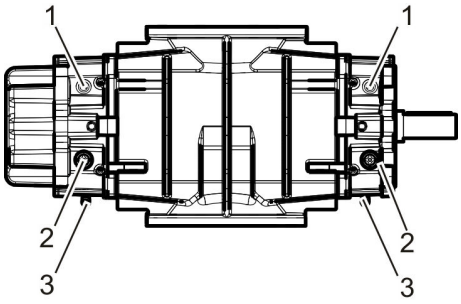


Fig. 113: GM 3S–GM 80L

1 Oil fill openings, marked in red
2 Oil level displays
3 Drain valves

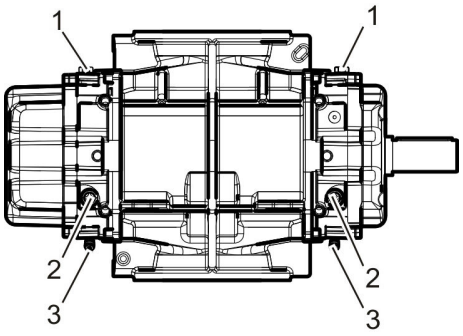


Fig. 114: GM 90S–GM 150L

1. Check the drain valves (pos.3) for firm seating.
2. Check the sealing caps of the drain valves (pos.3) for firm seating.
3. Open the oil fill openings (pos.1), the RED-marked blanking plugs.
4. Observe the oil quantity distribution.

   Guide value:

   - 1/3 of the entire lube oil quantity in the drive side.
   - 2/3 of the entire lube oil quantity in the wheel side.

   The display in the oil level sight glass is decisive.
5. **CAUTION!**
   Risk of skin irritation from lube oil!

   ENVIRONMENT!
   Risks to the environment due to incorrect handling of lubricants!

   Observe the oil quantity *Chapter 11.7.4 „Lubricant quantities“ on page 187* and specification *Chapter 11.7.1 „Lube oil specifications“ on page 182*.

   Fill with lube oil. To do this, fill with approx. 3/4 of the entire oil quantity. Fill this reduced total oil quantity according to the oil quantity distribution (approx. 1/3 drive side, approx. 2/3 wheel side) into both oil chambers.
6. Observe the oil level. Wait 5-10 minutes. The lube oil continues to flow.

   ⇨ The oil level regulates itself in the oil system and in the oil chambers.
7. Check the lube oil level.
8. Fill the rest of the lube oil up to the mark on the sight glass.

   ⇨ The oil level is correct when it is between min. and max.
9. Close the oil fill opening (pos.1) tightly with a seal.
10. **ENVIRONMENT!**
    Risk of environmental damage from incorrect storage of lube oil!

    Clean the workspace thoroughly.

    Dispose of the lube oil residue in an environmentally friendly way.

    Clean all auxiliary equipment.

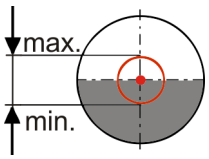
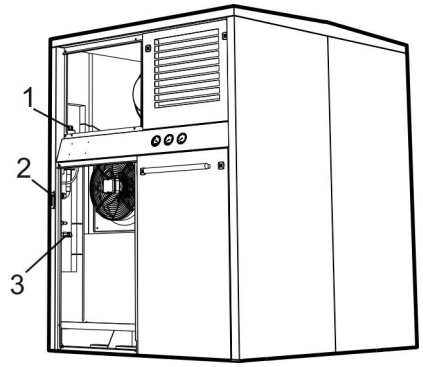


Fig. 115: Sight glass for oil level display (pos.2)

8.3.2 Checking the oil level

8.3.2.1 Model *with* oil system

Model with oil system



1 Oil fill opening (oil filling container)
2 Oil level display
3 Oil drain

Fig. 116: Oil system

Checking the oil level

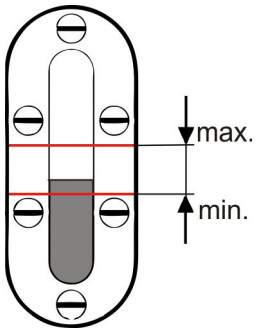


Fig. 117: Acoustic hood sight glass

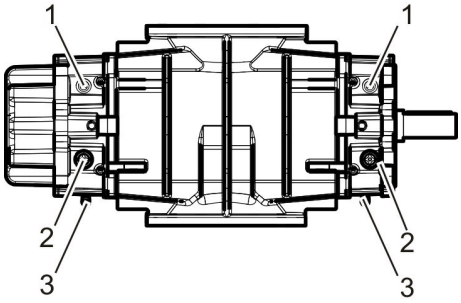


Fig. 118: Machine stage sight glasses

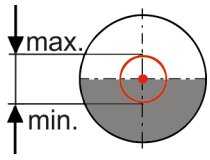


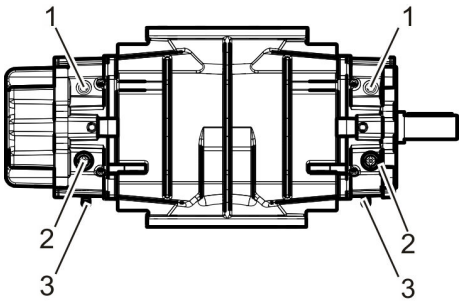
Fig. 119: Oil level display (pos.2)

1. Check the lube oil level. Correct if necessary.

2. Check the lube oil level on the machine stage's oil level displays (pos.2). Correct if necessary.

8.3.2.2 Model *without* oil system

Model without oil system



1 Oil fill openings, marked in red
2 Oil level displays
3 Drain valves

Fig. 120: GM 3S–GM 80L

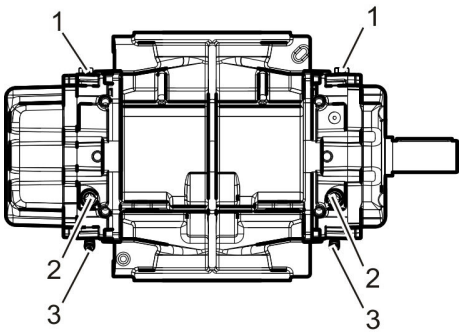


Fig. 121: GM 90S–GM 150S

Checking the oil level

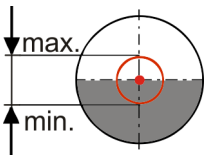


Fig. 122: Sight glass for oil level display

→ Check the lube oil level. Correct if necessary.

8.3.3 Correcting the oil level

8.3.3.1 Oil level too high

Model *with* oil system

Draining lube oil

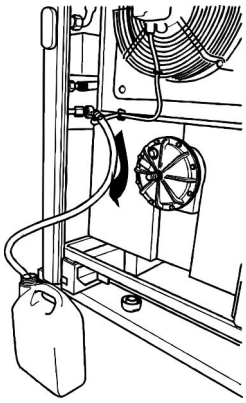


Fig. 123: Draining lube oil

1.

WARNING!
Risk of scalding from hot lube oil!

NOTICE!
Material damage to the drain hose from lube oil temperatures over 60 °C!

Allow the lube oil to cool down to the ambient temperature.

2.

Observe the volume of the lube oil and the oil-resistant receptacle. *Chapter 11.7.4 „Lubricant quantities“ on page 187*

Have a receptacle ready.

3. Open the oil opening on the oil filling container.

⇨ Lube oil flows out more evenly from the oil drain.

4. Feed the drain hose into the receptacle.

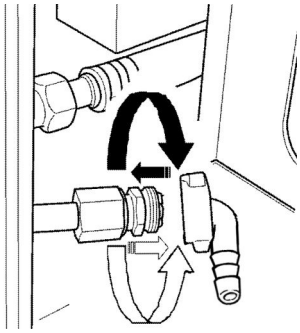


Fig. 124: Fitting the drain hose

5.

CAUTION!
Risk of skin irritation from old lube oil!

Remove the sealing cap from the drain valve.

Twist the drain hose onto the drain valve.

⇨ The drain valve opens automatically.

6.

CAUTION!
Risk of slipping from lube oil spillage!

Guide the excess lube oil into the receptacle.

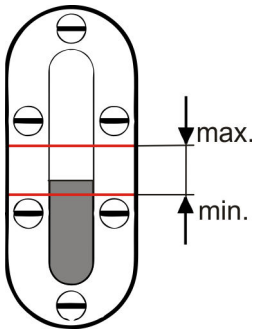


Fig. 125: Sight glass for oil level display

7. Observe and check the oil level.
8. If the permissible oil level is reached, remove the drain hose.
   ⇨ The drain valve closes automatically.
9. Screw the sealing cap onto the drain valve.
10. Close the oil fill opening.
11. **ENVIRONMENT!**
    Risk of environmental damage from lube oil!

    Collect old and residual lube oil properly and dispose of it in an environmentally friendly manner.

    Clean the workspace thoroughly.

    Clean all auxiliary equipment.

Model without oil system

Draining lube oil

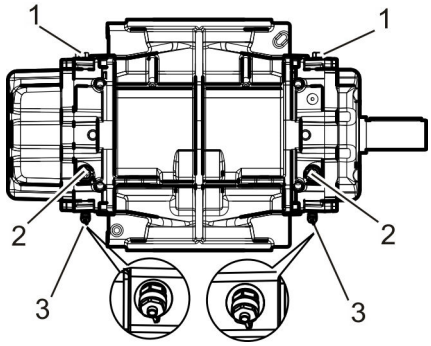


Fig. 126: Draining lube oil

3 Drain valves

1. **WARNING!**
   Risk of scalding from hot lube oil!

   NOTICE!
   Material damage to the drain hose from lube oil temperatures over 60 °C!

   Allow the lube oil to cool down to the ambient temperature.
2. *Observe the volume of the lube oil and the oil-resistant receptacle. ↬ Chapter 11.7.4 „Lubricant quantities“ on page 187.*

   Have a receptacle ready.
3. Select an oil chamber with an excessively high filling capacity.
4. Open the oil fill opening.
   ⇨ Lube oil flows out more evenly from the oil drain.

5. **CAUTION!**
Risk of skin irritation from old lube oil!

A blanking plug or a shut-off valve can be used as an alternative to the drain valve.

The oil chamber can be opened by:

- *Disassembly of the blanking plug*
  or by
- *Removing the sealing plug on the shut-off valve (shut-off valve is open).*

Remove the sealing cap from the drain valve.

If the sealing cap is very tightly in place, secure the drain valve using a wrench. Loosen the sealing cap with an additional wrench.

6. Feed the drain hose into the receptacle.
7. Twist the drain hose onto the drain valve.
   ⇨ The drain valve opens automatically.
8. **CAUTION!**
Risk of slipping from lube oil spillage!

Guide any excess lube oil into the receptacle.

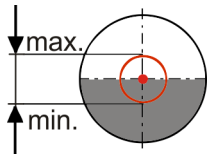


Fig. 127: Sight glass for oil level display

9. Observe and check the oil level.
10. If the oil level has been corrected, remove the drain hose.
    ⇨ The drain valve closes automatically.

A blanking plug or a shut-off valve can be used as an alternative to the drain valve.

The oil chamber can be closed by:

- *Mounting the blanking plug with a new sealing ring*
  or by
- *Sealing the output of the shut-off valve with sealing plugs (shut-off valve closes).*

11. Screw the sealing cap onto the drain valve.
12. Close the oil fill opening.

13. **ENVIRONMENT!**
Risk of environmental damage from lube oil!

Collect old and residual lube oil properly and dispose of it in an environmentally friendly manner.

Clean the workspace thoroughly.

Clean all auxiliary equipment.

8.3.3.2 Oil level too low

Model *with* oil system

Filling with lube oil

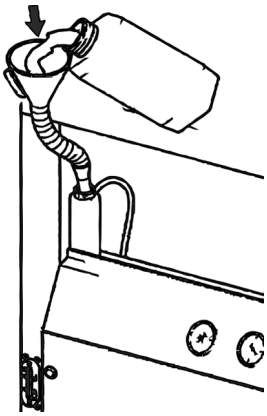


Fig. 128: Filling with lube oil

1. Check the drain valve for firm seating.
2. Check that the sealing cap of the drain valve is firmly in place.
3. Open the oil filling container.
4. Ensure that the ventilation pipe in the oil filling container is unobstructed.
5. **CAUTION!**
Risk of skin irritation from lube oil!

   ENVIRONMENT!
Risks to the environment due to incorrect handling of lubricants!

   Specifications ↬ *Chapter 11.7.1 „Lube oil specifications“ on page 182*

   Fill the lube oil in stages and in small quantities.
6. Observe the oil level. Wait 5-10 minutes. The lube oil continues to flow.

   ⇨ The oil level regulates itself in the oil system and in the oil chambers.

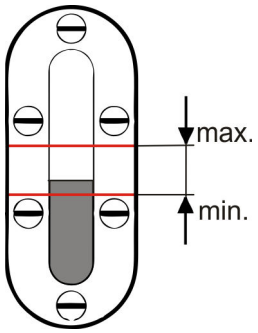


Fig. 129: Acoustic hood sight glass

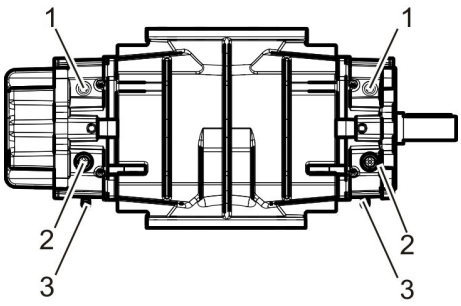


Fig. 130: Machine stage sight glasses

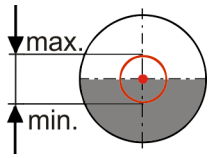


Fig. 131: Oil level display (pos.2)

7. Check the oil level.

8. Check the lube oil level on the oil level displays.

The lube oil level remains steady at a point between the min. and max. markings on the oil level display.
The oil level is OK.

The lube oil level does not remain steady at a point between the min. and max. markings on the oil level display.
Correct the oil level.

9. Close the oil filling container.

10.

ENVIRONMENT!
Risk of environmental damage from incorrect storage of lube oil!

Clean the workspace thoroughly.

Dispose of the lube oil residue in an environmentally friendly way.

Clean all auxiliary equipment.

Model without oil system

Filling with lube oil

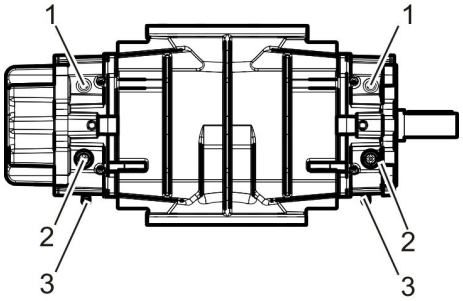


Fig. 132: GM 3S–GM 80L

1 Oil fill openings, marked in red
2 Oil level displays
3 Drain valves

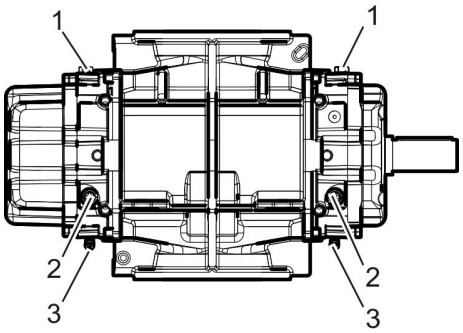


Fig. 133: GM 90S–GM 150S

1. Select the required oil chamber.

2. Check the drain valve (pos.3) for firm seating.

3. Check sealing cap of the drain valve (pos.3) for firm seating.

4. Open the oil fill opening, the RED-marked blanking plug.

5.

CAUTION!
Risk of skin irritation from lube oil!

ENVIRONMENT!
Risks to the environment due to incorrect handling of lubricants!

Observe the specifications *Chapter 11.7.1 „Lube oil specifications“ on page 182*.

Fill the lube oil in stages and in small quantities.

6. Observe the oil level. Wait 5-10 minutes. The lube oil continues to flow.

⇨ The oil level regulates itself in the oil system and in the oil chambers.

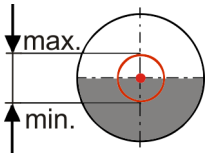


Fig. 134: Sight glass for oil level display (pos.2)

7. Check the lube oil level.

8. Check the lube oil level on the oil level displays.

The lube oil level remains steady at a point between the min. and max. markings on the oil level display.
The oil level is OK.

The lube oil level does not remain steady at a point between the min. and max. markings on the oil level display.
Correct the oil level.

9. Close the oil fill opening with a new seal.

10. If necessary, repeat the process at the other oil chamber.

11. **ENVIRONMENT!**
Risk of environmental damage from incorrect storage of lube oil!

Clean the workspace thoroughly.

Dispose of the lube oil residue in an environmentally friendly way.

Clean all auxiliary equipment.

8.3.4 Replacing the grease on gas-tight drive shafts

The replacement of grease is only required for the gas-tight version of the drive shaft (optional).

Press the grease a few operating hours before the lube oil change. The used, excess grease reaches the oil chamber of the machine stage and is discharged with the lube oil change.

Pressing the grease

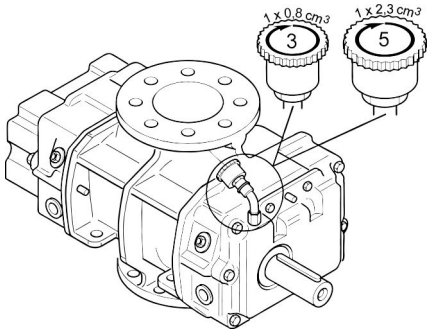


Fig. 135: Stauffer lubricator

1. **WARNING!**
Risk of burns from hot surfaces on the housing!

Allow the surfaces of the housing to cool down to ambient temperature.

2. Press the grease by turning the Stauffer lubricator.

CAUTION!
Risk of skin irritation from escaping grease!

Observe the grease amount and number of turns. *Chapter 11.7.4 „Lubricant quantities“ on page 187*

3. After pressing the required amount of grease, turn the Stauffer lubricator one revolution backwards. The volume of grease can then expand when it is heated.

4. Open the Stauffer lubricators and fill them with grease. Observe the specification of the grease. *Chapter 11.7.3 „Grease specifications“ on page 186*

8.3.5 Changing lube oil

8.3.5.1 Model *with* oil system

Draining lube oil

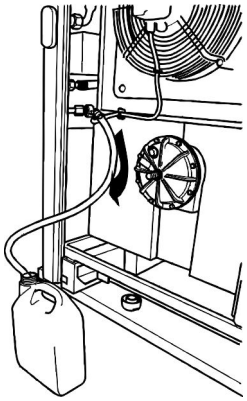


Fig. 136: Draining lube oil

1. **WARNING!**
   Risk of scalding from hot lube oil!

   NOTICE!
   Material damage to the drain hose from lube oil temperatures over 60 °C!

   Allow the lube oil to cool down to the ambient temperature.
2. *Observe the volume of the lube oil and the oil-resistant receptacle.* *↬ Chapter 11.7.4 „Lubricant quantities“ on page 187*

   Have a receptacle ready.
3. Open the oil opening on the oil filling container.
   ⇨ Lube oil flows out more evenly from the oil drain.
4. Feed the drain hose into the receptacle.
5. **CAUTION!**
   Risk of skin irritation from old lube oil!

   Remove the sealing cap from the drain valve.

   Twist the drain hose onto the drain valve.

   ⇨ The drain valve opens automatically.

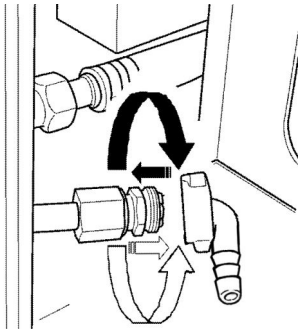


Fig. 137: Fitting the drain hose

6. **CAUTION!**
   Risk of slipping from lube oil spillage!

   Guide all emerging lube oil into the receptacle.
7. Remove the drain hose.
   ⇨ The drain valve closes automatically.
8. Screw the sealing cap onto the drain valve.
9. Close the oil filling container.

10. **ENVIRONMENT!**
Risk of environmental damage from lube oil!

Collect old and residual lube oil properly and dispose of it in an environmentally friendly manner.

Clean the workspace thoroughly.

Clean all auxiliary equipment.

Filling with lube oil

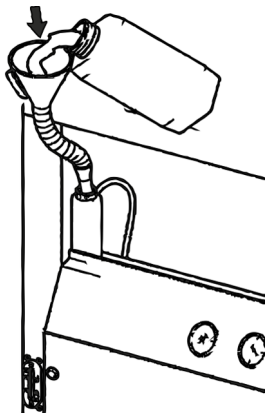


Fig. 138: Filling with lube oil

1. Check the drain valve for firm seating.
2. Check that the sealing cap of the drain valve is firmly in place.
3. Open the oil filling container.
4. Ensure that the ventilation pipe in the oil filling container is unobstructed.
5. **CAUTION!**
Risk of skin irritation from lube oil!

ENVIRONMENT!
Risks to the environment due to incorrect handling of lubricants!

Observe the oil quantity ↳ *Chapter 11.7.4 „Lubricant quantities“ on page 187* and specification ↳ *Chapter 11.7.1 „Lube oil specifications“ on page 182*.

First, fill 3/4 of the total listed quantity of lube oil.

6. Wait 5-10 minutes. The lube oil continues to flow.

⇨ The oil level regulates itself in the oil system and in the oil chambers.

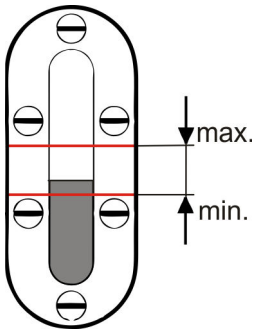


Fig. 139: Sight glass for oil level display

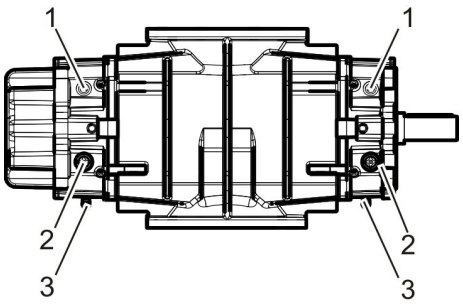


Fig. 140: Machine stage sight glasses

1 Oil fill openings, marked in red
2 Oil level displays
3 Drain valves

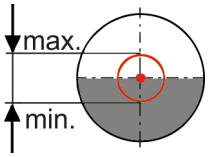


Fig. 141: Oil level display (pos.2)

7. Check the oil level.

8. Check the lube oil level on the machine stage's oil level displays (pos.2) and adjust as necessary.

The lube oil level remains steady at a point between the min. and max. markings on the oil level display.
The oil level is OK.

The lube oil level does not remain steady at a point between the min. and max. markings on the oil level display.
Correct the oil level.

9. Close the oil filling container.

10.

ENVIRONMENT!
Risk of environmental damage from incorrect storage of lube oil!

Clean the workspace thoroughly.

Dispose of the lube oil residue in an environmentally friendly way.

Clean all auxiliary equipment.

8.3.5.2 Model *without* oil system

Draining lube oil

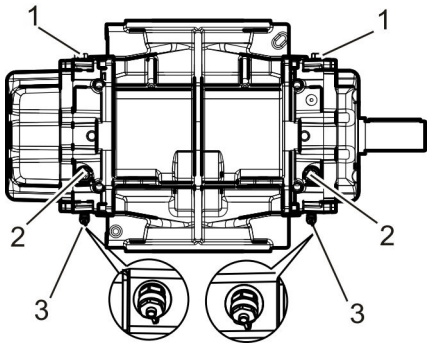


Fig. 142: Draining lube oil

1 Oil fill openings, marked in red
2 Oil level displays
3 Drain valves

1.

WARNING!
Risk of scalding from hot lube oil!

Allow the lube oil to cool down to the ambient temperature.

2.

Observe the volume of the lube oil and the oil-resistant receptacle. Chapter 11.7.4 „Lubricant quantities“ on page 187.

Have a receptacle ready.

3. Open the oil fill opening.

⇨ Allowing air to circulate in the oil chambers makes the lube oil drain more smoothly from the drain valves.

4.

CAUTION!
Risk of skin irritation from old lube oil!

Remove the sealing cap from the drain valve.

A blanking plug or a shut-off valve can be used as an alternative to the drain valve.

The oil chamber can be closed by:

- *Mounting the blanking plug with a new sealing ring*
  or by
- *Sealing the output of the shut-off valve with sealing plugs (shut-off valve closes).*

5.

NOTICE!
Material damage to the drain hose from lube oil temperatures over 60 °C!

Place the drain hose into the receptacle.

6. Twist the drain hose onto the drain valve.

⇨ The drain valve opens automatically.

7. **CAUTION!**
Risk of slipping from oil spillage!

Guide all emerging lube oil into the receptacle.

8. Remove the drain hose.

⇨ The drain valve closes automatically.

A blanking plug or a shut-off valve can be used as an alternative to the drain valve.

The oil chamber can be closed by:

– *Mounting the blanking plug with a new sealing ring*
or by
– *Sealing the output of the shut-off valve with sealing plugs (shut-off valve closes).*

9. Screw the sealing cap onto the drain valve.

10. Close the oil fill opening.

11. **ENVIRONMENT!**
Risk of environmental damage from waste oil!

Collect old and residual lube oil properly and dispose of it in an environmentally friendly manner.

Clean the workspace thoroughly.

Clean all auxiliary equipment.

Filling with lube oil

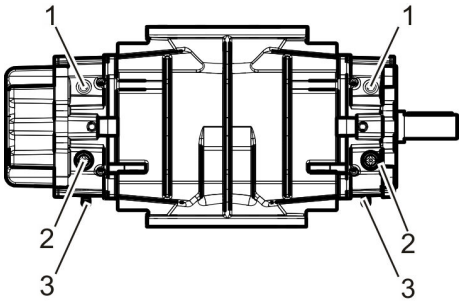


Fig. 143: GM 3S–GM 80L

1 Oil fill openings, marked in red
2 Oil level displays
3 Drain valves

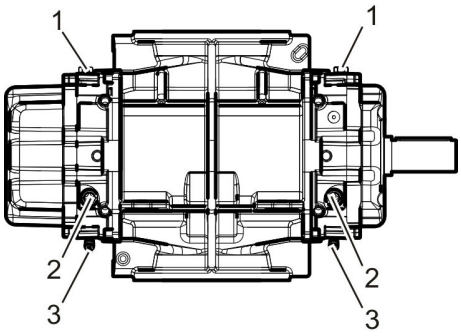


Fig. 144: GM 90S–GM 150S

1. Check the drain valves (pos.3) for firm seating.
2. Check the sealing caps of the drain valves (pos.3) for firm seating.
3. Open the oil fill openings (pos.1), the RED-marked blanking plugs.
4. Observe the oil quantity distribution.

   Guide value:

   - 1/3 of the entire lube oil quantity in the drive side.
   - 2/3 of the entire lube oil quantity in the wheel side.

   The display in the oil level sight glass is decisive.
5. **CAUTION!**
   Risk of skin irritation from lube oil!

   ENVIRONMENT!
   Risks to the environment due to incorrect handling of lubricants!

   Observe the oil quantity ↬ *Chapter 11.7.4 „Lubricant quantities“ on page 187* and specification ↬ *Chapter 11.7.1 „Lube oil specifications“ on page 182*.

   Fill with lube oil. To do this, fill with approx. 3/4 of the entire oil quantity. Fill this reduced total oil quantity according to the oil quantity distribution (approx. 1/3 driving side, approx. 2/3 wheel side) into both oil chambers.
6. Observe the oil level. Wait 5-10 minutes. The lube oil continues to flow.

   ⇨ The oil level regulates itself in the oil system and in the oil chambers.
7. Check the lube oil level.
8. Fill the rest of the lube oil up to the mark on the sight glass.

   The lube oil level remains steady at a point between the min. and max. markings on the oil level display.
   The oil level is OK.

   The lube oil level does not remain steady at a point between the min. and max. markings on the oil level display.
   Correct the oil level.
9. Close the oil fill opening (pos.1) tightly with a seal.

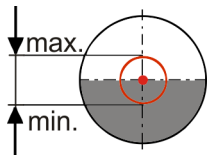


Fig. 145: Sight glass for oil level display (pos.2)

10. **ENVIRONMENT!**
Risk of environmental damage from incorrect storage of lube oil!

Clean the workspace thoroughly.

Dispose of the lube oil residue in an environmentally friendly way.

Clean all auxiliary equipment.

8.3.6 Replacing the intake filter

Replacing the intake filter

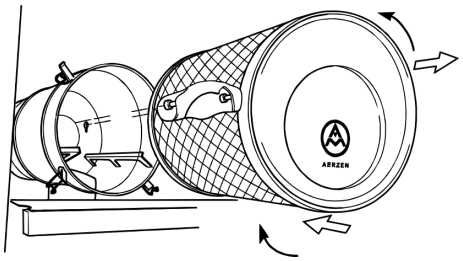


Fig. 146: Replacing the intake filter

1. **CAUTION!**
Risk of air contamination from scattered dust particles.

Open the cap locks of the intake silencer.

2. Remove the maintenance flap.
3. Loosen the intake filter by turning it anti-clockwise and remove it.
4. **NOTICE!**
Risk of machine damage from objects inside the intake silencer that enter the intake opening.

Remove residual dust inside the intake silencer.

5. Replace the intake filter.
6. Fasten the intake filter in place by turning it clockwise. Check that it is aligned correctly.
7. Fasten the maintenance flap on the housing of the intake silencer using the catch.
8. Reset the maintenance indicator (in accordance with the given variation).

8.3.7 Checking the sheaves

For wear and tear and damage

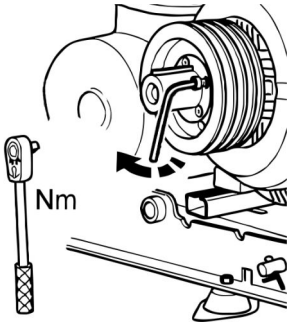


Fig. 147: Sheaves

1. Check for unusual wear and tear or obvious damage.
2. Check for correct alignment and stability.
3. If necessary, replace the sheaves.
4. Install the sheaves.
5. Fit the belt.

8.3.8 Moving and checking the protective cover of the sheaves

Moving on models without acoustic hood

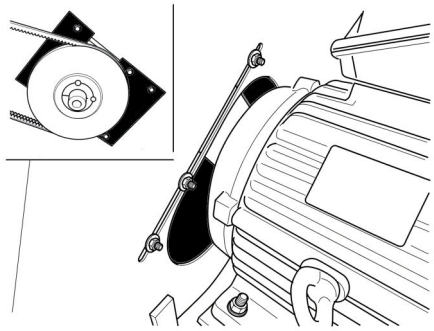


Fig. 148: Protective cover

1. Loosen the fitting of the protective cover before lifting the hinged motor support.
   ⇨ The protective cover can now be moved.
2. Lift the hinged motor support, e.g. for changing the belts.
3. Lower the hinged motor support.
   ⇨ The weight of the motor creates tension in the belts.
4. Push the protective cover in the direction of the motor shaft and tighten it.

Testing on models without acoustic hood

1. Check the spacing of the protective cover of the motor drive shaft.

   During operation, the protective cover should be at a distance of approx. 10 mm from the motor drive shaft.
2. Check the protective cover for firm seating and, if necessary, tighten it.

8.3.9 Replacing belts, version *with* lifting device

Raising the hinged motor support

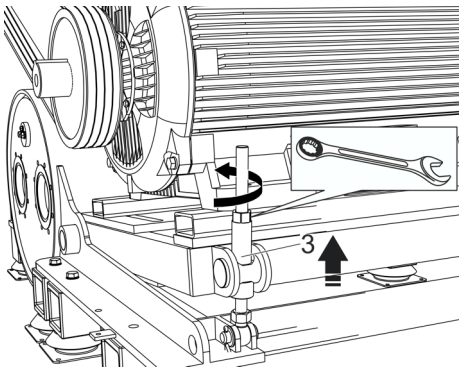


Fig. 149: Raising the hinged motor support

1. **WARNING!**
   Risk of injury from moving or rotating components!

   Lift the hinged motor support using the hinge jig.
2. Turn guide bushing (pos.3) anti-clockwise using the ratchet wrench.

   ⇨ The hinged motor support is raised.
3. Raise the hinged motor support until the belts are fully relieved of tension.
4. *Only replace belts as a set!*

WARNING!
Risk of getting caught by rotating sheaves!

5. Replace belts.
6. Observe the permissible groove layout.

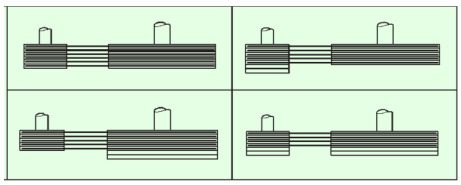


Fig. 150: Permissible belt layout

Pre-tensioning belts

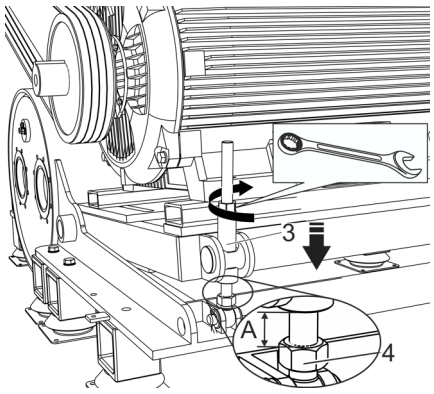


Fig. 151: Pre-tensioning belts

7.

CAUTION!
Risk of injury from tensioning components!

Turn guide bushing (pos.3) clockwise with the ratchet wrench until the belts are pre-tensioned.

⇨ The hinged motor support is partly held by the belt drive and rests lightly on the guide bushing (pos.3).

Adjusting the guide bushing

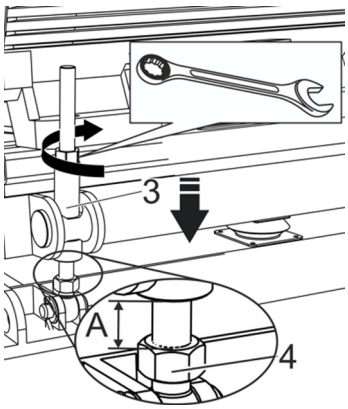


Fig. 152: Adjusting the gauge of the guide bushing

8. Set gauge A.

- Set self-locking nut (pos.4) to gauge A. Turn guide bushing (pos.3) using the ratchet wrench on to the self-locking nut (pos.4).

DN/discharge side	Gauge A in mm
80	20
100	25
125	30
150	35
200	40
250	45
300	50
Delta Blower G5	

Tensioning the belts

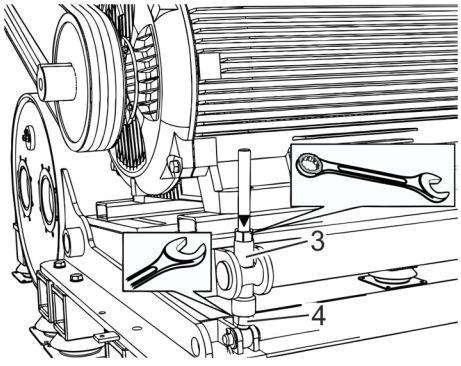


Fig. 153: Tensioning the belts

9.

CAUTION!
Risk of injury from moving and rotating components!

Tension the belts.

- Secure the guide bushing (pos.3) with the self-locking nut (pos.4).
- The hinged motor support is supported entirely by the belt drive.

Checking the protective cover

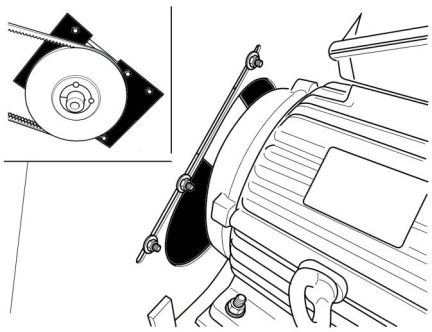


Fig. 154: Protective cover of the sheaves

10. Check the spacing of the protective cover of the motor drive shaft.

    The protective cover should be at a distance of approx. 10 mm from the motor drive shaft.

    By loosening the fastening screws, the protective cover can be moved.

    Check the protective cover for firm seating and, if necessary, tighten it.

8.3.10 Replacing belts, version *without* lifting device

Raising the hinged motor support of the DN50

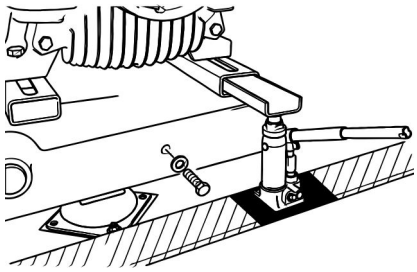


Fig. 155: Example: DN50

1. Insert the lifting bracket in the motor's attachment rail.

NOTICE!
Only use hydraulic lifts on solid, level ground.

Position the hydraulic lift securely.

2. **WARNING!**
Risk of shearing and crushing from moving loads!

Slowly raise the hinged motor support by pumping the hydraulic lift.

3. **WARNING!**
Risk of injury from the hydraulic lift tipping up or slipping!

Raise the hinged motor support in small steps and always support it with timbers! This prevents the sudden downward movement of the hinged motor support if the hydraulic lift tips up or slips.

Raising the hinged motor support of the DN80

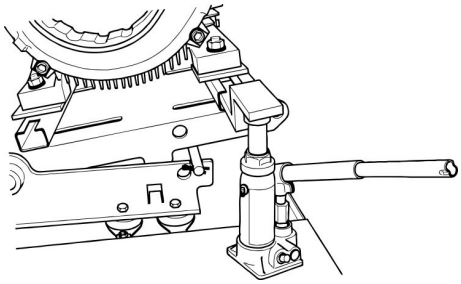


Fig. 156: Example: DN80

4. Insert the lifting bracket in the motor's attachment rail.

NOTICE!
Only use hydraulic lifts on solid, level ground.

Position the hydraulic lift securely.

5. **WARNING!**
Risk of shearing and crushing from moving loads!

Slowly raise the hinged motor support by pumping the hydraulic lift.

6. **WARNING!**
Risk of injury from the hydraulic lift tipping up or slipping!

Raise the hinged motor support in small steps. While doing so, use the transport safety rod to brace the hinged motor support in the recess of the base support. This prevents the sudden downward movement of the hinged motor support if the hydraulic lift tips up or slips.

7. Raise the hinged motor support until the belts can be fitted.

Fitting the belt

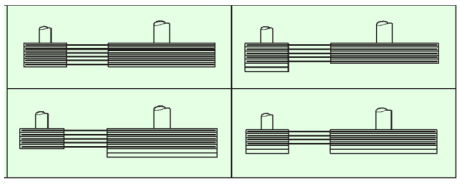


Fig. 157: Permissible belt layout

8. **CAUTION!**
Risk of injury from tensioning components!

Fit the belt. Observe and comply with the permissible groove layout.

Tensioning the belts

9. **WARNING!**
Risk of injury from tensioning, moving or rotating components!

Release the hydraulic lift carefully and slowly.

⇨ The hinged motor support is lowered.

If released too quickly, the hinged motor support drops abruptly.

The belts are tautened by the weight of the motor.

10. **NOTICE!**
Risk of damage to the belt drive! The hinged motor support must not rest on the base support, the transport securing rod or similar equipment.

Completely remove the hydraulic lift, transport securing rod and other auxiliary equipment and store them safely for future maintenance purposes.

8.3.11 Checking the AERZEN safety valve

Movement test

- G2", G3", DN 50, DN 80, DN 125

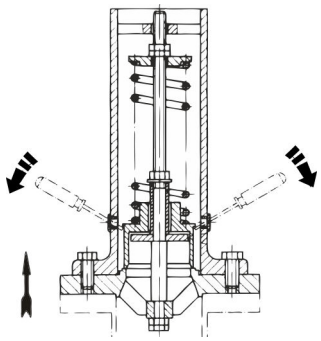


Fig. 158: using a screwdriver

1. Remove the protective caps or blanking plugs from the maintenance holes in the protective cylinder.
2. Guide a screwdriver into each hole.
3. Raise the valve bell with the screw drivers using leverage force.
   ⇨ The valve's opening function must be operational and the valve must move.
4. Lower the valve bell.
5. Remove the screwdrivers.
   ⇨ An intact valve will close.
6. Insert the protective caps or blanking plugs into the maintenance holes in the protective cylinder.

Movement test

- DN 150, DN 200, DN 300

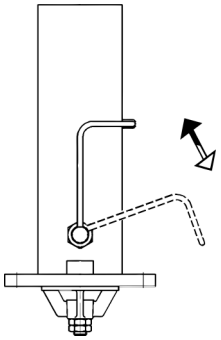


Fig. 159: using the stirrup

1. Raise the valve bell using the stirrup.
   ⇨ The valve's opening function must be operational and the valve must move.
2. Release the pressure on the stirrup and lower the valve bell.
   ⇨ An intact valve will close.

8.3.12 Checking the non-return flap

Checking for wear and tear and tightness

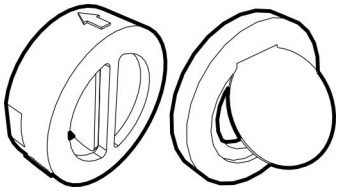


Fig. 160: Non-return flap

1. Loosen the fastening screws.

> *Light impact on the flange cover of the non-return flap loosens the sealing and makes disassembly easier.*

2. Remove the non-return flap from the housing.
3. Carry out a visual inspection.
4. If no damage and/or hardening is visible, the sealing is acceptable.
   ⇨ Re-use the non-return flap.
5. If damage and/or hardening is visible, the sealing is not acceptable.
   ⇨ Replace the non-return flap.

Assembling the non-return flap

1. Remove dirt, grease and used sealing agent from the flange surface.
2. Apply sealing agent (liquid surface sealant) to the flange surface of the housing.
3. Guide the non-return flap into the housing.

> *Remove any bleeding sealing agent with a cloth. Observe the curing time of the sealing material!*

4. Mount the flange cover with screws.

8.3.13 Cleaning the nozzle of the start unloading device

Cleaning the nozzle

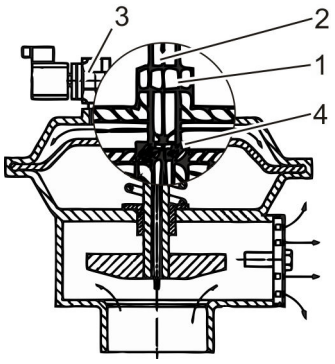


Fig. 161: Start unloading device

1. Undo counternut (pos.1).
2. Remove spindle (pos.2).
   ⇨ The nozzle (4) in the hole is accessible.
3. **WARNING!**
   Risk of injury from escaping dirt particles!

   Blow compressed air into the nozzle (pos.4).
   ⇨ Unobstructed cross-section of the nozzle.
4. Attach spindle (pos.2).
5. Setting the closing time of the start unloading device. *Chapter 11.10.3 „Start unloading device DN 80 to DN 400“ on page 191*
6. Secure spindle (pos.2) using nut (pos.1).

8.3.14 Checking the inlet and exhaust air openings of the acoustic hood

Checking the openings

1. Visual inspection of the inlet and exhaust air openings.
2. Clean the openings. Remove dirt.

Checking fan operation

1. Check the direction of flow in the operating position with the acoustic hood closed. Observe the information in the installation drawing.
2. If exhaust air is extracted from the acoustic hood, the check is finished.
   ⇨ The acoustic hood fan is operating correctly.
3. If no exhaust air emerges from the acoustic hood, the fan is malfunctioning.
   ⇨ Replace the fan.

Replacing the fan

1. Open the maintenance door of the acoustic hood.
2. **WARNING!**
   Risk of injury from rotating components!

   Loosen the fastening screw of the fan.
3. Pull the fan from the shaft and replace it.

4. Seal the fastening screw with liquid threadlocker.
5. Screw on the fan.
6. Close the maintenance door of the acoustic hood.
7. Check the cooling air throughput during machine operation.

8.3.15 Checking the belt guard

Damage and stability

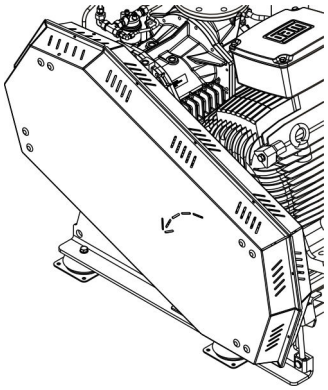


Fig. 162: Belt guard

1. **WARNING!**
   Risk of injury from hot surfaces!

   Check for damage and thorough stability.

   (stable on the base support and machine stage)
2. Remove dirt from the belt guard.
3. If necessary, tighten the belt guard fastener. If damaged, replace it.
4. Watch for any lubricant bleeding out at the drive shaft.

   If you spot any leaks, contact the site supervisor.

   Seal any leaks.

8.3.16 Checking pipelines for leaks

Checking for leaks on the discharge side

Check the pipelines for leaks (visual inspection).

Changing seals or bushings

Ensure that the pipelines have been depressurised!

1. Reinforce the pipelines if necessary.
2. Disassemble leaking pipe connections.
3. Use new seals or bushing.
4. Assemble the pipe connections.

8.4 Cleaning after maintenance

Cleaning after maintenance work

1. **NOTICE!**
   Risk of damage! Do not used high pressure cleaners, steam jet pumps, grease removal agents, thinners, compressed air etc. as cleaning methods.
2. Dust and dirt must be cleaned with suitable cloths.
3. Clean components susceptible to scratches, display units and touch panels of control systems, gauges etc. with a soft, wet towel.
4. Remove all cleaning agents from the immediate vicinity of the machine before commissioning.
5. Dispose of cloths in an environmentally-friendly way.

8.5 Commissioning after maintenance

Commissioning after maintenance

1. Inform the responsible on-site person about the result of the work carried out and agree commissioning steps with that person.
2. Check all previously loosened screw connections for tightness.
3. Properly install all previously loosened or disassembled assemblies or accessories.
4. Mount all protective hardware and protective covers that were previously removed.
5. Remove all used tools, materials and other equipment from the workspace.
6. Clean the workspace. Remove operating substances, operating materials, processing material and similar materials and dispose of them appropriately.
7. Check that there are no persons in the hazard area.
8. Release the main circuit breaker and activate it.
9. Release the EMERGENCY STOP function.
10. Start operation in accordance with the instructions in the “Operation” chapter.
11. Inform the responsible on-site person about the result of the work carried out.

8.6 Checks after maintenance work

Inspection	After the first 3 op. hrs	After the first 25 op. hrs
Safety valve	check for correct operation	
Oil level	check and, if necessary, correct	check and, if necessary, correct
Alignment of sheaves		check and, if necessary, correct
Op. hrs = operating hours		

9 Faults

The following chapters describe possible causes of faults and steps to be taken to rectify them.

If faults cannot be rectified using the following instructions, contact the manufacturer.

9.1 Safety instructions

Improper fault rectification

WARNING!

Risk of injury from improper operation fault rectification!

Improper fault rectification may lead to serious personal or material damage.

- Only perform fault rectification work when the machine has been switched off.
- Secure the machine against a restart.
- Allow the machine to cool down to the ambient temperature.
- Before beginning work, ensure that there is sufficient space for installation work.
- Keep the workspace tidy and clean.
- Only attempt to rectify faults with suitable tools.
- Ensure removed components are re-installed correctly.
- Re-install all fastening elements and observe the screw tightening torques.
- Check the following before a restart:
  - All safety and protective equipment is installed and functioning correctly.
  - No persons are located in the hazard area.

Electrical system

DANGER!

Risk of fatal injury from electric current!

There is a risk of fatal injury from touching live components. Live electrical components may make uncontrolled movements and cause extremely serious injury.

- Before beginning work, switch off the electric power supply and secure it against restarting.

Securing the machine against restarting

WARNING!

An unauthorised or unregulated restart can have fatal consequences.

An unauthorised or unregulated restart of the machine can lead to serious or fatal injuries. There may be people located in the hazard area.

– Before beginning work, switch off the energy supply and secure it against restarting.

Requirements for personnel

The fault rectification work described here may only be performed by the designated personnel. The personnel entrusted with the respective troubleshooting tasks are listed in the table of fault descriptions in addition to their designated tasks.

Requirements in the event of faults and for preparations for fault rectification work:

Personnel:
- Authorised electricians
- Service personnel

For commissioning after rectification of a malfunction, the following is necessary:

Personnel:
- Authorised electricians
- Service personnel

Protective equipment

For fault rectification work the following is necessary:

Protective equipment:
- Protective work clothing (7010-M010)
- Protective gloves
- Safety shoes (7010-M008)

Special tools

For fault rectification work the following is necessary:

Special tool:
- General tools
- Tools for authorised electricians
- General measurement tools and equipment

Special tool:
- Ratchet wrench

Special tool:
- Locking key

Behaviour in the event of faults

1. **DANGER!**
   Risk of injury during fault rectification!

   In case of a fault, activate the EMERGENCY STOP immediately.
2. Switch off the main circuit breaker and secure it against restarting.
3. Immediately inform the responsible staff on location about the fault.
4. **DANGER!**
   Risk of fatal injury from electric current!

   Ensure there is no live current.
5. Earth and short-circuit the device.
6. Cover or shut off adjacent live parts.
7. Establish the cause of the fault.

9.2 Fault displays

AERtronic (optional) fault message

Fig. 163: AERtronic display

A detailed explanation of fault messages is contained in the separate operating manual AS-002.

Control system fault message

Depending on the customer's control system, additional fault messages can be recorded and displayed.

9.3 Fault diagnosis and troubleshooting

If one of the listed faults occurs and it can only be rectified by the manufacturer, contact customer service immediately. *Chapter 1.4.2 „Customer service“ on page 12*

Fault description	Cause	Remedy	Personnel
Abnormal running sounds.	Sheaves are not aligned properly.	Check and, if necessary, correct them. ↳ *Chapter 8.3.7 „Checking the sheaves“ on page 151*	Service personnel
	Bearing damage.	Replace the bearings.	Manufacturer’s customer service division
	Foreign bodies in gear wheels.	Check gear wheels, rectify the damaged areas and if necessary, replace them.	Manufacturer’s customer service division
	Shaft deflection.	Determine the shaft deflection. Replace the component.	Manufacturer’s customer service division
Start unloading device does not close.	Nozzle is contaminated.	Clean the nozzle. ↳ *Chapter 8.3.13 „Cleaning the nozzle of the start unloading device“ on page 158*	Service personnel
The machine becomes hot.	Intake filter contaminated (display unit, max. -45 mbar).	Replace the intake filter. ↳ *Chapter 8.3.6 „Replacing the intake filter“ on page 150*	Service personnel
	Ambient temperature too high.	Ensure sufficient ventilation and air extraction.	User
	Openings of the acoustic hood for supply air and exhaust air are contaminated.	Clean the openings. ↳ *Chapter 8.3.14 „Checking the inlet and exhaust air openings of the acoustic hood“ on page 158*	User
	The acoustic hood fan is malfunctioning.	Replace the fan. ↳ *Chapter 8.3.14 „Checking the inlet and exhaust air openings of the acoustic hood“ on page 158*	Service personnel
	The permissible operating data have been exceeded.	Check and comply with the operating data.	User
	Foreign bodies on the belt guard.	Remove dirt.	User
Lube oil in the conveyed medium.	Wear and tear on seals.	Replace seals.	Manufacturer’s customer service division
	Oil level too high.	Correct the oil level. ↳ *Chapter 8.3.3 „Correcting the oil level“ on page 137*	Service personnel
	Balancing holes are sealed.	Remove the sealing cap.	Service personnel

Fault description	Cause	Remedy	Personnel
Intake volume too low.	Intake filter contaminated (display unit, max. -45 mbar).	Replace the intake filter. *Chapter 8.3.6 „Replacing the intake filter“ on page 150*	Service personnel
Intake volume too low.	Intake piping is leaking.	Seal intake piping.	Service personnel
The motor requires too much power.	The operating data differs from the order data.	Check and comply with the operating data.	User
	Mechanical damage.	Replace malfunctioning components.	Service personnel
Belts are vibrating.	Wear and tear on belts.	Replace the belts. *Chapter 8.3.9 „Replacing belts, version with lifting device“ on page 152* Replace the belts. *Chapter 8.3.10 „Replacing belts, version without lifting device “ on page 154*	Service personnel
	Sheaves are not aligned properly.	Check and, if necessary, correct them. *Chapter 8.3.7 „Checking the sheaves“ on page 151*	Service personnel
Machine turns in reverse after being shut down.	Non-return flap is leaking or malfunctioning.	Replace the component. *Chapter 8.3.12 „Checking the non-return flap“ on page 157*	Service personnel
Medium escapes from the safety valve.	Safety valve not opening or closing.	Replace the safety valve	Service personnel

9.4 Supplier status and fault messages

Control system fault message

Depending on the customer’s control system, additional fault messages can be recorded and displayed.

9.5 Commissioning after fault rectification

Commissioning after fault rectification

1. Check all previously loosened screw connections for tightness.
2. Properly install all previously loosened or disassembled assemblies or accessories.
3. Mount all protective hardware and protective covers that were previously removed.
4. Remove all used tools, materials and other equipment from the workspace.
5. Clean the workspace. Remove operating substances, operating materials, processing material and similar materials and dispose of them appropriately.

6. Inform the responsible on-site person about the result of troubleshooting.
7. Check that there are no persons in the hazard area.
8. Release the main circuit breaker and activate it.
9. Release the EMERGENCY STOP function.
10. Confirm the removal of the fault in the control system.
11. Start operation in accordance with the instructions in the “Operation” chapter. *Chapter 7.3 „Switching on“ on page 120*
12. Inform the responsible on-site person about the result of the work carried out

9.6 Checks after fault rectification

Inspection	After the first 3 op. hrs	After the first 25 op. hrs
Safety valve	check for correct operation	
Oil level	check and, if necessary, correct	check and, if necessary, correct
Alignment of sheaves		Check and correct if necessary
Op. hrs = operating hours		

10 Disassembly and disposal

Protecting the environment and conserving resources are among the manufacturer's foremost priorities.

Once the machine's service life is over, it must be disassembled and disposed of in an environmentally-friendly way. The following is a set of recommendations for environmentally-friendly disposal.

10.1 Safety instructions

Improper disassembly

WARNING!

Risk of injury from improper disassembly!

Stored residual energy, sharp components, edges and corners on or in the machine or on the necessary tools can cause injury.

- Before beginning work, ensure there is sufficient space.
  Allow the machine to cool down to the ambient temperature.
- Proceed with caution when working with open, sharp-edged components.
- Keep the workspace tidy and clean. Components and tools that are loosely stacked or lying around can cause accidents.
- Disassemble components correctly. Pay attention to the high dead weight of some components. If necessary, use hoists.
- Secure components, so they do not topple or fall.
- If in doubt, contact the manufacturer.

Electric current

DANGER!

Risk of fatal injury from electric current!

Disassembly of live components can cause serious or fatal injury.

- Switch off the power to the operating cable.
- Check there is no live current.

Disassembling the delivery line

WARNING!

Risk of injury from compressed conveyed materials!

For the disassembly of pressurised components such as pipes, containers, hoses or valves, hot conveying material escapes with a strong gas flow. This can result in serious injury.

– Before beginning work, fully relieve pressurised components of pressure.
– Check that components are not pressurised.
– Only disassemble pressurised components when they are not under pressure.

Requirements for personnel

Requirements for disassembly:

Disassembly of electrical components

Personnel:
- Authorised electricians

Personnel:
- Authorised electricians with additional qualifications

Requirements for disassembly:

Disassembly of mechanical components

Personnel:
- Service personnel

Protective equipment

Requirements for disassembly:

Protective equipment:
- Protective work clothing (7010-M010)
- Safety shoes (7010-M008)
- Hearing protection (7010-M003)
- Protective gloves
- Safety goggles (7010-M004)
- Industrial hard hat (7010-M014)

Special tools

Requirements for disassembly:

Special tool:
- General tools
- Tools for authorised electricians
- Auxiliary materials, tools
- Lifting equipment
- Transport equipment

Special tool: ■ Locking key

10.2 Disassembly

Preparation

1. Notify the responsible staff at the site of operation about disassembly.
2. Switch off the machine and secure it against restarting.
3. Shut off the pressure line and remove it.
4. Physically disconnect the entire power supply from the machine. Discharge the stored residual energy.
5. If necessary, disconnect the machine control system from a connected process control system.
6. Remove the operating, auxiliary and residual processing materials, and dispose of them in an environmentally friendly way.

Performing

1. In addition to this, clean the assemblies and components thoroughly. Dismantle them in accordance with local regulations for occupational safety and environmental protection.
2. Remove the machine's anchor bolts.
3. During disassembly, there should be a general sorting of parts according to disposal categories. *Chapter 10.3 „Disposal“ on page 170*

10.3 Disposal

The machine is composed primarily of steel, casting material and various non-ferrous metals. In general, metallic materials are fully recyclable.

Proper disposal

In as far as no agreement has been made on the return or disposal of the machine, send dismantled components for recycling:

- Scrap metals.
- Send plastics for recycling.
- Sort and dispose of other components according to material composition.

Improper disposal

ENVIRONMENT!

Environmental risk from improper disposal!

Improper disposal can present a risk to the environment.

– Have insulating material, electronic waste, electronic components, auxiliary materials and chemicals disposed of by a professional waste disposal company.
– If in doubt, contact the local authorities or specialist companies for information on environmentally-friendly waste disposal.

Lube oil and lubricants

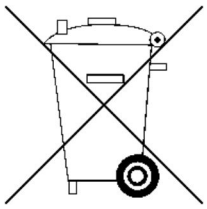
ENVIRONMENT!

Environmental risks from lube oil and lubricants!

The improper disposal of lube oil and lubricants can present a risk to the environment.

– Collect lube oil carefully, store it and dispose of it properly or recycle it.
– If in doubt, contact the local authorities or specialist waste disposal companies for information on environmentally-friendly waste disposal.

Battery



ENVIRONMENT!

Environmental risk from batteries!

The improper disposal of batteries, e.g. from the control system, can present a risk to the environment.

– Collect batteries and dispose of them properly at local collection points.
– If in doubt, contact the local authorities or specialist waste disposal companies for information on environmentally-friendly waste disposal.

Categories for sorting

Scrap iron	Non-ferrous metal (except for scrap iron)	Insulation material	Electronic waste (encoder electronics)	Auxiliary materials and chemicals
Scrap ■ Scrap steel ■ Foundry scrap ■ Scrap from non-rusting steels ■ Stainless steel scrap	Aluminium	Various isolators (in terminal boxes)	Electrical tools	Lube and gear oils Grease
Used metal/2A materials ■ Steel beams ■ Steel sheets	Copper	Voltage and current transformers	Measurement, control and regulatory systems	Cleaning agents and solvents
Machines made of metal ■ Without electronics	Brass	Power cables and leads		Paint residue
	Motor windings	Instrument wiring		Anti-corrosion agents
		Surge arresters		Cloths (soaked in agents or chemicals)
		Heat insulation materials		Batteries from the control system (AERtronic, AERsmart)
This does not include: ■ Hazardous adhesions ■ Sealed hollow parts (due to danger of deflagration or hazardous contents)	Valve disposal ■ Remove the medium before disposal! Neutralise residual medium in the valves.		This does not include: ■ PCB capacitors	■ Solvents, cleaning agents and paint residue must not be allowed to mix! ■ Sort oils separately according to emulsions and solvents. ■ Agents and chemicals must be collected in separate, labelled containers.

Disposal of accessories

Motor

- For safety reasons, disposal may only be performed by specialists for industrial waste or, alternatively, it can be returned to the manufacturer.
- The encoder electronics are electronic waste.

Frequency converter

DANGER!
Hazard if the capacitor explodes and forms poisonous gases!

- For safety reasons, disposal may only be performed by specialists for industrial waste or, alternatively, it can be returned to the manufacturer.
- The encoder electronics are electronic waste.

11 Technical data

11.1 Dimensions and weights

General information

The following dimensions and weights relate to standard variants and can vary depending on the specific model.

Exact details can be found on the installation drawing.

Information on weight can be found on the packing note and the designation on the rating plate.

Dimensions, including packaging, are included in the forwarding order.

Tab. 3: Dimensions and weights

Positive pressure operation						
Size	**Width (W) mm**	**Depth (D) mm**	**Height (H) mm**	**Nominal diameter DN**	**Weight without acoustic hood, without motor and without belt drive approx. kg**	**Weight with acoustic hood, without motor and without belt drive approx. kg**
GM 3 S	800	800	1055	50	160	220
GM 4 S	925	1135	1280	80	210	320
GM 7 L	925	1135	1280	80	210	320
GM 10 S / DN80	925	1135	1280	80	240	350
GM 10 S / DN100	1250	1350	1500	100	350	510
GM 15 L	1250	1350	1500	100	360	530
GM 25 S	1250	1350	1500	125	420	580
GM 30 L	1500	1800	1900	150	660	980
GM 35 S	1500	1800	1900	150	760	1040
GM 50 L / DN150	1500	1800	1900	150	810	1130
GM 50 L / DN200	1700	2055	2111	200	840	1310
GM 60 S	1700	2055	2111	200	1000	1460
These dimensions and weights refer to the standard model, and are approximate values. The information may vary depending on the order.						

Positive pressure operation						
Size	**Width (W) mm**	**Depth (D) mm**	**Height (H) mm**	**Nominal diameter DN**	**Weight without acoustic hood, without motor and without belt drive approx. kg**	**Weight with acoustic hood, without motor and without belt drive approx. kg**
GM 80 L	1900	2200	2308	250	2720	3570
GM 90 S	1900	2200	2308	250	2780	3630
GM 130 L	2100	2850	2345	300	2265	3230
GM 150 S	2100	2850	2345	300	2510	3470
These dimensions and weights refer to the standard model, and are approximate values. The information may vary depending on the order.						

11.2 Dimension specifications sheet

An accompanying dimension specifications sheet/installation drawing is provided with the product documentation.

These documents contain important dimensions for installation and set-up.

11.3 Operating data

11.4 Technical performance data

Tab. 4: Performance data and application limits

Positive pressure operation			
Size	**Differential pressure max. mbar**	**Flow rate max. m^3/h**	**Motor rating max. kW**
GM 3 S	900	247	7.5
GM 4 S	1000	282	15
GM 7 L	700	493	15
GM 10 S / DN80	1000	542	22
GM 10 S / DN100	1000	696	30
GM 15 L	700	1038	30
GM 25 S	1000	1452	55
GM 30 L	700	2082	75
GM 35 S	1000	2418	90
GM 50 L / DN150	700	2610	75
GM 50 L / DN200	700	3306	90
GM 60 S	1000	3540	132
GM 80 L	700	5034	160
GM 90 S	1000	5418	200
GM 130 L	700	8040	200
GM 150 S	1000	9120	355
These operating limits are maximum values. Difficult operating conditions can adversely affect these data.			

Environmental limits

Data	Value	Unit
Temperature range	-10 to +40	°C
Relative humidity	0 to 80	%
Chemical-free atmosphere		

Maximum installation elevation

Data	Value	Unit
Maximum installation elevation above NN*	1000	m

If installing at a different elevation, observe the order-specific design data sheets.

Environmental limits

Data	Value	Unit
Temperature range	-10 to +40	°C
Mounting of acoustic hood heater	less than -10	°C
Relative humidity	0 to 80	%
Chemical-free atmosphere		

Operating period

Data	Value	Unit
Maximum operating period	24	hrs
Pause until next operation	-	hrs

11.5 Rating plate(s) and their locations

Placement on the machine stage

Manufacturer/rating plate on the machine stage.

Pos.1 Manufacturer plate
Pos.2 Rating plate

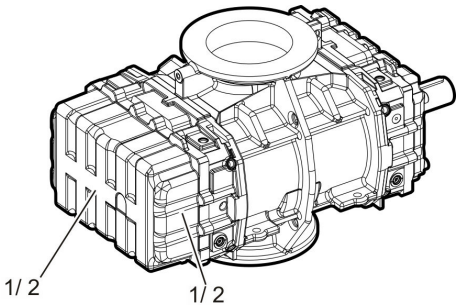


Fig. 164: Layout examples

Manufacturer plate - pos.1

Manufacturer plate

Fig. 165: Manufacturer plate

Rating plate - pos.2

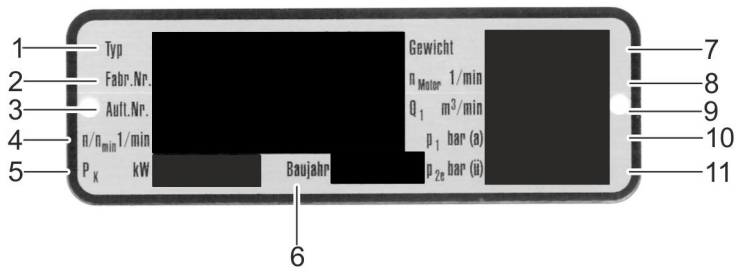


Fig. 166: Rating plate

Pos.1 Machine type
Pos.2 Factory/serial number
Pos.3 Order number
Pos.4 Speed of machine
Pos.5 Power consumption
Pos.6 Year of manufacture
Pos.7 Weight
Pos.8 Speed of motor
Pos.9 Conveyed quantity
Pos.10 Pressure input (absolute) p1
Pos.11 Overpressure output p2e

Position on the acoustic hood

The manufacturer and rating plate are on the operating side of the acoustic hood.

Pos.1 / acoustic hood Manufacturer and rating plate

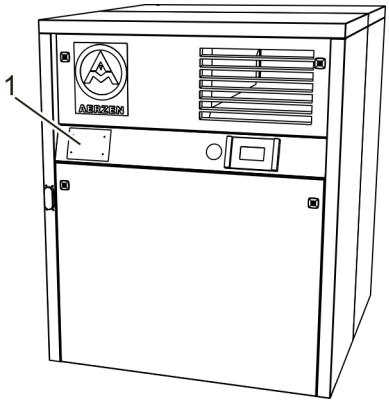


Fig. 167: Acoustic hood signage

Manufacturer and rating plate - pos. 1

Fig. 168: Manufacturer and rating plate of the acoustic hood

Pos.1 Manufacturer, including address
Pos.2 Designation
Pos.3 Machine type
Pos.4 Customer order number
Pos.5 Serial number
Pos.6 Year of manufacture
Pos.7 Max. intake pressure (absolute) p1
Pos.8 Max. discharge pressure (absolute) p2
Pos.9 Nominal power of motor
Pos.10 Machine weight (total)

Type designation

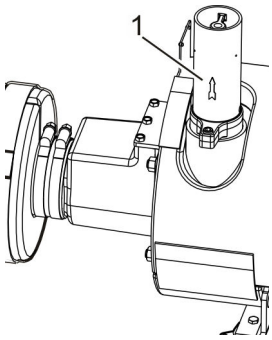
The type designation is derived from the following table:

Tab. 5: Explanation using example: ***GM 90 S***

Designation	Explanation	Details
GM	Product designation	Positive displacement blower
90	Maximum flow rate in m³/min (approx.)	
S	Design	L: Pressure differences up to 700 mbar
		S: Pressure differences up to 1,000 mbar

Safety valve signage

When using the AERZEN safety valve, the rating plate is on the valve housing.



Pos.1 Manufacturer and rating plate

Fig. 169: Signage

Safety valve rating plate

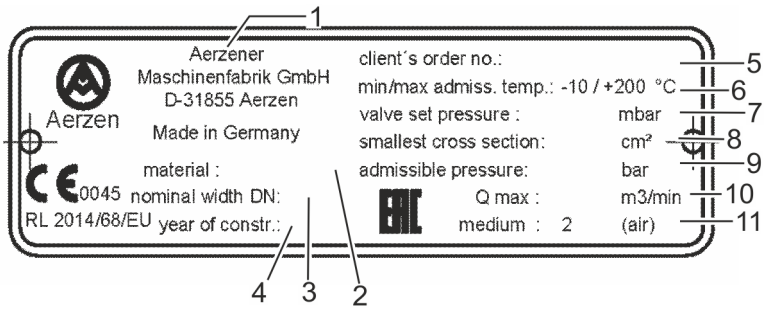


Fig. 170: Manufacturer and performance data plate

Pos.1 Manufacturer, including address
Pos.2 Material
Pos.3 Nominal diameter
Pos.4 Year of manufacture
Pos.5 Customer order number
Pos.6 Application temperatures
Pos.7 Valve set pressure
Pos.8 Narrowest cross-section
Pos.9 Maximum permissible pressure
Pos.10 max. flow rate
Pos.11 Medium type

11.6 Noise levels

Information on noise emissions

This information is determined in accordance with the performance data. ↳ *Chapter 11.4 „Technical performance data“ on page 177*.

No-load operation or operation below the maximum performance values reduces noise emissions.

Machines without an acoustic hood have considerably higher noise emissions. Observe the measures for noise emission reduction. ↳ *Chapter 5.2 „Requirements for the installation site“ on page 88*

Measurement requirements

- applied basic standard DIN EN ISO 2151
- measured according to basic standard DIN EN ISO 3744
- with acoustic hood
- Connected, insulated pipelines
- Tolerance ± 2 dB(A)

Positive pressure

Size	A-weighted sound pressure level, L_{pA}dB(A)
GM 3 S	72
GM 4 S	72
GM 7 L	72
GM 10 S / DN 80	74
GM 10 S / DN 100	74
GM 15 L	75
GM 25 S	75
GM 30 L	77
GM 35 S	77
GM 50 L / DN 150	77
GM 50 L / DN 200	78
GM 60 S	80
GM 80 L	82
GM 90 S	83
GM 130 L	86
GM 150 S	86

11.7 Operating materials

11.7.1 Lube oil specifications

Lube oil specifications

Choice of lubricant

When operating the machine, only use lubricants that comply with this specification!

The quality of lube oil has a considerable effect on the service life of the machine.

When selecting a lube oil, the application conditions and the relevant additives and viscosity class are decisive.

Taking the operating conditions into account, only use the following lube oils with the corresponding viscosities and additives.

* Ambient temperature = the temperature in the immediate vicinity of the machine all year round.

Low-load operation

Using these machines for **"low-load operation with minor pressure differences"** requires prior consultation with AERZEN Customer Service or the sales company. To select a suitable lubricant, the operating conditions, load and operating data need to be taken into account.

Properties of lube oil

Tab. 6: General requirements for lube oil properties

Kinematic viscosity at operating oil temperature	min. 10-13 cSt (mm^2/s)
Kinematic viscosity at -10°C	min. ≤ 3500 cSt (mm^2/s)

Tab. 7: Minimum properties of the oil additive

EP wear-protection additives for use in rolling bearing drives
Oxidisation stability up to 110°C oil sump temperature
Foam suppressor
Detergent for dissolving deposits
Neutrality with regard to seal materials of fluoropolymer elastomer (Viton)
Neutrality with regard to one-component resin primers
Sufficient shear stability

11.7.1.1 Lube oils

Tab. 8: Standard first oil filling

Delta Lube 06	
Intake temperature (machine stage)	up to 50°C
Final compression temperature (machine stage)	up to 140°C
Ambient temperature*	no constraints
This lube oil is used as initial oil filling for standard use conditions.	

11.7.1.1.1 Alternative lube oils

Tab. 9: One or two-shift operation/intermittent operation

AERZEN special rotary piston oil	
Intake temperature (machine stage)	up to 50°C
Final compression temperature (machine stage)	up to 140°C
Ambient temperature*	no constraints

Tab. 10: Continuous operation: 24 hours a day

ISO VG 150	
Fully-synthetic poly-alpha-olefin (PAO), gear or compressor oil	
Intake temperature (machine stage)	up to 50°C
Final compression temperature (machine stage)	up to 140°C
Ambient temperature*	no constraints
Example: MOBIL SHC 629	

Tab. 11: Operation with a final compression temperature of over 140°C

ISO VG 220	
Synthetic lube oil with a base oil of type polyglycol	
Continuous oil temperature	120°C-140°C
Final compression temperature (machine stage)	over 140°C
Ambient temperature*	no constraints
Example: ESSO Glycolube 220, ARAL Degol GS 220	

11.7.1.2 Changing lube oils

Delta Lube 06, AERZEN special rotary piston oil --> fully synthetic PAO lubricants

The AERZEN lubricants (Delta Lube 06, AERZEN special rotary piston oil) are fully compatible with fully synthetic PAO lubricants.

Measures: If you change to another lube oil, no specific measures need be taken. However, to preserve the working properties of the new lube oil, the lube oil that is replaced should be drained completely. After an operating time of 100 hours, the lube oil and the oil filter (if any) must be replaced once. Only lube oil of the same type should be used for topping up.

Delta Lube 06, AERZEN special rotary piston oil, fully synthetic PAO lubricants --> polyglycol oils (PAG)

The AERZEN lubricants (Delta Lube 06, AERZEN special rotary piston oil) as well as PAO lubricants are ***not*** compatible with polyglycol oils (PAG) or perfluorinated polyether oils, e.g. Fomblin.

Measures: In order to change the lube oil type, the machine must be completely dismantled and the entire oil system thoroughly cleaned of residue. A rinsing is recommended before initial commissioning. Only lube oil of the same type should be used for topping up.

11.7.2 Lube oils in the food and pharmaceutical industry

For a positive displacement blower, lube oils can be used which have approval according to the specification USDA H1.

Operational experience is **only** available for the lube oils stated hereafter.

AERZEN does not issue any approval for any other lube oils.

It is recommended that you carry out an oil analysis after 1,000 operating hours in consultation with the lube oil manufacturer.

ISO VG 46	
Continuous oil temperature	up to 100°C
Final compression temperature	up to 120°C
Lubricant to be used: **Klüberöl 4UH1-46 N**	

ISO VG 100	
Continuous oil temperature	up to 100°C
Final compression temperature	up to 120°C
Lubricant to be used: **Klüberöl 4UH1-100 N**	

ISO VG 220	
Continuous oil temperature	over 100°C
Final compression temperature	over 120°C
Lubricant to be used: **Klüberöl 4UH1-220 N**	

11.7.3 Grease specifications

Only for the gas-tight version of the drive shaft!

Tab. 12: Greases for the gasket of the drive shaft

Grease KHC-2P-30	
Using the lubricating oils according to AERZEN lube oil specification, *excluding polyglycol oils*	
Filling at the factory	**KLÜBER PETAMO GHY 133 N**

Grease MPG2K-40	
Using a polyglycol oil according to AERZEN lube oil specification	
Filling at the factory	**KLÜBER SYNTHESO PROBA 270**

Information on grease

- Avoid mixing different greases.
- Relubrication is only permitted with the same grease.
- If these greases are not available, completely remove the grease and replace it with another grease in accordance with KHC-2P-30 or MPG2K-40.
- Observe the seal compatibility with Viton!

11.7.4 Lubricant quantities

The following values for lubricant levels are guide-line values. The main factor in determining the oil fill quantity is the level shown on the relevant oil level displays.

Tab. 13: Model with oil system

Total oil quantity **Oil level middle sight glass on the acoustic hood**			
Operating material	**Machine type**	**Filling quantity, approx.**	**Unit**
Lube oil	GM 3 S	0.55	Litres (ltr)
	GM 4 S	1.00	
	GM 7 L	1.00	
	GM 10 S	1.40	
	GM 15 L	1.40	
	GM 25 S	1.75	
	GM 30 L	1.75	
	GM 35 S	3.75	
	GM 50 L	4.50	
	GM 60 S	7.50	
	GM 80 L	7.50	
	GM 90 S	12.50	
	GM 130 L	12.50	
	GM 150 S	12.00	

Tab. 14: Model without oil system

Total oil quantity **Oil level at centre of sight glasses on machine stage**			
Operating material	**Machine type**	**Filling quantity, approx.**	**Unit**
Lube oil	GM 3 S	0.55	Litres (ltr)
	GM 4 S	0.55	
	GM 7 L	0.55	
	GM 10 S	0.86	
	GM 15 L	0.86	

Total oil quantity Oil level at centre of sight glasses on machine stage			
Operating material	**Machine type**	**Filling quantity, approx.**	**Unit**
	GM 25 S	1.20	
	GM 30 L	1.20	
	GM 35 S	3.00	
	GM 50 L	3.50	
	GM 60 S	6.50	
	GM 80 L	6.50	
	GM 90 S	11.50	
	GM 130 L	11.50	
	GM 150 S	11.00	

Grease filling quantity for machine stage

Only for the gas-tight model of the drive shaft!

Operating material	Machine type	Filling quantity, approx.	Unit
Grease	GM 3 S	5	cm^3
	GM 4 S	5	
	GM 7 L	5	
	GM 10 S	5	
	GM 15 L	5	
	GM 25 S	5	
	GM 30 L	5	
	GM 35 S	10	
	GM 50 L	10	
	GM 60 S	10	
	GM 80 L	10	
	GM 90 S	10	
	GM 130 L	10	
	GM 150 S	20	

Stauffer lubricators

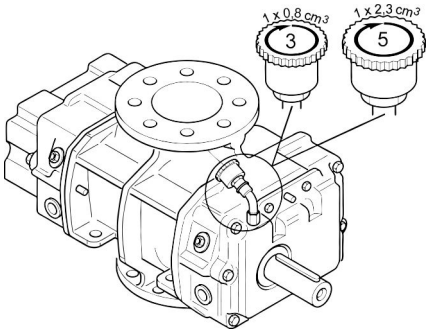


Fig. 171: Stauffer lubricator

Tab. 15: Grease amount per Stauffer lubricator for each rotation

Stauffer lubricator size	Rotation	Grease amount in cm^3
3	1	0.8
5	1	2.3

Drive motor grease quantity

Operating material	Motor size	Filling quantity, approx.	Unit
Grease	Observe the information in the motor documentation and on the rating plate!		

11.8 Paintwork

Corrosion protection

The housing surfaces receive the following coatings to protect them against corrosion.

Standard coating	
Undercoat	Corrosion protection on alkyd resin basis
End coating	Alkyd resin surface coating

Coating for heightened corrosion protection	
Undercoat	Corrosion protection on 2-component basis (epoxy resin micaceous iron oxide)
Intermediate coating	
End coating	Polyurethane surface coating

11.9 Electrical information

11.9.1 Voltage fluctuations

Permissible voltage fluctuations

Permissible voltage fluctuations are described in the international standard IEC 60038 subject to country-specific supply voltage tolerances.

Machine use only in a stable three-phase power supply. Voltage fluctuations or drops beyond the tolerance level may cause serious damage to the drive system.

11.9.2 Earthing strap cross-section

Earthing strap

	Power [kW]	Cross-section [mm²]
to	55	14
to	200	70
to	315	2 x 70

11.9.3 Motor overload protection

Installation value

Nominal motor current [%]
max. 110

11.10 Details of accessories

11.10.1 Intake filter

Technical data

Intake filter	Values	Unit
Filter resistance in clean condition	> 10	mbar
max. filter resistance	45	mbar

11.10.2 Start unloading device DN 50 to DN 80

Technical data

Start unloading device	Value	Unit
Voltage	230	V
Frequency	50	Hz
Protection type	IP 65	
Power	8	W
open without current		

11.10.3 Start unloading device DN 80 to DN 400

Technical data

Start unloading device	Value	Unit
Voltage	230	V
Frequency	50	Hz
Protection type	IP 65	
Power	8	W
closed without current		

11.10.4 Balancing grade

Technical data

The vibration behaviour is determined not only by the balancing grade of the drive shafts but also by the balancing grade of the drive elements.

The drive shafts of the pistons and rotors are balanced according to the half-key principle. Sheaves and couplings must therefore correspond to balancing type “H”.

12 Notes on the Declaration of Conformity

This document is provided for informational purposes only and gives an account of the contents of the Declaration of Conformity. The original document is provided with the product or is sent in a separate document.

AERZEN

Declaration of Conformity

1012-1		

pursuant to the EC Machinery Directive 2006/42/EC, Appendix II 1A	
Translation of Original Declaration of Conformity	CE
Manufacturer	**Representative pursuant to the Machinery Directive** **Representative for technical documentation**
Aerzener Maschinenfabrik GmbH	Aerzener Maschinenfabrik GmbH
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Reherweg 28	Reherweg 28
31855 Aerzen, Germany	31855 Aerzen, Germany

Product	
Designation	
Type	
Serial no.	
Order no.	
Year of construction	

We hereby declare that the aforementioned product complies with all applicable provisions of the Machinery Directive 2006/42/EC.

The aforementioned product fulfils the requirements of the following applicable directives:

► Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC (recast) 2006/42/EC

The following harmonised standards were applied:

► DIN EN ISO 12100:2011-03 Safety of machinery - General principles for design - Risk assessment and risk reduction (ISO 12100:2010)

► DIN EN 1012-1:2011-02 Compressors and vacuum pumps - Safety requirements - Part 1: Air compressors; German version EN 1012-1:2010

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13 Glossary

•AERZEN safety valve

Component in pneumatic systems for limiting the maximum permissible pressure and for safeguarding the machine.

AERZEN safety valves may only be operated in conjunction with a product that has been manufactured by AERZEN!

AERZEN safety valves fulfill the function of a pressure valve. They are not designed to fulfill a safety function.

•Bar chart display

A bar chart display is a display method which uses a scale to represent the size of a signal, with a bar that changes in length depending on the signal size.

•Belt run

The belt section between two sheaves is termed a “belt run”.

•Discharge temperature

Temperature measured at the discharge sockets of the machine stage.

•EMERGENCY STOP function

A function intended to alleviate the danger of impending hazards in terms of injury or damage to persons and machines during operation, or to reduce the danger of hazards that are already present.

A function that is activated by one single action by an individual person.

The purposeful shut-down of the machine to avoid a dangerous situation. Voltage-carrying components are still active.

EMERGENCY STOP.

•Machine

A machine is an assembly of linked parts or components, at least one of which moves. A machine is fitted or intended to be fitted with a drive system. The machine has a proper intended use and is assembled for a specific purpose. Another technical term for “machine” is “unit”.

•Machine stage

A machine stage is an incomplete machine. It is an assembly that almost constitutes a machine, but that does not fulfil a specific function. A machine stage is only intended to be installed in and added to other machines or other incomplete machines.

•Modbus RTU

Modbus RTU transfers data in binary form. This ensures a good data throughput rate. The data cannot be evaluated directly by persons, rather they must first be converted into a readable format.

•Oil system

The oil system is used in a multitude of acoustic hoods. It comprises a filling vessel, an additional oil level display on the acoustic hood, and the oil pipe connection.

•PROFIBUS-DP

PROFIBUS-DP is a system that allows central controllers to communicate with local input/output modules via a high-speed serial connection.

•Sentinel filter

A sentinel filter is another filter downstream from a filter.

It fulfills an end cleaning function and a safety function.

•Stop category 0

Stop category 0.

Shut-down by means of immediate interruption of the power supply to the machine.

Performs a shut-down by means of mechanical disconnection (uncoupling) of components that pose a danger and their mechanical drive elements and, if necessary, performs a braking procedure.

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