

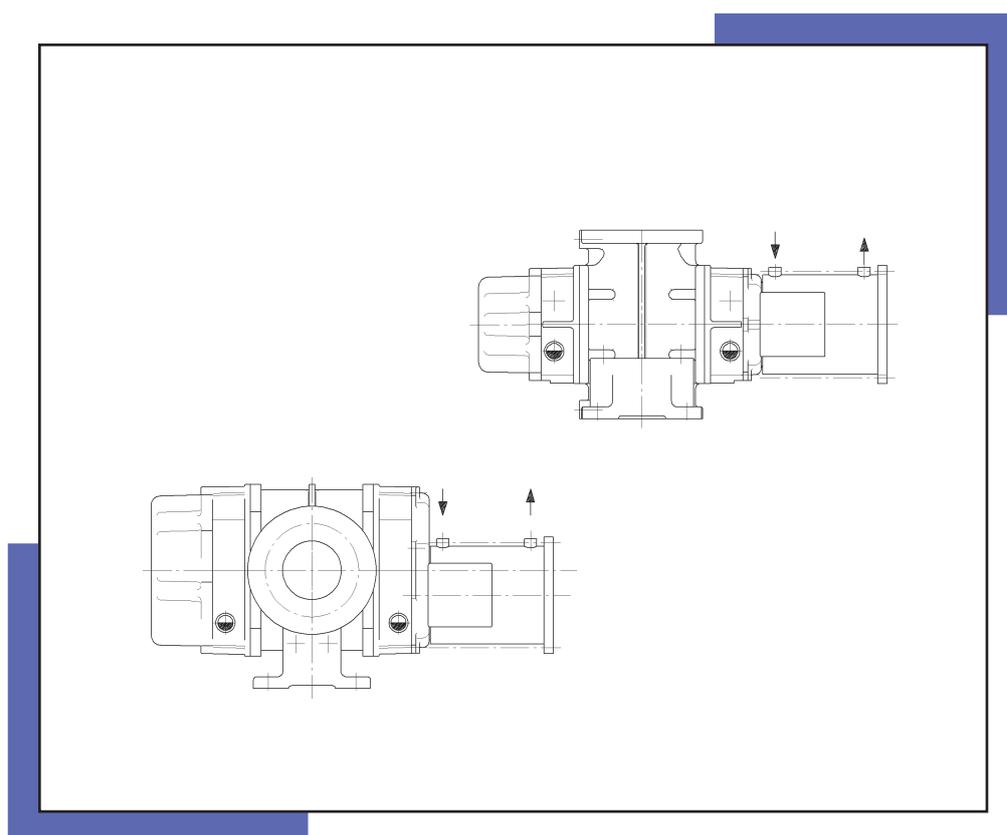
Vacuum

Rotary piston blower stage

Water-cooled canned drive

Operating instructions

ENGLISH



AERZEN

G4-014 P EN

200 003 2708 01-2018



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Possible notes and changes indicated herein are to be effected.

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Konformitäts-Erklärung
 Declaration of Conformity
 Certificat de conformité
 EG-Verklaring van over-een-
 stemming voor machines
 Declaración de conformidad
 Dichiarazione di conformità

Leistungsdaten
 Performance data
 Performances
 Capaciteitsgegevens
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 Dati di esercizio

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Translation of the original instructions



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 tiva
 Informazioni

appendix I, II, III

Declaration of Conformity

pursuant to the EC Machinery Directive 2006/42/EC, Annex II 1A

Translation of Original Declaration of Conformity



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Product

Designation

Type

Serial no.

Order no.

Year of manufacture

We hereby declare that the above 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 1299:2009-02 Mechanical vibration and shock - Vibration isolation of machines - Information for the application of source isolation; German version EN 1299:1997+A1:2008

► DIN EN 1012-2:2011-12 Compressors and vacuum pumps - Safety requirements - Part 2: Vacuum pumps; German version EN 1012-2:1996+A1:2,009

Information on the

Signatory

Location, date of issue

Ersatzteile, spare parts, pièces dé tachée, onderdelen, repuestos, pezzi di ricambio

- AERZENER MASCHINENFABRIK -

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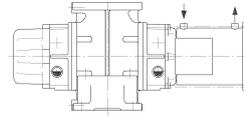
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Leistungsdaten

Performance data



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Appendix

Suitability/General information

The German version of these operating instructions represents the „original operating instructions“.

Versions in all other languages are a „translation of the original operating instructions“.

Aerzener rotary piston machines are suitable for the oil-free conveying of air and neutral gases, as well as for use in special applications in industrial high vacuum technology. Prior to commissioning the machine, the conveyor piping must be connected in order to prevent people reaching into the machine!

Note / synthetic resin can --> In the case of the transport of aggressive gases, trials on resistance are to be undertaken prior to operation. These trials are to be validated and recorded. If a lack of suitability is found, the SRM series is to be used.

The technical performance limits must be observed if perfect operation of the equipment is to be ensured in the long term.

The performance limits stated in the order confirmation apply.

On this topic, please also note the blower-specific K0 and the charts on safe operation, as well as the tables in the appendix. The related charts can be requested from the manufacturer.

The intake temperature t_1 specified on the order confirmation serves as the installation site ambient temperature.

Non-observance of the technical performance limits or the safety information will absolve Aerzener Maschinenfabrik of its warranty obligations and its liability to pay damages or compensation as a result of any consequential damage. The same applies to defects that can be traced back to recommended inspections not being performed correctly or on time.

The vibration behaviour of blowers and compressors is determined by the balance quality of the pistons / rotors etc.

At Aerzener Maschinenfabrik, the piston/rotor drive shafts are balanced using the „half-key balancing“ technique.

The maintenance intervals according to these operating instructions must be followed and carried out properly. Complying with the maintenance specifications will ensure that the machine retains its value and will also promote operational reliability.

Example of type identification:

GM / GL 2800 HM-C

GM	=	Blowers vertical conveying
GL	=	Blowers horizontal conveying
2800	=	Volumetric flow rate at 50 Hz
HM	=	Hermetic motor
N	=	N > Mains frequency
		C > High frequency, continuous mode
		Y > High frequency, cycle mode



1.1

Operator's obligations

The machine is used in industrial environments. The machine operator must therefore meet the legal obligations regarding occupational safety.

In addition to the safety instructions in this manual, the safety, occupational safety and environmental protection regulations for the machine's field of application must be observed.

The operator must:

- Familiarise himself with the applicable occupational safety regulations.
- In a hazard assessment, the operator must determine any additional hazards ensuing from the special working conditions at the machine's location. The operator must implement the results in the form of operating instructions for the machine. The requisite safety data sheets must be obtained from the manufacturer concerned.
- The operator must check, while the machine is in use, whether the operating instructions he has compiled conform to the latest version of the regulations. Adapt the operating instructions if necessary.
- Clearly set out and define the responsibilities for installation, operation, fault rectification, maintenance and cleaning.
- Ensure that all persons who handle the machine have read and understood this manual. In addition, he must train personnel at regular intervals and communicate the hazards.
- Provide personnel with and obligate them to wear the requisite protective equipment.

The operator is also responsible for ensuring that the machine is in a technically faultless condition at all times.

The following therefore applies:

- The maintenance intervals described in this manual must be respected.
- Check all safety equipment on a regular basis for operability and completeness.

The operator must ensure that the following points are respected and executed at all times:

- Operate the machine only in the as-delivered condition. Additions or conversions render the manufacturer's Declaration of Conformity invalid.
- Refrain from any procedures that compromise the safety of the machine.
- Keep the machine in a technically faultless condition at all times. Replace damaged or non-functional components immediately. In case of doubt, contact the manufacturer or the relevant point of contact.
- Do not operate the machine if safety equipment has been dismantled or bypassed.
- Observe all warning and information signs attached to the machine and make sure such signs are legible at all times. Replace detached or barely legible signs without fail. Request replacements from the manufacturer.
- Mount the components stipulated in the extent of supply and delivered as separate items on the machine and integrate them into the safety concept.
- Do not dismount connections or fit faulty electrical, mechanical or hydraulic connections.
- A suitable earthing system must be provided to protect against possible damage caused by lightning strikes.

- If the medium tends to form condensate, the condensate has to be dissipated (e.g. through a collecting vessel or residual gas lines, or by opening the bottom bores for a short period).
- Eliminate dusty accompanying substances prior to entry into the machine. Particularly substances that accumulate in the conveying chamber or the rotors present a hazard to the operational safety of the machine.

The operator must ensure that the following points at the installation site are respected and executed at all times:

- The machine must only be used in stable three-phase supply networks. Voltage fluctuations/dips beyond the tolerance zone can seriously damage the drive system.
- Activate the motor overload protection system.
- In the case of system versions without main circuit breakers and with EMERGENCY STOP function, integrate the machine's safety circuit into the EMERGENCY STOP concept of the overall system. Make sure additional EMERGENCY STOP switches in the vicinity of the machine are accessible.
- For operation, the machine must be equipped with one or more EMERGENCY STOP control devices.
- The EMERGENCY STOP function must be available and operable at all times and in any operating mode.
- Carry out maintenance work or troubleshooting only when the machine is switched off.
- It must be guaranteed that a stopped machine cannot start-up automatically.
- The machine must be equipped for operation with a control device which stops the machine in case of a potential hazard.
- The power supply to the motor must be interrupted. If this is not possible, the "shut down" operating state must be monitored and maintained.
- Avoid electrostatic discharge. Connect equipotential bonding.
- In case of accident or emergency, integrate emergency procedures for the machine into the emergency procedures for operation. Integrate these procedures particularly into escape and rescue plans, and also into the fire alarm plan.
-
- Use only couplings approved by AERZEN. AERZEN uses Rotex couplings, type: 001, as standard.
- The machine is suitable only for indoor installation. If the machine is installed outdoors, it must be equipped with an acoustic hood.
- Operate flange-mounted motors only in conjunction with the AERZEN connector. Observe screw tightening torques!

Thread size	Strength class 8.8 / in Nm
M8	22
M10	43
M12	75
M16	186

- **The operator must ensure that the following points are observed and executed prior to commissioning:**
 -
 - **Warning!**
Risk of injury from vibrations.
Vibrations may, in the long term, lead to injuries and chronic damage to personal health. Use vibration-absorbing machine feet and flexible connecting sleeves.
 -
 - **Warning!**
Risk of injury due to incorrect machine installation.
Incorrect machine installation causes personal injury and property damage. Guarantee safe and proper machine installation.
 - Correctly drill and dowel four mounting holes and screw the machine to these so that it is safe to operate.
 -
 - **Warning!**
Risk of injury from unsuitable and incorrectly installed drives.
Provide and use only suitable drives in accordance with AERZEN requirements. Drives must be designed for this machine and installed properly.
- **DANGER!**
Mortal danger from electric current!
Contact with live parts presents immediate mortal danger from electric shock. Damage to the insulation or individual components can be fatal. Have all work on the electrical system carried out by authorised electricians. If insulation becomes damaged, switch off the power supply immediately and arrange a repair.
Before starting work on active parts of electrical systems and equipment de-energise and maintain this state for the duration of the work.

Observe the 5 safety rules:
 - De-energise.
 - Secure to prevent restart.
 - Establish de-energised state.
 - Earth and short-circuit.
 - Cover or cordon off adjacent live parts.
 - Never bypass or decommission fuses.
 - To replace fuses, observe the correct current strength specification.
 - Protect live parts from moisture. Moisture can cause a short-circuit.
- **DANGER!**
Mortal danger when using frequency converters!
Frequency converters are energy stores - this means that even after the power supply has been disconnected, the poles can still be live; earth connection poles before touching them for the first time.
- **Warning!**
High risk of injury on approaching and reaching into rotating components.
During operation, components rotate inside the machine at high speed. Connect machine flanges with the corresponding lines and accessory components.
Reaching into the machine interior through the flange openings must be prevented by connecting the system line.

- **Caution!**
Operation without sensors presents the risk of injury and property damage.
In order to guarantee the working pressures, never operate the machine without sensors or pressure and temperature switches.
- **Caution!**
Risk of injury and property damage due to disregarding the operating data.
Disregarding the operating data can lead to unforeseen situations that put people in danger.
Implement all procedures that guarantee safe machine operation.
Check and observe operating data at all times.
- **Caution!**
Risk of injury and property damage due to operation without pressure / safety valves.
Operation without pressure / safety valves can lead to unforeseen situations that put people in danger.
Never operate the machine without these valves.
Integrate pressure / safety valves into the design.

Warning!**Fire hazard from hot surfaces at the installation site.**

Connected pipes and attached accessories reach high temperatures when the machine is operated!

After switch-off or shutdown, allow the machine to cool down to room temperature.
Attach any necessary warning signs.

- **Warning!**
Fire hazard caused by work that causes sparks and from ignition sources in the direct proximity of the machine!
- **in the direct proximity of the machine!**
Avoid naked flames near the machine.

DANGER!**Mortal danger from rotating components!**

Carry out work on the machine ONLY when it is shutdown.

Version without flanged motor:

- **Warning!**
High risk of injury from rotating drive shaft.
During operation, components rotate at the machine drive shaft at high speed.
Never operate the machine without coupling or belt protection.
Always provide a suitable guard.

Construction, mode of operation

Blower stage:

The blower stage is supplied as a fully assembled unit.

The following additional work must be carried out:

- Correct installation/assembly in the relevant unit/system
- Connect the conveying ducts.
- Check lubricating oil level.
- Top up lubricating oil level if necessary.
- Install any special accessories which have been supplied separately.

Motor connection:

Electrical installation of the drive motor must only be carried out by an authorised electrical fitter.

Connect the motor and control voltage to a stable common network to ensure that the power contactor is no longer latched if the power supply fails. Voltage fluctuations and voltage dips must be avoided.

Alternative: An electronic monitoring relay must be installed in parallel to the drive motor so that the power contactor is no longer latched in the event of a power failure.

It must only be possible to restart the machine once it has stopped.

Prerequisites for operating rotary piston machines with asynchronous electric motors on a 3-phase AC supply network:

The machine should only be used on stable three-phase supply networks.

The voltage and frequency limits must be observed. These are specified in EN 60034-1.

Voltage fluctuations/dips beyond the tolerance zone can lead to serious damage to all the drive system elements, such as couplings, V-belts, V-belt pulleys, shafts and gear wheels, etc. .

If excessive voltage fluctuations arise in the system,

Aerzener Maschinenfabrik recommends the following measures in order to prevent the blower, compressor or motor from sustaining damage:

- Use suitable protective equipment that will shut down the motor and safeguard it against an automatic restart when inadmissible operating data are detected. Also comply with EN 60034-1 and EN 60 204-1 in this respect.

Unit/System:

The blower stage must be installed/assembled in a unit/system in the correct way so that it is safe to operate.

There must be no forces or moments acting on the flange that could distort the blower housing.

The assembly/installation must be guaranteed to be resistant to distortion.

The blower stage must be installed level and flat.

Operational safety/reliability will be affected to the extent of any misalignment.

Startup screen:

It must be ensured that the intake gas is free of dirt and impurities to ensure the the blower stages are operating reliably.

If the intake is from a duct, we recommend using a startup screen.

The degree of contamination or the specifications on the maintenance schedule determines when the startup screen must be cleaned or replaced.

Mode of operation:

Aerzener rotary piston blowers are dual-shaft rotary piston machines with pistons which rotate uniformly in opposite directions. Timing gear wheels ensure that the rotary pistons run contact-free.

The direction of rotation defines the conveying direction of the blower.

At the operating point, the medium to be conveyed flows through the intake flange into the housing. From there, it is forced through the conveying chambers (consisting of the pistons and the blower cylinder) in the direction of the outlet.

The installation is driven by a canned motor which is hermetically flanged in front of the drive shaft.

The conveying chamber (cylinder) is sealed off from the oil chambers (housing cover and gear case) by a combined oil retainer partition and rectangular ring labyrinth seal.

This type of sealing is not hermetically sealed. In some instances, special measures might be necessary for short pump cycles, in order to prevent oil flowing into the conveying chamber.

Please contact Aerzener Maschinenfabrik GmbH for further information on this topic.

The level of the lubricating oil for supplying the bearings and the gear wheels can be seen in the oil sight glasses. It is essential to keep an eye on the MAX. level.

If the oil level is too high, oil can penetrate into the conveying chamber in an uncontrolled manner.

When gases are conveyed, compression heat is produced. Some of the heat is dissipated via the outer surfaces of the blower and conveying duct into the ambient air. Outer surfaces and conveying ducts reach temperatures which can cause burns to exposed skin.

Foreseeable incorrect operation or use

Dust contaminants should be removed before entry into the blower. In particular, substances which can settle in the conveying chamber or on the rotors can jeopardise the operational reliability of the machine.

The same applies to the compression of resublimating gases containing solid particles, which can separate from the gas phase and deposit in the machine. Resublimation in the blower must be prevented by using suitable process control measures (pressure, partial pressure, temperature and speed etc.).

Exceeding the performance limits may lead to overheating in the rotary blower and jeopardise operational reliability. The pump-stand builder must run a test to check whether the designed pump process can cause the blower to overheat. If necessary, special measures to ensure reliable use of the blower must be agreed with Aerzener Maschinenfabrik. It is particularly important to make sure that performance specifications supplied by Aerzener Maschinenfabrik relate to the delivery medium "air" and the lubricating oil "mineral oil".

Due care must be taken before and during operation

CAUTION!  Identifies all hazardous situations

WARNING !  Indicates direct risk to personnel.

Upon arrival/receipt, the rotary piston machine must be checked against the delivery and order documentation to make sure that it has not been damaged during transit and is complete.

Work safety regulations, safety information and operating instructions must all be complied with.

Read the **INFORMATION sheet** prior to commissioning. Any notes or changes stated on it must be observed.

The tasks described below must only be carried out by qualified personnel who are familiar with the purpose and operation of the machine and its components, and have been instructed in the relevant safety information.

This rotary piston machine conforms to European safety regulations. Nevertheless, residual technical risks, which could endanger persons and property, may remain. To prevent this, operators must take note of the following **safety information**:

- **Assembling the blower stage in the unit**
Keep the flange connections sealed until they are about to be installed. The ingress of dirt, burring, sputtering, liquids and similar must be avoided. Otherwise the blower stage may become blocked or sustain serious damage.
- **Information about operating data**
 - The operating data must be observed. The machine must be used appropriately and in compliance with the regulations, and within its performance limits.
 - The sound pressure level may deviate from that stated in the operating data, depending on the operating state. A sound pressure level in excess of 85 dB(A) may therefore occur for a short period of time.
- **Information about general operation**
 - The general safety and industrial accident prevention regulations set down by law must be taken into account in addition to the information in the operating instructions.
 - The user is responsible for making sure that the machine is only run if it is in perfect working order, safe to operate and in its original condition. Damaged compressors or compressors which are not in perfect working order must be replaced immediately.
 - Any operation that impairs machine safety is prohibited.
 - The supplier documentation provided with the accessories must also be observed.
 - Protective equipment such as the belt guard / coupling guard, hood elements, electrical safety elements, valves, motor protection/EMERGENCY OFF etc., must not be removed or its operational safety restricted whilst the machine is in operation. **Risk of injury!**
 - Do not operate the machine if electrical, mechanical or hydraulic connections are defective or missing.
 - It is expressly prohibited to operate the rotary piston machine without appropriate protective equipment or safety devices.
 - The machine must only be used in stable three-phase supply networks. Voltage fluctuations/dips outside the tolerance zone can seriously damage all the elements that make up the drive system. These include couplings, V-belts, V-belt pulleys, shafts, etc.



**Erst lesen -
dann bedienen!**

*Read first,
then operate !*



- **CAUTION!** Mechanical damage will result if the machine is operated without sufficient oil!
- The safety, operating and maintenance information of the drive motor manufacturer must be followed!
- Follow the instructions of the accessories manufacturer, as well as the general safety regulations.
- If the conveying medium is helium or oxygen etc. the „Safety data sheets“ and the general safety instructions as well as the related safety regulations must be followed!

Safety instructions for commissioning

- You must read and understand these operating instructions before commissioning the machine.
- Commissioning must only be carried out by persons with the relevant knowledge and skills.
- Before switching on the machine, ensure that you are familiar with all protection, operation and monitoring elements by referring to these instructions.
- Prior to first use, check that the intake side is clean.
Any evidence of dirt, dust or foreign matter must be removed from the intake area.
- An adequate supply of lubricating oil must be ensured during operation.
- Compliance with the maintenance schedule is absolutely mandatory.
- The operator must use oil of a suitable quality, conforming to the Aerzener lubricating oil specifications.
- It must be ensured that a stopped positive displacement machine cannot be moved from the rest position without operating the start function, no matter what the cause!
- Damaged rotary piston machines or machines that are not in perfect working order must be replaced immediately.

Qualification of operators

- Each person dealing with the installation, operation, maintenance and repair of this unit must have read and understood the operating instructions.
- The unit must only be operated by trained and authorised personnel.
- Personnel must undergo training with reference to the operating instructions.
- Responsibility for operation must be precisely defined in order to prevent any unclear designation of responsibilities.
- Operators must be proficient and instructed and appointed for the work.
- Work on current-carrying components must only be carried out by trained and authorised specialist personnel. The unit must be disconnected from the power supply. Fuses must be disconnected.

Safety instructions in relation to prevailing residual risks

- The warning and information signs on the machine must be observed. They provide important information about potential sources of danger.
- Before commissioning, check that the machine is not damaged in any way.
- Do not operate the unit if electrical connections are damaged, defective or not properly connected.
- Do not operate the unit with an open intake or discharge nozzle, as rotary piston machines are positive displacement machines which present a risk of injury in the area around the conveying chamber.
- Only suitable tools that correspond to the respective standards and design of the bolts, nuts and screwed connections must be used.
- When using cleaning agents and sprays, there is a **risk of poisoning** from inhalation, and a **risk of burning** from coming into contact with them.

Warning signs for hazardous operations

- Repairs and modifications to the unit must only be carried out in a professional manner. If you have any problems, please contact Aerzener After-Sales Service for assistance.
- Before carrying out any retrofitting, servicing or maintenance work that requires protective equipment to be removed, the power supply must be disconnected and the machine secured to prevent it starting up.





- All lubricating and control oil pipes should only be retightened or opened while the machine is in a depressurised state.
- Depressurise conveying ducts before attempting to remove them. Allow a sufficient delay of several minutes for the lines to depressurise.
- Screwed connections should only be retightened while the machine is in a depressurised state!

- Take note of the oil temperature when changing the oil. The oil temperature must not be above 60°C. If it is above 60°C, there is a **risk of burns!**

Personal protective measures

- Conveying ducts or components on the discharge side must not be touched without adequate protection. The ducts and components can reach temperatures in excess of 70°C.
Risk of burns!
- There is a **risk of burns**
Wear protective clothing.
- Close-fitting clothing is required due to the presence of rotating components.
Risk of injury!
- **Use ear defenders** when the machine is operating!

Information about the installation site

- It is the operator's responsibility to use and operate the machine in accordance with its intended use taking into account the local conditions.
- The machine must only be operated in a suitable, well-ventilated installation site. The installation site must be free from excessive dust, acids, steam and explosive or flammable gases.
- The protective equipment provides protection against injury and must not be modified or bypassed.
- The machine is to be installed such that objects are safely prevented from falling on the machine!

Instructions and responsibilities for taking care of the drive motor

- All work on the motor must only be carried out when it is switched off and secured against switching on again.
- All work must only be carried out by qualified, responsible specialist personnel. Also comply with: VDE 0105, IEC 364.
- Low voltage machines may have dangerous, live, rotating components as well as hot surfaces.
- You must follow the safety instructions when using cleaning agents.
- It is only permitted to use the lifting eye on the motor housing to transport the motor as a separate component.
- Ensure that the machine has a proper supply of coolant.
- Fill the machine with lubricating oil according to its size.
- The cross section of the connection cable must be matched to the rated motor current according to the local regulations.
- Only tested cable glands may be used for the cable routing.
- Holes in the connecting terminal compartment which are „not“ used must be closed with blind grommets.

Instructions for running motors with liquid-cooled housings

- The flow of coolant must only be limited by throttling the return line. This is the only way to guarantee that the cooling jacket is completely filled and the air bubbles are discharged.

INADMISSIBLE OPERATION

- Installation on inclined and/or sloping foundations
- Failure to observe the operating data.
- Failure to observe the maintenance intervals
- Incorrect direction of rotation
- Switching on
 - while coasting down
 - when rotation is in reverse
- Inadmissible pressure increase
- Not reaching or exceeding the speed limit.
- Exceeding the limit discharge temperature / see also type plate.
- Changing poles at low speed before the motor stops
- Operating the machine without modules designed to ensure the safety of the personnel and machine or with such modules which are damaged or faulty.
- Overfilling beyond the max. oil level.
- Operating the machine without oil
- Exceeding the permitted motor currents. See Appendix I.
- Running with a insufficient supply of cooling water.
- Running without a supply of cooling water.

“Reasonably foreseeable misuse” that can result from easily foreseeable human behaviour:

- Operating the machine without having filled the lubricant.
- Operating the machine with too much lubricant.
- Operating the machine with reduced intake performance, e.g. due to a soiled intake filter, starting strainer etc.
- Assembly and commissioning of the rotary piston machine with intake-side and/or discharge-side flange sealers, protection covers or similar.
- Insufficient ventilation at the installation site, no insulated lines.
- Operating the machine without an isolated protective device, open belt or coupling drive.
- Risk of injury from rotating components!

Foreseeable incorrect operation or use

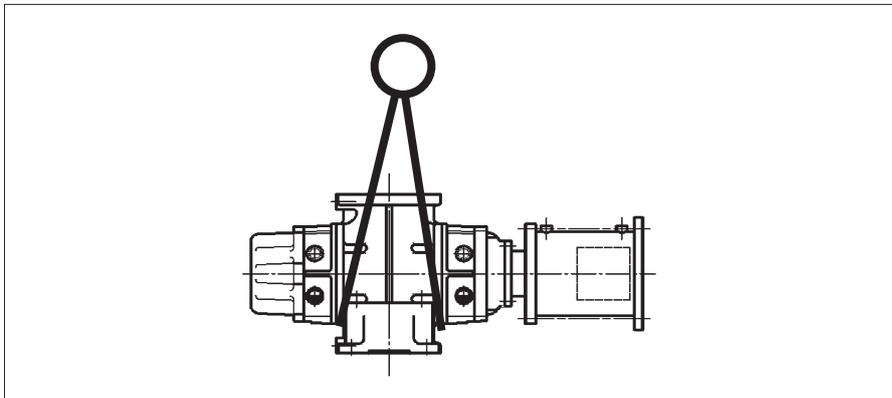
- Dust contaminants should be removed before entry into the blower. In particular, substances which can settle in the conveying chamber or the rotors can jeopardise the operational reliability of the machine.
- The same applies to the compression of resublimating gases containing solid particles, which can separate from the gas phase and deposit in the machine. Resublimation in the blower must be prevented via suitable process control (pressure, partial pressure, temperature and speed etc.).



Transport/Installation

When transporting the machine, the following key points must be observed:

- Do not expose the blower to impact loads.
- Transport the blower using a crane, fork-lift truck, lift trolley or similar.
- Only suspend the blower as shown on the sketch.
- Use suitable hoisting gear that is appropriate for the load concerned. Failure to observe this point could result in damage or injury!
- The hoist, cables and chains etc. must be designed for the load concerned.
- The hoist must be arranged in accordance with the machine's centre of gravity.
- The hoist must not be able to exert any forces on the machine that could result in damage.



During installation the following points must be observed:

- Prior to delivery, rotary piston machines are treated and packaged to allow for a 12-month storage period. If they are to remain in storage following this 12-month period, they will need to be retreated; see storage and mothballing guidelines TNO 1175.
- While the units are in storage, ensure that they are correctly preserved and packaged and, if necessary, that they undergo nitrogen replenishment in accordance with TNO 1175. They must be checked every six weeks.
- You must eliminate any adverse influences immediately to ensure ongoing preservation of the units.
- Intermediate storage must be in dry, clean rooms that are free of vibrations.
- The oil chambers have been sufficiently preserved for one year.
- In the case of belt-driven machines, the V-belts should be slackened during storage.
- If the unit is intended to be taken out of operation for longer than six weeks, the conveying chamber, piston and bare parts must be preserved.
- The blower must be installed on a level, vibration-free and slope-free foundation and the connections made.
- CAUTION! If the blower is installed with a tilt, this will result in irreparable damage to the machine caused by the uneven oil level. The machine's operational safety/reliability and service life will be affected in accordance with the extent of any misalignment.
- Remove all packaging material. If your machine features an acoustic hood, ensure that the inlet and exhaust air louvre profiles can be accessed.

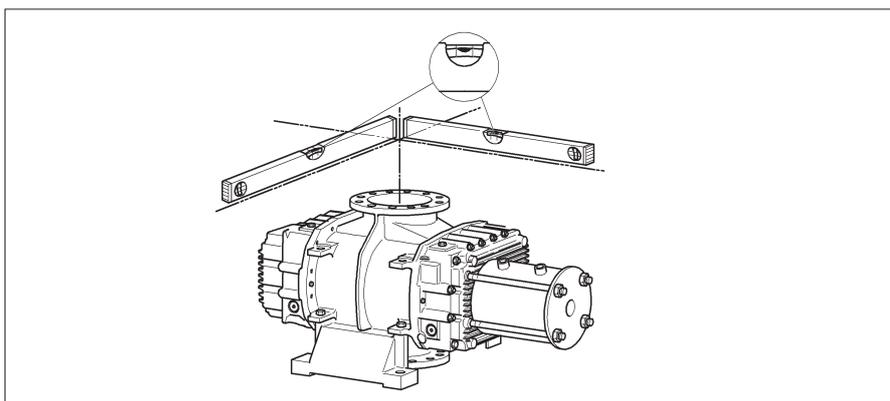


- Ensure that the installation site is adequately ventilated.
- The following standard installation conditions must be maintained:

Ambient temperature	:	-10°C	to	40°C
Rel. air humidity	:	0%	to	80%

Chemical-free atmosphere
- Check that the rotary piston machine can run freely. Sluggishness indicates the presence of distortion or foreign bodies.
- To prevent the units acquiring an electrostatic charge, the motor, acoustic hood and base frame must be earthed via the connections provided.
- Fasten the ducting on the discharge side and the ducting on the intake side separately to make sure the connection is stable.
- There must be no forces and/or moments acting on the flange or connections.
- Make sure that the blower runs freely before it is installed.
Sluggishness indicates the presence of foreign matter inside the conveying chamber.
- Remember to remove the sealing covers from the intake-side and discharge-side flanges prior to installation!
- The blower must not be distorted by alignment or tightening operations.
- Make sure that the blower can run freely after it is installed.
Sluggishness indicates the presence of foreign matter inside the delivery chamber or distortions.
- Take noise protection into consideration. Ducting and foundations may be induced to produce natural vibrations and the associated sound emissions.
- If you are planning the system in-house, the safety information, maintenance information and technical documentation provided by your component suppliers must also be followed.

Before commissioning, check the oil level in the oil chambers on the blower stage and correct if necessary.



Ducting

- When installing the ducting on the intake side, make sure that it is clean. Foreign matter and dirt will damage the blower.
- Any ducting which must be connected must be carefully cleaned and must be free of foreign matter.
- Ducting on the intake side must be supported. There must be no forces and/or moments acting on the blower housing.
- A start-up screen should be installed for the first 500 operating hours to prevent damage from contaminants. Install the start-up screen together with a seal on the intake side.
- Before tightening, the ducting and seals must be seated on the blower housing flange stress-free.
- The maximum distance in the sealing surface area is 0.05 mm on one side.
- Once it has been tightened, the blower stage should rotate freely without any resistance.
- Please note that ducting and foundations may be induced to producing vibrations and sound emissions when the blower is in operation.
- Therefore, insulation and soundproofing measures should be taken into consideration right from the planning stage.
- If you are planning a system in-house and/or plan to install the blower stage yourself, the safety information and technical documentation provided by your component suppliers must also be followed.



Operating instructions and instructions for use

Operating instructions and instructions for use for the vacuum blower with canned motor drive

The maximum differential pressure of the blower is specified in Appendix II „Operating data“ in relation to the operating time.

The differential pressure specified in column 4 is only permissible for a duration of 5 minutes.

The blower must then be run for at least 15 minutes continuously at the differential pressure, Column 5 = cooling phase in the rated range.

This period can be shortened by reducing the voltage while operating within the rated range.

The permissible performance limits in Appendix II must be complied with,

The motors are fitted with up to 3 ptc thermistor detectors. To avoid damaging the motor, we recommend connecting the ptc thermistor detector to a monitoring control device.

Type of connection and voltages

The motors must be connected according to the data on the motor rating plate.

A) Motors with the rating plate data 400V/50Hz and 460V/60Hz

Can be run on a three-phase network without a frequency converter.

The motor windings are designed for Y-connection.

If the poles on the terminal board are connected in delta, the motors must be run at 265V/60Hz or 230V/50Hz.

CAUTION!

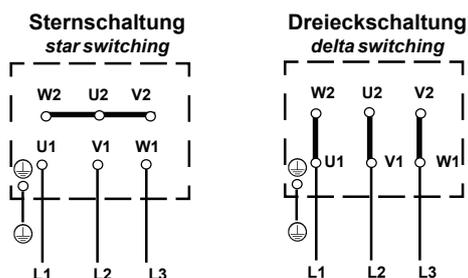
At low voltages, the motor load must be reduced to prevent it from overheating.

Running without frequency converter at 460V/60Hz or 400V/50Hz (mains operation)

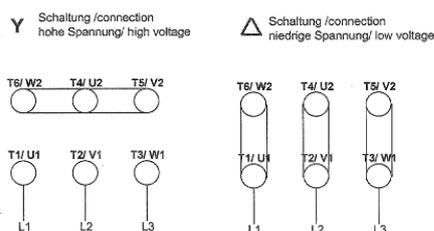
In the connecting terminal compartment, 3 poles must be connected as the neutral. L1, L2 and L3 must be connected to the remaining poles.

Running without frequency converter at 200-265V/60Hz or 200-230V/50Hz (mains operation)

In the connecting terminal compartment, 6 poles must be delta connected to L1, L2 and L3.



Rüetschi Motor



EMOD Motor

B) Motors with frequency specifications not equal to 50 / 60 Hz

may only be run with the frequency converter.

Running these motors on a three-phase network without a frequency converter is inadmissible.

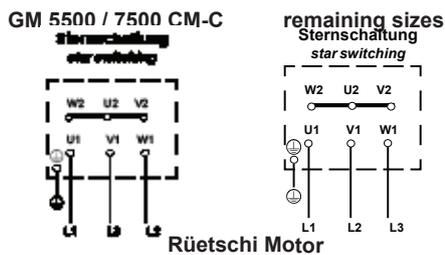
The motor windings are designed for Y-connection.

The design voltage at the rated frequency is stipulated in Appendix I.

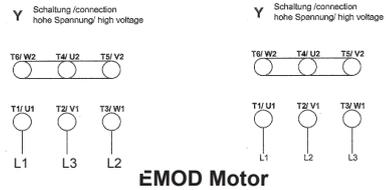
Running at frequency converter design voltage

350-400V (line voltages L1, L2, L3)

In the connecting terminal compartment, 3 poles must be connected as the neutral. L1, L2 and L3 must be connected to the remaining poles.



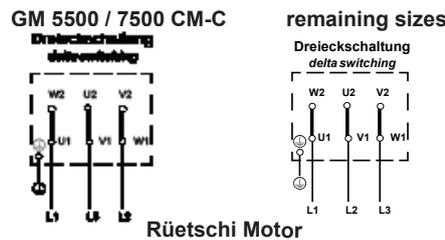
GM 5500 / 7500 HM-C all othes sizes



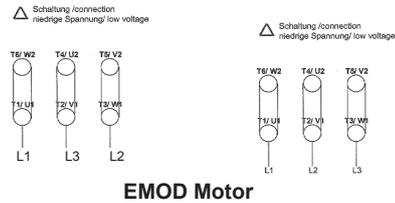
Running at frequency converter design voltage

200-230V (line voltages L1, L2, L3)

In the connecting terminal compartment, 6 poles must be delta connected to L1, L2 and L3.



GM 5500 / 7500 HM-C all othes sizes



Connection / thermal winding protection

All motors have a PTC sensor to monitor the winding temperature.

Connection terminals / motor terminal strip

2x2 pole thermistor connection terminals are provided on the motor terminal strip.

Thus, the motor can be protected at 155°C or 180°C.

The PTCs must be connected to the frequency converter or to a suitable electronic selector in order to prevent damage to the motor due to overheating.

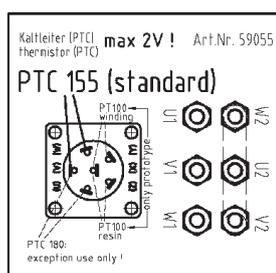
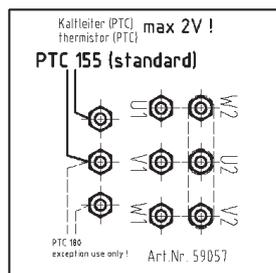
The PTC must be selected according to the operating data.

C- / N-operation: PTC 155

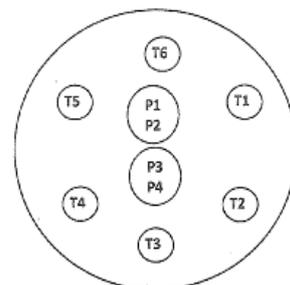
Y-operation : PTC 180

Also follow the connection instructions inside the motor terminal compartment.

Rüetschi Motor



EMOD Motor



Operating instructions and instructions for use for the canned motor

Use

Drive unit for vacuum blowers

Operating modes

- N** : Running at mains frequency 50 / 60 Hz on a three-phase supply network,
no frequency converter necessary.
- C** : Constant operation at max. speed, frequency converter mode possible,
no transient peak load possible.
- Y** : Periodic interval mode
Max. 5 minutes peak load; Min. 25 minutes partial load.

Cooling

Cooling medium : clean tapwater,
pH = 7

Flow rate
of the cooling medium : see sep. Table: > ... Litres/minute

Operating pressure of the cooling medium : 2 bar ... 5 bar
Inlet temperature of the cooling medium : + 5°C to + 25°C

Circuit diagrams

The circuit diagrams for the motor connection are cast in the terminal box cover or listed in these operating instructions.

Connection terminals / motor terminal strip

2x2 pole thermistor connection terminals are provided on the motor terminal strip. Thus, the motor can be protected at 155°C or 180°C. The PTCs must be connected to the frequency converter in order to prevent damage to the motor due to overheating.

Direction of rotation

The direction of rotation must be checked via the sight glass in the front of the motor cover.

Reverse the direction of rotation if necessary by swapping over the two outer pole lines.

CAUTION!

The wrong direction of rotation will damage the vacuum blower.

The minimum speeds mentioned here apply to the following operating cases:

- Brief high vacuum operation for max. 30 min continuous operation allowed, Risk of rotary piston start-up malfunction as a consequence of overheating and lack of lubrication !
- Operation without motor, rotary pistons rotate due to a volumetric flow (windmilling) drawn through the blower.

Minimum speeds			
Profil 1000 / 1400:	$n_{min} =$	750	rpm
Profil 2000 / 2800:	$n_{min} =$	700	rpm
Profil 4000:	$n_{min} =$	500	rpm
Profil 5500 / 7500:	$n_{min} =$	500	rpm
Profil 8000 / 9500:	$n_{min} =$	500	rpm

Guarantee conditions

As soon as the operator opens the drive motor or makes changes to the mechanical or electrical components, the guarantee is void. This does not apply to opening the connecting terminal compartment.

Proper maintenance as stipulated in the section „Maintenance“ does not count as intervention according to the guarantee conditions.

The guarantee agreed by the manufacturer is not thereby affected.

Repair

Only the manufacturer is allowed to carry out repairs and only the manufacturer is allowed to open the motor.

Choice and requirements for the frequency converter

Choice

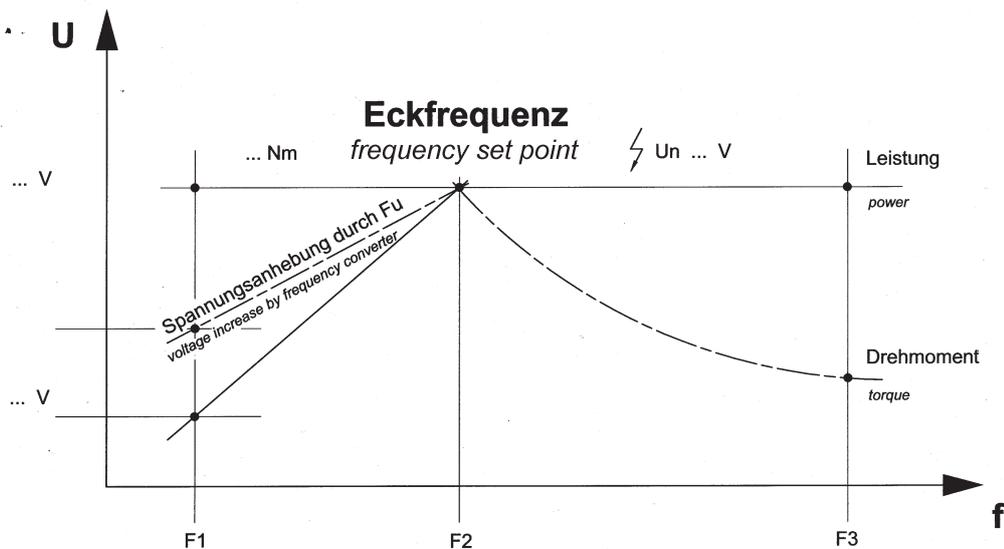
Output rated current	:	The rated current required for the motor is selected according to the converter rating plate. <i>Not according to the motor power!</i>
Mains voltage	:	According to the local conditions. The output voltage must not exceed the supply voltage!
Mains frequency	:	According to the local conditions
Output filter	:	Adapted to suit the converter
Cycle frequency (rated switching frequency)	:	> 15 kHz (select as high as possible)
Voltage dip	:	Also known as energy saver mode. Not used as a saver mode but as a component of the function.
Boost	:	Autoboost or adjustable.

Requirements

All the parameters listed below must be adjusted and checked before commissioning. Parameters which are missing or incorrectly adjusted will destroy the drives!

Original operating instructions	:	Available, read through and understood
EMC principles	:	Installation checked
Operating voltage (mains)	:	According to the local conditions Basic settings of the drive

Frequency set point : According to the motor rating plate
 At this adjusted frequency, the converter reaches its maximum output voltage.
 If the frequency set point is not correctly adjusted, the motor may overheat!



Rated current : According to the motor rating plate
 Rated voltage : According to the motor rating plate
 Rated frequency : According to the motor rating plate
 Number of poles on motor : According to the motor rating plate
 Cycle frequency : > 15 kHz

Frequency converter parameter assignment principle

According to the frequency converter constant torque characteristic => the torque does not change with the speed!

Boost: : Autoboot or approx. 2% ... 5%
 The voltage dip can be compensated for by the boost so that the pull-out torque of the motor remains almost constant over the entire voltage range.

Voltage dip (Energy saving mode)	:	Drops to a minimum of 70% of the motor rated voltage When the motor is operating in interval mode at reduced power, the rated voltage must be reduced to relieve the can. If the motor is run for longer than 10 minutes at the rated voltage (depending on the load), the motor will be destroyed!
Motor protection	:	PTC in the motor; connected to the converter! Earth installed!
Length of motor line	:	Shielded line; as short as possible

Commissioning

The drive can be adapted to the requirements by programming the converter. Most manufacturers supply their converters with standard settings. It is essential that these are adjusted before commissioning the canned motor!

Minimum requirements for the frequency converter

The maximum permissible rate of voltage rise for the frequency converter is 1200 V/ms. If this value is exceeded, e.g. by excessively long cables or the make of frequency converter etc. a motor choke / motor filter coil which matches the frequency converter must be fitted.

Omitting these components can damage the motor's insulation and lead to its breakdown.

Voltage rise during the start-up phase

The frequency converter has an auto-boost function.

The auto-boost function must be activated to improve the motor operating behaviour while running at low speed and when it is starting.

If no auto-boost function is available, the converter frequency characteristic can be increased by up to 10% of the design voltage at rated frequency.

Voltage dip under partial load

The frequency converter must have an automatic voltage dip device in the partial load range (energy saving mode).

Running without an energy saving mode can lead to serious damage to the motor.

This invalidates claims under the guarantee.

The voltage dip may be more than 50% of the design voltage at rated frequency, depending on the manufacturer.

- 1) GM 1000/1400 HM-Y, GM 2000/2800 HM-C:
max. n = 100 Hz possible without voltage dip
- 2) GM 2000/2800 HM-Y, GM 4000 HM-C:
max. n = 70 Hz possible without voltage dip
- 3) GM 4000 HM-Y, GM 5500/7500 HM-Y:
max. n = 50 Hz possible without voltage dip
- 4) GM 8000/9500 HM-C / Y:
no voltage dip necessary

The following frequency converters have been successfully tested:

Fuji	FRN-G11S		
KEB	Combivert F5	/	Not permissible with default, Aerzener parameter assignment. Take note of the Aerzener specifications in Appendix III.

The size of the frequency converter is determined by the motor current required, pay attention to the technical data and Appendix I.

Minimum parameter assignment for running with the frequency converter

Design voltage at rated frequency 400V (Y-connection), 200-230V (Delta connection)

Frequency set point, see data on the motor rating plate and compare Appendix I.

To protect the motor, the maximum motor current must be parameterised according to the motor rating plate and Appendix I as the current limit. Particularly in networks where the motor is intended to be run up to the frequency set point at voltages below the design voltage at rated frequency, it is essential that the current limit be parameterised in order to protect the motor.

Starting at the current limit.

PTC monitor

Electronic bypass regulator

When using an Aerzener frequency converter, an „electronic bypass regulator“ is also available which protects both the Roots pump itself and any other pumps connected downstream from overload.

If there is an increase in the pressure on the intake side of the Roots pump, the electronic regulator adjusts the speed of the root pump accordingly.

Sudden increase in pressure => sudden reduction in speed.

(e.g. opening the door of a process chamber under vacuum)

If the permissible differential pressure load is exceeded, the Roots pump is suddenly stopped. After resting for 15 seconds, the Roots pump restarts and accelerates up to the maximum possible speed.

Gradual increase in pressure => gradual speed regulation.

If the intake pressures slowly increase or fluctuate, the frequency converter regulates the speed so that the maximum permissible differential pressure load is not exceeded.

From the point of view of the system, it is necessary to make sure that the Roots pump is only run outside the permissible pressure conditions briefly (5 minutes maximum).

Otherwise, the rotors will overheat and startup damage must be expected.

Reducing the speed appropriately protects the Roots pump and the backing pump from mechanical overload.

A mechanical bypass valve is not necessary.

Commissioning

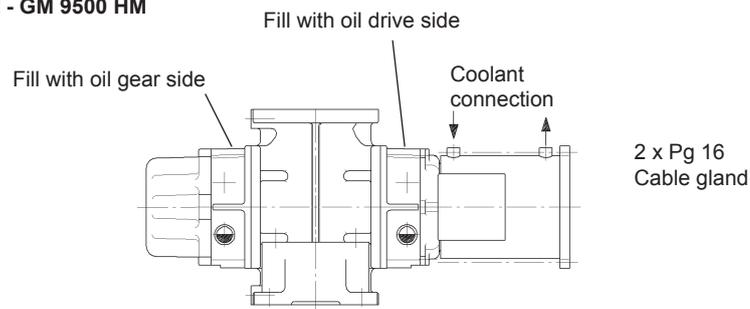
1. Install and assemble the blower stage in accordance with these instructions.
2. **When commissioning**
Fill with lubricating oil.

Blower : Fill with oil gear side and drive side

Check lubricating oil level and correct if necessary.
Check that the oil filler plug and the drain valve are seated securely and do not leak.

3. Connecting the coolant supply for the drive motor.
Please take note of the following figure. The arrows indicate the permitted flow direction for the coolant.

GM 1000 HM - GM 9500 HM

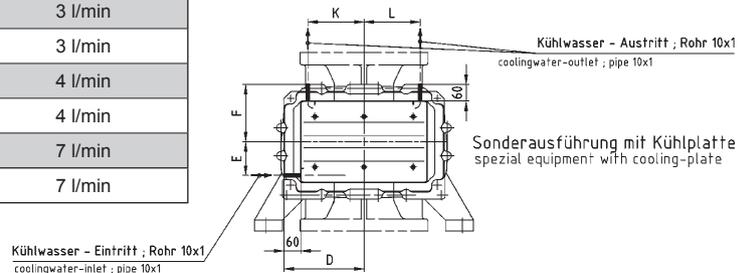


The coolant must be kept free of contaminants.
Provide a filter if there is a risk of contaminants capable of forming deposits.

Optional version

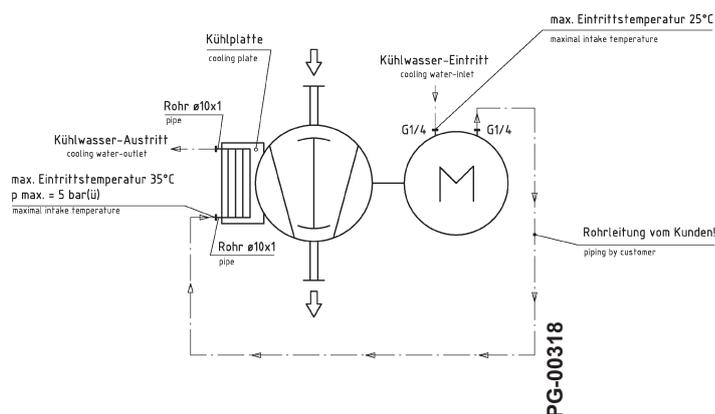
Connecting the coolant supply for cooling plate system.

Kühlwasserbedarf Kühlplatte cooling water demand cooling plate	
SRM/HDM 150/120	3 l/min
VDWK 100/2-120	3 l/min
SRM/HDM 200/200	3 l/min
VDWK 132/2-200	3 l/min
SRM/HDM 240/200	4 l/min
VDWK 160/2-200	4 l/min
SRM/HDM 240/300	7 l/min
VDWK 160/2-300	7 l/min



Kühlwasser - Eintritt ; Rohr 10x1
coolingwater-inlet ; pipe 10x1





4. Measuring the insulation resistance.
Make the electrical connection.
Observe the motor "right rotating field"
With frequency-converter drive, adjust to „*right rotating field*“.
Connect the PTC thermister protection / temperature alarm for the winding.
5. Operating data according to the performance curves.
6. Check direction of rotation. Note the direction of rotation data on the vacuum machine also.
The motor must be started briefly for 1-2 seconds at most to check the direction of rotation.
Do not run it for any longer under any circumstances since the wrong direction of rotation will damage the vacuum machine.
CAUTION! The wrong direction of rotation will destroy the vacuum machine !
7. **CAUTION!** Do not switch on the machine while it is coasting down.
If you do, there is a risk of causing serious damage !
8. Also comply with the information and operating instructions of the machine manufacturer.
9. Open the slide on the system side. The machine can now run.
10. Switch on the drive motor!
Switch it off after approx. 20 seconds and monitor the blower to make sure it coasts down smoothly.
Check the EMERGENCY OFF switch.
11. The unit is now ready for operation.

Switch off / shutdown

- Switch off is effected via the power switch on the motor.
- To shut the unit down completely the fuses must be removed after the blower has come to a standstill. The valves on the conveying pipes must be closed. Avoid possible entry of condensate into the blower stage.
- In case of a shutdown for more than six weeks the conveying chamber is to be preserved and the blower turned regularly by hand to avoid damage due to standstill. Observe also the TN01175 regulations governing storage and preservation.

In case of danger:

Press EMERGENCY - OFF button. For details refer to the instructions of the supplier of electrical components or the plant manufacturer.

Maintenance

Maintenance is to ensure that all functions are maintained or that they can be restored after a breakdown.

Maintenance includes specifications about inspection, service and repairs.

Maintenance includes instructions for trained and qualified personnel.

If anything is unclear consult Aerzener customer service.

During inquiries please state:

- order and serial number
- prevailing faults / malfunctions as accurately as possible
- steps taken to rectify faults.

Is the machine sent back to the supplier, the following measures are to be carried out:

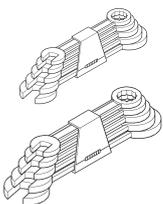
- Completely drain oil, otherwise it is transport of hazardous goods.
- Treat bare components with preservative.
- Seal flange with blind cover.
- Seal open connections.
- Also observe instructions in chapter "Transport".

Inspections / inspection schedule

A general inspection should be carried out by a service technician from Aerzener after 3 years or 20,000 operating hours.

This includes the preventive maintenance of wearing and replacement parts such as bearings, seal, etc.

We recommend maintaining a stock of replacement and wearing parts to avoid or reduce waiting times and downtimes.



Maintenance schedule



10.2

Whenever work is carried out on the rotary piston machine, it must be switched off and isolated from the electrical mains supply. Failure to observe this point could result in damage or injury!
Various steps should be taken to achieve a long service life and provide the optimum operating conditions. These include carrying out the maintenance work stipulated in this table at the intervals stipulated in this table.

We recommend carrying out the maintenance work on the rotary piston machine at the stipulated intervals. The operating hours represent average operating conditions.
The actual service life of the equipment may vary depending on environmental conditions and operating data. If you think this situation applies to you, please contact Aerzener Maschinenfabrik.

Maintenance times

Period in operating hours (Oh)	Mechanics	Lubrication
Weekly		Check oil level
*) After the first 500 Oh		Change oil
***) after every 4000 Oh, and at least after 1 year		Change oil
After every subsequent 25,000 Oh	- Change wearing parts - Check gearwheels, replace according to state of wear.	
***) after every 25,000 Oh, and at least after 3 year		Change PFPE oil under normal, clean operating conditions

*) Under normal, clean operating conditions, the basic performance of the lubricant only changes due to the wear on the bearings and gearwheel while running in.
We therefore recommend removing any abrasion residues from the running-in phase by changing the lubricant after the first 500 Oh.

** Mineral oils / synthetic oils

Providing the operating conditions are normal, it is sufficient to change the lubricant every 4000 Oh or at least once a year.

Shorter intervals will be necessary for the conveying of corrosive vapours / gases and/or high dust levels in association with frequent changes between atmospheric and vacuum pressure.

Under these conditions, we recommend determining the state of the oil with regular oil tests.

*** PFPE oils

PFPE lubricants (e.g. Fomblin) do not wear out if used properly.

Due to its outstanding, chemical, thermal and mechanical stability, its basic performance generally does not change.

Under normal operating conditions therefore, it is possible to achieve service lives above 25000 Oh or 3 years.

It may be necessary to change the lubricant before this if the oil is contaminated and/or the oil properties change due to the process gas.

Whether it is necessary to change the PFPE may have to be decided by carrying out an oil test.

We therefore recommend changing the PFPE after one year at the latest.

Dark discoloration of the lubricant indicates mechanical wear in the bearings, gears and/or seals. The machine must be immediately taken out of service and repaired.

Arrange for the rotary piston machine to undergo a complete check by the Aerzener Service department at the stipulated intervals

and certainly at least once a year.

Or: Take out a maintenance contract with Aerzener Maschinenfabrik.

Assuming that maintenance work is carried out regularly and professionally,

Aerzener Maschinenfabrik is confident that your machine will offer maximum reliability for your application.

10.3

Lubricating oil specifications

Lubricating oils with the following properties must be used for the lubrication of the vacuum rotary blower:

Lubricating oil for oil chambers

High ageing resistant fully synthetic oil with good, natural corrosion and ageing protection.

Lubricating oil which meets the minimum requirements as per:

Type CL according to DIN 51 517 Part 2.

At 100°C, the lubricating oil must not exceed a vapour pressure of 1×10^{-4} mbar.

If installed outdoors, make sure that the pour point of the lubricating oil used is below the lowest ambient temperature.

Lubricating oil manufacturers	Oil types
FRAGOL	Anderol 555**
** Ester oil	
Table 001	



Lubricating oil when conveying helium

Lubricating oil manufacturers	Oil types
Cognis	Breox Lubricant B 35
Table 002	

“The lubrication recommendations issued by Aerzener Maschinenfabrik relate to the company’s own tests and operating experience. Aerzener Maschinenfabrik reserves the right to withdraw the lubrication recommendations if the lubricant or material properties of the machine elements change or if the lubricant is found not to be suitable from practical experience.”

Lubricating oil for use in the food industry

Lubricating oil manufacturers	Oil types
SOLVAY SOLEXIS	Fomblin YLVAC 25/6
Table 003	

Fomblin oil is approved according to NSF-H1 and NSF-H2.



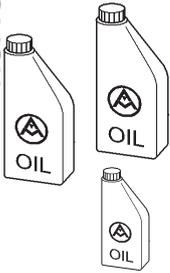
10.4

Lubricating oil volumes

Oil filling, in approx. litres / gear side and drive side			GL ... Horizontal delivery	GM ... Vertical delivery
Blower type				
12.5	12.6	GM/GL 1000 HM / 1400 HM	1,1	1,5
13.f7	13.8	GM/GL 2000 HM / 2800 HM	2,1	2,5
14.9		GM/GL 4000 HM	4,6	7,5
15.10	15.11	GM/GL 5500 HM / 7500 HM	7,0	11,5
16.12	16.f13	16.13 GM/GL 8000 HM / 9500 HM	7,6	12,0

NOTE: The quantities of lubricating oil stated here are guide values. To determine the quantity of oil to be poured in, monitor the indicator in the blower's oil sight glasses.

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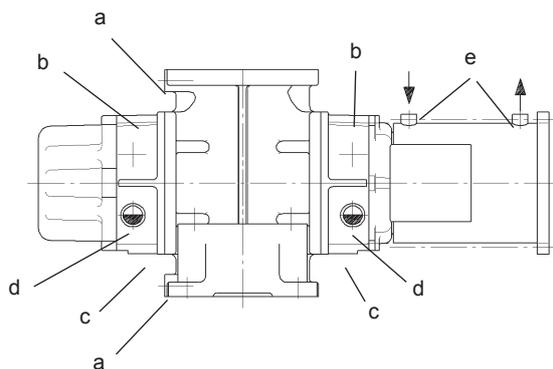


Filling oil chambers with lubricating oil / GM / GL

- The oil drains (c) must be sealed closed.
Ensure the valves or sealing plugs are correctly seated!
- Open the oil fillers (b1).
- Fill with oil. Fill to bottom of the sight glasses.
- Allow oil to run down the inside walls.
- After waiting a short time, the oil level will reach a steady state.
- The oil level must now be topped up according to the information stated below.
- Seal the oil fillers (b1) with a new sealing ring.

Make sure that each of the oil chambers is filled and drained separately and that they are checked at the two sight glasses.

GM 1000 HM - GM 9500 HM

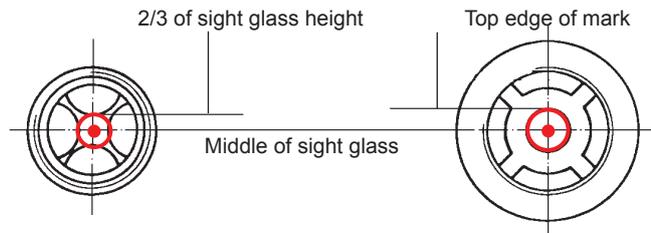


- a - Instrument connection
- b1 - Oil filler, blower
- c - Oil drain / drain valve
- d - Oil level
- e - Coolant connections

10.5

Lubricating oil level according to lubricating oil recommendation

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Blower type		Lubricating oil level display
GMa 12 - 13	GM/GL 1000HM - 2800HM	1/2 sight glass height
GLa 12 - 13	GM/GL 1000HM - 2800HM	2/3 sight glass height
GMb 14 - 16	GM/GL 4000HM - 9500HM	1/2 sight glass height
GLb 14 - 16	GM/GL 4000HM - 9500HM	Top edge of mark
Filling level with machine stationary		

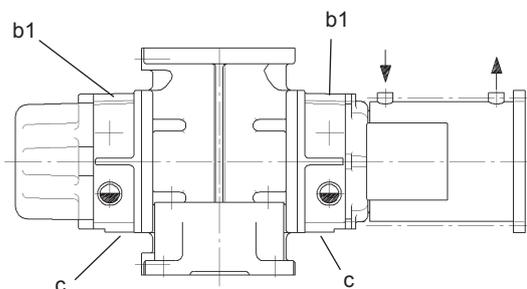
Lubricating oil level with Fomblin oil filling

Blower type		Lubricating oil level display
GMa 12 - 13	GM/GL 1000HM - 2800HM	2/3 sight glass height
GLa 12 - 13	GM/GL 1000HM - 2800HM	2/3 sight glass height
GMb 14 - 16	GM/GL 4000HM - 9500HM	2/3 sight glass height
GLb 14 - 16	GM/GL 4000HM - 9500HM	2/3 sight glass height
Filling level with machine stationary		

Draining lubricating oil

GM 1000 HM - GM 9500 HM

b1 - Oil filler, blower
c - Oil drain / drain valve



- To bleed the oil chamber, open screw plugs b1 and b2, if present.
- Remove screw plugs c.
- Collect the waste oil in a container.
- The waste oil should be disposed of properly and in an environmentally-friendly manner.
- Fit screw plugs correctly with a new sealing ring.
- Check for leaks.



Error diagnostics/Troubleshooting/Maintenance

Repairs to rotary piston machines may only be performed by authorised and trained personnel. Improper repairs may result in considerable risks to the user/ personnel.

Error messages/ Faults What do I do if . . ?	Possible causes . .	Remedy . .
...abnormal running noises occur?	<ul style="list-style-type: none"> • Damaged bearings • Rotary pistons coming into contact with one another or with the conveying chamber • Rotary pistons coming into contact due to contamination • Foreign bodies in gear wheels • Shaft deflection 	<ul style="list-style-type: none"> • Replace bearings • Check play settings, check cylinder for cracks • Clean conveying chamber • Check, clean and, if necessary, replace gear wheels • Measure shaft deflection, replace rotary pistons if necessary
...the blower becomes too hot?	<ul style="list-style-type: none"> • Intake filter soiled • Ambient temperature too high • Hood inlet openings blocked • Hood fan faulty • Oil level or oil viscosity too high • Rotary piston play too great • Overloaded 	<ul style="list-style-type: none"> • Replace filter • Ensure that there is adequate ventilation • Clean acoustic hood air supply • Replace fan • Correct oil level, note the viscosity • Replace damaged components • Check and comply with operating data
... is there oil in the material to be conveyed?	<ul style="list-style-type: none"> • Oil level too high • Worn seal 	<ul style="list-style-type: none"> • Correct oil level • Replace seals
... is the intake volume too low?	<ul style="list-style-type: none"> • Starting strainer/intake filter contaminated • Lines leaking • Blower incorrect dimensions • Damaged rotary pistons / cylinder 	<ul style="list-style-type: none"> • Clean, replace if necessary • Seal lines • Check design • Replace damaged components

Error messages/ Faults What do I do if . . ?	Possible causes . .	Remedy . .
... does the motor draw too much power?	<ul style="list-style-type: none"> • Operating data does not agree with ordering data • Mechanical damage to blower or motor • Drop in motor voltage 	<ul style="list-style-type: none"> • Check and comply with operating data • Replace damaged components • Adjust power; see motor instructions
... does the blower rotation reverse after shutdown?	<ul style="list-style-type: none"> • Non-return valve faulty or not tight 	<ul style="list-style-type: none"> • Replace valve
... if the machine is damaged, is this because of a faulty mains connection?	<ul style="list-style-type: none"> • Motor and electr. control have been connected to two different mains power supplies. 	<ul style="list-style-type: none"> • Connect motor and control voltage to a single mains power supply. • Alternatively: Use a current monitoring relay.
<p>Whenever it is necessary to intervene because of a fault, the following must be checked:</p> <ul style="list-style-type: none"> • Freedom of running of the rotary piston machine • Contact-free rotation • Lubricating oil level • Correct operation and connection • Compliance with the safety and warning information 		

Spare parts - overview

For effective and durable use of the rotary piston machine, there follows a list of components necessary for maintenance, an inspection or a repair.

The components are grouped by expected life into three spare part versions.

1.) Maintenance

- Shaft sealing ring(s)
- Inner ring, shaft sleeve, bush
- Sealing rings and screw plugs, drain valves for oil drain
- V-belt / wearing parts on coupling
- Air filter element
- Lubricating oil, oil filter element

2.) Inspection

- Components from point 1.)
- Bearing and sealing components
- for compressor plus the adjustable bearing cover including the related minor items

3.) Repair

- Components from point 1.) and 2.)
- Rotor pair / rotary piston pair
- Timing gear wheels
- for compressor plus the torsion shaft and the oil pump

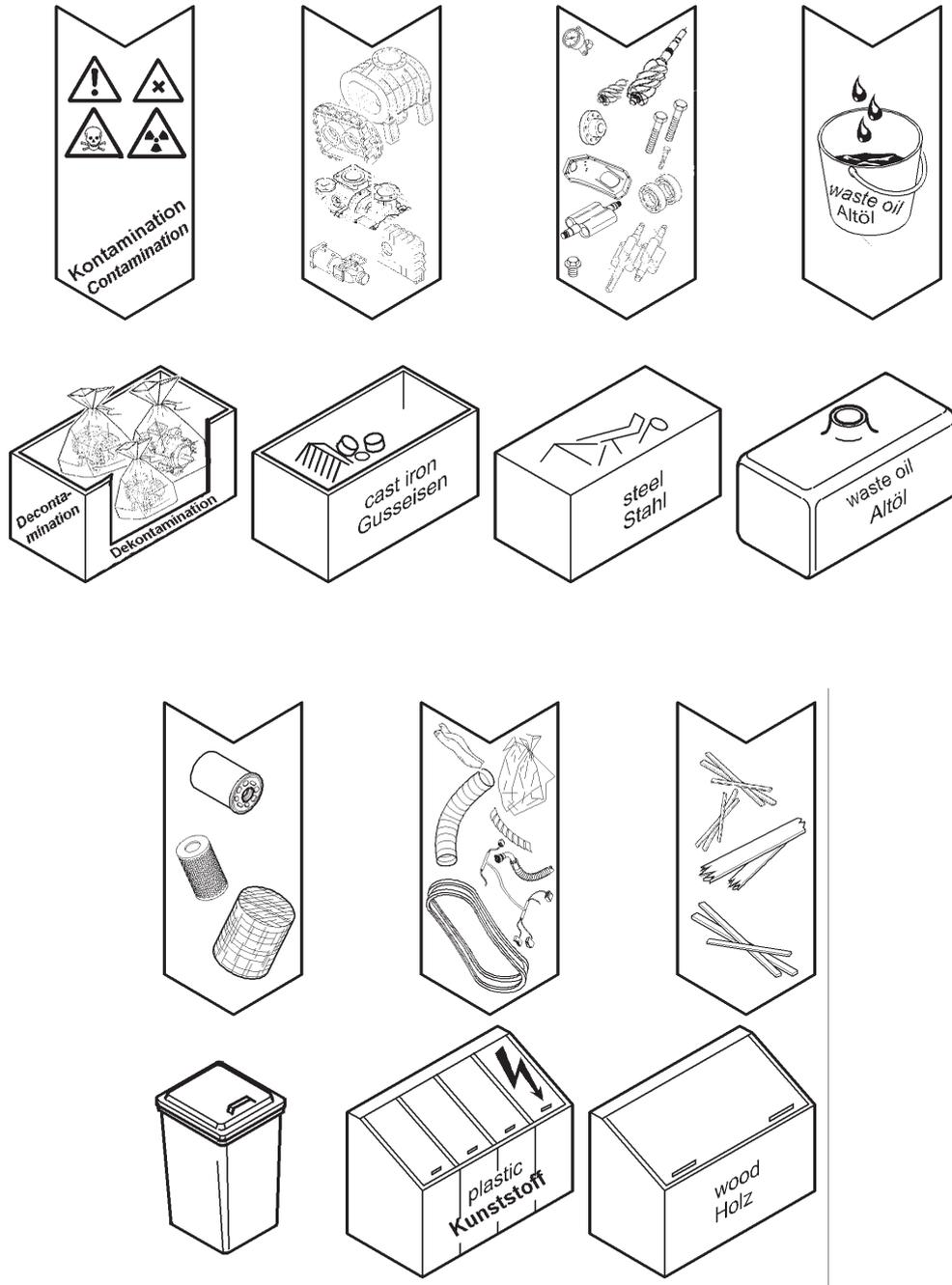
Spare parts and accessories

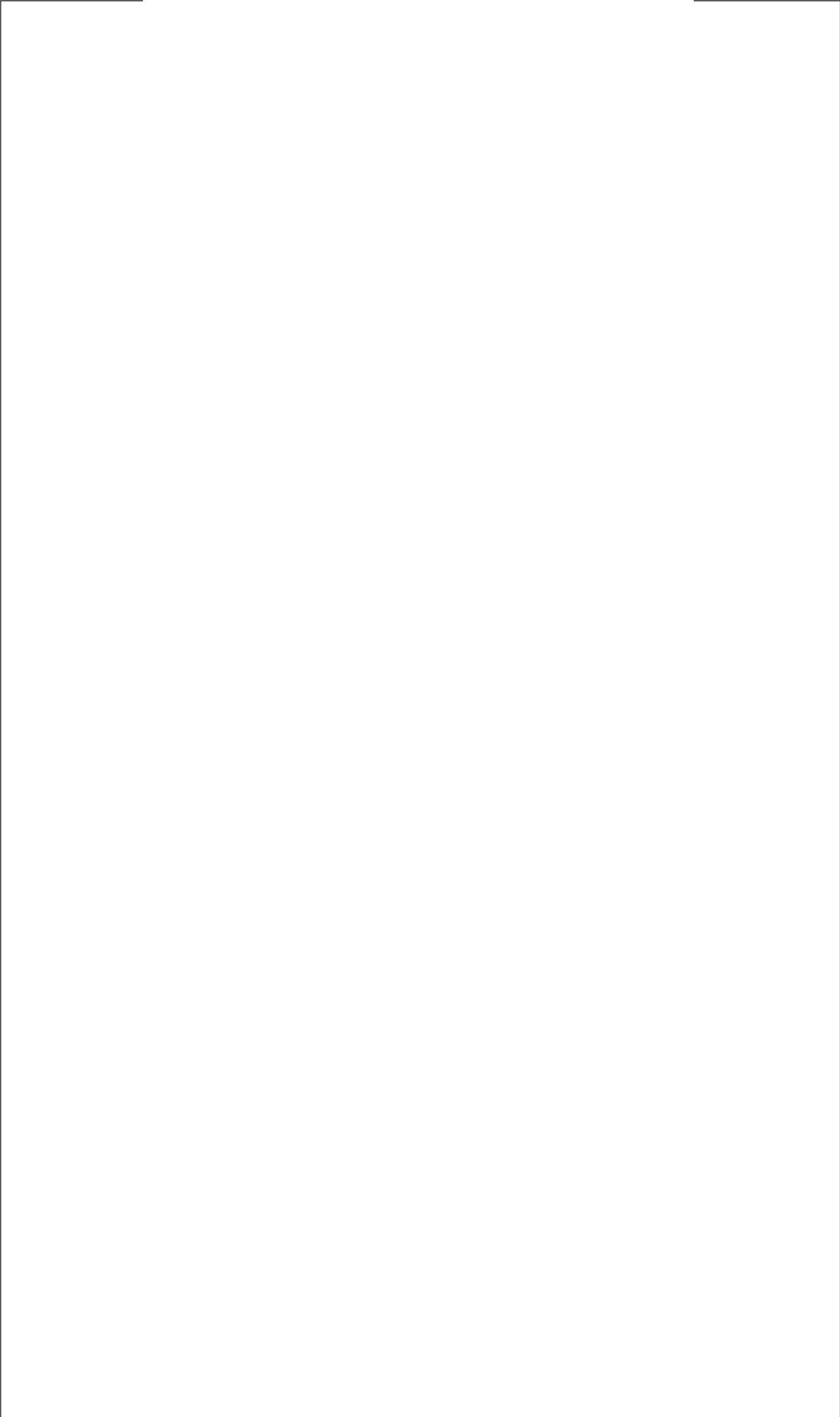
It is specifically highlighted that original parts and accessories not supplied by us have also not been tested or approved by us.

Therefore, installing or mounting and using any such products could, under certain circumstances, degrade the stipulated system characteristics. The manufacturer shall assume no liability whatsoever for damage caused by the use of non-genuine parts or accessories.

Recycling / Disposal

- All waste products are to be disposed of or treated not harmful to the environment.
- Used lubricants are to be disposed of properly.
- Contaminated components and auxiliary material are to be packed and decontaminated.

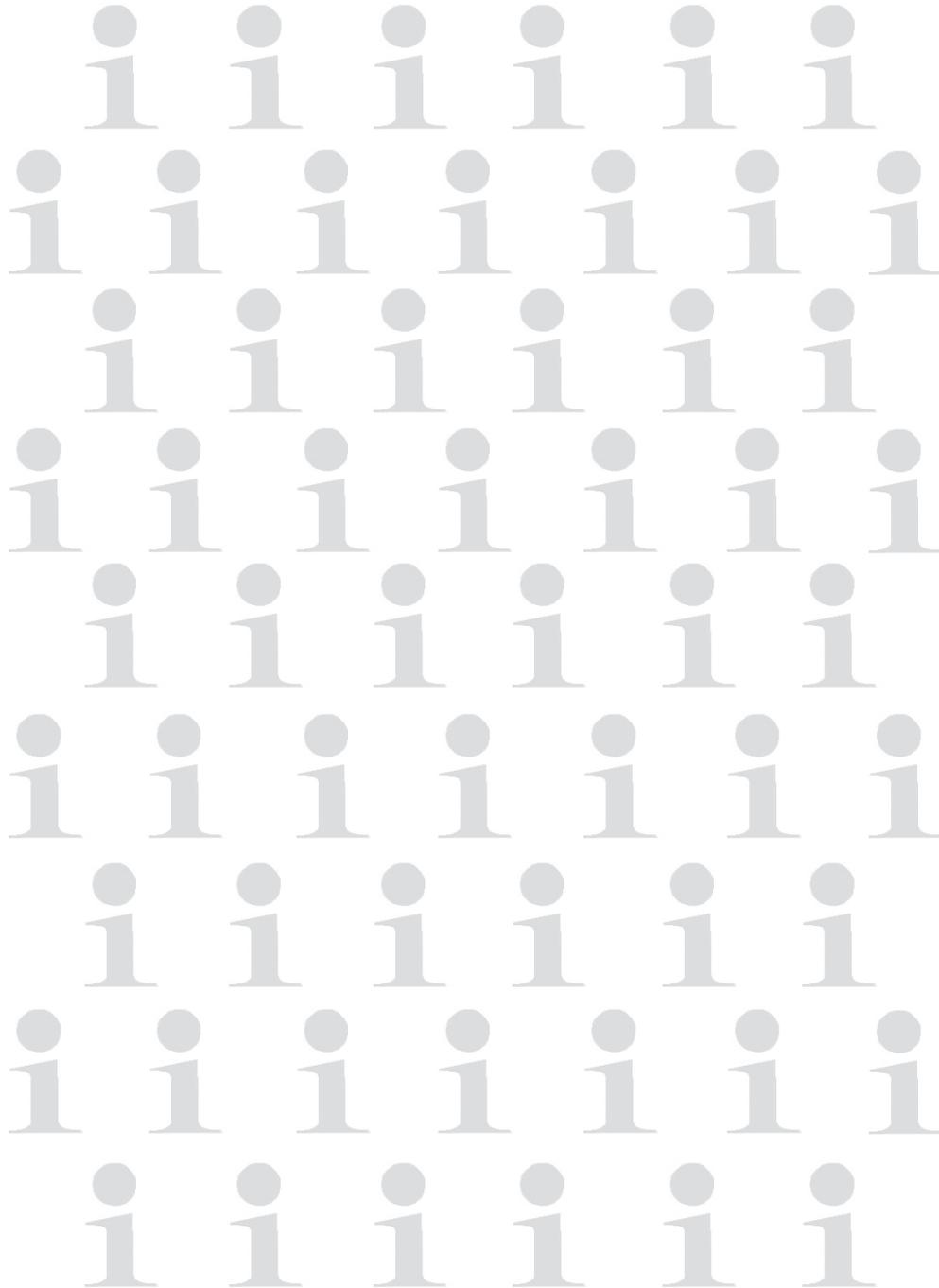




INFO - SEITE

*Information sheet
Info - bladzijde*

*Page infos
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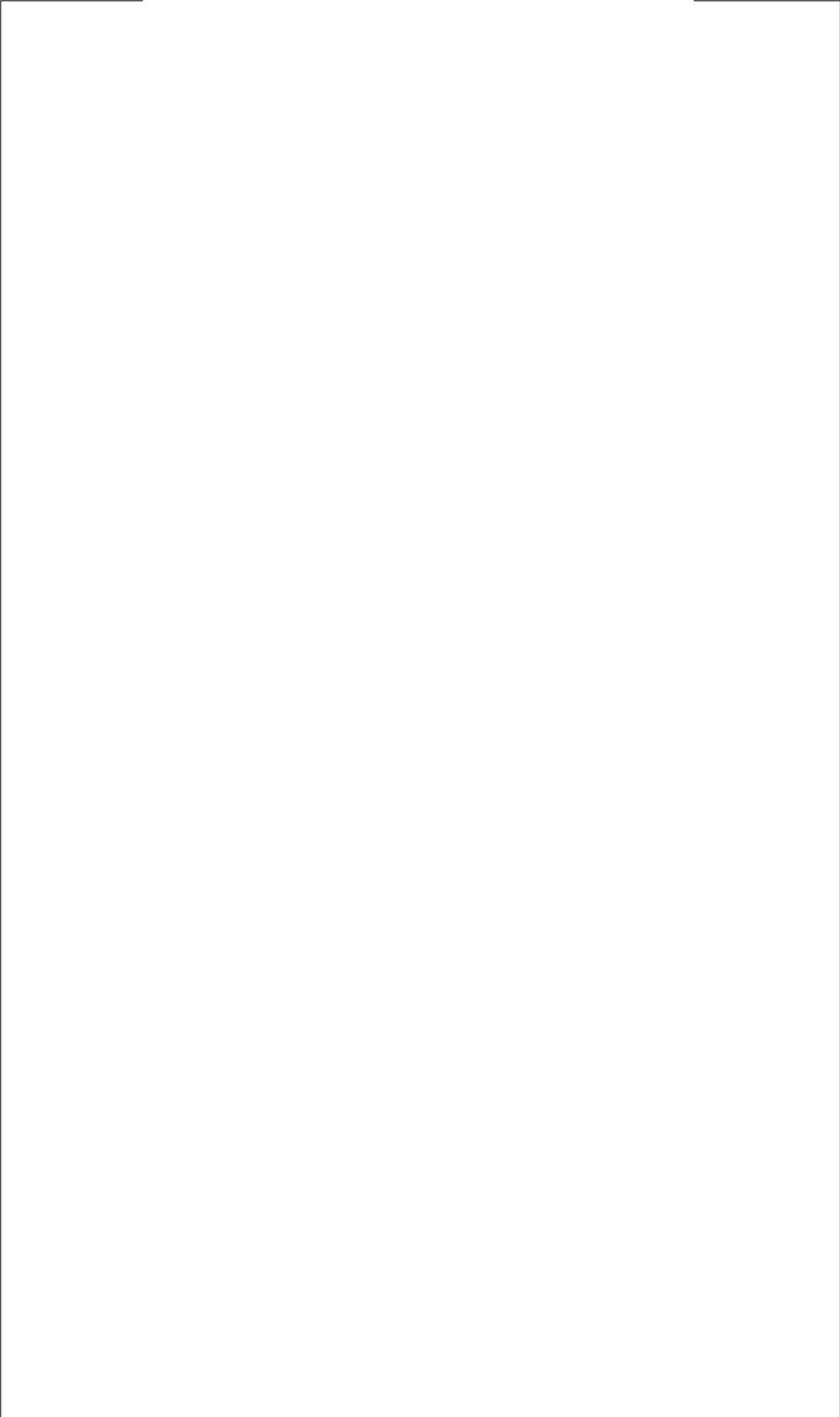


Gegenüber Darstellungen und Angaben dieser Betriebsanleitung sind technische Änderungen, die zur Verbesserung der Drehkolbenmaschinen notwendig werden, vorbehalten.
This operating- and installation manual is subject to engineering changes necessary for the compressor advancement.
Nous nous réservons le droit dans les instructions de service procéder à toutes modifications techniques utiles visant à améliorer la qualité des compresseurs.
Wat de betreft de tekeningen en gegevens in deze bedienings- en opstellings-handleiding verbetering van de schroefcompressor noodzakelijk worden, voorbehouden.
Nos reservamos el derecho de efectuar, frente a las representaciones e indicaciones de esta instrucciones de montaje servicio modificaciones técnicas necesarias para perfeccionar.
Rispetto all'illustrazione ed alle indicazioni di questa Istruzioni di Esercizio ci si riserva quelle modifiche tecniche che sono necessarie per migliorare i compressori.



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Anhang I / Appendix I

Index i / 24.05.2016

elektrische Motordaten / electrical motor data

elektrische Motordaten electrical motor data		IP 65		Parameter Frequenzumrichter Set of parameters variable frequency drive		Kurzzeitig short term operation < 5 Minuten	Dauerbetrieb Continuous operation/ cool down
Motortyp motortype	Gebläsetypen blower type	Spannung voltage	Frequenz frequency	Leistung power		Eckfrequenz frequency set point	I nenn current
				Mode S6 overload < 5 min	Mode S1 continuous operation / cool down		
	GM / GL HV	Stern / Dreieck star / delta	Hz	Mode S6 kW	Stern / Dreieck star / delta	Stern / Dreieck star / delta	I nenn current
		V		kW	V	A	A

HDM 150 / 120	1000HM-Y / 1400HM-Y	70-400 / 40-230	20 - 120	15,0	400 / 230	100	5,6 / 9,6
HDM 150 / 120	2000HM-C / 2800HM-C	60-400 / 35-230	16 - 100	-	400/230	100	18,7 / 32,4
EM* HDM 200 / 200	2000HM-Y / 2800HM-Y	65-400 / 37-230	16 - 100	20,0	400 / 230	100	16 / 28
PM* HDM 200 / 200	2000HM-Y / 2800HM-Y	65-400 / 37-230	16 - 100	30,0	400 / 230	100	16 / 28
HDM 200 / 200	4000HM-C	65-400 / 37-230	16 - 100	-	400 / 230	100	41 / 71
HDM 200 / 200	5500HM-C / 7500HM-C	80 -290/ 45-167	16 - 60	-	245/ 142	60	47 / 81
EM* HDM 240/ 200	GM 4000HM-Y	50-400 / 29-230	16 - 80	29	400/ 230	60	30/52
PM* HDM 240/ 200	GM 4000HM-Y	50-400 / 29-230	16 - 80	35	400/ 230	60	30/52
HDM 240/ 200	5500HM-N / 7500HM-N	400 / 230	50	-	400 / 230	50	34,5 / 60
HDM 240/ 200	5500HM-N / 7500HM-N	460 / 265	60	-	460 / 265	60	35,5 / 61,5
EM* HDM 240/ 200	5500HM-Y / 7500HM-Y	110 - 400 / 62 - 230	16 - 60 (FU)	23,0	400 / 230	60	24 / 42
PM* HDM 240/ 200	5500HM-Y / 7500HM-Y	110 - 400 / 62 - 230	16 - 60 (FU)	40,0	400 / 230	60	24 / 42
HDM 240/ 200	8000HM-C / 9500HM-C	auf Anfrage/ on request					
EM* HDM 240 / 300	8000HM-Y / 9500HM-Y	160-400/ 92-230	16 - 40	36	400 / 230	40	40 / 23
PM* HDM 240 / 300	8000HM-Y / 9500HM-Y	160-400/ 92-230	16 - 40	53,1	400 / 230	40	40 / 23

*EM = Efficiency
mode: Reduced motor
*PM = Performance
mode: full motor

ACHTUNG: Bei Nichtbeachtung der gebläsespezifischen K0- bzw. Betriebsleistungscurven besteht die Gefahr einer Überhitzung des Gebläses!
ATTENTION: In case of non-observance of the blower-specific K0-/ resp. operation safety curves, there is the risk of blower overheating!

¹⁾ Werte können von den Angaben auf dem Motortypenschild abweichen, die Stromaufnahme des Motors hängt von der zulässigen Druckdifferenz des Gebläses ab (siehe auch Anhang II)!
Beachte: Für die Auswahl des Frequenzumrichters sind die Angaben dieser Betriebsanleitung (s.o.) ausschlaggebend!

EMOD Motor

Anhang I / Appendix I

elektrische Motordaten/ electrical motor data

Motortyp motortype	Gebläsetypen blower type	Spannung voltage		Frequenz frequency	Leistung power		IP 65	Parameter Frequenzumrichter Set of parameters variable frequency drive		Kurzzeitig short term operation < 5 Minuten Mode S6	Dauerbetrieb Continuous operation/ cool down Mode S1
		Stern / Dreieck star / delta	V		Mode S6 overload < 5 min	kW		Eckspannung voltage set point Stern / Dreieck star / delta	Eckfrequenz frequency set point		
										Hz	kW
VDWK 100/2-120	1000HM-Y / 1400HM-Y	70-400 / 40-230		20 - 120	15,0	1,0		400 / 230	100	31 / 53	5,1 / 8,8
VDWK 100/2-120	2000HM-C / 2800HM-C	60-400 / 35-230		16 - 100	-	9,0		400 / 230	100	-	19,9 / 34,5
VDWK 132/2-200	2000HM-Y / 2800HM-Y	65-400 / 37-230		16 - 100	30,0	3,0		400 / 230	100	60 / 95	16 / 28
VDWK 132/2-200	4000HM-C	65-400 / 37-230		16 - 100	-	20,0		400 / 230	100	-	44 / 65
VDWK 132/2-200	5500HM-C / 7500HM-C	80-290 / 45-167		16 - 60	-	15,0		245 / 142	60	-	47 / 76
VDWK 132/2-200	GM7500HM-C, 85Hz	80-290 / 45-167		16 - 85	-	15,0		245 / 142	60	-	47 / 76
VDWK 160/2-200	4000HM-Y	50-400 / 29-230		16 - 80	35,0	4,0		400 / 230	60	70,5 / 122	21,5 / 37
VDWK 160/2-200	5500HM-Y / 7500HM-Y	110-400 / 62-230		16 - 60	45,0	4,0		400 / 230	60	81 / 140	24 / 42
VDWK 160/2-200	8000HM-C / 9500HM-C			auf Anfrage							
VDWK 160/2-300	8000HM-Y / 9500HM-Y	160-400 / 92-230		16 - 40	53,1	4,0		400 / 230	40	97 / 168	23 / 40

ACHTUNG: Bei Nichtbeachtung der gebläsespezifischen K0-/ bzw. Betriebssicherheitskurven besteht die Gefahr einer Überhitzung des Gebläses!

ATTENTION: In case of non-observance of the blower-specific K0-/ resp. operation safety curves, there is the risk of blower overheating!

^{*)} Werte können von den Angaben auf dem Motortypenschild abweichen, die Stromaufnahme des Motors hängt von der zulässigen Druckdifferenz des Gebläses ab (siehe auch Anhang II)!

Beachte: Für die Auswahl des Frequenzumrichters sind die Angaben dieser Betriebsanleitung (s.o.) ausschlaggebend!

Datum: 19-12-2017



Anhang II / Appendix II

Betriebsdaten / Operating data

Gebläsetypen blower type	GM / GL HV	Gebläsetypen blower type	Motortyp motor type	Kurzzeitbetrieb von 5 Minuten, S6 / short-term operation of 5 minutes, S6	Dauerbetrieb Nennbereich, S1 / continuous operation nominal range, S1	min. Drehzahl / min. speed	max. Drehzahl / max. speed Mineral-Öl / oil	max. Drehzahl / max. speed Formblin Öl / oil	max. Wicklungs- temperatur / max. winding temperature	Kühlmittelbedarf / coolant consumption	Kühlmittel Nachlaufzeit / coolant afterrunning time	120 Hz Zyklusbetrieb cycle operation
	12.5	1000 HM-Y	HDM 150/120	150	50	20	120	120	150	3	5	120 Hz Zyklusbetrieb cycle operation
	12.6	1400 HM-Y	HDM 150/120	100	30	20	120	120	150	3	5	
	13.17	2000 HM-C	HDM 150/120	/	50	16	100	100	150	3	5	100 Hz Dauerbetrieb continuous operation
	13.8	2800 HM-C	HDM 150/120	/	30	16	100	100	150	3	5	
	13.17	2000 HM-Y	HDM 200/200	150 EM*	50	16	100	100	150	4	5	100 Hz Zyklusbetrieb cycle operation
	13.17	2000 HM-Y	HDM 200/200	230 PM*	50	16	100	100	150	4	5	
	13.8	2800 HM-Y	HDM 200/200	100 EM*	30	16	100	100	150	4	5	
	13.8	2800 HM-Y	HDM 200/200	160 PM*	30	16	100	100	150	4	5	
	14.9	4000 HM-C	HDM 200/200	/	70	16	100	100	150	4	5	100 Hz Dauerbetrieb continuous operation
	14.9	4000 HM-Y	HDM 240/200	150 EM*	50	/	/	/	/	/	/	/
	14.9	4000 HM-Y	HDM 240/200	185 PM*	50	/	/	/	/	/	/	/
	15.10	5500 HM-C	HDM 200/200	/	65	16	60	60	150	4	5	60 Hz Dauerbetrieb continuous operation
	15.11	7500 HM-C	HDM 200/200	/	45	16	60	60	150	4	5	
	15.10	5500 HM-Y	HDM 240/200	110 EM*	70	16	60	60	150	4	5	60 Hz Zyklusbetrieb cycle operation
	15.10	5500 HM-Y	HDM 240/200	200 PM*	70	16	60	60	150	4	5	
	15.11	7500 HM-Y	HDM 240/200	80 EM*	55	16	60	60	150	4	5	
	15.11	7500 HM-Y	HDM 240/200	150 PM*	55	16	60	60	150	4	5	
	15.10	5500 HM-N	HDM 240/200	/	100	16	50/60	50/60	150	4	5	50/60 Hz Netzbetrieb net operation
	15.11	7500 HM-N	HDM 240/200	/	75	16	50/60	50/60	150	4	5	
	16.f13	8000 HM-C/Y	HDM 240/300	90 EM*	50	16	40	40	150	7	5	40 Hz
	16.f13	8000 HM-C/Y	HDM 240/300	130 PM*	50	16	40	40	150	7	5	
	16.13	9500 HM-C/Y	HDM 240/300	75 EM*	45	16	40	40	150	7	5	40 Hz
	16.13	9500 HM-C/Y	HDM 240/300	110 PM*	45	16	40	40	150	7	5	

*EM = Efficiency mode / reduzierte Motorleistung, siehe Anhang I / reduced motor rating, please refer appendix I

*PM = Performance mode / vollständige Motorleistung, siehe Anhang I / full motor rating, please refer appendix I

Anhang II / Appendix II										
Betriebsdaten / Operating data										
Gebläsetypen blower type	Gebläsetypen blower type	Motortyp motor type	Kurzzeitbetrieb von 5 Minuten, S6 / short-term operation of 5 minutes, S6	Dauerbetrieb Nennbereich, S1 / continuous operation nominal range, S1	min. Drehzahl / min. speed	max. Drehzahl / max. speed Mineral-Öl / oil	max. Drehzahl / max. speed Fomblin Öl / oil	max. Wicklungs- temperatur / max. winding temperature	Kühlmittelbedarf / coolant consumption	Kühlmittel Nachlaufzeit / coolant afterrunning time
GM / GL HV	... CM									
12.5	1000 HM-Y	VDWK 100/2-120	150	50	20	120	120	150	4	5
12.6	1400 HM-Y	VDWK 100/2-120	100	30	20	120	120	150	4	5
13.17	2000 HM-C	VDWK 100/2-120	/	50	16	100	100	150	4	5
13.8	2800 HM-C	VDWK 100/2-120	/	30	16	100	100	150	4	5
13.17	2000 HM-Y	VDWK 132/2-200	215	50	16	100	100	150	6	5
13.8	2800 HM-Y	VDWK 132/2-200	145	30	16	100	100	150	6	5
14.9	4000 HM-C	VDWK 132/2-200	/	60	16	100	100	150	6	5
15.10	5500 HM-C	VDWK 132/2-200	/	55	16	60	60	150	6	5
15.11	7500 HM-C	VDWK 132/2-200	/	35	16	60	60	150	6	5
15.11	GM7500 HM-C	VDWK 132/2-200	/	35	16	85	85	150	6	5
14.9	4000 HM-Y	VDWK 160/2-200	145	50	16	80	80	150	8	5
15.10	5500 HM-Y	VDWK 160/2-200	160	70	16	60	60	150	8	5
15.11	7500 HM-Y	VDWK 160/2-200	110	55	16	60	60	150	8	5
16.113	8000 HM-C	VDWK 160/2-200								
16.13	9500 HM-C	VDWK 160/2-200								
16.113	8000 HM-Y	VDWK 160/2-300	130	50	16	40	40	150	8	5
16.13	9500 HM-Y	VDWK 160/2-300	110	45	16	40	40	150	8	5

Datum: 19-12-2017

Anhang III Trudeldrehzahl HV-Gebläse

	max. zul. Drehzahlen für Trudelbetrieb mit FU (1/min)								
Typ / type									
GM/GL170 HM	190	<p>Bei Trudelbetrieb ist sicherzustellen, dass spätestens alle 24 Stunden ein Hochlauf auf die Nenndrehzahl erfolgt, um eine hinreichende Ölversorgung von Lagern und Zahnrädern sicherzustellen.</p> <p>Erfolgt dieser Hochlauf nicht, sind Schäden an diesen Bauteilen nicht auszuschließen!</p>							
GM/GL 250 HM	190								
GM/GL 340 HM	190								
GM/GL 500 HM	150								
GM/GL 700 HM	150								
GM/GL 1000 HM	120								
GM/GL 1400 HM	120								
GM/GL 2000 HM	90								
GM/GL 2800 HM	90								
GM/GL 4000 HM	75								
GM/GL 5500 HM	60								
GM/GL 7500 HM	60								
GM/GL 8000 HM	50								
GM/GL 9500 HM	50								
GM/GL 9500 HM	50								
gültig für Betriebsanleitung G4-014 ...									
09-2012									

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Appendix III Coasting speed HV blower

	Max. perm. speeds for coasting mode with frequency converter (1/min)								
Typ / type									
GM/GL170 HM	190	<p>In the case of the coasting mode it is to be ensured that the unit is run up to the rated speed at the latest every 24 hours to ensure an adequate supply of oil to the bearings and gear wheels.</p> <p>If the unit is not run up, damage to these parts cannot be excluded!</p>							
GM/GL 250 HM	190								
GM/GL 340 HM	190								
GM/GL 500 HM	150								
GM/GL 700 HM	150								
GM/GL 1000 HM	120								
GM/GL 1400 HM	120								
GM/GL 2000 HM	90								
GM/GL 2800 HM	90								
GM/GL 4000 HM	75								
GM/GL 5500 HM	60								
GM/GL 7500 HM	60								
GM/GL 8000 HM	50								
GM/GL 9500 HM	50								
GM/GL 9500 HM	50								
applies to operating instructions G4-014 ...									
09-2012									




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