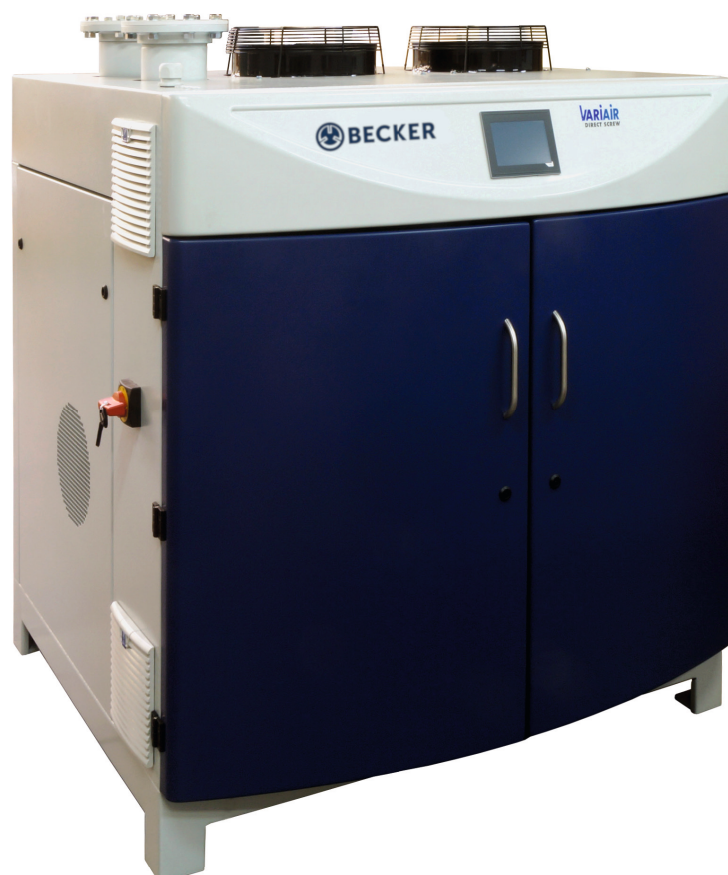


(en) TRANSLATION OF THE ORIGINAL OPERATING INSTRUCTIONS

VADS 1500+

SCREW VACUUM PUMPS SCREW COMPRESSORS

MAKE IT BECKER



VARIAIR
DIRECT SCREW

 **BECKER**

Important notes for the user of the operating instructions

We reserve the right to make technical changes and additions to the operating instructions.

No liability is accepted for the content, in particular for damage caused by existing, non-existing or incorrect information.

Passing on these operating instructions is not permitted unless expressly authorised. Additions / improvements are expressly desired, but require approval.

Operating instructions valid for:

General designation	Screw pump
Product type	Direct driven and air cooled, with frequency converter
Model	VADS 1500+
Manufacturer	Gebr. Becker GmbH Hölker Feld 29-31 42279 Wuppertal

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1 TO THE OPERATING INSTRUCTIONS

1.1 GENERAL

These operating instructions contain the necessary information and important notes to ensure safe and efficient use of the VADS 1500+. This document is an integral part of the machine.

The operator is responsible for ensuring the availability of this document. If the operating instructions are damaged or lost, the operator is responsible for obtaining a replacement.

The operating instructions contain important information on how to operate the VADS 1500+ safely and properly. Observing them helps:

- Avoid Hazards,
- Reduce repair costs and downtime, as well as
- Increase the reliability and service life of the product.

All work on the machine must only be carried out by authorised persons. Unauthorised persons must be removed from the machine. If persons are assigned to work on the machine, these persons must be expressly designated by an authorised person for the upcoming activity and informed about the machine before the activity begins.

All persons who carry out activities on the machine must have read and understood these operating instructions. This applies to the machine as well as to purchased components and assemblies.

Pay special attention to chapter 2 „Basic safety instructions“.

In addition to these operating instructions, the regulations for accident prevention and environmental protection applicable in the country of use and at the place of use must also be observed.

The illustrations in these operating instructions are for general understanding and may not represent the machine to scale or realistically. This applies in particular to illustrations of computer-aided representations of the machine model.

1.2 STRUCTURE OF THE SAFETY INSTRUCTIONS

Safety instructions are identified by a pictogram and a signal word. The following signal words are used to indicate dangers, prohibitions and important information:



DANGER

This signal word indicates an imminent danger that will result in serious injury or even death.



WARNING

This signal word indicates a possibly imminent danger that can result in serious injuries or even death.



CAUTION

This signal word indicates a possible imminent danger that may result in minor or severe injuries.



NOTE

This signal word indicates a possible imminent danger that may result in property damage.

1.3 SAFETY SYMBOLS

The following **warning signs** are used in these operating instructions:

-  General warning sign
-  Warning of hot surface
-  Warning of electrical voltage
-  Warning of automatic start-up
-  Warning of hand injuries
-  Explosion hazard
-  Fire hazard

Table 1.1: Warning signs

The following **prohibition signs** are used in these operating instructions:

-  Eating and drinking prohibited

Table 1.2: Prohibition signs

The following **command signs** are used in these operating instructions:

-  Use hearing protection
-  Use foot protection
-  hand protection

Table 1.3: Commandment sign

The following **signs for hazardous substances** are used in these operating instructions:

-  Caution, dangerous for the environment

Table 1.4: Hazardous substances

1.4 ADDITIONAL DOCUMENTATION

In addition to these operating instructions, the following documents and notes must be observed:

- Safety symbols according to chapter 1.3 on the machine as well as on containers for hazardous substances
- Regulations on accident prevention, occupational safety and environmental protection
- Operating instructions and documentation for components, assemblies and aids provided by third-party manufacturers
- General drawings, test results, certificates, calculations, plans
- Spare parts lists and parts lists

1.5 WARRANTY AND LIABILITY

Warranty and liability claims for personal injury or property damage are rejected in the event of

- Failure to observe the instructions for transport and assembly;
- improper use (misuse) or improper operation;
- Failure to observe the operating instructions and the instructions contained therein;
- improper or non-executed maintenance and servicing work;
- faulty installation, commissioning, maintenance, servicing and cleaning;
- Use of incorrect operating materials, lubricants or spare parts;

- Defective, incorrectly installed or dismantled protective devices;
- Inadequate monitoring of machine parts subject to wear;
- Use of externally procured equipment that has not been approved by the manufacturer;
- improper disassembly;

1.6 CHANGES AND CONVERSIONS

Modifications or conversions are excluded without written permission.



NOTE

For all conversions and modifications, it must be assessed whether the machine is thereby „significantly“ changed in the sense of the Product Safety Act (ProdSG) and the Official Gazette (Bek. d. BMAS vom 9.4.2015, IIIb5396073). Depending on the case decision, various new obligations may arise for the manufacturer. The occupational safety specialist (FaSi) should be informed and consulted!



WARNING

Risk of injury! Safety risk due to incorrect spare parts

Incorrect or faulty spare parts can impair safety and lead to damage, malfunctions or total failure.
Therefore: Only use original spare parts from the manufacturer.

2 BASIC SAFETY INSTRUCTIONS

These operating instructions serve as a basis for the safe use and operation of the VADS 1500+. The operating instructions, in particular the safety instructions and the rules and regulations applicable to the place of use, must be observed by all persons working on or with the VADS 1500+.

Furthermore, the generally applicable legal and other rules and regulations for accident prevention (e.g. personal protective equipment) and environmental protection must be observed.



NOTE

Some activities on the VADS 1500+ require special safety instructions. These safety instructions can be found in the respective chapters of these operating instructions.

The generally applicable legal and other rules and regulations for accident prevention and environmental protection for the place of use must be observed in any case.



IMPORTANT

The operating instructions must always be kept at the place of use and be freely accessible to all persons with tasks on the VADS 1500+.

The general and local regulations on accident prevention and environmental protection must be observed. The instructions of the occupational safety specialist as well as the instructions for action from the briefings must be followed without fail.

The VADS 1500+ is only intended for the intended use described in chapter 2.6. The use of the VADS 1500+ outside of the intended use is prohibited.

All activities on the VADS 1500+ may only be carried out by qualified and trained personnel. All information on the necessary qualifications can be found in chapter 2.4 „Qualification of personnel“.

The VADS 1500+ may only be used if it is in perfect technical condition. The VADS 1500+ must not be put into operation if the protective devices have been dismantled, defective, modified or put out of operation.

Protective equipment taken out of service for maintenance work must be reassembled and put back into service immediately after completion of the work.

For all activities on the VADS 1500+, the residual risks specified in chapter 2.9 must be observed. In addition, the instructions for the respective phase of life must be observed.

Before each start of the machine, the operational safety of the VADS 1500+ must be checked. If defects or faults are found during the check, these must be rectified immediately. The VADS 1500+ may only be started if it is in perfect working order.

If defects or malfunctions are detected during operation, the VADS 1500+ must be shut down immediately. A production step that has been started may not be completed as scheduled under these circumstances. Safety has priority over the production process of the VADS 1500+ at all times. Defects and malfunctions must be rectified immediately. Recommissioning is only permitted in perfect condition. The responsible senior manager of the VADS 1500+ must be informed of any defect.

**WARNING****Risk of injury! Burning due to hot surfaces**

During operation, individual parts inside the pump can heat up to more than 100°C. When working indoors, allow the pump to cool down for a while.

**WARNING****Risk of injury! Due to unexpected start-up**

In case of repair, guards may be dismantled to replace parts. In this case, the employee has access to possibly open rotating parts, in the case of an unexpected start-up, there is a risk of the employee injuring himself in the area of the outer extremities or losing them.

The following steps are mandatory when preparing for maintenance and servicing activities:

Switch off the VADS 1500+ and all attached assemblies.

Switch off the power supply and secure it against unintentional reconnection, or disconnect the drive from the supply voltage.

Disconnect from air supply

2.1 PROVISION

The VADS 1500+ is a machine in the sense of the Machinery Directive 2006/42/EC Art 2a. The machine conforms to the health and safety requirements of the Machinery Directive 2006/42/EC.

Furthermore, the machine is work equipment according to §2 Para. 1 of the Ordinance on Industrial Safety and Health (BetrSichV). According to this, the machine may only be used when the employer has determined that the use of the machine is safe according to the state of development. (cf. §4 para. 1 BetrSichV). The use of the machine is prohibited until the employer has determined that the machine is safe according to the state of development.

This is fulfilled if, among other things, the operating conditions listed in these operating instructions have been fully implemented in accordance with Directive 2006/42/EC Annex 1 Para. 1.7.4.2.i.

2.2 OBLIGATIONS OF THE OPERATOR

The operator undertakes to only allow persons to work on the VADS 1500+ who

- are familiar with the basic regulations of occupational safety and accident prevention;
- have been instructed for the activities on the VADS 1500+;
- have read and understood these operating instructions before carrying out any activities on the VADS 1500+;
- have reached the legal minimum age;
- are fit for work;
- are rested and not under the influence of drugs or medication;
- reliably perform the assigned work.

In addition, the operator must train the staff at regular intervals and inform them about the dangers.

The personnel of the operating company shall be permanently committed to safe working practices and informed about the hazards and risks of the VADS 1500+.

The operating company must ensure that new personnel are conscientiously and completely instructed in the use of the VADS 1500+. This applies in particular to the safety instructions.

The responsibilities of the personnel must be clearly defined at all times. The responsibilities for installation, operation, maintenance and cleaning must be clearly regulated and defined.

The operator must provide the personnel with the necessary protective equipment.

2.3 OBLIGATIONS OF THE STAFF

All persons assigned to work on the VADS 1500+ undertake, before commencing work, to

- observe the basic regulations on occupational safety and accident prevention and
- to read and observe these operating instructions.

**NOTE**

Only persons who have read and understood these operating instructions may carry out activities on and with the VADS 1500+!

The operating company is responsible for occupational safety and the safety of the work equipment used. The personnel of the operating company must comply with the following safety instructions:

- According to chapter 9.1 „Maintenance and servicing“, tests and inspections must be carried out regularly in order to detect potential hazards and damage at an early stage.
- Unauthorised persons, especially visitors and children, must be ordered away from the machine and must not be in the immediate vicinity of the VADS 1500+.
- The personnel of the operating company shall be permanently committed to safe working practices and shall be informed about the hazards and risks of the VADS 1500+.
- The personnel entrusted with activities on the VADS 1500+ must be trained on the basis of these operating instructions.
- Untrained personnel and personnel who have not read these operating instructions must not carry out any activities on the VADS 1500+.
- The personnel of the operating company must be familiar with the basic regulations and guidelines of occupational safety and accident prevention.
- In case of questions, contact the supervisor or manufacturer. If there are any uncertainties, stop working on the VADS 1500+ until all uncertainties have been clarified.
- The proof of compliance with the safety instructions must be signed by every person working on the VADS 1500+. The signature serves as proof that all persons carrying out activities on the machine have read and understood these operating instructions in full. With the signature, the respective person also confirms that all safety instructions have been observed and that he/she is sufficiently qualified and authorised for the respective activity.

2.4 QUALIFICATION PERSONNEL

Certain activities require a specific qualification to be demonstrated by the personnel carrying them out. The following table summarises these qualifications:

Activity	People		
	Instructed operating personnel	Specially trained staff	Instructed persons with specialist training
Commissioning	-	-	x
Operation	x	-	-
Maintenance & Servicing	-	-	x
Disassembly	-	-	x
Symbol „x“ qualification required // Symbol „-“ qualification insufficient			

Table 2.1: Qualification of the staff

In addition to the required qualification, activities on the VADS 1500+ may only be carried out by instructed and authorised persons. Furthermore, activities may only be carried out by persons if these persons have

- have reached the legal minimum age;
- are fit for work;
- are rested and not under the influence of drugs or medication;
- reliably carry out the work assigned



DANGER

Danger to life due to electrical work!

Electrical work may only be carried out by trained specialist personnel.

The VADS 1500+ may only be operated by specially trained personnel (see Table 2.1). Personnel to be trained and instructed may work on the VADS 1500+ under the constant supervision of an experienced person. The person responsible for the VADS 1500+ must be informed of these activities in advance and they must be recorded in writing.

2.5 PROOF OF COMPLIANCE WITH THE SAFETY INSTRUCTIONS

As part of the responsibility for occupational safety, the operator must instruct the personnel who carry out activities on the VADS 1500+ in accordance with the legal requirements and the specifications in this operating manual. The instruction must be recorded in writing.

2.6 INTENDED USE

The operational safety of the VADS 1500+ is only guaranteed if it is used as intended. Intended use also includes observance of these operating instructions and the operating instructions of suppliers as well as compliance with all

maintenance and service work.

The VADS 1500+ may only be used in accordance with the machine description and technical data.

The intended use is summarised below:

The unit is used to generate negative pressure (vacuum - use 1) or to generate pressure (use 2).

- Operation is intended for normal atmospheric air only.
- Conveying of any other gases, with special attention to hazardous substances, is not permitted and prohibited.
- The pumping of flammable or explosive gases is also prohibited.
- The permissible ambient temperature (5°C...40°C) must be observed.
- The product must not be operated in potentially explosive atmospheres.
- The product must be protected from the weather.
- The product may be operated at a maximum humidity of up to 90%.
- The characteristics apply up to an altitude of 1000 m above sea level. For use at altitudes above this, the manufacturer must be consulted.

NOTE

Only use the VADS 1500+ for its intended purpose and only use it if it is in perfect working order! This is the only way to ensure the operational safety of the VADS 1500+!

The VADS 1500+ is of a high technical standard and has been built according to the recognised safety regulations. When using the VADS 1500+, health hazards for persons directly working with the VADS 1500+ and third parties cannot be excluded. Furthermore, hazards to the machine itself and other material assets cannot be ruled out when using the VADS 1500+.

2.7 REASONABLY FORESEEABLE MISUSE

The following foreseeable misuse is considered in the development:

- The VADS 1500+ can reach hot surfaces of over 100 °C when:
 - The specified ambient temperature is exceeded by
 - » direct sunlight
 - » Failure to maintain minimum distances from adjacent walls
 - » Use in heavily polluted environments
 - » Failure to comply with the maintenance intervals

This can lead to fires or other dangerous events.
- The intake of media outside the specified physical limits can cause damage to the product. It is possible that the exhaust air will be contaminated with other operating materials.
- If maintenance intervals are not observed, the VADS 1500+ will not be able to maintain operation within the specified operating parameters. It is possible that the VADS 1500+ will lose its operational capability as a result.
- The use of operating materials that are outside the specification of Gebr. Becker GmbH or the established subsidiary can lead to a reduced performance of the unit.
- If the product is painted by the customer. The lacquer may be highly flammable and combustible. Ignition cannot be ruled out.
- The product must not be cleaned with flammable cleaning agents (for example petroleum, diesel or brake cleaner).
- After a product has stood for a long time due to failure, biological residues of the intake air in the product can lead to biological hazards.
- The VADS 1500+ could be used in residential areas, commercial and retail establishments or small businesses.

NOTE

The VADS 1500+ may only be used in the context of industrial applications.

The VADS 1500+ must not be operated or commissioned with defects. An inexhaustive list of example defects is below.

- Leaks
- Faulty fill levels
- Incorrect operating resources
- Incorrect or insufficient lubricants
- Worn, damaged or defective components
- Loose or damaged screws

- Worn, damaged or illegible signage
- Worn, damaged or defective safety devices
- Deactivated or modified safety devices
- Impermissible or modified connections or fuses
- Impermissible, modified or damaged control or load electrics

The protective devices must not be dismantled, modified or put out of operation. In the event of protective devices being dismantled, modified or put out of operation, the VADS 1500+ must be shut down and secured immediately. Defects in protective equipment must be rectified immediately. All protective devices must be undamaged, completely mounted and functional. All protective devices must be checked for functionality, damage and completeness before each start of the VADS 1500+.



DANGER

Danger to life due to defective, dismantled and manipulated protective devices

The VADS 1500+ may only be operated if all safety and protective devices are fully present and functional!

Faulty safety and protective equipment can lead to dangerous situations! For this reason:

- Switch off the machine immediately,
- secure against restarting and
- Disconnect from air supply and electric current!



NOTE

Any changes to supply lines have a direct influence on the operating behaviour of the VADS 1500+.



DANGER

Danger to life when used in potentially explosive atmospheres

The VADS 1500+ is not approved for use in potentially explosive atmospheres.



DANGER

Danger to life due to electric shock if the residual current circuit breaker is missing.

The VADS 1500+ may only be connected to a mains supply protected by a residual current device (RCD)!

Protective measures with residual current devices (RCD) must be checked for effectiveness by a qualified electrician at the prescribed legal intervals.

Maintenance work may only be carried out when the machine is shut down and secured.

Maintenance activities cannot be carried out by unqualified personnel. Maintenance on the VADS 1500+ may only be carried out by professionally trained, instructed and authorised personnel.



DANGER

Danger to life due to electrical work!

Electrical work may only be carried out by trained specialist personnel.

The VADS 1500+ must be adequately secured against unauthorised and accidental switch-on. Further safety measures depend on the maintenance activity and are the responsibility of the skilled personnel.



DANGER

Danger to life due to unexpected start-up

The following steps are mandatory when preparing for maintenance and servicing activities:

1. Switch off the VADS 1500+ and all attached assemblies.
2. Switch off the power supply and secure it against unintentional reconnection, or disconnect the drive from the supply voltage.
3. Disconnect from air supply



WARNING

Safety risk due to incorrect spare parts

Incorrect or faulty spare parts can impair safety and lead to damage, malfunctions or total failure. Only use original spare parts from the manufacturer.

If a maintenance activity requires the dismantling of protective devices, these may only be dismantled for the duration of the maintenance activity. Immediately after completion of the maintenance work, all guards must be completely

installed in the designated place and checked for proper function. The prescribed testing and replacement intervals for protective devices must be observed and complied with. Protective devices may only be maintained, replaced and serviced by specially trained, instructed and authorised personnel.

Safety-related parts of the VADS 1500+ could be damaged or disabled by unauthorised intervention and manipulation. Unauthorised tampering with the safety-related parts of the VADS 1500+ along with any adjustable components is strictly prohibited and must be reported immediately to the person responsible for the VADS 1500+.

Only welding work approved by the manufacturer may be carried out on the VADS 1500+.



DANGER

Danger to life due to welding work

Welding on pump housings is generally prohibited. Welding work is only permitted with the express permission of the manufacturer. Welding work may only be carried out by professionally trained, instructed and authorised personnel.

Wearing personal protective equipment is mandatory for all work on the VADS 1500+.

2.8 PROTECTIVE MEASURES FOR USERS

When working on the VADS 1500+, personal protective equipment must be worn to minimise health hazards.

The necessary protective equipment for the respective work must be worn at all times during work. Personal protective equipment notices posted in the work area must be followed.



WARNING

Risk of injury to hands due to crushing, cutting and high temperatures

During all work on the VADS 1500+, appropriate hand protection must be worn.



WARNING

Risk of injury to feet from crushing and falling objects

Foot protection must be worn during all activities on the VADS 1500+.



WARNING

Hearing damage due to high volume

Hearing protection must be worn during activities that must be carried out while the VADS 1500+ is in operation.

Hand protection must be provided by the operator and must be suitable for the activities to be carried out and comply with the applicable standards (e.g. EN 388:201903).

Foot protection must be provided by the operator and must be suitable for the activities to be carried out and comply with the applicable standards (e.g. DIN EN ISO 20345:202006).

Hearing protection must be provided by the operator and must be suitable for the noise levels generated and comply with the applicable standards (e.g. DIN EN 3527:200304).

2.9 DISCLOSURES ON RESIDUAL RISKS

The VADS 1500+ meets the technical standards and was built according to the recognised safety rules. To avoid danger to the user or damage to the machine, the VADS 1500+ may only be used for its intended use (see chapter 2.6 „Intended use“) and in a safe and technically perfect condition.

The hazards identified were considered in the risk assessment and sufficiently mitigated so that there is no unacceptable risk when used as intended. Nevertheless, risks and impairments can occur when using the VADS 1500+.

- for the operators or third parties,
- for the VADS 1500+ itself or
- in other tangible assets arise.

The hazards and risks in the respective life phases of the VADS 1500+ are described below. It is essential to observe the following hazard warnings.

2.10 TRANSPORT AND ASSEMBLY

The following safety instructions apply to the „transport and assembly“ life phase:



WARNING

Risk of injury! Danger of crushing in the hand and arm area due to product assembly.

If assembly work is carried out, the employee must be trained in the use of the transport equipment and must have provided proof of this.



NOTE

Wear gloves

During all work on the VADS 1500+, appropriate hand protection must be worn.



NOTE

Wear safety shoes

Foot protection must be worn during all activities on the VADS 1500+.

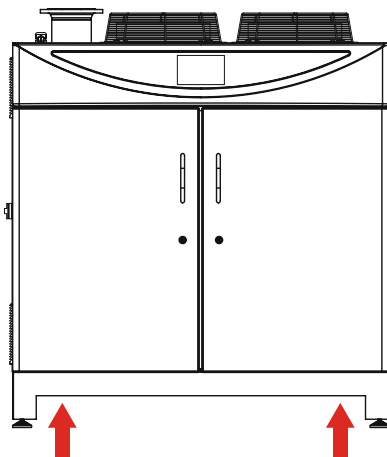


WARNING

Risk of injury due to incorrect lifting conditions

If assembly work is carried out, the employee must be trained in the use of the transport equipment and must have provided proof of this.

The VADS 1500+ is delivered on a transport pallet so that it can be lifted and transported to the final location.



For internal transport, lift the VADS 1500+ only at the marked points.

Lift and transport only by the lifting points.

2.11 ELECTRICAL INSTALLATION

The following safety instructions apply to the „Electrical installation“ life phase:



DANGER

Danger to life due to electric shock on electric drives

During the electrical installation of the load electrics of the machine, the employee comes into direct contact with live components. (Terminal box of the motor)

There is a risk of electric shock to the employee. The electric shock may result in fatal injuries to the employee.

To perform tasks and activities on the electrical system of the installation, work must be carried out in accordance with the five safety regulations according to DIN VDE 0105:

1. Isolation
2. Secure against restarting
3. Determine freedom from voltage
4. Grounding and short-circuiting
5. Cover or fence off adjacent live parts



DANGER

Danger to life due to electrical work!

Electrical work may only be carried out by trained specialist personnel.

2.12 NORMAL OPERATION

The following safety instructions apply to the „normal operation“ life phase:

The VADS 1500+ must be installed and operated in a separate room.



WARNING

Hearing damage due to high volume

Suitable hearing protection must be worn (> 85dB(A)) during activities that must be carried out while the VADS 1500+ is in operation.



WARNING

Pressure differences due to lack of room ventilation

The VADS 1500+ conveys air into or out of the installation room. This must be taken into account during the planning stage.



DANGER

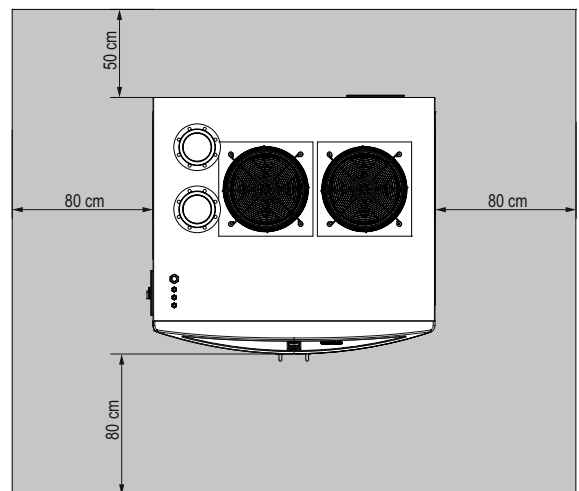
Fire and life hazard due to insufficient distances to neighbouring parts!

Minimum distances from the product must be maintained to prevent potential fires.

Minimum distance back wall: 50 cm

Minimum distance side walls: 80 cm

Minimum distance front: 80 cm



NOTE

Personal protective equipment

PPE must be worn in accordance with chapter 2.8.

2.13 FAULT

A malfunction is to be assumed if the VADS 1500+ cannot properly perform its intended use due to defects, incorrect operation or other events.

Malfunctions must be handled with special care, as unexpected hazard events can occur suddenly. The VADS 1500+ must therefore be shut down immediately if a malfunction is detected and secured against being switched on again. The person responsible for the VADS 1500+ as well as maintenance and servicing must be notified immediately.

**DANGER****Danger to life due to unexpected start-up**

The following steps are mandatory when preparing for maintenance and servicing activities:

1. Switch off the VADS 1500+ and all attached assemblies.
2. Switch off the power supply and secure against unintentional restart or disconnect the drive from the supply voltage.
3. Disconnect from air supply

**WARNING****Risk of injury from slipping, tripping and falling**

In the event of malfunctions, the VADS 1500+ must be shut down immediately.

**WARNING****Shutting down the machine when leaving the operating parameters**

Safe operation of the machine can no longer be guaranteed outside the permitted operating parameters. The limits of the permissible operating parameters are shown in chapter 10.2.

2.14 MAINTENANCE/MAINTENANCE

Maintenance and servicing is carried out according to the company's internal procedure. Before maintenance and servicing work is carried out, access to the machine area concerned must be cordoned off and marked. Unauthorised persons are to be expelled from the cordoned-off machine area.

The intervals for maintenance and servicing specified in chapter 9.1 must be observed.

Maintenance and servicing activities may only be carried out by appropriately qualified personnel. The qualification of the personnel can be found in chapter 2.4.

For maintenance work, the machine must be shut down and secured against being switched on again. In addition, a warning sign must be attached to the mains disconnection device.

All motors must be individually isolated. Maintenance during operation or when the machine is switched on is strictly prohibited.

If safety devices have to be dismantled or modified for maintenance and servicing purposes, they must be refitted, adjusted and tested immediately after completion of the maintenance and servicing activities and before the VADS 1500+ is started.

When carrying out maintenance and servicing work, the following safety instructions must be observed in addition to the safety instructions in chapter 2 of this manual:

- Use appropriate tools and handle with care.
- Personal protective equipment must be used to prevent injury from tools or components.
- The maintenance area must be kept clean and tidy. Objects lying around can be a tripping hazard.
- Heavy components must be secured against falling and tipping before they are detached from the machine.
- If anything is unclear, consult the supervisor or the manufacturer.

**DANGER****Danger to life due to unexpected start-up**

Freedom from voltage must be ensured

The ruling system is to be isolated

**DANGER****Potentially fatal hazards due to improper work on the VADS 1500+**

Work and tasks on the machine electrics, machine hydraulics and machine pneumatics may only be carried out by skilled personnel who can provide evidence of successfully completed and recognised training in the respective specialist field and who have been instructed in the special technical features of the VADS 1500+.

The performance of electrical or pneumatic work, including the simplest auxiliary activities, is prohibited without exception for persons who do not fulfil the above conditions.

**DANGER****Danger to life due to electric shock**

There is an immediate danger to life in case of contact with live parts. Damage to the insulation or individual components can be life-threatening.

Therefore:

- If the insulation is damaged, switch off the power supply immediately and arrange for repairs.
- Only allow work on the electrical machine to be carried out by qualified electricians.
- Whenever working on the electrical machine, disconnect it from the power supply and check that it is not live.
- Before maintenance, cleaning and repair work, switch off the power supply and secure it against being switched on again.
- Do not bypass or disable fuses. When replacing fuses, observe the correct amperage.
- Keep moisture away from live parts. This can lead to a short circuit.

**DANGER****Danger to life due to electric shock**

To perform tasks and activities on the electrical system of the VADS 1500+, work must be carried out in accordance with the five safety rules.

1. Isolation
2. Secure against restarting
3. Determine and document absence of voltage
4. Grounding and short-circuiting
5. Cover or fence off adjacent live parts

**DANGER****Danger to life due to electric shock**

The following steps are mandatory when preparing for maintenance and servicing activities:

1. Switch off the VADS 1500+ and all attached assemblies.
2. Switch off the power supply and secure it against unintentional reconnection, or disconnect the drive from the supply voltage.

**WARNING****Risk of injury from slipping, tripping and falling**

Obstacles and danger spots, especially exposed floor slabs and with coolants and lubricants contaminated areas, shall be clearly marked.



The obstacles and danger points are to be provided with a sturdy double-sided warning sign that is contains the warning „Caution - danger of slipping“ or „Caution - danger of falling“ in text and as a symbol. Large danger areas must be secured with barrier tapes, chain barrier systems and warning cones. The operator of the machine is responsible for ensuring road safety.

**WARNING****Danger due to high temperatures**

During operation, media and machine parts can reach high temperatures. Therefore, a sufficiently long time must be waited before manual intervention in the machine to avoid burns and scalds.

**NOTE****Wear chemical protective gloves**

Caution: Danger of scalding from 100°C hot oil!

**WARNING****Risk of injury due to stored residual energies**

The occurrence of mechanical, pneumatic and electrical residual energies on the machine after operating the unit to stop it in an emergency or after switching off the machine must be observed!

**WARNING****Safety risk due to incorrect spare parts**

Incorrect or faulty spare parts can impair safety and lead to damage, malfunctions or total failure.

Only use original spare parts from the manufacturer.

2.15 TROUBLESHOOTING

If a malfunction occurs, the machine must be stopped immediately and secured against unexpected start-up. Before entering the danger areas, the mains disconnection device must be switched to the safe position („0“ position) and secured with a padlock according to the lock-out / tag-out principle against being switched on again.

If troubleshooting is carried out immediately after operation, it is essential to observe the cooling time

Before troubleshooting, check whether lubricants have leaked. If coolants and lubricants have leaked, remove them first to avoid slipping during troubleshooting.

Troubleshooting must be carried out with the utmost care. The malfunction must be rectified with the utmost care. After troubleshooting and after rectifying the malfunction, remove all foreign objects from the machine.

Restarting the machine is only permitted if there is no damage to the machine, the malfunction has been rectified and no person is exposed to danger.

**DANGER****Danger due to improper troubleshooting**

Troubleshooting for mechanical faults is usually done during set-up operation at reduced speed or during normal operation at increased speed.

In contrast, troubleshooting for electrical faults is carried out during standstill with load current applied, whereby utmost caution is required.

Troubleshooting may only be carried out by specially trained personnel.

**DANGER****Danger to life due to electric shock**

There is an immediate danger to life in case of contact with live parts. Damage to the insulation or individual components can be life-threatening.

Therefore:

- If the insulation is damaged, switch off the power supply immediately and arrange for repair.
- Only allow work on the electrical machine to be carried out by qualified electricians.
- Whenever working on the electrical machine, disconnect it from the power supply and check that it is not live.
- Before maintenance, cleaning and repair work, switch off the power supply and secure it against being switched on again.
- Do not bypass or disable fuses. When replacing fuses, observe the correct amperage.
- Keep moisture away from live parts. This can lead to a short circuit.

**DANGER****Danger to life due to electric shock**

To perform tasks and activities on the electrical system of the VADS 1500+, work must be carried out in accordance with the five safety rules.

1. Isolation
2. Secure against restarting
3. Determine and document absence of voltage
4. Grounding and short-circuiting
5. Cover or fence off adjacent live parts

**DANGER****Danger to life due to unexpected start-up**

The following steps are mandatory when preparing for maintenance and servicing activities:

1. Switch off the VADS 1500+ and all attached assemblies.
2. Switch off the power supply and secure against unintentional restart or disconnect the drive from the supply voltage.
3. Von Luftversorgung trennen

**DANGER****Danger to life due to arcing and creepage path formation when disconnecting plug connections**

Always switch off the power supply before disconnecting any plug connections.

**WARNING****Danger due to high temperatures**

During operation, media and machine parts can reach high temperatures. Therefore, a sufficiently long time must be waited before manual intervention in the machine to avoid burns and scalds.

**NOTE****Wear protective gloves**

Before carrying out any work on the machine, the machine must cool down for a time appropriate to its temperature.

If this time cannot be guaranteed, protective gloves with adequate heat protection must be used.

**WARNING****Risk of injury due to stored residual energies**

The occurrence of mechanical, pneumatic and electrical residual energies on the machine after operating the unit to stop it in an emergency or after switching off the machine must be observed!

**WARNING****Safety risk due to incorrect spare parts**

Incorrect or faulty spare parts can impair safety and lead to damage, malfunctions or total failure.

Only use original spare parts from the manufacturer.

2.17 DISMANTLING / DECOMMISSIONING

Decommissioning includes shutting down the machine, disconnecting the power and media supply, and cleaning and preserving the machine for storage or disposal. In both cases, special care must be taken when disconnecting the power and media supply and when disassembling and transporting away machine parts.

**WARNING****Risk of injury due to stored residual energies**

The occurrence of mechanical, pneumatic and electrical residual energies on the machine after operating the unit to stop it in an emergency or after switching off the machine must be observed!

**DANGER****Danger to life due to electric shock**

Electrical work may only be carried out by trained specialist personnel.

To perform tasks and activities on the electrical system of the installation, work must be carried out in accordance with the five safety regulations according to DIN VDE 0105:

1. Isolation
2. Secure against restarting
3. Determine and document absence of voltage
4. Grounding and short-circuiting
5. Cover or fence off adjacent live parts

**DANGER****Danger to life due to electric shock**

There is an immediate danger to life in case of contact with live parts. Damage to the insulation or individual components can be life-threatening.

Therefore:

- If the insulation is damaged, switch off the power supply immediately and arrange for repairs.
- Only allow work on the electrical machine to be carried out by qualified electricians.
- Whenever working on the electrical machine, disconnect it from the power supply and check that it is not live.
- Before maintenance, cleaning and repair work, switch off the power supply and secure it against being switched on again.
- Do not bypass or disable fuses. When replacing fuses, observe the correct amperage.
- Keep moisture away from live parts. This can lead to a short circuit.

**WARNING****Risk of injury from slipping, tripping and falling**

Obstacles and danger spots, especially exposed floor slabs and with coolants and lubricants contaminated areas, shall be clearly marked.



The obstacles and danger points are to be provided with a sturdy double-sided warning sign that is contains the warning „Caution - danger of slipping“ or „Caution - danger of falling“ in text and as a symbol. Large danger areas must be secured with barrier tapes, chain barrier systems and warning cones. The operator of the machine is responsible for ensuring road safety.

**NOTE****Wear chemical protective gloves**

Caution: Danger of scalding from 100°C hot oil!

2.18 DISPOSAL

The VADS 1500+ is disposed of in a dismantled state. During dismantling, the safety instructions in chapter 2.16 „Dismantling / decommissioning“ must be observed. The main hazards during disposal are the transport of machine parts and the disposal of environmentally harmful operating materials.

**WARNING****Risk of injury from slipping, tripping and falling**

Obstacles and danger spots, especially exposed floor slabs and with coolants and lubricants contaminated areas, shall be clearly marked.



The obstacles and danger points are to be provided with a sturdy double-sided warning sign that is contains the warning „Caution - danger of slipping“ or „Caution - danger of falling“ in text and as a symbol. Large danger areas must be secured with barrier tapes, chain barrier systems and warning cones. The operator of the machine is responsible for ensuring road safety.

**WARNING****Risk of injury due to stored residual energies**

The occurrence of mechanical, pneumatic and electrical residual energies on the machine after operating the unit to stop it in an emergency or after switching off the machine must be observed!

**WARNING****Environmental hazards due to hazardous substances**

The operating materials (especially oils) must not be disposed of in the environment. Disposal must comply with the requirements for the disposal of hazardous substances and the Waste Oil Ordinance (AltöIV).

2.19 BEHAVIOUR IN THE EVENT OF DANGER AND ACCIDENTS

The protective measures to be taken and the responsibility for developing an occupational safety concept lie with the operator of the workplace. In this chapter, the interface between the measures for behaviour in the event of danger or accidents, which are derived from the machine protection, and the operator's occupational safety concept is examined.

Standalone products

These products have internal fuses. The operator must ensure safe use by observing the „operating conditions“ described in chapter 3.

Systems

In the event of a hazardous situation at a facility, the following options are available for hazard reduction:

- Our systems are equipped with emergency stop devices (door switches) to stop all drives and moving machine parts and thus all movements on the system.
- The entire machine can be switched off immediately at the switchgear connection via the mains disconnection device.

2.20 REQUIREMENTS FOR STABILITY

The VADS 1500+ must be installed horizontally on a flat surface.

2.21 WORKING PROTECTION

The VADS 1500+ has been set up in accordance with the Machinery Directive 2006/42/EC and the relevant occupational health and safety and accident prevention regulations. Primary energies such as the power supply must be switched off, de-energised and depressurised during repair work in order to prevent accidents. Protective devices that were previously dismantled must be reattached before commissioning.

Detected irregularities in the operation must be reported immediately to the responsible persons of VADS 1500+.

In the event of a malfunction of the VADS 1500+ that impairs or endangers the safety of persons, it must be shut down immediately. The VADS 1500+ may only be put back into operation after the fault has been rectified.

2.22 AIRBORNE SOUND EMISSIONS

According to Directive 2006/42/EC, information on the airborne noise emission of the machine must be provided. Exact details can be found in the MRL under point 1.7.4.2.

See also chapter 4.7 (Technical data VADS 1500+)

2.23 ERGONOMY

With regard to maintenance and servicing, special behaviour with regard to ergonomics, in accordance with RL2006/42/EC Annex i 1.1.6 „Ergonomics“, must be taken into account:

- Heavy spare parts must be held in position by a hoist for assembly.

3 OPERATING CONDITIONS

The CE conformity of the product only becomes legally valid when all product safety requirements of the „operating conditions“ formulated in this chapter in the sense of Directive 2006/42/EC Annex I 1.7.4.2.i have been fully and completely implemented by the operator. If one or more points are not fully implemented in practice, CE conformity is not valid and the product may not be operated.

Operating condition 1: Safety instructions for maintenance work

1. Standalone products - not implemented in a control system

BA Shutting down the machine for maintenance

In the event of maintenance, work must be carried out with the guards removed. This work may only be carried out when the machine is at a standstill. To ensure that the machine is at a safe standstill, the machine must be disconnected from the electrical supply and the five safety rules according to DIN VDE 0105 must be observed:

1. Isolation
2. Secure against restarting
3. Determine and document absence of voltage
4. Grounding and short-circuiting
5. Cover or fence off adjacent live parts

2. Implemented products - product is controlled via control of the operator

If the machine is implemented in a control system by the operator, the following conditions apply to the „Maintenance“ operating mode:

1. The drive must be disconnected from the power supply
2. Or, in the case of a shutdown stored in the control, the requirements of DIN EN 61800-1 :2018-11 correspond.

Operating condition 2: Ventilation of the operating room

The operator must ensure that the operating room of the pump is sufficiently ventilated. This can be realised via permanent access to the outside air, via a sufficiently large volume of the operating location (large production hall) or via a ventilation system that provides a constant air flow via safety-oriented software.

Operating condition 3: Approved equipment

Gebr. Becker GmbH recommends the following oil:

- Becker Lube G 70

Furthermore, only oils that comply with the parameters of the safety data sheet of the above-mentioned oil are permissible.

Operating condition 4: Behaviour when leaving the operating parameters

If the machine leaves the operating parameters specified by the manufacturer, it must be switched off.

Leaving the operating parameters with regard to the current must be prevented by a safety component regardless of the will.

Operation outside the operating parameters is prohibited by the manufacturer.

4 MACHINE DESCRIPTION

This chapter describes the assemblies and components of the VADS 1500+ and explains how they work.

The following information is intended to help you understand how the VADS 1500+ works. This information can help to avoid dangers and errors due to incorrect operation.

4.1 OPERATING PRINCIPLE

The VADS 1500+ is a positive displacement pump in which the shape of the rotating displacer resembles that of a spindle screw.

The VADS 1500+ consists of two counter-rotating rotors and a housing that encloses the rotors. The rotors are designed with a regular, thread-shaped profile and mesh with each other like cogwheels. The hollow spaces formed by these three construction elements form the conveying spaces for the pumped medium. When the rotors rotate, they move out in a machine direction and convey the medium from the suction side (inlet) to the pressure side (outlet).



1. Inlet / bottom: Suction until the inlet plate closes the suction chamber due to the rotor rotation.
2. Upper side: compression space closes - space between rotors, casing and outlet plate > start of compression
3. Compression of the gas by reducing the compression space (gas transport in axial direction)
4. Outlet: End of compression, rotation of rotors until outlet side opens

The direct drive via an integrated frequency converter eliminates the otherwise required drive gear. With the help of two synchronising gears, the rotors with screw profile rotate in opposite directions and without contact. The working chamber of the machines is 100% oil-free. The integrated speed control enables energy-optimised operation of the units.

Depending on the application, a distinction is made between screw compressors and screw vacuum pumps.

4.2 DESIGNATION OF THE MACHINE

Company name and full address of the manufacturer	Gebr. Becker GmbH Hölker Feld 29 42279 Wuppertal Germany
Designation of the machine	Screw pump VADS 1500+
Series or type designation	VADS 1500+

Table 4.1: Designation of the machine

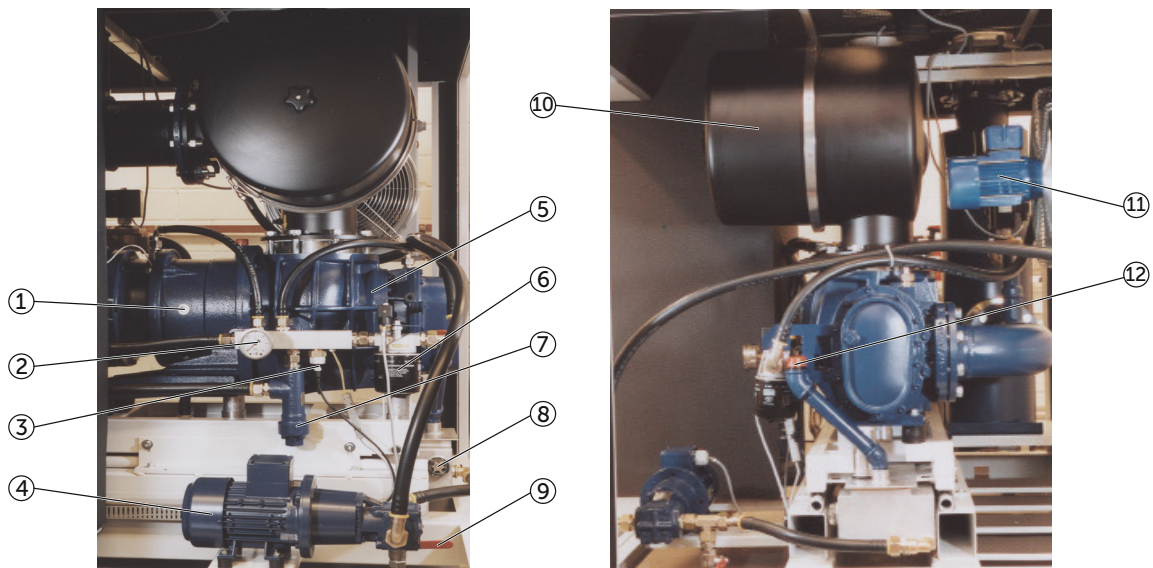
4.3 ASSEMBLIES AND COMPONENTS

4.3.1 EXTERIOR VIEW

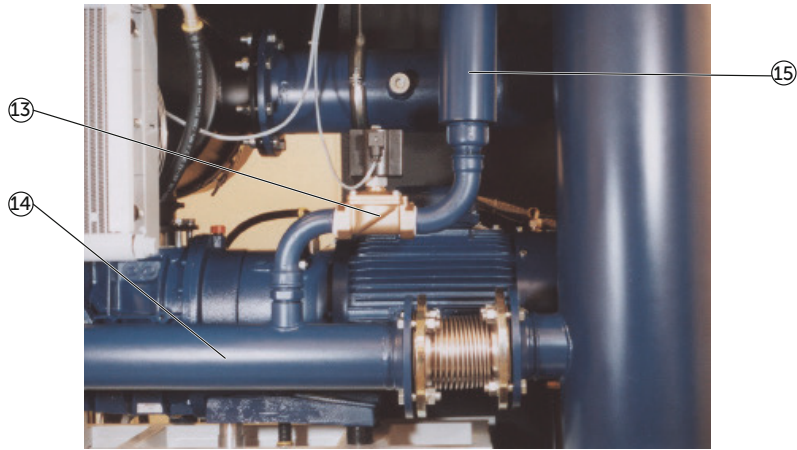


Position	Designation	Position	Designation
1	Main switch	4	Ceiling fan
2	Pressure connection (rear)	5	Touch panel for pump operation
3	Vacuum connection (front)		

4.3.2 INTERIOR VIEW - COMPRESSOR

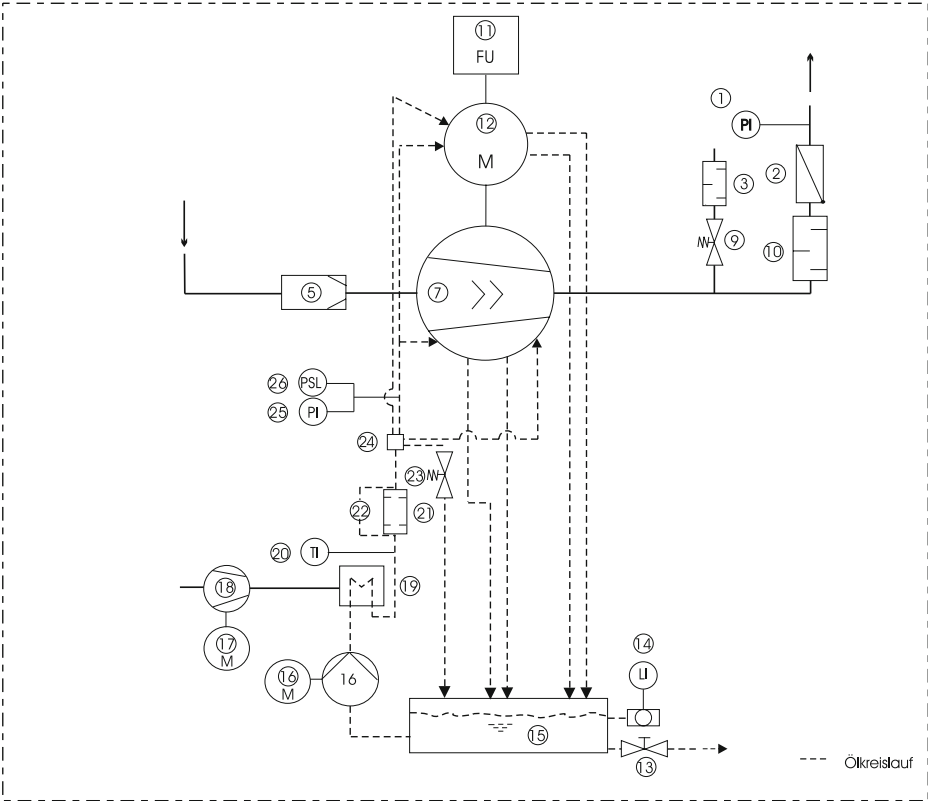


Position	Designation	Position	Designation
1	Direction of motor rotation	7	Overflow valve
2	Oil pressure gauge (manometer)	8	Oil sight glass
3	Oil pressure switch	9	Ball valve for oil drain
4	Oil pump	10	Air intake filter
5	Compressor unit	11	Oil cooler fan
6	Oil filter with differential pressure switch	12	Oil filler neck



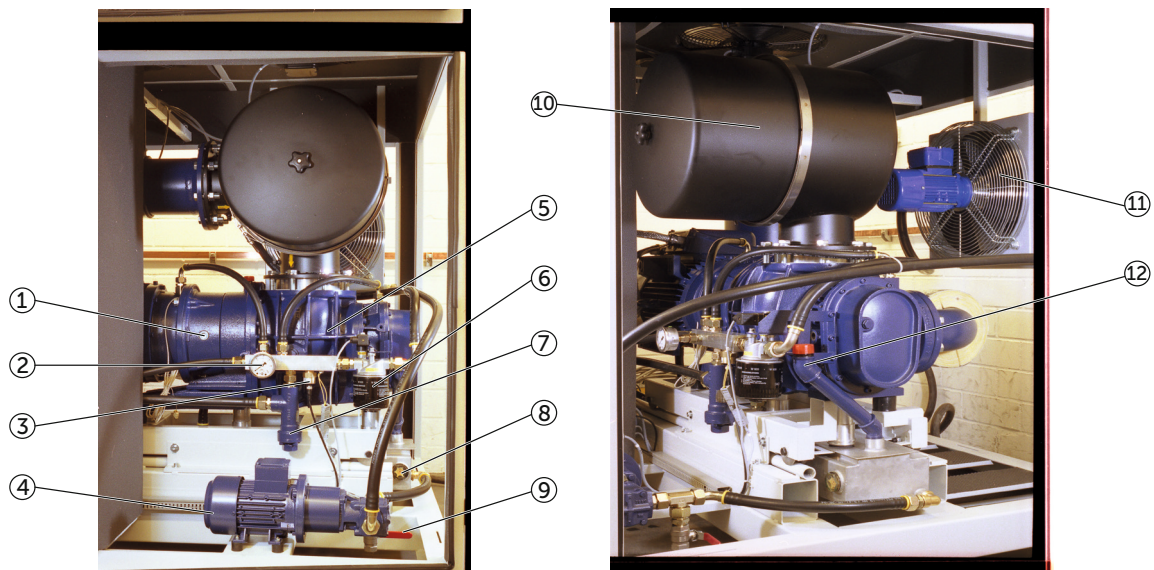
Position	Designation	Position	Designation
13	Bypass solenoid valve	15	Blow-off silencer
14	Compressed air line		

4.3.3 PRINCIPLE STRUCTURE COMPRESSOR

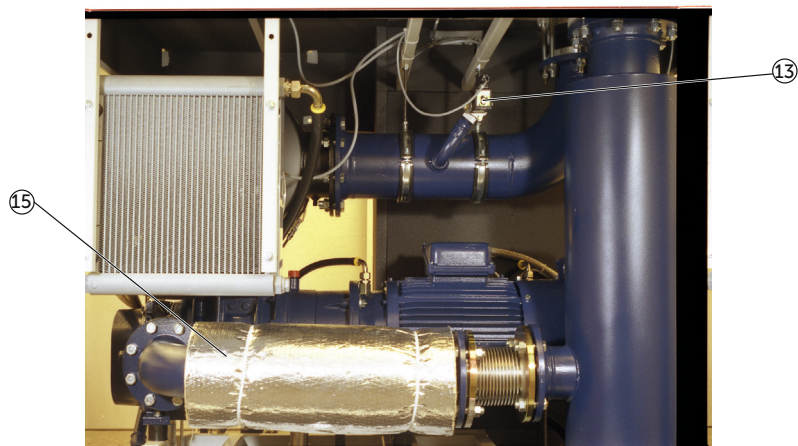


Position	Designation	Position	Designation
1	Pressure transducer	15	Oil reservoir
2	Non-return valve	16	Oil pump / 16 M. - Engine oil pump
3	Silencer	17	Motor for fan
5	Air intake filter	18	Fan for oil cooler
7	Screw unit	19	Oil cooler
9	Pressure safety valve	20	Oil temperature
10	Pressure silencer	21	Oil filter
11	Frequency converter	22	Differential pressure oil
12	Drive motor	23	Overflow valve
13	Oil drain cock	24	Distributor
14	Oil level switch	25	Oil pressure gauge
15	Oil reservoir with oil sight glass	26	Oil pressure switch

4.3.4 INTERIOR VIEW - VACUUM PUMP

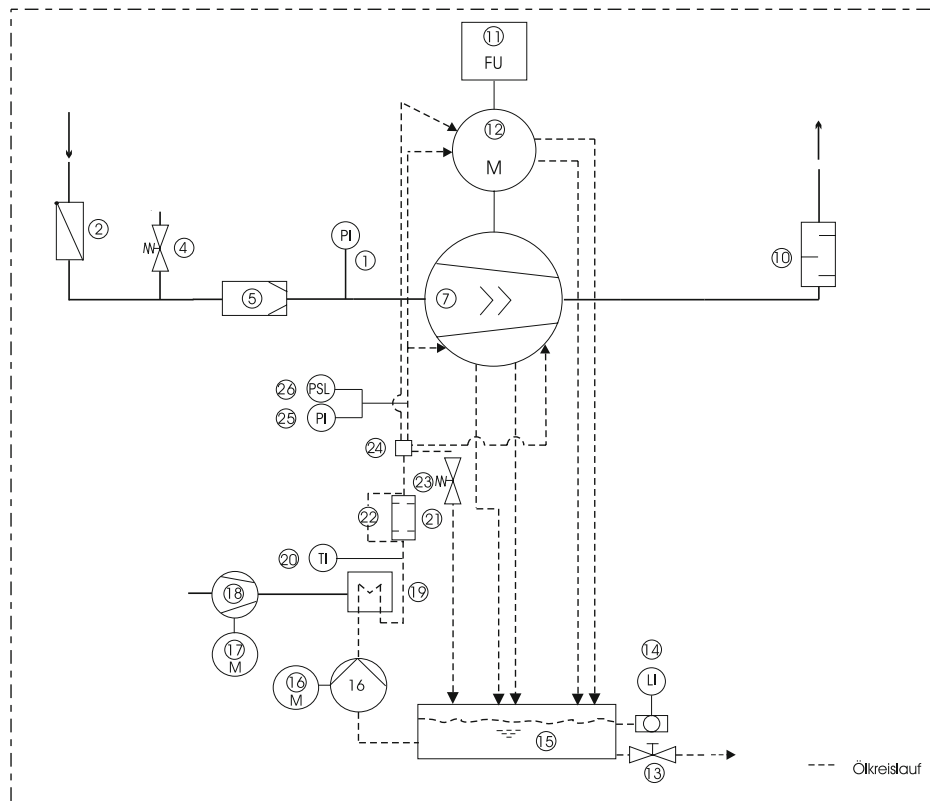


Position	Designation	Position	Designation
1	Direction of motor rotation	7	Overflow valve
2	Oil pressure gauge (manometer)	8	Oil sight glass
3	Oil pressure switch	9	Ball valve for oil drain
4	Oil pump	10	Intake filter
5	Compressor unit	11	Oil cooler fan
6	Oil filter with differential pressure switch	12	Oil filler neck



Position	Designation	Position	Designation
13	Bypass solenoid	15	Exhaust air line

4.3.5 PRINCIPLE STRUCTURE VACUUM PUMP



Position	Designation	Position	Designation
1	Pressure transducer	16	Oil pump / 16 M. - Engine oil pump
2	Non-return valve	17	Motor for fan
4	Vacuum safety valve	18	Fan for oil cooler
5	Air intake filter	19	Oil cooler
7	Screw unit	20	Oil temperature
10	Pressure silencer	21	Oil filter
11	Frequency converter	22	Differential pressure switch oil
12	Drive motor	23	Overflow valve
13	Oil drain cock	24	Distributor
14	Oil level switch	25	Oil pressure gauge
15	Oil reservoir with oil sight glass	26	Oil pressure switch

4.4 SAFETY AND PROTECTIVE DEVICES

The protective devices of the VADS 1500+ must not be dismantled, modified or put out of operation. If the protective devices are dismantled, modified or put out of operation, the VADS 1500+ must be shut down and secured immediately.

Defects in protective equipment must be rectified immediately. All protective equipment must be undamaged, fully assembled and functional.

All protective devices must be checked for functionality, damage and completeness after each maintenance of the VADS 1500+.

If a maintenance activity requires the dismantling of protective devices, these may only be dismantled for the duration of the maintenance activity. Immediately after completion of the maintenance work, all guards must be completely installed in the designated place and checked for proper functioning.

The prescribed inspection and replacement intervals for protective devices must be observed and complied with. Protective devices may only be maintained, replaced and serviced by trained, instructed and authorised specialist personnel.

Unauthorised tampering with the safety-related parts of the VADS 1500+ along with any adjustable components is strictly prohibited and must be reported immediately to the person responsible for the VADS 1500+.

The use of any tools, controls, machine parameters or sealed machine parts is strictly forbidden and must be reported

immediately to the person in charge of the VADS 1500+.

Modification of safety-related parameters of the machine control system is strictly prohibited.

All equipment serving safety and accident prevention, such as warning and information signs, covers, protective coverings, etc., must be in place. The removal or alteration of these facilities is prohibited. Damaged equipment must be repaired immediately. Warning and information signs must be clearly visible.



DANGER

Danger to life due to defective, dismantled and manipulated protective devices

The VADS 1500+ may only be operated if all safety and protective devices are fully present and functional!

Faulty safety and protective equipment can lead to dangerous situations! For this reason:

- Switch off the machine immediately,
- secure against restarting and
- Disconnect from air supply and electric current!

4.5 TESTING OF THE SAFETY AND PROTECTIVE DEVICES



NOTE

All safety and protective devices must be checked regularly.

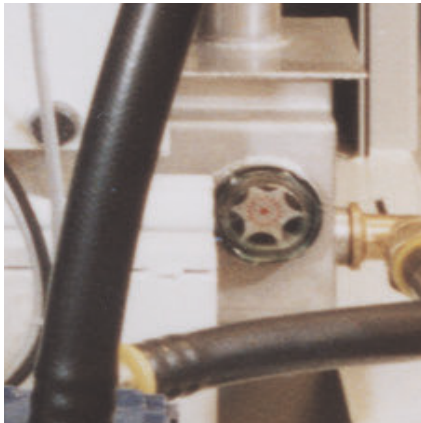
The condition and function of safety and protective devices must be checked when:

- Modifications and repairs have been made to the VADS 1500+
- Damage has occurred to the VADS 1500+
- maintenance and servicing intervals are to be carried out.

If the VADS 1500+ is used in continuous operation or continuously over a longer period of time, the loads on safety and protective equipment will increase. In this case, the operating intervals must be adjusted accordingly.

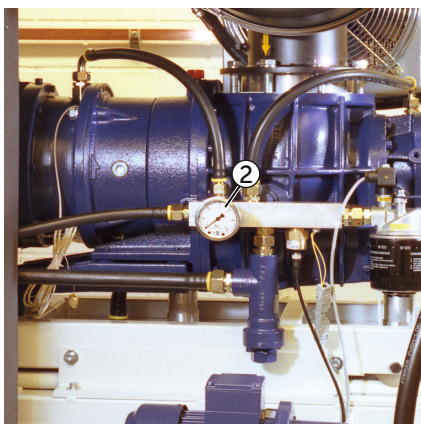
4.6 DISPLAY ELEMENTS

Indicator element Oil sight glass



The oil sight glass shows the exact oil level when the pump is not running. The oil sight glass has a scale that indicates the ideal level. During operation, the display does not give a verifiable value due to the swirling of the oil.

Indicating element pressure gauge



The pressure gauge shows the oil pressure in the system.

4.7 TECHNICAL DATA

The general technical data of the VADS 1500+ are listed in table form below:

Vacuum pump	VADS 1500+	Compressor	VADS 1500+
Pumping speed	750 - 1380 m ³ /h	Delivery quantity	750 - 1230 m ³ /h
Operating vacuum (continuous operation)	200 mbar abs.	Operating pressure (continuous operation)	2 bar abs. (1 bar rel.)
Installed inverter/motor power	30/37 kW	Installed inverter/motor power	45/37 kW
Compressor speed	6600-12000 min ⁻¹	Compressor speed	4800-10000 min ⁻¹
Sound level at typical operating pressure ¹⁾	75 dB(A) - (110 Hz) 450 mbar abs.	Sound level at typical operating pressure ¹⁾	85 dB(A) - (110 Hz) 650 mbar rel.
Length	1600 mm	Length	1600 mm
Wide	1510 mm	Wide	1510 mm
Height	1806 mm	Height	1806 mm
Weight	ca. 1200 kg	Weight	ca. 1200 kg
Suction connection	DN 150 / PN 6	Suction or intake connection	DN 150 / PN 6
Exhaust air connection	DN 150 / PN 6	Compressed air connection	DN 150 / PN 6
¹⁾ Sound level according to EN ISO 2151: 90 dB(A) at 200 Hz and free intake		¹⁾ Sound level according to EN ISO 2151: 88 dB(A) at 165 Hz and 800 mbar rel. humidity	

Table 4.2: General technical data

4.8 FUELS AND CHEMICALS



CAUTION

Contamination and damage to the environment by operating materials

The operating materials used for the proper functioning of the VADS 1500+ and water contaminated with these operating materials can pose a danger to the environment.

Suitable absorbents must always be kept on hand to ensure rapid absorption of spills and contaminated water.

Used absorbents must always be disposed of according to the prescribed procedures.

All environmental protection regulations must always be observed when handling and disposing of operating materials.

Operating materials and contaminated water must be disposed of in accordance with the environmental protection conditions applicable on site.



DANGER

Risk of infection and poisoning from eating and drinking in the machine area

Eating and drinking is prohibited in the entire machine area.

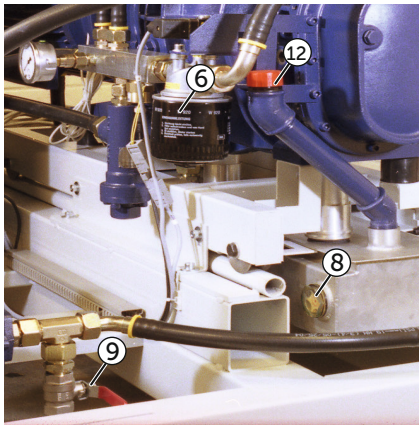
5 ASSEMBLY AND INSTALLATION

5.1 ASSEMBLY AND SETTINGS

General

When assembling components and assemblies, the following points must be observed to avoid injury and damage to the machine:

- Third-party components may only be installed if they have been approved by the manufacturer and comply with the directives and laws applicable in the country of use.
- All components must be properly aligned and balanced, if necessary, to avoid vibration, imbalance and breakage during operation.
- Loose and non-machine parts must be removed from the machine environment after assembly.
- Protruding parts (pipes, cables, etc.) must be properly mounted, routed and marked.
- Contact points of components must be clean and intact.



Fill in oil

The VADS 1500+ is delivered without oil. Oil (BECKER LUBE G70) must be filled in before commissioning.

1. Open the cover on the oil filler neck (pos. 12) to vent the oil.
2. Fill in oil. The oil level must not exceed the max. level (upper edge of the oil sight glass (pos. 8)).
3. Close the cap on the oil filler neck
4. The oil level drops to about the middle of the oil sight glass when the machine is running.

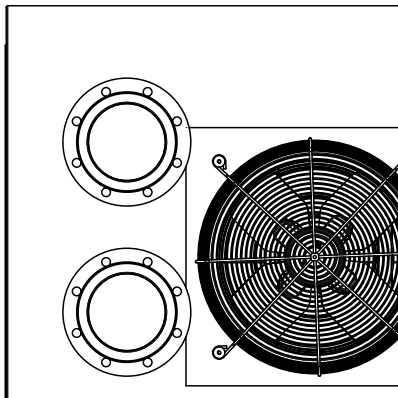
Dimensioning of the media lines

The diameter of the media lines depends on their length.

The diameter of the pipes must be at least the same as the nominal connection diameter of the connection pieces.

Avoid mechanical tensions on the suction side by installing a compensator.

When installing media lines that have a high temperature, please note that these must be covered, insulated and labelled accordingly in order to prevent injuries and damage to the machine.



5.2 SCREW CONNECTIONS

Screw connections are often used when assembling components and assemblies. The following points must be observed for screw connections:

- Flange surfaces must be clean and free of oil or grease before screwing.
- Threaded holes and nuts must be clean.

5.3 ELECTRICAL INSTALLATION

The electrical installation of the machine must comply with the requirements of Directive 2006/42/EC and EN 60204:2019.

The following points must be observed in particular when installing the pump:

- The VADS 1500+ must be fused via overload protection
- The supply line of the VADS 1500+ must comply with the minimum requirements of the state of the art.
- The installation of the VADS 1500+ must comply with the requirements on the nameplate of the motor.
- The installation must comply with the requirements on the nameplate of the inverter

The following requirements must be met for integration into the control system:

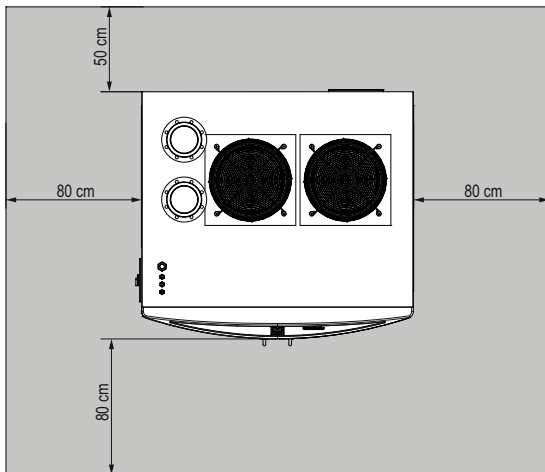
- After an unintentional voltage drop, the VADS 1500+ must not restart by itself. The measures against unexpected start-up according to DIN EN ISO 14118:201807 must be implemented. This also applies after a shutdown following an emergency stop.

6 COMMISSIONING AND OPERATION

6.1 COMMISSIONING REQUIREMENTS

The following commissioning requirements must be fulfilled in accordance with RL 2006/42/EC Annex 1, point 1.7.4.2.i in order to ensure the safe operation of the VADS 1500+. Operation without full compliance with all of the following points is prohibited.

- The product may only compress / evacuate atmospheric air (humidity up to 90%) from a room.
- Evacuation / conveyance of any other gases, with special attention to hazardous materials, is not permitted and prohibited.
- Evacuation / transport of flammable or explosive gases is also prohibited.
- The product may be used up to a maximum altitude of 1000m NN. All installation locations that exceed this limit must be agreed with the manufacturer.
- The aspirated media must have a temperature in the range of 5°-40° Celsius.
- The product must not be operated in potentially explosive atmospheres.
- The VADS 1500+ must be installed horizontally on a level surface. If installed on an inclined plane, the oil circulation can no longer be guaranteed. This will result in damage to the unit.
- The minimum distances must be maintained between the VADS 1500+ and adjacent parts.



Commissioning takes place after proper assembly and installation of the VADS 1500+.

6.2 SWITCH ON VADS 1500+

For stand-alone installation, the VADS 1500+ can be started directly via the display or, if available, via a customer control. If several VADS 1500+ work together, they are not switched on at the unit itself, but by a control of the customer. After switching on, the VADS 1500+ goes directly into normal operating mode. There are no subordinate operating modes for setup, maintenance or troubleshooting.

The VADS 1500+ must not be switched on until it has been properly set up, the electrical installation has been properly installed and the media lines have been connected.

6.3 NORMAL OPERATION

In normal operation, the VADS 1500+ operates fully automatically within its physical limits, according to the customer's control.

6.4 TROUBLESHOOTING

Troubleshooting is only allowed on the VADS 1500+ under the following conditions:

1. Shutdown via the operator

For troubleshooting, the machine must be shut down and secured against being switched on again. In addition, a warning sign must be attached to the mains disconnection device.

Maintenance during operation or when the machine is switched on is strictly prohibited.

If safety devices have to be dismantled or modified for troubleshooting, they must be reattached, adjusted and tested immediately after completion of the maintenance and servicing activities and before starting the VADS 1500+.

After this, a verifiably qualified electrician may carry out activities on the VADS 1500+, taking into account the 5 Safety Rules.

After completion of the activities, the VADS 1500+ may be put back into operation after a visual inspection.

2. Disconnection from the power supply

A verifiably qualified electrician isolates the motor and disconnects it. After implementing the 5 safety rules, non-qualified electricians may also carry out activities on the VADS 1500+.

After completion of the activities, the activities under the point: „Recommissioning“ must be followed.

When troubleshooting, check the following defects in particular.

- Damage, especially to:
 - » Ventilation grilles
 - » Screw fittings
 - » Media lines
 - » Electrical cables
- Leaks
- Loose objects
- Loose screw connections or fastenings
- Contact protection on live parts



NOTE

Visual inspection: The machine is free of foreign objects. After initial inspection, the machine is in a damage-free condition. This also includes checking the electrical and pneumatic components and connections.

- Expel unauthorised persons from the machine.
- Check the levels of lubricants.
- Make ready all units for emergency shutdown.

If defects and dangers become visible during the inspection, the machine must be shut down immediately and secured against being switched on again. The VADS 1500+ may only be put into operation if it is in perfect condition.

The chapter „Maintenance“ must be followed.

6.5 SWITCH OFF MACHINE

1. Shutdown via the operator

To switch off, the machine must be shut down and secured against being switched on again. In addition, a warning sign must be attached to the mains disconnection device.

All motors must be individually isolated. Maintenance during operation or when the machine is switched on is strictly prohibited.

2. Disconnection from the power supply

A demonstrably qualified electrician isolates the motor and disconnects it. After implementing the 5 safety rules, non-qualified electricians may also carry out activities on the VADS 1500+.

After completion of the activities, the activities under the point: „Recommissioning“ must be followed.

6.6 RECOMMISSIONING

This chapter contains important information for the safe recommissioning of the VADS 1500+.

After the storage and shutdown period, the VADS 1500+ must be checked for operational capability. If the unit is not in proper working order, appropriate maintenance and servicing measures must be carried out in order to restore its working order.

The following points must be worked through in the specified order to enable safe recommissioning of the VADS 1500+:

1. If the VADS 1500+ has been dismantled, it may only be reassembled by personnel authorised and trained by the manufacturer.
2. The VADS 1500+ must be serviced, cleaned and, if necessary, repaired on the basis of the chapters „Maintenance and servicing“ and „Cleaning“.
3. Electrical components must be put back into operation in accordance with the installation instructions and the manufacturer's documentation. The power supply must not yet be restored.
4. All safety devices must be fitted and checked for functionality and effectiveness. Damaged parts must be replaced immediately.

7 CONTROL VADS1500+

7.1 OPERATING MODES OF THE SCREW UNIT

Without external PLC control (single unit):



Vacuum or pressure stabilisation via internal PID controller. Setting the operating mode to „controller“ in the main window.

Setpoint pressure
1000mbar(a)

Setting the setpoint via the setpoint pressure input field in the main window. Setting range:
Vacuum 200 - 1000 mbar abs
Pressure 1000 - 2000 mbar abs

Regelparameter	
P-intel	0.100 0.00
I-intel	0.100 0.00
D-intel	0.000 0.00

The PID parameters can be set in the controller window. This is accessible with extended authorisation.



Operation with fixed speed, adjustable in manual mode and changeable during operation via the setpoint input field in the main window.

Setpoint frequency
110

Setpoint frequency setting by signal (0-10 V, 4-20 mA) via connection to terminal strip X6.1 / X6.2 on the mounting plate.

Vacuum: 110 - 200 Hz adjustable.

Pressure: 80 - 165 Hz adjustable.

With external PLC control:

Request by external PLC (terminal strip X4.15 / X4.16): Release contact (normally open contact) of the PLC.
Operation feedback for PLC (terminal strip X4.18 / X4.19).

Setpoint frequency
110

Operation with setpoint frequency by external PLC (terminal strip X6.1 / X6.2): Signal from the external PLC (0-10 V).

Vacuum: 110 - 200 Hz adjustable.

Pressure: 80 - 165 Hz adjustable.

7.2 OPERATION ON THE CONTROLLER DISPLAY

To obtain extended rights, it is necessary to tap on the bottom right corner of the touch display. The login dialogue then appears. The extended rights are valid for one hour by default. The corresponding countdown is displayed on the right side in the status bar.

The status bar (bottom) shows from left to right:



Connection BUS master for external control.



Display language in the form of the corresponding national flag.



Connection of a USB stick.



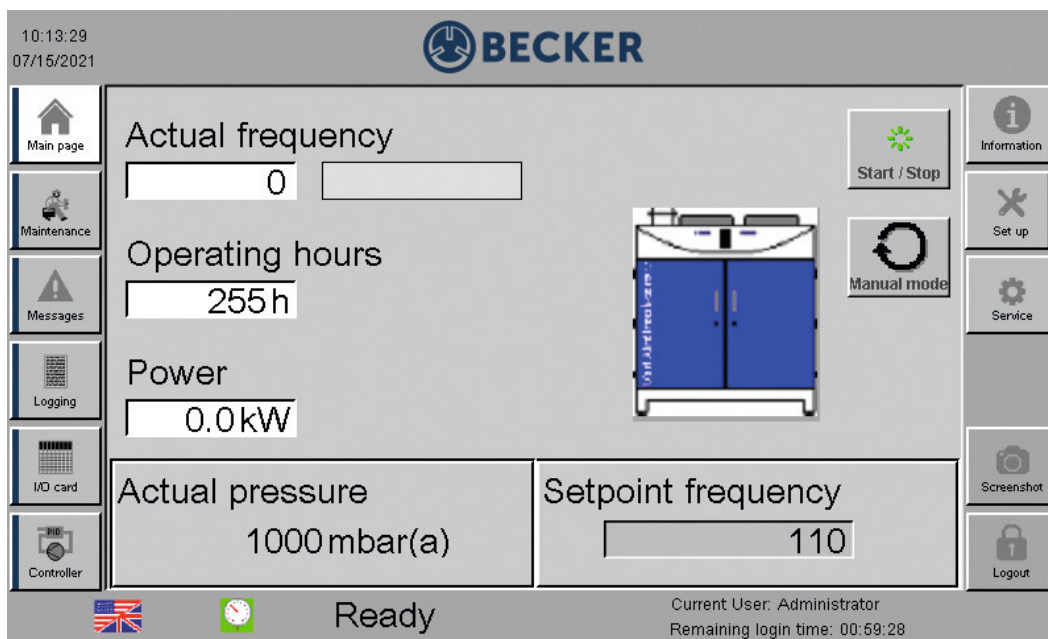
Status of the safety valve.



Status of the weekly timer, if configured.

Status of the machine in text form.

Display of the currently logged in user, as well as the countdown timer for automatically logging out the user.



The different display pages are selected using the buttons on the right and left of the edge.

Main page:

An overview of the machine's operating status and the various system parameters is displayed here.



Manual mode

In manual mode, the unit can be operated by specifying the speed in the input field.

Setpoint frequency
0

The screw stage rotates with the frequency entered there. Inadmissible setpoint specifications are not possible.

The main page displays the actual frequency from the frequency inverter, the operating hours of the unit, the instantaneous power, the actual pressure and the specified setpoint.

Maintenance:

The operating hours, the number of starts and the maintenance information are displayed here. With extended rights, maintenance can also be confirmed or postponed here.

Messages:

The current faults, warnings or extended information are displayed here and can be acknowledged.

Protocol:

Faults, warnings or extended information from the past are displayed here and can be deleted.

IO card:

Here, the digital and analogue inputs and outputs can be displayed, and digital signals can be set manually.

Controller:

With extended rights, the parameters of the PID control can be changed here, and the behaviour of the PID control can be viewed.

Information:

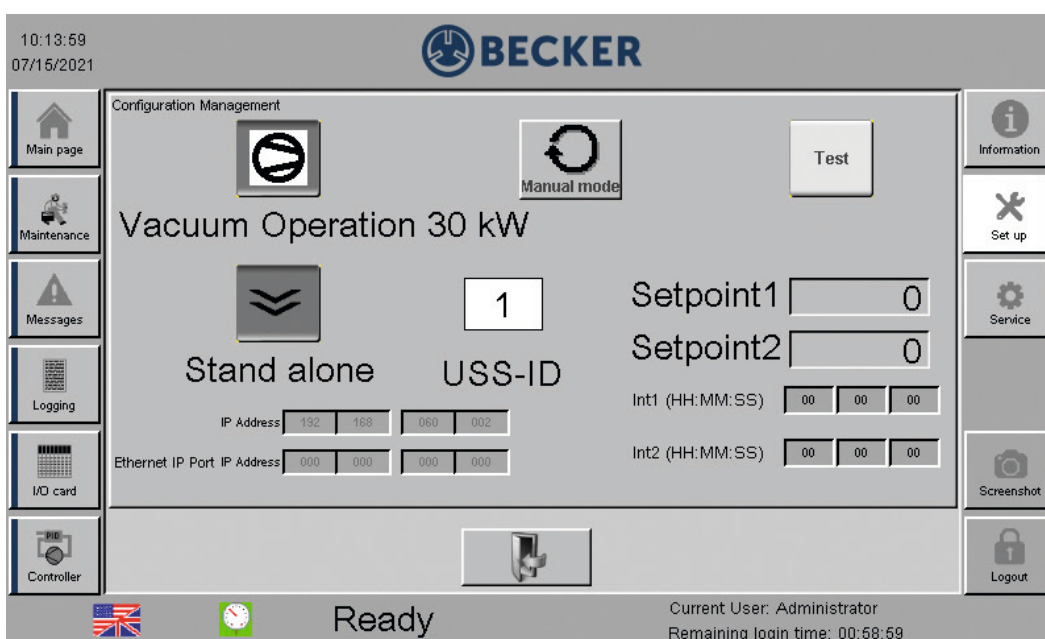
The system information is displayed here.

Set up:

Here the settings regarding language, units, date and time can be made.

**Setup -> System**

The basic settings of the machine can be made with extended rights via the „System“ button.



Configuration: Pressure or vacuum stage.

Mode of operation:



Fixed speed (manual operation)



PID control with sensor

The 2 options can also be set on the main page.

Control:



Single unit



external control

Selection of the USS address for control with an external control.

Setup -> Network Settings

The network settings of the machine can be changed with extended rights via the button „Network settings“.

Set up -> Timer

Weekly timers can be programmed with extended rights via the „Timer“ button.

Service:

Here, with extended rights, further functions are available, e.g. file management or parameterisation of the frequency inverter.

7.3 SAFETY DEVICES

All protective devices installed in the unit are monitored by the control system. The critical variables such as contacts, switches or critical system pressure are continuously updated during operation and checked for possible malfunctions or service cases.

Oil circuit

The medium to be conveyed is monitored by the following sensor system:

- [2] Non-return valve: The non-return valve integrated in the suction line (for vacuum) or pressure line (for compressor) prevents reverse running when the unit is switched off.
- [4] Safety valve: If the system pressure rises above the factory-set trigger value, the solenoid valve in the bypass of the suction line (for vacuum) or discharge line (for compressor) opens. The open solenoid valve closes as soon as the system pressure falls below the second factory-set threshold value.

Oil circuit

The oil circuit is protected by the following switches or auxiliary contacts.

- [14] Oil level switch: The oil level in the oil tank is monitored by an integrated float. This is located below the drive motor. A critical drop in the oil level leads to a shutdown.
- [16] Oil pump: The operation of the oil pump is monitored by an auxiliary contact attached to the motor protection switch. This auxiliary contact trips in the event of a short circuit, overload or wire breakage. The entire unit is switched off.
- [20] Oil temperature switch: The oil temperature is monitored between the outlet of the oil cooler and the inlet to the oil distributor. The trigger point is 60°C. If it is exceeded, the unit is shut down.
- [22] Oil filter monitoring: The degree of contamination of the filter cartridge is monitored by the maintenance switch integrated in the oil filter housing. The display „Change oil filter“ appears periodically in the display of the frequency

inverter. There is no switch-off.

- [23] Overflow valve: The valve is installed in the bypass between the oil distributor and the oil tank. It has a spring that can be adjusted according to the desired opening pressure. The overflow valve prevents the permissible operating pressure of the oil from being exceeded.
- [25] Oil pressure gauge: The pressure gauge as an indicator is located between the distributor and the a-side oil inlet.
- [26] Oil pressure switch: The oil pressure switch has an adjustable switching point. It serves to intercept an oil pressure that is too low (warning), but does not automatically lead to shutdown.

Other hedges

- Motor PTC thermistor: The integrated PTC thermistor is part of the protection of the drive motor. If the motor overheats, it triggers a fault in the frequency inverter that leads to a shutdown. The message „Motor thermistor“ appears.
- Power pack fuse protection: The corresponding fuse protection is provided by a circuit breaker. The 24 V DC is used, among other things, to supply the control unit, so that a failure of this component causes all rotating components to come to a standstill and the unit to shut down.
- Unit: In the event of a malfunction, the integrated load-break switch protects the unit from the external power supply network by tripping the fuses if the current consumption is too high.

7.4 COMMISSIONING

Switching the unit on or off

To energise the complete unit, the following steps must be carried out, without which the main switch cannot be switched on.

1. Switch on all motor protection switches.
2. Turn the main switch to the right as far as it will go.

Starting the vacuum pump or compressor

Initialisation:

After approx. 30 seconds, the control unit is booted up and the display shows the main page.

If all devices in the periphery as well as the connection to the frequency inverter are in order, the button „Messages“ is not highlighted in colour and „Ready“ is displayed in the status line.

Start/stop without PLC

If „Single unit“ has been selected in Setup -> System, the unit is switched on after setting the desired setpoint.

The oil pump is started with the „Start/Stop“ button and runs up to the selected frequency with the status text „Start“. First, the oil pump starts, and after the minimum oil pressure has been built up, the fans switch on, and the pressure / vacuum generator starts.

The unit is stopped by tapping „Start/Stop“ again. The unit is shut down and the status „Stop“ appears until the fan run-on time has ended (5 minutes).

Start/stop with PLC

If „External control“ was selected in Setup -> System, the unit is operated externally via the interfaces. In this case, the analogue setpoint must be applied as a 0-10 V signal to terminals X6:1 and X6:2, and the start/stop signal as a potential-free make contact to X4:15 and X4:16. The external PLC can access operating data and the status of the VADS1500+ via the RS485 interface of the control unit (X5:1, X5:2 and X5:PE).

Note: A unit that has been started automatically can be stopped manually at any time by pressing the „Stop“ button. To return the unit to automatic operation, press the „Start“ button. If the release signal from the PLC is present at this time, the unit restarts.

Troubleshooting

- Error analysis: If an error has occurred that has caused the unit to shut down, the cause of the error should be analysed according to the table shown in section 2.5: (Error messages and troubleshooting). Only then can the unit

be restarted according to the following methods.

- Motor protection switch: If a malfunction has occurred because a motor protection switch has tripped, the system will only restart automatically when the corresponding switch is closed.
- Temperature switch: In the event of shutdown for reasons of overtemperature, a restart is only possible if the switch has switched back to the idle position.

7.5 ERROR MESSAGES AND TROUBLESHOOTING

Maintenance messages

If maintenance is necessary, the button „Maintenance“ is highlighted in blue. Pressing this button takes you to the maintenance overview. Here, the operating hours of the machine and all four maintenance events are displayed with the corresponding intervals and the remaining operating hours until the next maintenance.

With extended rights, maintenance can be postponed here or marked as performed. The respective times change accordingly.

Active maintenance messages are also displayed in blue in the „Messages“ window and in chronological order in the „Log“ window. Past maintenance can be tracked in the „Log“ window.

The messages and their meaning (tripping contact/switch; effect; cause; remedy):

- Oil/oil filter change: A change of oil and filter is necessary
- Clean/change filter/ filter mats: Filter change or cleaning is necessary (operating hours counter; warning message; contamination; carry out (have carried out) maintenance and acknowledge (have carried out) message)
- Unit service: Service of the compressor element (an overhaul of the compressor element is recommended).
- Motor service: Service of the electrical motor (an overhaul of the motor is recommended).

Fault messages

If there is a malfunction, the „Messages“ button is highlighted in red, and the malfunction is made clearly visible in the upper part of the screen by an alarm symbol. Pressing this button takes you to the message overview, where the fault messages are also highlighted in red and displayed in chronological order in a table.

A selection and acknowledgement of the respective fault is possible here if the fault is no longer present. In the window In the „Log“, the past faults can still be seen with the respective time stamp. The fault messages and their meaning (trigger contact/switch; effect; cause; remedy):

Display text Display	Release contact / -switch	Effect	Cause	Remedy
„Oil pressure low“	[26] Oil pressure-switch	Warning message in the display	Lower switching point of the oil pressure switch	[23] Check the overflow valve and replace the defective part. Increase the spring tension of the valve Check the oil circuit for possible leaks and top up the oil if necessary.
"no OIL!"	[14] Oil level switch	Shutdown and fault message	The oil level in the tank has dropped below the minimum level.	Inspect the oil circuit for possible leaks Check the electrical wiring.
„Overtemp oil“	[20] Temperature switch oil	Shutdown and fault message	Maximum permissible oil temperature exceeded	Check the function of the oil cooler valve Reduce the ambient temperature, top up with oil Check and clean the filter mat.
"Oil cooler malfunction"	Auxiliary contact motor protection switch [F2]	Shutdown and fault message	F2 has triggered	Check the electrical supply to the oil cooler fan Check the oil cooler fan for short circuits Remove foreign bodies from the fan Check the setting of the motor protection switch.

Display text Display	Release contact / -switch	Effect	Cause	Remedy
„Oil pump fault“	auxiliary contact Motor protection switch [F3]	Shutdown and fault message	F3 has triggered	Electrical supply line to the Check oil pump Check oil pump for short circuit Clean suction connection of pump Check the setting value of the motor protection switch
“Ceiling vent. Mal-function”	Auxiliary contact for motor protection switch [F4.1]; [F4.2].	Shutdown and fault message	F4.1 and/or F4.2 has triggered	Checking the electrical supply to the cabinet fans Check outer fan guard for damage Check fan for short circuit
„Motor fan fault“	auxiliary contact Motor protection switch [F5]	Shutdown and fault message	F5 has triggered	Electrical supply to the Check forced cooling fan of the drive motor Check fan for short circuit Remove foreign objects from the valve gate Check the setting of the motor protection switch.
“Oil filter change”	[22] Differential pressure switch	Warning message in the display	Oil filter cartridge clogged	Renew cartridge
„Vacuum too high“ „Pressure too high“	[1] Pressure transducer	Shutdown and fault message	When the solenoid valve is open, the unit is switched off after the set overrun time.	Open the shut-off valve of the line or check the air filter (for vacuum operation).

Table 7.1: Fault messages

Other faults

Problem	Cause	Remedy
Unit in manual mode does not start	A fault message is present	-
Unit does not start in automatic/PLC mode	A fault message is present	Display messages
System pressure is not shown correctly in the display	Wiring or pressure transducer defective	Check wiring to pressure transducer

Table 7.2: Other disturbances

8 FAULTS AND FAULT CLEARANCE

The following chapters contain information on faults, errors and defects of the VADS 1500+ and their possible causes. It is essential to read the chapter Error! Reference source could not be found. „Safety“ must be observed.

In the event of malfunctions, faults and defects, the VADS 1500+ must be shut down immediately and secured against being switched on again. Correcting faults during operation or when the machine is switched on is strictly prohibited.

If a malfunction or fault occurs, the VADS 1500+ must be switched off and secured against an unexpected start-up.



DANGER

Danger to life due to unexpected start-up

The following steps must be followed when preparing for troubleshooting:

1. Switch off the VADS 1500+ and all attached assemblies.
2. Switch off the power supply and secure it against unintentional reconnection, or disconnect the drive from the supply voltage.

Work may only be carried out on the VADS 1500+ when it is in operation. The guards may only be deactivated and dismantled when the machine is at a standstill.

Before troubleshooting, check whether operating fluids have leaked out. If operating materials have leaked out, they must first be removed to avoid slipping during troubleshooting.



DANGER

Risk of slipping due to leaked coolants and lubricants or media

The following steps must be followed when preparing for troubleshooting:

1. Switch off the VADS 1500+ and all attached assemblies.
2. Switch off the power supply and secure it against unintentional reconnection, or disconnect the drive from the supply voltage.

If lubricants leak from the machine, the machine must be stopped immediately and secured against an unexpected start-up. The contaminated areas may only be entered with the utmost caution when the machine is at a standstill.

Small puddles of leaked coolants and lubricants must be removed independently using binding agents. The contaminated operating materials must be disposed of in accordance with the safety data sheet of the operating material.

After disposing of the leaked lubricants, cleaning the machine and rectifying the malfunction, remove all foreign bodies from the machine.

The machine may only be restarted when all leaked coolants and lubricants have been collected and there is no danger to persons.



DANGER

Danger due to defective, dismantled and manipulated protective devices

The VADS 1500+ may only be operated if all safety and protective devices are fully present and functional!

Faulty safety and protective equipment can lead to dangerous situations! For this reason:

1. Switch off the machine immediately,
2. secure against restarting and
3. Disconnect the electrical supply and media line from the machine.

8.1 DISTURBANCE TABLES

The following tables describe possible causes for malfunctions and the activities to eliminate them. In case of malfunctions that cannot be remedied by the following instructions, the manufacturer of the VADS 1500+ must be contacted.

The VADS 1500+ does not start.		
Error	Cause	Troubleshooting
Power supply not switched on	e.g. emergency stop activated, voltage not released, start conditions of the operator not met	Check controls and customer installation Check compliance with the start conditions for the respective operating mode See also Table 6.3
Supply voltage is not present	Faulty installation e.g. cable break, faulty connection	The machine must not be switched on until it has been checked by a qualified electrician.
Security body has triggered	e.g. fuse protection, motor circuit breaker, line protection	The machine must not be switched on until it has been checked by a qualified electrician. Replace defective cable Check the motor protection switch with the information on the rated current on the type plate and adjust the setting if necessary. If the adjustment is outside the range of the motor protection switch, a suitable motor protection switch must be installed. See table 6.2

Table 8.1: The VADS 1500+ does not start up

The electrical fuse has tripped	
Cause	Troubleshooting
Power consumption too high	The machine must not be switched on again until it has been checked by a qualified electrician.
Electrical supply line cross-section too small	The machine must not be switched on again until it has been checked by a qualified electrician.
Max. Backup fuse too small	The machine must not be switched on again until it has been checked by a qualified electrician.
Short circuit	The machine must not be switched on again until it has been checked by a qualified electrician.
Fault current	The machine must not be switched on again until it has been checked by a qualified electrician.

Table 8.2: The electrical fuse has tripped

The VADS 1500+ does not reach the required operating point	
Cause	Troubleshooting
Leakage at suction line	Check media lines for leaks and repair if necessary
Strainer in the intake manifold is clogged	The VADS 1500+ must be shut down safely or disconnected from the supply voltage by a qualified electrician. The sieve must be cleaned. Attention: If this measure only leads to a solution in a very short interval, the process-related interfaces must be considered and, if necessary, a cleaning of the VADS 1500+ must be carried out beforehand.
Media line blocked	The VADS 1500+ must be shut down safely or disconnected from the supply voltage by a qualified electrician. Check media line Remove foreign bodies from the media line.
Undersized service lines	If the discharge cross-section is too small, not enough volume can be evacuated or discharged. The cross-section must be corrected in consultation with the manufacturer.

Table 8.3: The VADS 1500+ does not reach the required operating point

Media supply interrupted	
Cause	Troubleshooting
Media line damaged	The machine must not be switched on again until it has been checked by a specialist. Replace the media line.
Media pressure too low	The machine must not be switched on again until it has been checked by a specialist.
Media temperature faulty	The machine must not be switched on again until it has been checked by a specialist.
Media connection incorrect	The machine must not be switched on again until it has been checked by a specialist.

Table 8.4: Media supply interrupted

The motor circuit breaker has tripped	
Cause	Troubleshooting
Power consumption too high	The machine must not be switched on again until it has been checked by a specialist.
Overheating of the motors	The machine must not be switched on again until it has been checked by a specialist. Allow the motors to cool down. Check forced cooling fan.

Table 8.5: The motor protection switch has tripped

The VADS 1500+ does not achieve the required performance and / or emits interference noise	
Cause	Troubleshooting
Incorrect installation of the motor (incomplete connection of the phases)	The motor installation must be checked by a qualified electrician and corrected if necessary.
The motor runs in the wrong direction of rotation if the VADS 1500+ does not suck in correctly and emits loud noise.	A qualified electrician must correct the application of the phases.
Foreign bodies sucked into the pump, stuck bearings or other components.	If several components have to be dismantled for the removal of foreign bodies, the Becker service must be notified. Likewise, only original spare parts may be used to replace damaged or worn components.
Insufficient oil level	The oil recommended by the manufacturer must be adjusted to the correct level (see oil sight glass).

Table 8.6: The VADS 1500+ does not achieve the required performance and / or emits interference noise

The VADS 1500+ gets unusually hot	
Cause	Troubleshooting
Fan damaged or closed	Heavy contamination can cause the fan to no longer rotate correctly and thus no longer cool the VADS 1500+ sufficiently. The VADS 1500+ must be shut down safely or disconnected from the supply voltage by a qualified electrician. The protective device „fan guard“ must be removed and the fan wheel cleaned of dirt or replaced if damaged.
Temperature of the evacuated gas is too high	The intake temperature of the gas to be evacuated has been limited by the manufacturer to 50° Celsius. This temperature limit must be observed.
Supply voltage too high	The supply voltage must be within the tolerated range indicated on the type plate. The VADS 1500+ must be shut down safely or disconnected from the supply voltage by a qualified electrician. The sieve must be cleaned. Attention: If this measure only leads to a solution in a very short interval, the process-related interfaces must be considered and, if necessary, a cleaning of the VADS 1500+ must be carried out beforehand.

Table 8.7: The VADS 1500+ gets unusually hot

9 MAINTENANCE, SERVICING AND DISMANTLING

9.1 MAINTENANCE AND MAINTENANCE

The VADS 1500+ is built according to the state of the art and the recognised safety rules. As a prerequisite for safe and proper operation, it is therefore essential that the machine is serviced and maintained at regular intervals by appropriately qualified personnel. In addition, regular servicing and maintenance increases availability and extends the service life of the VADS 1500+. The recommended service and maintenance intervals are listed in this chapter.

9.2 PREPARATIONS

The responsibilities of the personnel must be clearly defined at all times. The responsibilities for installation, operation, maintenance and cleaning must be clearly regulated and defined and recorded in the table in chapter 2.4.

For maintenance and servicing measures, it must be ensured that sufficient space is available for all work. The space for maintenance and servicing measures must be as free as possible from tripping and falling hazards. Possible tripping and falling hazards must be pointed out. The maintenance area must be secured.

The following steps must be followed when preparing for maintenance and servicing activities:

- 1. All motors must be individually isolated. Maintenance during operation or when the machine is switched on is strictly prohibited.
- 2. If safety devices have to be dismantled or modified for troubleshooting, they must be reattached, adjusted and tested immediately after completion of the maintenance and servicing activities and before starting the VADS 1500+.
- 3. According to this, a verifiably qualified electrician may carry out activities on the VADS 1500+, taking into account the 5 safety rules.

After completion of the activities, the VADS 1500+ may be put back into operation after a visual inspection.

9.3 MAINTENANCE INTERVALS

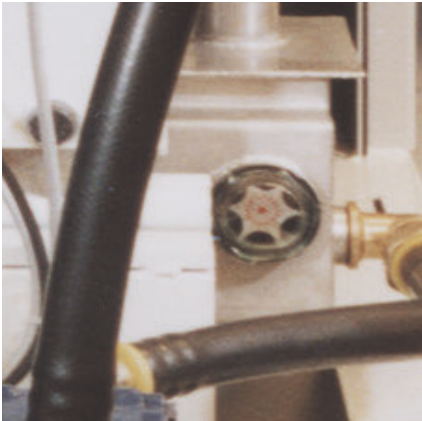
The following overview shows the maintenance intervals:

Component	Interval time			
	40h	40-200h	8000h (min. 1x/a)	
Intake filter		check clean (change, min 2x/a)		
Oil	Oil level check		change	
Oil filter			change	
Oil cooler		clean exterior		
Oil cooler (filter mat)			change	
Housing		clean		
Electrocell (filter mat)			change	

Table 9.1: Maintenance intervals

9.4 MAINTENANCE ACTIVITIES

The maintenance plan provides for the following activities:



Check oil level

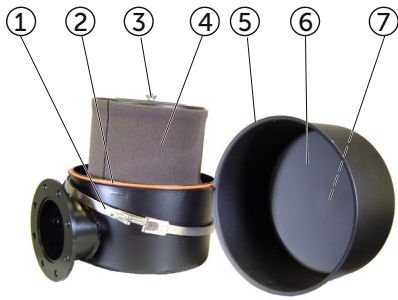
The oil level must be checked through the oil sight glass (chapter 4.3.2 - item 8). The oil level can only be realistically represented when the machine is at a standstill after an appropriate waiting time and should not drop below 2/3 of the sight glass.

The oil is responsible for the lubrication of the bearings. Therefore, the oil level must be checked and adjusted if necessary.

The following oil is recommended by Gebr:

Becker Lube G 70

Alternative oils according to ISO VG 68 can also be used in consultation with the manufacturer.



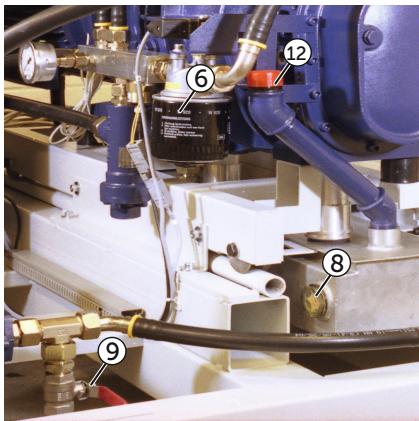
Clean air filter

The filter cartridge ④, part no. 709580, in the intake filter must be replaced if the pressure difference is too high. Otherwise, too high temperatures will be generated in the system. The contamination of the filter cartridge depends on the individual conditions. We recommend that you first check the degree of contamination of the filter cartridge every 14 days

Disassembly: Unscrew the knurled nut ⑦ on the filter cover ⑥ and loosen the clamping ring ① while holding the filter cover and pushing the clamping ring backwards. Lift off the filter cover towards the front. Unscrew the wing nut ③ of the filter cartridge, change the filter cartridge and fasten the wing nut again.

Assembly: Two persons are recommended. Press the filter cover onto the O-ring ② for an exact fit. Check the flanging ⑤ of the filter cover and filter housing for equal distances. Move the clamping ring again, align and tighten: Check the accuracy of fit. Check that the clamping ring is firmly seated.

When mounting the filter cover, make sure that it is firmly and securely closed. Otherwise, there could be a danger that the filter cover will burst off uncontrollably if the unit malfunctions. We recommend that the unit is not put into operation until the doors are locked.



Oil change

The oil must be changed at intervals of every 8000 operating hours or at least once a year.

Oil change:

1. Ensure that all requirements for maintenance operation have been met.
2. Placement of a container to collect the waste oil
3. Open the cover on the oil filler neck (pos. 12) to vent the oil.
4. Open the ball valve (pos. 9) and fill the waste oil into the container.
5. Close the ball valve again
6. Fill with new oil. Make sure that the max. filling level (upper edge in the oil sight glass, pos. 8) is not exceeded.
7. Close the cap on the oil filler neck
8. Proper disposal of the used oil in accordance with the national regulations for the disposal of hazardous goods.

Change oil filter

The oil filter (pos. 6) is changed at the same interval with every oil change.

9.5 MEDIA LINES

Lines, hoses, pipes, valves and connections must be checked for damage (leaks) at regular intervals.

It is essential to observe the following instructions when carrying out maintenance and servicing work on media lines:

- Damage to media lines must be repaired immediately. Under no circumstances may the VADS 1500+ be operated with defective media lines.
- Before starting work on media lines, all systems must be depressurised and secured against being switched on again. Residual energy must be dissipated or discharged. Residual liquids in media lines must be drained off.



WARNING

Risk of injury due to stored residual energies

The occurrence of mechanical, pneumatic and electrical residual energies on the machine after operating the unit to stop it in an emergency or after switching off the machine must be observed!

9.6 CONDITIONS FOR RECONNECTION

Before restarting after maintenance and servicing activities, the following points must be observed:

- Unauthorised persons are to be expelled from the machine.
- Check for proper connection between the machine and the media lines.
- The media lines must be checked for leaks and damage.
- The power supply must be checked for damage and proper functioning.
- All operating materials must have a proper fill level.
- All protective devices must be present, functional and tested.

9.7 TEMPORARY IMMOBILISATION

The following steps must be observed in the event of temporary decommissioning:

1. Shutdown via the operator
2. To switch off, the machine must be shut down and secured against being switched on again. In addition, a warning sign must be attached to the mains disconnection device.
3. All motors must be individually isolated. Maintenance during operation or when the machine is switched on is strictly prohibited.
4. Disconnection from the power supply
5. A qualified electrician must disconnect and isolate the motor. After following the 5 safety rules, non-qualified electricians may also carry out work on the VADS 1500+.

After completion of the activities, the activities under the point: „Recommissioning“ must be followed.

9.8 CLEANING

Bei der Reinigung der Maschine sind unbedingt alle SicherheitsNOTEE des Kap. 2 dieser Anleitung zu beachten.

Die gesamte Maschine ist in regelmäßigen Abständen abhängig vom Staubanfall zu reinigen. Hierzu gehört:

- Reinigen der aller Oberflächen der VADS 1500+ mit Druckluftpistole und befeuchtetem Reinigungstuch



NOTE

Eine falsch ausgeführte Reinigung und die Verwendung falscher Reinigungsmittel oder Reinigungsgeräte (z.B. Hochdruckreiniger) können zu Schäden an der VADS 1500+ führen.

Für Reinigungsmittel sind die Sicherheitsdatenblätter des Reinigungsmittelherstellers zu beachten.

Die Reinigungsanweisungen der Hersteller von Komponenten und Baugruppen sind zu beachten.

Die Verwendung von Lösungsmitteln oder Reinigungsmitteln die Lösungsmittel enthalten ist verboten.

Die Verwendung von Reinigungsmitteln, die leichtentzündlich oder generell entflammbar sind, sind verboten!

Die gesetzlichen Vorschriften des Umweltschutzes sind bei der Reinigung zu beachten. Dies gilt insbesondere bei der Entsorgung von Reinigungsbetriebsmitteln.

Vor Reinigungsarbeiten ist die VADS 1500+ auszuschalten und gegen einen unerwarteten Anlauf zu sichern. Der DANGERbereich der Maschine darf erst bei Stillstand betreten werden.

Vor der Reinigung ist zu prüfen, ob Flüssigkeiten ausgelaufen sind. Sind Flüssigkeiten ausgetreten, sind diese zunächst zu beseitigen, um ein Ausrutschen bei der weiteren Reinigung zu vermeiden.

**DANGER****RutschDANGER durch ausgetretene Schmierstoffe**

Treten Schmierstoffe an der Maschine aus, ist die Maschine unverzüglich stillzusetzen und gegen einen unerwarteten Anlauf zu sichern. Die kontaminierten Bereiche dürfen erst bei Stillstand der Maschine mit größter CAUTION betreten werden.

**NOTE**

Kleinere Lachen ausgetretener Kühl- und Schmierstoffe sind eigenständig mit Hilfe von Bindemitteln zu beseitigen. Bei großflächiger oder großvolumiger Kontamination inkl. des Abfließens von Flüssigkeiten außerhalb der Auffangwanne, ist die Maschine von Fachkräften zu Reinigen und zu Dekontaminieren.

Die kontaminierten Flüssigkeiten sind in Behältern zu entsorgen, da ein Abfluss aus Gründen des Umweltschutzes verboten ist.

Nach der Entsorgung der ausgetretenen Kühl- und Schmierstoffe, der Reinigung der Maschine und nach Behebung der Fehlfunktion sind alle Fremdkörper aus der Maschine zu entfernen.

Nach der Reinigung sind alle Fremdkörper aus der Maschine zu entfernen.

Das Wiedereinschalten der Maschine ist nur gestattet, wenn keine Beschädigungen an der Maschine vorhanden sind und keine Person einer DANGER ausgesetzt ist.

**DANGER****Danger to life due to unexpected start-up**

Folgende Schritte sind bei der Vorbereitung zur Störungsbeseitigung zwingend einzuhalten:

1. Die VADS 1500+ und alle angebauten Baugruppen ausschalten.
2. Die Stromversorgung ausschalten und gegen unbeabsichtigtes Wiedereinschalten sichern, oder den Antrieb von der Versorgungsspannung trennen.

**WARNING**

Danger due to high temperatures During operation, media and machine parts can reach high temperatures. Therefore, a sufficiently long time must be waited before manual intervention in the machine to avoid burns and scalds.

**NOTE**

All equipment cannot be disposed of in the environment or in the normal waste disposal system. All goods must be disposed of as such in accordance with local regulations.

9.9 DISMANTLING AND DECOMMISSIONING

In addition to the following steps for dismantling and decommissioning the machine, it is essential to observe the safety instructions in chapter 2 of this manual.

The following steps must be observed during dismantling and decommissioning:

1. Switch off the VADS 1500+ and isolate the drive.
2. Switch off the power supply and secure it against unintentional reconnection.
3. Disconnect the supply line of the drive.
4. Secure the media lines against reconnection.
5. Disconnect media lines from VADS 1500+.
6. Clean the machine thoroughly and remove operating materials and chemicals.
7. Disassemble the machine in reverse order of assembly or according to separate disassembly instructions. Loose parts must be secured to prevent them from tipping over or falling down.
8. Protect the machine from further contamination
9. Dispose of operating materials in accordance with the applicable local regulations.

**DANGER****Danger to life during electrical work!**

Electrical work may only be carried out by trained specialist personnel.

To perform tasks and activities on the electrical system of the installation, work must be carried out in accordance with the five safety regulations according to DIN VDE 0105:

1. Isolate
2. Secure against restarting
3. Determine freedom from voltage
4. Grounding and short-circuiting
5. Cover or fence off adjacent live parts

**DANGER****Danger to life due to electric shock**

There is an immediate danger to life in case of contact with live parts. Damage to the insulation or individual components can be life-threatening.

Therefore:

- If the insulation is damaged, switch off the power supply immediately and arrange for repairs.
- Only allow work on the electrical machine to be carried out by qualified electricians.
- Whenever working on the electrical machine, disconnect it from the power supply and check that it is not live.
- Before maintenance, cleaning and repair work, switch off the power supply and secure it against being switched on again.
- Do not bypass or disable fuses. When replacing fuses, observe the correct amperage.
- Keep moisture away from live parts. This can lead to a short circuit.

**DANGER****Danger to life due to arcing and creepage path formation when disconnecting plug connections.**

Always switch off the power supply before disconnecting any plug connections.

**DANGER****Danger of slipping due to leaked lubricants**

If lubricants leak from the machine, the machine must be stopped immediately and secured against an unexpected start-up. The contaminated areas may only be entered with the utmost caution when the machine is at a standstill.

Small puddles of leaked coolants and lubricants must be removed independently using binding agents.

In the event of large-area or large-volume contamination, including run-off of liquids outside the collection tray, the machine must be cleaned and decontaminated by qualified personnel.

The contaminated liquids must be disposed of in containers, as discharge is prohibited for environmental protection reasons.

After disposing of the leaked coolants and lubricants, cleaning the machine and rectifying the malfunction, remove all foreign bodies from the machine.

**WARNING****Risk of injury due to stored residual energies**

The occurrence of mechanical, pneumatic and electrical residual energies on the machine after operating the unit to stop it in an emergency or after switching off the machine must be observed!

**WARNING**

Danger due to high temperatures During operation, media and machine parts can reach high temperatures. Therefore, a sufficiently long time must be waited before manual intervention in the machine to avoid burns and scalds.

**NOTE**

All equipment cannot be disposed of in the environment or in the normal waste disposal system. All goods must be disposed of as such in accordance with local regulations.

9.10 STORAGE

The following requirements for the storage location must be observed during storage in order to store the unused machine in a proper condition for a longer period of time.

**NOTE**

If the following requirements are not observed, damage to the VADS 1500+ may occur during storage.

The storage location must be

- dry and clean;
- not be exposed to sudden changes in temperature and humidity;
- be protected from salt spray, industrial gases, corrosive liquids, rodents and fungal attack;
- have access protection to prevent unauthorised operation and theft;
- be in a roofed building.

If the compressor is to be taken out of service for a longer period of time, it must be protected against corrosion, especially if it is installed outside or in cool rooms.

The method of corrosion protection depends on the climatic conditions at the installation site and the duration of decommissioning or storage.

Duration of decommissioning	Measures
up to one month	No special precautions need to be taken. The oil film in the rolling bearings and gearbox can be maintained by running the compressor for 10 minutes per week.
longer than one month	Drain all lubricating oil completely and add anti-corrosion oil. Running the compressor for a short period of 5 to 10 minutes will build up a protective film in the bearings and gearbox.
longer than 6 months	If the compressor unit is to be shut down for a longer period of time and the compressor module remains in the unit during the shutdown period, we recommend an additional short-term operation of approx. 10 minutes at low frequency every 4-6 weeks. This causes a renewed wetting of the internal components with the corrosion protection oil, which refreshes the (internal) corrosion protection. Of course, in this case too, storage should take place in a suitable environment (see above). All surfaces that have not been preserved must be provided with corrosion protection. Turning by hand during the storage period is not necessary. The compression chamber is corrosion-resistant due to the coating of the rotor pair and rotor housing and does not need to be specially protected.

9.11 DISPOSAL

When disposing of the machine, pay attention to environmental protection and the relevant local statutory environmental regulations.

Operating materials and chemicals must be taken to a designated collection point. Water contaminated with operating materials must not enter the groundwater and must be disposed of in accordance with the operating materials.

All water-polluting substances must be stored and disposed of in watertight containers. The safety data sheets for operating materials and chemicals must be observed.

Components and assemblies must be separated and disposed of according to the type of waste. The local legal regulations must be observed.



CAUTION

Contamination and damage to the environment by operating materials

The operating materials used for the proper functioning of the VADS 1500+ and water contaminated with these operating materials can pose a danger to the environment.

Suitable absorbents must always be kept on hand to ensure rapid absorption of spills and contaminated water.

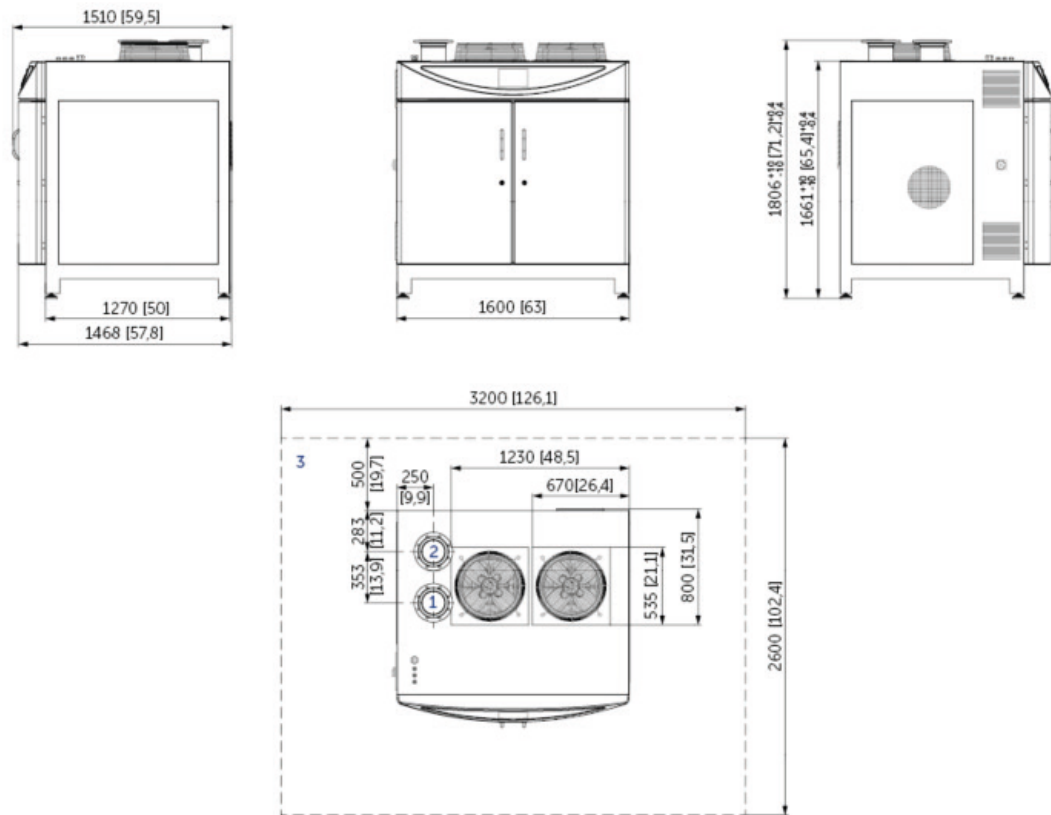
Used absorbents must always be disposed of according to the prescribed procedures.

All environmental protection regulations must always be observed when handling and disposing of operating materials.

Operating materials and contaminated water must be disposed of in accordance with the environmental protection conditions applicable on site.

10 PRODUCT DATASHEET

10.1 PRODUCT OVERVIEW



10.2 OPERATING PARAMETERS

Vacuum pump	VADS 1500+	Compressor	VADS 1500+
Pumping speed	750 – 1380 m ³ /h	Delivery quantity	550 – 1230 m ³ /h
Weight	approx. 1200 kg	Weight	approx. 1200 kg
Maximum intake pressure	200 mbar abs.	Maximum intake pressure	1000 mbar abs.
Minimum intake temperature	5 °C	Minimum intake temperature	5 °C
Operating vacuum (continuous operation)	min. 200 mbar abs.	Operating pressure (continuous operation)	max. 2 bar abs.
Maximum installation height	1000 m above sea level	Maximum installation height	1000 m above sea level



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