

# User manual

BA series



**Product and dealer information**

**Note**

For the specifications of the pump, drive and enclosure, refer to the corresponding type plates.

Delivery date : \_\_\_\_\_

**Product information**

Model : \_\_\_\_\_

Identification number : \_\_\_\_\_

Motor serial number : \_\_\_\_\_

Trailer serial number (optional) : \_\_\_\_\_

Customer's product number : \_\_\_\_\_

**Dealer information**

Name : \_\_\_\_\_

Address : \_\_\_\_\_

City : \_\_\_\_\_

Country : \_\_\_\_\_

	Dealer contact	Telephone number	Email
Sales	:	_____	_____
Parts	:	_____	_____
Service	:	_____	_____

## Pumps BA serie

This user manual is for the BA series of pumps. The original version was written in Dutch by BBA Pompen en Buizen BV.

The BA series pumps are manufactured by:  
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Hereafter, the manufacturer will simply be referred to as BBA Pumps.

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The original manual was written in Dutch. Versions in other languages are translations of the original instructions. A translation may contain information that differs from the original due to interpretation of the content and meaning of the original text.

In the case of such discrepancies, the original Dutch-language instructions will be considered the sole authentic source for the purpose of determining the content and meaning of the text.

This manual reflects the state of the art in technology at the time of publication.

BBA Pumps reserves the right to make interim changes in both technical and execution specifications without prior notice.

BBA Pumps cannot be held responsible for accidents and/or damage that results from failure to follow the guidelines and instructions in this user manual.

Publication date: 2401

EN manual: 97000101001

Version no.: 02

### Preface

This user manual contains information for the installation, use and user maintenance of pumps from the BA series. The information in this manual must therefore be strictly followed. Read and understand the manual completely before installing and commissioning the pump.

Contact BBA Pumps if you have any questions or anything is unclear.

BBA Pumps can never be held responsible for accidents and/or damage resulting from failure to follow the instructions in these manuals.

Keep this manual with the pump. You can order an extra copy of the manual from BBA Pumps.

This manual is part of the pump. If it is transferred to another user, this manual must accompany it. Depending on the drive motor used, these operating instructions may be enclosed with the respective drive motor, or they can be found at [www.bbapumps.com](http://www.bbapumps.com). Read the supplied manual carefully and follow the procedures and safety instructions.

### Version and application

The BA series consists of different types of pumps and various versions. The pump is available as a separate component or as a complete installation. The complete pump set can be driven by an electric motor, diesel engine or hydraulic motor. They are mounted in an open frame, half-closed frame or silenced enclosure. From this point forward we simply refer to an enclosure. For movement of the pump set, the pump frame can be equipped with wheels and a tow bar.

#### Note

**Because the BA series of pumps consists of a number of different types and versions, the illustrations in this manual may not match the actual situation.**

## Definition of terms

### Management

The management with authority over the person who is currently using the pump set.

### LMRA

LMRA stands for Last Minute Risk Analysis. It is a brief assessment of the risks of the work to be carried out. Performing an LMRA before starting the work increases safety awareness of all the hazards and risks.

### Pump set

Pump with drive, in all the different versions. Diesel engine driven pump, electric motor driven pump, power pack and submersible pump.

### Work area

Area comprising the space required for placing, connecting, operating, servicing (maintenance and repair), disconnecting and removing the pump set.

### Public road

By public road, we mean all publicly accessible locations. Roads and sites free for use by everyone at all conceivable times.

### NPSH (Net Positive Suction Head)

This is a term related to the intake conditions of a pump and is expressed in metres water column. We distinguish between:

- Net Positive Suction Head Available (NPSHa) – this is the pressure available at the suction flange of the pump and is determined by the system in which the pump is installed.
- Net Positive Suction Head Required (NPSHr) – this is the pressure required by the pump at the suction flange to operate without cavitation, which we determine by reading the pump curves.

### Best Efficiency Point

BEP stands for Best Efficiency Point. This is a point or operating range on the pump curve with the highest pump efficiency. At the BEP the pump set operates optimally with minimal internal turbulence and/or flow losses. Select the operating point of the pump to be as close as possible to BEP to keep energy consumption and maintenance costs low.

### Cavitation

Cavitation is a phenomenon in which vapour bubbles form in a liquid due to negative pressure and then implode when the pressure increases again. Cavitation in pumps causes not only the rattling sound but also considerable damage to the pump.

### **Water hammer**

Water hammer is a pressure wave that occurs when liquid flows through a pipe and there is a sudden change in the liquid's velocity. This results in pressure changes that can lead to damage to the pump or piping system.

### **Autostart**

Autostart is a level control system via which the pump set automatically starts up when the liquid level rises and shuts down again when the liquid level has fallen. Depending on the application, the automatic level control is regulated by float switches or a pressure sensor in the liquid flow.

### **Original parts**

Original parts are parts that have been developed, manufactured and supplied by BBA Pumps (or one of our selected suppliers). Original parts meet the highest quality standards and correspond exactly to the parts used during manufacture of the pump set.

### **IP protection class**

The IP code, or 'ingress protection code', is used for electrical components to indicate the degree of protection provided by the device or enclosure against the entry of moisture, water and dust.

### **ATEX**

The term ATEX covers all situations where there is a risk of gas and dust explosions. The abbreviation comes from the French words ATmosphères EXplosibles, from the European directives on explosion protection. Working with explosive substances and gases entails great risks.

### **HPU**

HPU is the abbreviation for Hydraulic Power Unit. An HPU is a BBA Pumps power pack for powering hydraulically driven BA submersible pumps and is part of a complete delivery.

### **MSDS**

MSDS is the abbreviation for Material Safety Data Sheet. An MSDS is a safety data sheet that contains important information about a hazardous substance and recommendations for handling it safely.

### **Motor Stop Assistant (MSA)**

Optionally, the pump set can be equipped with Motor Stop Assistant. Hereinafter, we will use the abbreviation MSA. This is an additional emergency stop provision that allows remote shutdown of the pump set via a central system. Before use, read the procedures concerning the MSA and the 'Shutting down and restarting' section in this manual.

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# 1 Description, operating principle and application

## 1.1 Description

The BA series of pumps have a large solids handling capacity and good wear resistance and are therefore suitable for pumping both clean and partially polluted liquids.

The pumps are fitted with any of several types of impeller in combination with a wear plate or wear ring that can be replaced quickly.

To clean the pump internally, large cleaning covers have been fitted.

The design of the pump shaft seal is dependent on the application. The pump shaft seal is oil cooled as standard.

The specifications of the standard pump sets can be found on our website, at [www.bbapumps.com](http://www.bbapumps.com). Always check that the pump set is suitable for the job before connecting the pump set.

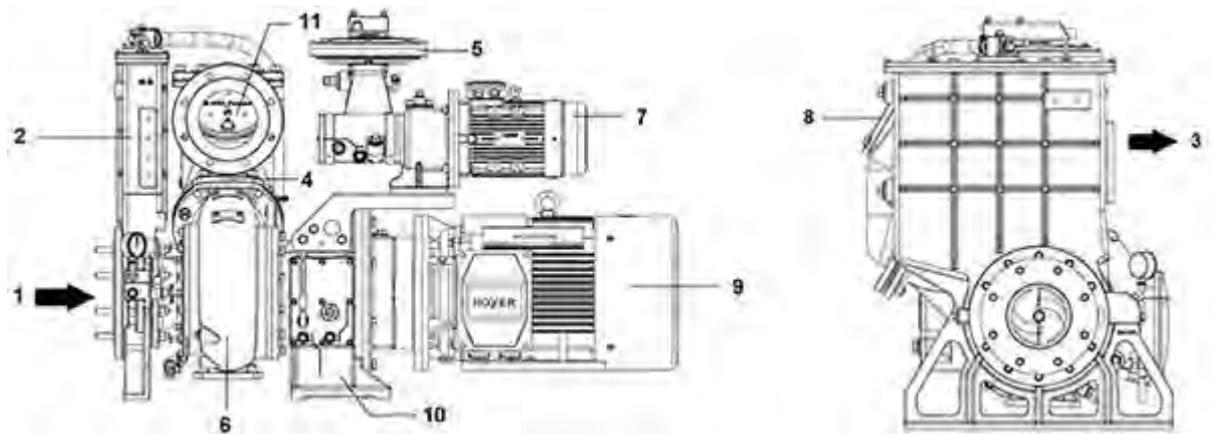
### Note

The user is responsible for checking whether the materials present in the pump and fittings are suitable for the liquid to be pumped.

## 1.2 Construction and working principle of the pump

### Construction

The pump consists of the following main components:



- |                   |                      |
|-------------------|----------------------|
| 1. Suction side   | 7. Pump housing      |
| 2. Float chamber  | 8. Vacuum pump drive |
| 3. Delivery side  | 9. Electric motor    |
| 4. Cleaning cover | 10. Standard block   |
| 5. Vacuum pump    | 11. Non-return valve |
| 6. Driveshaft     |                      |

### Working principle of the vacuum system

The BA vacuum-assisted ('dry prime') centrifugal pump differs from the standard self-priming ('wet prime') centrifugal pump in that it includes a separate vacuum pump. The vacuum pump is belt driven by the driveshaft. In some cases the vacuum pump is driven by a separate electric or hydraulic drive. The vacuum pump draws the air out of the suction line and pump housing via a float chamber. A non-return valve is fitted on the delivery side of the pump to ensure that vacuum is drawn in the suction line

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and pump housing. Once sufficient vacuum has developed, the pump housing fills itself with liquid and the pump begins moving the liquid.

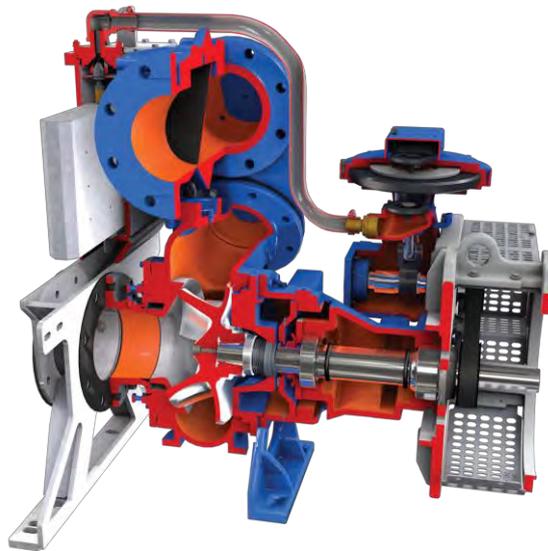


### **WARNING**

**To avoid damage to the pump, heating up of the pump and generation of sparks, the pump must never run without liquid for more than five minutes.**

The designation 'dry prime centrifugal pump' indicates that the pump housing does not need to be filled before the pump is started.

The drawing below is an exploded-view of a BA dry prime centrifugal pump.



### 1.3 Construction and operation of the submersible pump with hydraulic drive

For technical data for the submersible pump with hydraulic drive, see the specification sheets.

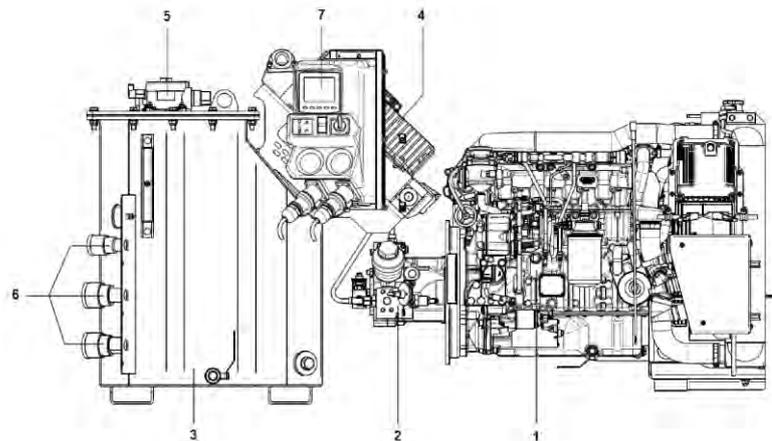
The oil tanks and their cooling systems are designed for high ambient temperatures, to facilitate operation at the optimum oil temperature and corresponding viscosity at all times.

The following hydraulic functions are monitored electronically: oil level/temperature and oil filter contamination indicators.

If faults occur in the system, specific fault codes are generated and displayed on the control panel as described in chapter 'Troubleshooting table – BA series hydraulic power packs with submersible pump'.

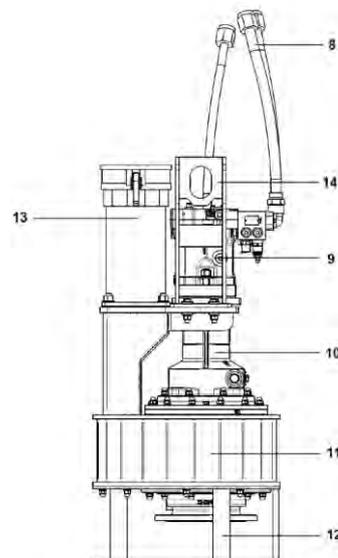
The hydraulic power pack consists of the following main components:

12. Diesel engine
13. Hydraulic axial piston pump
14. Hydraulic tank
15. Cooling unit
16. Filters
17. Hydraulic quick couplings
18. LC control panel



The hydraulic submersible pump consists of the following main components:

19. Hydraulic quick couplings
20. Hydraulic axial piston motor
21. Drive housing
22. Pump housing
23. Suction strainer
24. Delivery connection
25. Lifting lug



The hydraulic submersible pump consists of the following main components:

### 1.4 Intended use

- The BA series pump is suitable for pumping viscous liquids with a viscosity of up to 50 mm<sup>2</sup>/s (cSt). For a higher value contact BBA Pumps.
- For pumps from the BA series, the maximum permissible ambient temperature depends on several factors, such as the type of drive, construction and selected operating point:
  1. Silenced pump sets with an air-cooled diesel engine – maximum 35 °C (95 °F).
  2. Silenced pump sets with a liquid-cooled diesel engine – maximum 48 °C (118 °F).
  3. Electric drive pump sets – maximum 40 °C (104 °F).
- For a dry prime pump with a plastic float element in the vacuum system, the maximum temperature of the pumped liquid is 45 °C (113 °F). Some BA models come with a stainless steel float that allows the maximum permissible fluid temperature to be 70 °C (158 °F).
- BA manure pumps are suitable for pumping thin manure. If the manure is too thick to pump, mix it with water. Avoid foaming and gassing of the manure during pumping. Preferably, use a filling pump to fill the BA manure pump during the pumping process.
- The maximum pre-pressure for a dry prime pump is 2 mWc. Place a shut-off valve in the hose between the float chamber and vacuum pump to shut off the supply at pre-pressure.
- The hydraulic power pack is designed and built to hydraulically drive BBA Pumps submersible pumps. Any other use or use beyond that described is considered improper and is expressly prohibited.

For more detailed information, see the pump specification sheet. It can be found at [www.bbapumps.com](http://www.bbapumps.com).

#### Note

**The BA series is not designed for food processing, but can be used for such applications if they are not subject to any special hygiene standards.**

**The materials used in the selected pump version must in all cases be checked in advance for their suitability for the concerned foodstuff.**

### 1.5 Unintended use

- It is not permitted to use the pump set for pumping flammable and/or explosive substances.
- It is not permitted to deploy a standard pump set in an environment in which there is a danger of fire and/or explosion.
- It is not permitted to deploy a standard pump set in an ATEX environment.
- Use the pump set only for those applications listed on the specification sheet for the pump set.
- It is not permitted to use the pump set for any application and/or field of activity other than that for which the pump set was originally specified and installed without written permission from BBA Pumps.



#### WARNING

**BBA Pumps is not responsible for incorrect use and/or application of the pump set or use of a type of drive that is not compliant with local legislation and regulations.**



**WARNING**

The use of a defective pump set is dangerous and strictly forbidden.

## 1.6 Warranty

See the BBA warranty book for the warranty conditions. It can be found at [www.bbapumps.com](http://www.bbapumps.com).

## 2 Data

### 2.1 Specification sheets

For a detailed overview of the data, sizes and weights, see the specification sheet for the pump set concerned, at [www.bbapumps.com](http://www.bbapumps.com).

### 2.2 Explanation of type code

General abbreviations for BBA Pumps

#### Type

BA	BA pump series, dry prime centrifugal pump
BA-C	BA-C series, dry prime centrifugal pump
BA... E..	BA pump with E impeller, suitable for polluted water
BA... K or KS..	BA pump with K or KS impeller, suitable for sewage water
BA... H..	BA pump with high-pressure impeller, suitable for slightly polluted water
BA... G...	BA pump with G impeller, suitable for slightly polluted surface water
BA...SUB	BA pump series, hydraulically driven submersible pump
BA-C... H..	BA-C pump with high-pressure impeller, suitable for slightly polluted water
BA-C... S..	BA-C pump with S impeller, suitable for polluted water
BA... D..	D in combination with number indicates impeller diameter
BA... D.. SM	SM after D with number indicates throttle plate

#### Construction

...MC...	Electrically driven
...NMC...	Electric drive via push-on shaft
...NMD...	Hydraulic drive via push-on shaft with splines
...BF...	Beam foundation
...TF...	Tank frame
...GL...	Silenced

#### Drive

...PE...	Perkins
...HA...	Hatz
...VO...	Volvo Penta
...CA...	Caterpillar
...JD...	John Deere
...HPU...	Hydraulic Power Unit

## 2.3 Noise level – 10 m

Because the pump, with or without the drive unit, is usually part of a complete installation, the final configuration is usually not known at the time of delivery. The noise level also depends in part on the noise production of the other components in the installation.

BBA Pumps conducts random noise measurements on a complete installation. The average of the measured values is less than 80 dB(A).

These measurements do not take the drive system or piping into consideration. It is assumed, however, that the pump is set up/installed in accordance with the instructions and is operating without cavitation.

### Correction in dB(A) as a function of the distance from the sound source

Distance (metric)	Distance (imperial)	Correction
metres	feet	dB(A)
1	3.3	8.0
5	16.5	23.0
10	33	29.0
15	49.5	31.5
20	66	35.0

### LWA value -/- correction = dB(A)

Example:

Measured LWA value	76 dB(A)
Distance	10 m (33 ft)
Correction	29 dB(A)
Noise level	47 dB(A)

Hearing protection must be worn if the noise emission level exceeds 85 dB(A).

## 2.4 Applied directives and standards

The pumps from the BA series are affixed with the CE marking. This means that these pumps conform to the applicable European directives on health and safety. The applied directives are listed in the EC Declaration of Conformity.

## 3 Warnings and safety instructions

### 3.1 Warning and safety symbols

This manual contains warning and safety symbols. Do not ignore the instructions. They are provided for the benefit of your health and safety and to prevent damage to the environment and the pump set.



#### **DANGER**

**When the danger symbol with the text DANGER is shown, it is accompanied by information that is of great importance for the safety of everyone concerned. Ignoring the information can result in injury (possibly severe) or even death.**



#### **WARNING**

**When the warning symbol with the text WARNING is shown, it is accompanied by information that is of great importance for everyone concerned with the pump set.**

**Ignoring the information can result in injury or (possibly severe) damage to the pump set.**

### 3.2 Safety instructions – general

The pump set conforms to the European Machinery Directive. Read and understand the user manual before use. Follow all safety instructions in the user manual.

Check all safety provisions before use of the pump set.

Use of the pump for an application and/or deployment of the pump in an environment other than defined at the time of purchase is strictly prohibited and can result in a hazardous situation. This is particularly true for corrosive, toxic or other hazardous liquids.

The pump set may only be installed, operated and maintained by people who have received appropriate training and are aware of the associated dangers. No one may be in the work area of the pump, with the exception of operating and maintenance personnel.

It is not permitted to make changes to the pump set without written permission from BBA Pumps. If any changes are made to the pump without the written permission of BBA Pumps, BBA Pumps disclaims all liability.

Hearing protection must be worn if the noise emission level exceeds 85 dB(A).

If the pump set is equipped with a trailer, always check whether it is authorised for use on public roads or intended for off-road use only. Always check the local safety instructions and trailer-related regulations.



#### **DANGER**

**Modifications to machine parts or the control program may pose a danger to the user.**



#### **DANGER**

**In the event of a fault, switch off the pump set immediately and secure it against restart – even by third parties. Report faults to your organisation's management and resolve them immediately.**

### 3.2.1 Additional safety instructions for transport, installation and operation

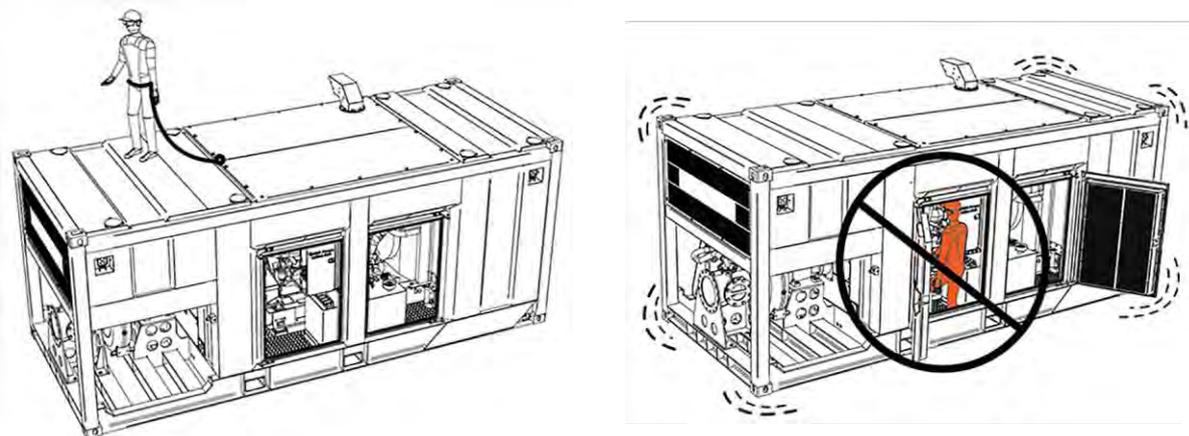
The installation, operating and maintenance personnel must comply with the locally applicable safety instructions. The management is responsible for ensuring that all work is performed safely and by qualified personnel.

The following safety instructions must always, but not exclusively, be observed:

- Wear closed protective work clothing, such as fire-retardant overalls.
- Wear hearing protection, safety shoes and safety glasses. See also the chapters on safety instructions.
- Wear work gloves when connecting and disconnecting pipes/hoses.
- Pay attention to protruding parts.
- Never stand on the pump; use a ladder with a valid inspection sticker.

#### Entering engine compartment

If you are on the roof of a mobile pump set where there is a risk of injury in case of an accident or fall, take all possible precautions, such as tethering or other fall protection measures. When a mobile pump set is running, entering the enclosure or the engine compartment is prohibited.



#### Transport

- The pump set must be transported using suitable equipment, by trained personnel. Safety shoes and work gloves must be worn during transport.
- The pump set must be transported using suitable equipment, such as a crane and forklift, by appropriately trained personnel.
- Both the crane and the forklift to be used must have a current inspection sticker.
- The lifting equipment to be used must have a current inspection/approval, and each must have adequate lifting capacity to independently lift the entire load.
- The crane operator must be in possession of a current crane safety certificate.
- The forklift operator must be in possession of a current forklift safety certificate.
- During placement of the pump set, no people may be in the work area of the pump set.

### Installation

- Use the pump set only on a flat, firm surface that can bear at least twice the weight of the pump set.
- Before starting the pump, connect an earth wire from the enclosure/frame of the pump and motor to earth via an earthing rod. See also chapter 'General connection information'.
- Cover exposed electrical cables before starting the pump.
- The pump set must not be exposed to chemicals, vibration or other conditions that may affect its operation and safety.
- The pump set must not be used in explosive or flammable atmospheres.
- Access to the pump doors must be unimpeded.
- Secure the doors against being blown shut during operation, maintenance and repair.



#### **WARNING**

**Use certified lifting equipment with an adequate lifting capacity and always lift from directly above. Lifting from an angle can lead to dangerous situations. Lifting work may only be performed by appropriately authorised personnel. Because many different versions of the pump set are available, only general instructions are provided. For the weight and dimensions, see the specification sheet for the pump set concerned, at [www.bbapumps.com](http://www.bbapumps.com).**

### Operation

- Close and lock the doors after starting the pump.
- Prior to work with the pump set, cordon off the work area of the pump set with red and white tape, chains or fences with signs labelled: 'Unauthorised entry prohibited'.
- The work area around the pump set must be tidy and provide adequate space for the user to perform maintenance and repairs.
- Ensure that there is adequate lighting at the pump set.
- Install the prescribed safeguard(s) in the correct manner.

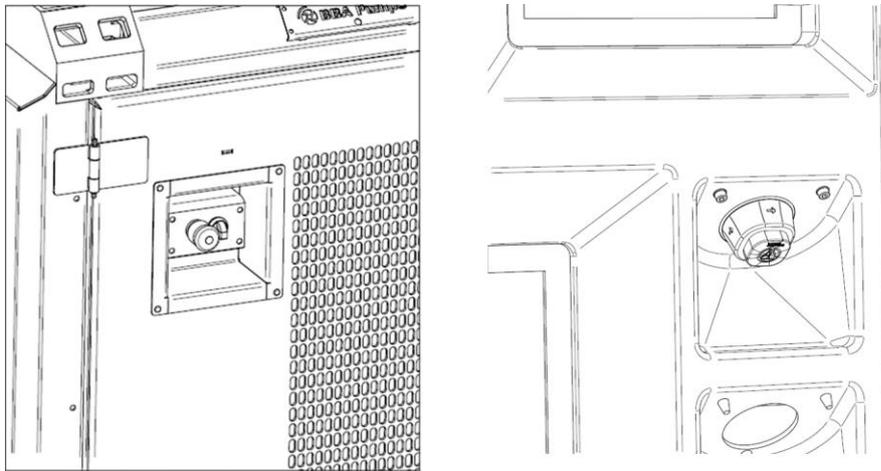


#### **DANGER**

**Failure to heed the safety instructions above can lead to (possibly severe) injury or even death.**

### 3.2.2 Emergency stop and/or main switch for emergency shutdown

In conformance with applicable laws and regulations, all BBA Pumps pump sets are equipped with a main switch and/or emergency stop, which allows the installation to be immediately and completely switched off in the event of an emergency.



#### WARNING

Use the emergency stop, or sudden switch-off via the main switch, only in the event of imminent danger. The emergency stop should be activated to avert actual or imminent dangerous situations. In this way, the risks of dangerous situations can be minimised.

Sudden shutdown of the system can cause serious damage.

BBA Pumps is in no way liable for damage caused by use of the emergency stop or incorrect shutdown of the pump set with the main switch.



#### WARNING

Take the necessary precautions during setup and operation of the pump installation to prevent inappropriate operation of the emergency stop or main switch, or operation by unauthorised people.



#### WARNING

There may not be any obstacles in front of the emergency stop.

### 3.2.3 Deactivating emergency stop

#### Deactivating the emergency stop on a pump set with diesel engine drive:

1. After the emergency stop is activated, the engine switches off and the pump stops.
2. **Note:** It is forbidden to deactivate (pull out) the emergency stop immediately after activating it.
3. First the control switch must be set to 0.
4. Then determine why the emergency stop was pressed.
5. Next, take measures to rectify the unsafe situation and make the pump set safe again.
6. Then determine whether the pump set, and the area around the pump set, are completely safe again so that the pump set can be safely started.
7. After that, the emergency stop may be pulled out.
8. Then the control switch can be set to 1 so that the motor and pump of the pump set start running again.

#### Deactivating the emergency stop on a pump set with electric drive and variable-frequency drive:

1. After the emergency stop is activated, the red fault lamp comes on.
2. **Note:** It is forbidden to deactivate (pull out) the emergency stop immediately after activating it.
3. First the control switch must be set to 0.
4. Then determine why the emergency stop was pressed.
5. Next, take measures to rectify the unsafe situation and make the pump set safe again.
6. Then determine whether the pump set, and the area around the pump set, are completely safe again so that the pump set can be safely started.
7. After that, the emergency stop may be pulled out.
8. Then the blue reset button must be pressed.
9. The red fault lamp now goes out.
10. Then the control switch can be set to 1 so that the motor and pump of the pump unit start running again.

#### Deactivating the emergency stop on a pump set with electric drive and with star-delta starter or soft starter:

1. After the emergency stop is activated, the main switch automatically goes directly to the TRIP position and the red fault lamp comes on.
2. **Note:** It is forbidden to deactivate (pull out) the emergency stop immediately after activating it.
3. First the control switch must be set to 0.
4. Then determine why the emergency stop was pressed.
5. Next, take measures to rectify the unsafe situation and make the pump set safe again.
6. Then determine whether the pump set, and the area around the pump set, are completely safe again so that the pump set can be safely started.
7. After that, the emergency stop may be pulled out.
8. After this, turn the main switch to the OFF position.
9. Then the blue reset button must be pressed.
10. The red fault lamp now goes out.
11. Then turn the main switch to the ON position.
12. Then the control switch can be set to 1 so that the motor and pump of the pump unit start running again.

**DANGER**

If the pump set is equipped with a remote emergency stop device (Motor Stop Assistant), follow all the steps and procedures as described in this manual. Also read 'Shutting down and restarting' section, and always contact the management first.

### 3.2.4 Motor Stop Assistant (MSA)

At a location where an MSA may be in use, the user of the pump set must report to the operator of the central MSA system before starting work on the pump set.

The user must provide the following to the operator of the central MSA system:

- Their name
- Their mobile phone number
- Their position
- The name of the company they work for
- What work they will carry out on the pump set, indicating an estimated duration of the total work

The user then asks for the phone number where the operator of the central MSA system can be reached.

If the emergency stop of the pump set is activated remotely via a central system, the person activating this emergency stop remotely must be aware that there is a time delay on the emergency stop of the pump set. This must then be reported to the operator responsible for activation of the central MSA system.

If the emergency stop of the pump set is activated remotely via a central system, an acoustic signal, mounted on the pump set, is immediately audible at more than 100 dB(A). Everyone around the pump set should immediately move a safe distance away from the work area of the pump set.

#### Deactivating the MSA:

1. After the MSA is activated, the pump set shuts down.
2. Note: It is forbidden to deactivate the MSA again immediately after activating it.
3. Immediately contact the operator of the central MSA system and ask why the MSA was activated centrally.
4. If the reason was a problem in the vicinity of the pump set, take measures to eliminate the unsafe situation and make the pump set safe again.
5. Then determine whether the pump set, and the area around the pump set, are completely safe again so that the pump unit can be safely started.
6. Contact the operator of the central MSA system and ask if the pump set can be restarted.
7. If not, notify the operator of the central MSA system to report to the user as soon as the pump set can be restarted.
8. If so, see the 'Preparation and steps for starting the pump set' section.

### 3.3 General safety instructions – pump

Do not exceed the limit values of the pump curves. See the specification sheet for the pump concerned, at [www.bbapumps.com](http://www.bbapumps.com).

Ensure that hot/cold and rotating parts of the pump are shielded adequately, to prevent unintentional contact.

It is not permitted to start the pump set if such guards are missing or damaged.

The company management must ensure that everyone who works with/on the pump set is aware of the type of liquid that is being pumped. It must be clear what measures are to be taken in the event of leakage.

Dispose of any liquids that have leaked, in a responsible manner. Observe local regulations.

If pumping liquids with a temperature of 45 °C (113 °F) or higher, the hot surfaces of the pump and piping must be shielded. Apply 'hot surface' warning symbols.

If volatile and/or hazardous liquids are being pumped, the hazards of these substances must be taken into consideration when performing work on the pump set. Make use of personal protective equipment and provide sufficient ventilation.

Never allow the pump set to run with a blocked delivery line. The heat build-up could lead to an explosion.

When connecting the cables, quick couplings and parts, make sure no fingers or hands get in between.

### 3.4 Safety instructions – diesel drive pump set

- Never run the engine in an enclosed space.
- Provide a proper gas-tight discharge for exhaust gases.
- Provide sufficient ventilation.
- Never fill the fuel tank or urea (AdBlue ®) tank while the engine is running.
- Wear hearing protection while in the vicinity of a running engine.
- Do not disconnect fuel or injector lines while the engine is running.
- Follow the instructions for the aftertreatment system in the separate LC40/LC45 manual.



#### **DANGER**

**Exhaust gases contain carbon monoxide. Carbon monoxide is a colourless, odourless and deadly gas which, when inhaled, prevents the body from absorbing oxygen, resulting in asphyxiation. Severe carbon monoxide poisoning can result in brain damage or death.**



#### **DANGER**

**During diesel particulate filter (DPF) regeneration on modern diesel engines, the exhaust temperature increases further. Therefore, strictly follow the instructions in the separate LC40/LC45 operating manual. This operating manual can be downloaded from [www.bbapumps.com](http://www.bbapumps.com).**

### 3.5 Safety instructions – electric drive pump set

The electrical installation must be compliant with the applicable national and local regulations and guidelines for working safely with electricity from the respective authorities and the local electricity grid operator in the country where the pump set is used.

The electrical system to which the pump set is connected must be equipped with a reliable safety circuit and cabling. The safety circuit and cabling must be compliant with local government regulations and the specifications established by the electricity grid operator.

If the electrical system is deficient in any way, the pump set may not be started. Do not exceed the ratings of the electric motor in terms of insulation class and protection class.

In the case of an electric motor not supplied by BBA Pumps, follow the installation guidelines provided with the motor.

Before connecting an electric motor to the mains, consult the applicable local regulations of the power supplier and the EN 60204-1 standard.

The electrical system must be equipped with protective measures, to ensure that the user can work with the installation safely at all times.

Work may only be performed on the installation when it is completely de-energised. The installation must be protected against inadvertent starting.



#### **DANGER**

**Electrical devices, connection terminals and parts of control systems can be at mains voltage even during standstill. Contact can result in death, severe bodily injury or irreparable material damage.**



#### **WARNING**

**It is the management's responsibility to ensure that the pump set safety measures (such as protection against excessive power consumption) and the resulting actions (such as shutdown of the pump) are included in the safety circuit.**

#### **Note**

**Check the voltage and frequency beforehand. These must correspond to the data on the type plate of the motor**

### 3.6 Safety instructions – hydraulic drive pump set

The hydraulic power pack is constructed in accordance with the latest technical requirements and applicable safety instructions. It is equipped with safety provisions and is subjected to internal safety tests.

The hydraulic power pack may only be used in a technically flawless state, as intended, and with awareness of safety and possible dangers in accordance with this manual.

Repair any faults that may affect safety immediately.

#### High-pressure hazards

Precautions to be taken when working with equipment that can generate high pressure:



**DANGER**

Be aware that the hydraulic system is under high pressure during operation. Also take these high pressures into account during maintenance work.



**DANGER**

Even after stopping the machine, the hydraulic system may still contain high pressure.



**DANGER**

Beware of high hydraulic pressures. Near hydraulic pipes and connections there is a risk of leaks and injury from hydraulic injection.



**DANGER**

Take care when sealing leaks while the system is still under pressure. Pressurised oil, water or air can penetrate the skin and cause injury or infection.



**DANGER**

Hydraulic oil is toxic. Always wear safety glasses and gloves.



**DANGER**

Work on the hydraulic equipment may only be carried out by adequately trained specialist personnel.



**DANGER**

Defective pressure lines and connections can cause serious injury.

**DANGER**

With unprofessional installation there is a risk of injury from the force of bursting hydraulic hoses and pipes.

**DANGER**

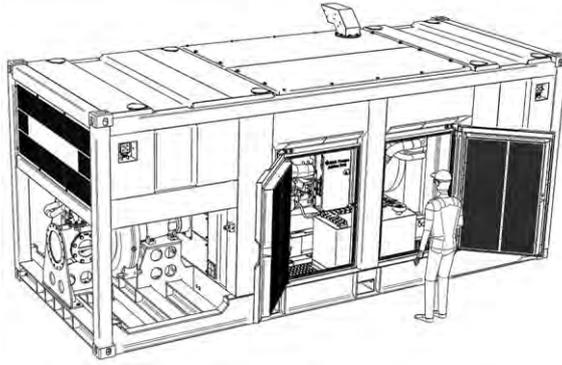
Hydraulic hoses under pressure may whip back and forth violently.

### 3.7 Safety instructions – during maintenance and repair

- Work may only be performed on the pump set when it has been put out of operation.
- For work to be performed safely the work area around the pump set must be free of obstacles.
- The user must carry out an LMRA before starting the work.
- Secure the hinged roof panel during work to prevent it from being blown closed.
- Follow the procedure described in this manual to put the pump set out of operation.
- Ensure that all pressure within the pump set has been relieved before starting the work.
- When opening the pump follow all the instructions for handling the liquid to be pumped, such as those concerning protective clothing, safety goggles, no smoking etc.
- Consult the Material Safety Data Sheet (MSDS) for the liquid to be pumped.
- If the pump set is being used to pump a hazardous liquid, it must first be cleaned and neutralised.
- Protect the drive motor against unintended and unauthorised activation throughout the duration of the work activities (remember to deactivate remote systems and external electrical power sources).
- Maintenance work on the electrical system may only commence after the power supply has been disconnected and may only be performed by personnel who have been trained and authorised to do so.
- In the interest of safety, only use parts purchased from or approved by the supplier.
- Modifications to the pump set or the application are only permitted after consultation with the supplier. The reliability of the pump set can only be guaranteed when the pump set is used for the application and in the manner for which it is intended, as specified at the time of delivery.
- After the work, secure all protective guards around rotating parts with the original fasteners before starting the pump. See also chapter 'Pump safety instructions' and 'Safety instructions during maintenance and repair'.
- Review the operating instructions before restarting the pump set.
- The roof panels may only be removed and installed by trained, instructed personnel. The instructed personnel must use a ladder with a grab rail that has a current inspection sticker.
- It is forbidden for the user to climb on/stand on the enclosure in any situation. If the user wishes to look into the pump set from above for repairs and/or maintenance, he/she must use a ladder with a grab rail that has a current inspection sticker.

## Pumps BA serie

- You may only place your hand in the pump impeller (to remove any dirt) when the pump set is completely stationary, the key has been removed from the key switch and the earth switch has been switched off. If the pump set does not have an earth switch, the battery cable clamp must be removed from the terminal (negative pole).
- During maintenance and inspection of large pumps in which the technician enters the engine compartment, a safety helmet must be worn.



### **WARNING**

**Make sure that doors and roof panels cannot fall shut or be blown shut, which could result in entrapment injuries.**



### **WARNING**

**Make sure the engine cannot be started by closing the doors and roof panels from outside.**

### 3.8 Safety and handling of batteries



#### WARNING

Ensure safety when installing and handling batteries by following all the safety instructions and directions below.



#### DANGER

Some batteries contain sulphuric acid and produce explosive mixtures of hydrogen and oxygen. Always wear either ANSI Z87.1 (U.S.) or CE EN166 (Europe) approved safety glasses and a face shield or splash proof goggles when working near batteries.

- Always wear suitable eye, face and hand protection.
- If electrolyte comes into contact with an eye, flush immediately by holding the eyelids open while rinsing with clean, cold water for at least fifteen minutes. Consult a doctor immediately.
- If electrolyte is swallowed, drink lots of water or milk. Do not try to induce vomiting. Consult a doctor immediately.
- Neutralise any leaked or spilled electrolyte on the vehicle or in the workplace with baking soda. When the electrolyte is neutralised, rinse the soiled surface with water.



#### DANGER

Battery acid or electrolyte is a solution of sulphuric acid in water and can burn the skin and damage clothing. Be very careful when handling electrolyte and always have a neutralising solution like soda or ammonia with water ready.

### 3.9 Setting up the pump set alongside a public road

- Use safety barriers, along with red/white cones, around the work area for the pump set and pipes/hoses.
- Place red/white warning signs against each safety barrier.
- The management is responsible for providing suitable crossings for pedestrians and cyclists where pipes/hoses leading to and from the pump cross a footpath or cycle path. If this is not possible, then signs should be placed on the safety barriers stating that pedestrians and cyclists must use the roadway.
- Use plastic/rubber hose protection ramps if necessary.
- Ensure that the pump set is adequately illuminated so it is visible to all road users.

- Place a light on each safety barrier (not a flashing light) and switch it on.



### 3.10 Training and knowledge level of personnel

The company management must ensure that all the maintenance, inspection and installation work is performed by authorised and qualified personnel who possess the required level of knowledge concerning the BBA pump set.

The responsibilities of the concerned personnel and the personnel responsible for their supervision must be explicitly defined by the company management. If the personnel have insufficient knowledge, the company management must arrange for suitable training, provided by the supplier or manufacturer of the pump set.

The company management must also ensure that the content of this manual is clear to all employees who work with/on the pump set.

### 3.11 Responsibilities of the management

- The management is responsible for ensuring that third parties do not enter the work area of the pump set.
- The management is responsible for ensuring that all hoses, pipes and fittings to be connected are properly attached and secured.
- The management is aware of the possible tripping hazards around the pump installation.
- The management must be in possession of a permit to work on public roads or public grounds, if required by local legislation.

### 3.12 Environmental protection

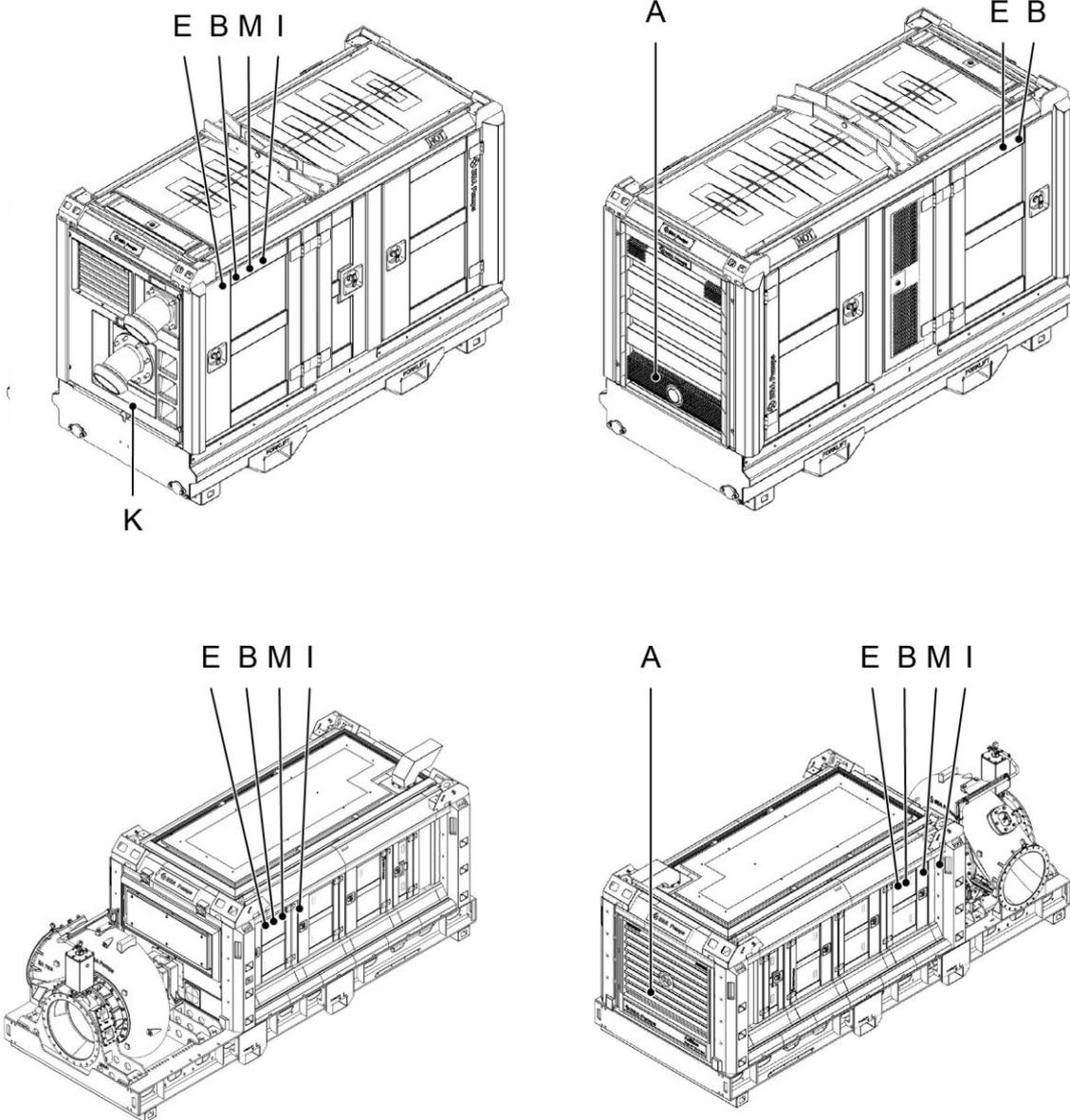
Pollution poses a serious threat to the environment. The following rules must be observed to prevent environmental pollution:

- Check the pump set and the connected piping for leaks on a regular basis.
- If an external fuel tank is used, the connections and routing of the piping must be checked carefully. Use only pipes and connections made of materials suitable for diesel. The use of incorrect materials, or pipes that are incorrectly connected, can result in leaks that can cause environmental damage.
- Do not dispose of any environmentally harmful substances to surface water, in sewers or on the ground. This is illegal and punishable.
- Keep environmentally harmful substances separate and submit them to a designated disposal facility for processing or destruction.
- Maintain the pump set in accordance with the instructions.
- Make sure that environmentally harmful liquids (e.g. urea) never enter the environment.

### 3.13 Warning stickers - BA series

Warning stickers are applied to the pump set as applicable to the specific version. Make sure these symbols are and remain clearly legible.

A		Caution: hot surface
B		Caution: crushing danger The pump may start automatically.
C		Oil
D		Hazardous or irritating substances
E		General hazard
F		Danger: high voltage
G		Danger: magnetic field
H		Wear hearing protection
I		Instructions for use
J		Dispose of in an environmentally responsible manner at the end of the product's useful life.
K		Prohibited to insert a hand through the suction side into the pump.



**WARNING**

Inserting a hand into the pump via the suction side is prohibited. This only applies if it is theoretically possible that the pump is running or can be switched on. To remove dirt particles, take all the precautions described in chapter 3 'Safety'.

## 4 Receiving, transport and storage

### 4.1 Receiving

Carefully check the pump set upon receipt for any damage that may have occurred during transport. Check whether the shipment matches the bill of lading.

Report any damage or incomplete shipment to the transporter straight away. The transporter must immediately note this on the shipping documentation.

### 4.2 Transport



**WARNING**

**Always disconnect all external connections before moving the pump set. Prevent leaks that are harmful to the environment.**



**WARNING**

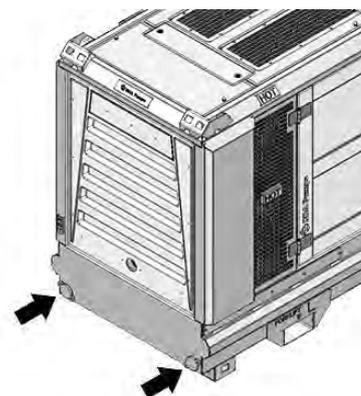
**Use certified lifting equipment with an adequate lifting capacity and always lift from directly above. Lifting from an angle can lead to dangerous situations. Lifting work may only be performed by appropriately authorised personnel. Because many different versions of the pump set are available, only general instructions are provided. For the weight and dimensions, see the specification sheet for the pump set concerned, at [www.bbapumps.com](http://www.bbapumps.com).**

**Note**

**Contact BBA Pumps if you have any questions or concerns.**

To prevent liquids from leaking and causing dangerous situations during transport of the pump set, the following precautionary measures must be taken:

- Disconnect the suction and delivery lines from the pump.
- If an external fuel tank was used, the fuel lines from the external tank must be disconnected. Take necessary measures to contain any draining fuel.
- Drain any liquid that is present in the pump set.
- Clean the pump set.
- Drain the drip tray under the tank via the drain plugs (see figure). Make sure that no diesel or oil is released into the environment.



### 4.3 Lifting instructions BA pump set

**DANGER**

Never walk under a raised load. This can result in a life-threatening situation.

**WARNING**

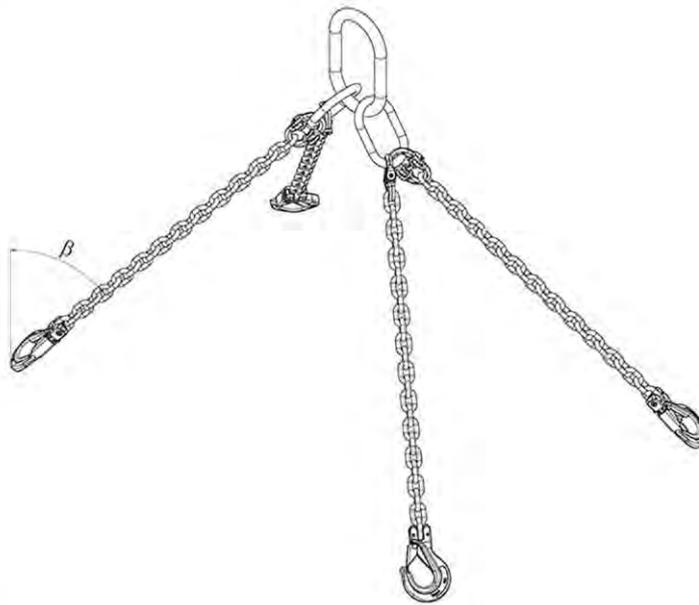
Always disconnect all external connections before moving the pump set. Prevent leaks that are harmful to the environment.

**WARNING**

The pump set must be lifted as vertically as possible; the maximum lifting angle is 15°.

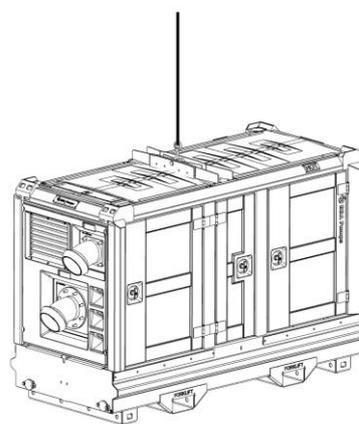
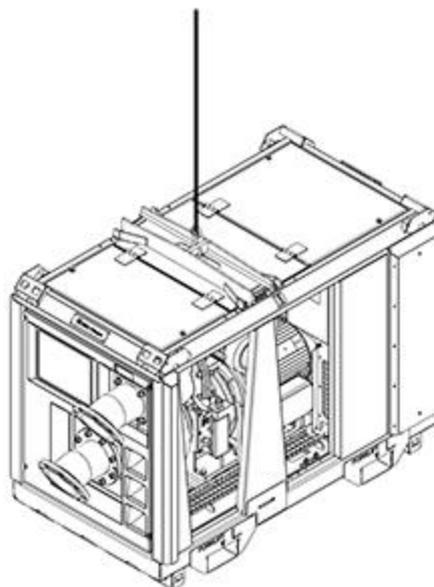
**DANGER**

The maximum lifting angle when using a 4-leg chain sling is 45°. Use extension chains if necessary.

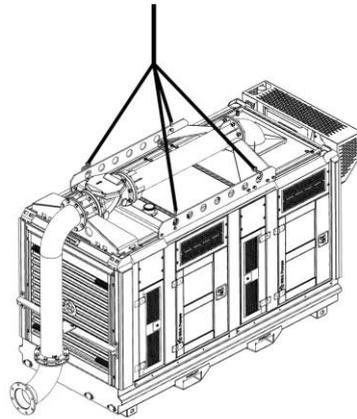


$$B \leq 45^\circ$$

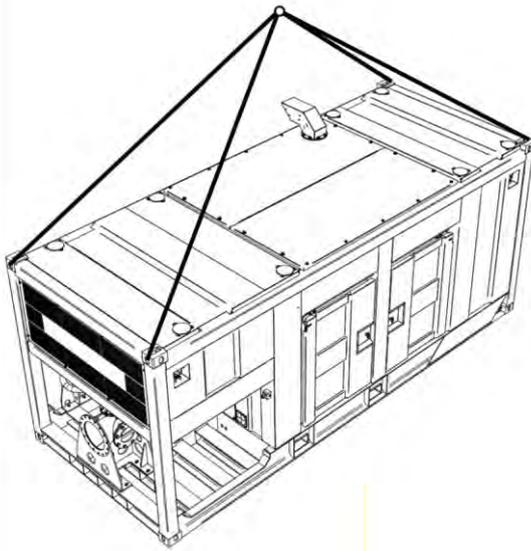
## Pumps BA serie



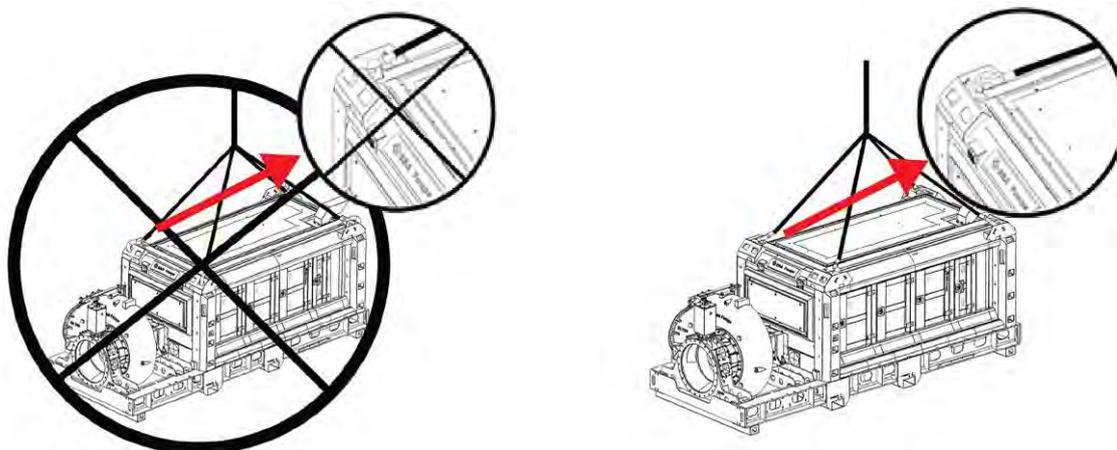
Enclosures and frames with a central lifting eye.



Enclosures with multiple lifting eyes.  
Select the lifting eyes on both sides so that the pump set hangs in balance.  
The maximum lifting angle when using a 4-leg chain sling is 45°.



For enclosures of type EL24-60, shipping container size, use twist locks for lifting operations.



EL enclosures.

There are four lifting eyes at the top of the enclosure, one on the inside of each corner. Use only these lifting eyes for lifting operations.



### **DANGER**

The standard lifting provisions of BBA pump sets are **NOT** designed to lift trailers or other additional heavy components (such as a pull-up frame or pontoon) at the same time. It is strictly forbidden to use the standard lifting provision to lift or move the pump sets with a higher total weight than stated in the specification sheets. This can result in a life-threatening situation.

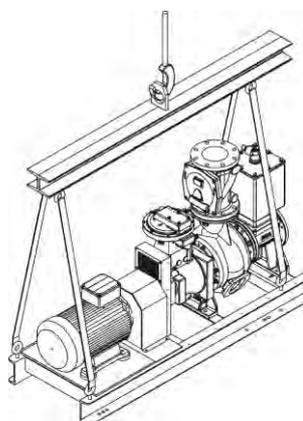


### **WARNING**

If the pump set is placed on boggy or muddy ground, the installation may become 'stuck' to the ground.

### **Pump set on frame**

1. Attach lifting eyes to the corners of the frame.
2. Connect a lifting beam with lifting straps to the lifting eyes.
3. Raise the pump set carefully until it is just above the floor. Check whether the pump set is hanging horizontally.



#### 4.4 Lifting instructions BA free shaft end and hydraulically driven pumps



**DANGER**

Never walk under a raised load. This can result in a life-threatening situation.



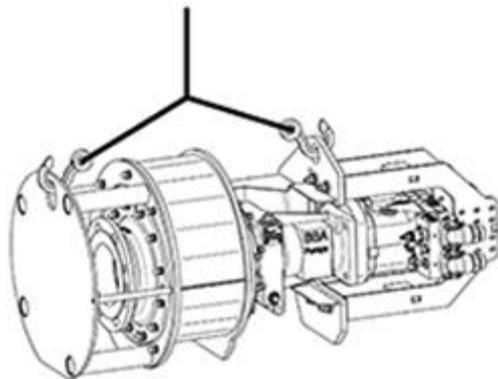
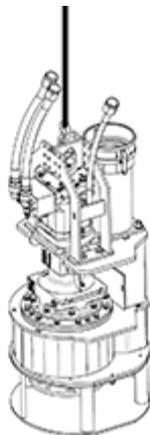
**WARNING**

Always disconnect all external connections before moving the pump set. Prevent leaks that are harmful to the environment.



**WARNING**

The lifting eye of both the motor and the free shaft end pump are intended for use during lifting, not for use during transport.

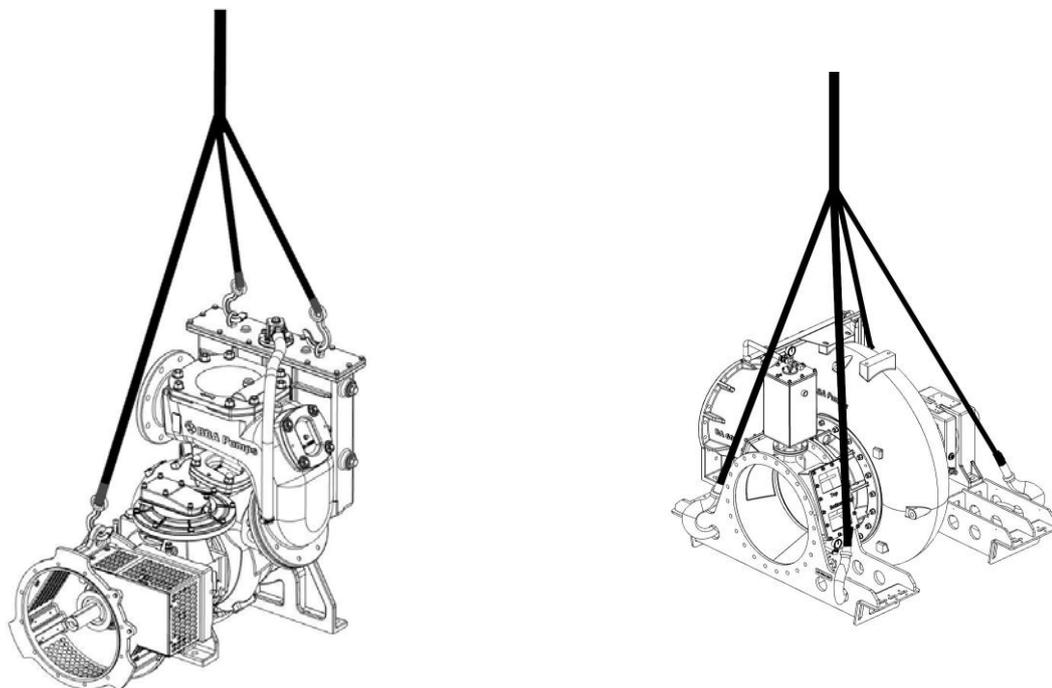


**WARNING**

Lifting must be done as vertically as possible.

### Separate pump

1. Use the lifting eyes on either the top or both sides of the pump.
2. Raise the pump carefully until it is just above the floor. Check whether the pump is hanging horizontally.



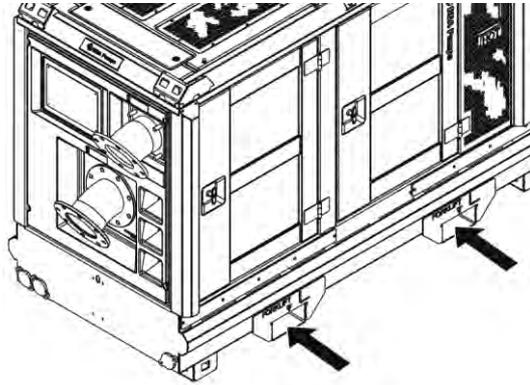
### **DANGER**

The standard lifting provisions of drive motors and BBA free shaft end pumps are **NOT** designed to support complete pump sets and/or additional heavy components

as well.

## 4.5 Moving the pump set with a forklift

Forklift pockets (if present) can be used for moving the pump set with a forklift. The tines of the forklift must be fully inserted into these pockets to lift the pump set.



### WARNING

Always disconnect all external connections before moving the pump set. Prevent leaks that are harmful to the environment.

## 4.6 Moving the pump set with trailer

Most BBA pump sets can be equipped with a trailer. Always observe the locally applicable regulations. For the detailed user manual on trailers, see [www.bbapumps.com](http://www.bbapumps.com).

## 4.7 Moving the pump set with a pull-up frame



### WARNING

The driver and their management are responsible for ensuring that the combined hook loader and pull-up frame is compliant with local regulations before it is driven on public roads.

Before moving the pump set, you must:

- Check the safety of the surroundings.
- Make sure that all components are mounted and/or secured to the pull-up frame within the legal dimensions.
- Check whether the pull-up frame is compatible with the hook loader.
- Ensure that the surface is level at the rollers so that no unnecessary forces are applied to the frame and pump set during loading, which would affect the alignment between the pump and engine/motor.
- Ensure that the pull-up frame is positioned so it is supported along its entire bottom surface.

### Loading and unloading

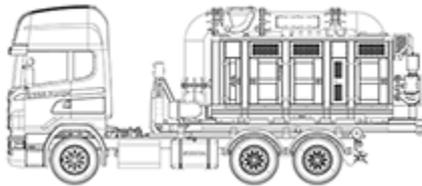


#### WARNING

The following instructions have been simplified. The driver and their management are responsible for correct loading and unloading of systems with BBA Pumps pull-up frames.

Perform the following steps:

- From top to bottom for unloading.
- From bottom to top for loading.



#### Unloading 1:

- Position the truck in front of the location where the pump set is to be placed.
- Prepare the truck for unloading.

#### Loading 6:

- Prepare the truck for driving.
- Loading is complete!

#### Unloading 2:

- With the service brake applied or parking brake engaged, slide the hook back as far as it will go.

#### Loading 5:

- Slide the mast forward.
- Make sure the carriage lock on the truck is engaged.

#### Unloading 3:

- Tilt the hook backward (if present).

#### Loading 4:

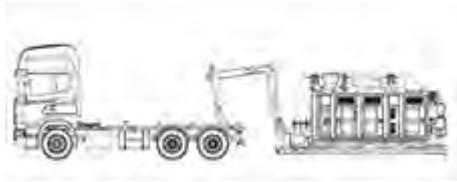
- Tilt the hook forward.

#### Unloading 4:

- Extend the main cylinder and release the service brake or disengage the parking brake the moment the pump set touches the ground.

#### Loading 3:

- Pull the pump set onto the truck.

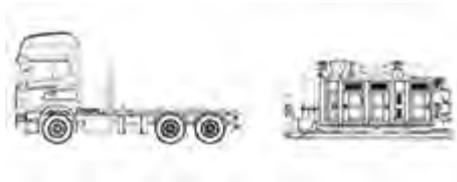


Unloading 5:

- Drive slowly forward when the pump set is fully on the ground.

Loading 2:

- Slide the hook back as far as it will go.
- Tilt the hook backward (if present).
- Extend the main cylinders and raise the hook to the height of the beam.
- Drive slowly toward the pump set and stop when the hook is engaged.



Unloading 6:

- Retract the main cylinder.
- Tilt the hook forward (if present).
- Slide the hook forward as far as it will go.
- Prepare the truck for driving.
- Unloading is complete!

Loading 1:

- Position the truck in front of the pump set.
- Prepare the truck for loading.

## 4.8 Moving the pump set with a tractor frame

When moving a pump set with tractor frame, remember to connect the lighting plug to the tractor. Always turn off the work lights during transport to avoid blinding other road users.

If the tractor pump is fitted with pipe racks, always secure all loose components, such as pipes or accessories, in accordance with local regulations before the pump set is transported.

## 4.9 Preservation and storage



**WARNING**

The BBA pump sets may be stacked for storage purposes. Pump sets may not be stacked more than two high. Consult the specification sheet to check whether the pump sets concerned are stackable.

### 4.9.1 Preservation

When pumps are shipped they may be coated with a preservation agent. This remains effective for up to 12 months.

Store the pump covered and well ventilated. Avoid temperatures below freezing and high humidity.

### 4.9.2 Storage

- Switch off the earth switch (any telematics or remote systems remain active).
- Make sure the fuel tank is filled with FAME-free fuel (see original engine manufacturer's manual).
- If the pump set is fitted with a urea (AdBlue ®) tank, ensure that it is not filled beyond 80% to prevent frost damage.
- For proper storage of urea (AdBlue ®) and fuel, contact your supplier to prevent pump/engine damage in the future.
- Liquids such as fuel and urea are subject to ageing, so always check the expiry date.
- Ensure that the pump set has sufficient ventilation.
- For storage instructions for the drive system, see the engine/motor manufacturer's original instructions.
- Make sure the pump is drained.

### 4.9.3 Storage for up to 12 months

- When storing electric pump sets with soft starter or variable-frequency drive, there is a risk of components 'sticking together'. Therefore, at least once a year, supply power to the pump set and switch on the main switch so that the display becomes active (pump set does not have to run).
- If a diesel driven pump set is to be stored for a period longer than 6 months, remove the battery from the pump set and charge it regularly.

#### Note

**During storage, manually turn the driveshaft one complete revolution each month to prevent sticking of the shaft seal.**

### 4.9.4 Storage longer than 12 months

For storage longer than 12 months, take the following measures:

- Apply a layer of preservation agent to all unpainted parts and rotating parts.
- Seal the pump flanges liquid-tight.
- Seal the connection for flushing, circulation or cooling (if present).
- For storage longer than 24 months: first connect electric pump sets with soft starter or variable-frequency drive to a reforming unit. This device starts the system slowly and prevents damage (see supplier's user manual).

#### Note

**The type of preservation agent to be used depends on the materials and the application. Consult BBA Pumps for the correct preservation agent.**

- Fill the pump with preservation agent.
- Slowly rotate the driveshaft one revolution by hand.
- Seal the pressure flange liquid-tight.

## 4.10 Inspection during storage

1. Ensure that the pump sets are not stacked more than two high (if applicable).
2. Check the level of the preservation agent once every three months. Add additional preservation agent if necessary.
3. Slowly rotate the driveshaft one revolution by hand.

## 4.11 Transport of pump with preservation agent

Prior to transport, check the pump for leakage of preservation agent.



### **WARNING**

**Leakage of preservation agent can cause the floor to become dangerously slippery and may lead to preservation agent entering the environment.**

## 4.12 Removal of preservation agent

Drain the preservation agent before putting the machine in operation.

If the preservation agent is detrimental to the pumped liquid, the pump must be flushed thoroughly.

- Drain the preservation agent. Capture the liquid. See section 'Draining the pump when there is a danger of freezing'.
- Flush the pump thoroughly. Capture the liquid.
- Fit the cleaning cover and drain plugs.
- Dispose of the preservation agent and flushing liquid in a responsible manner.

### **Note**

**If preservation agent is to be applied again, do not reuse the old preservation agent.**

## 5 Installing the pump set



### WARNING

Failure to follow the guidelines for the placement and installation of the pump set can result in danger to the user and/or severe damage to the pump set.

### 5.1 Placement – general

#### Note

BBA Pumps is not responsible for accidents and damage that result from failure to follow the guidelines in this manual. Such use results in forfeiture of the right to assert any warranty or damage compensation claims.

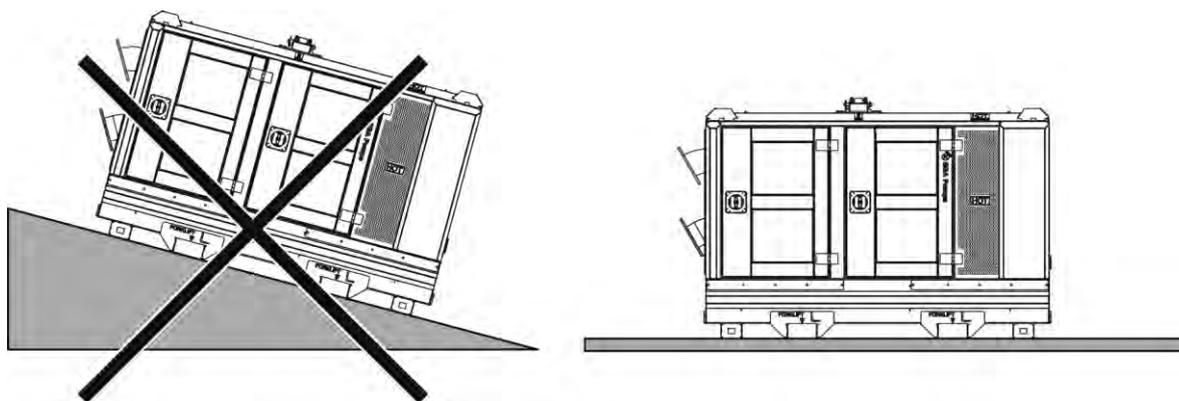
#### Note

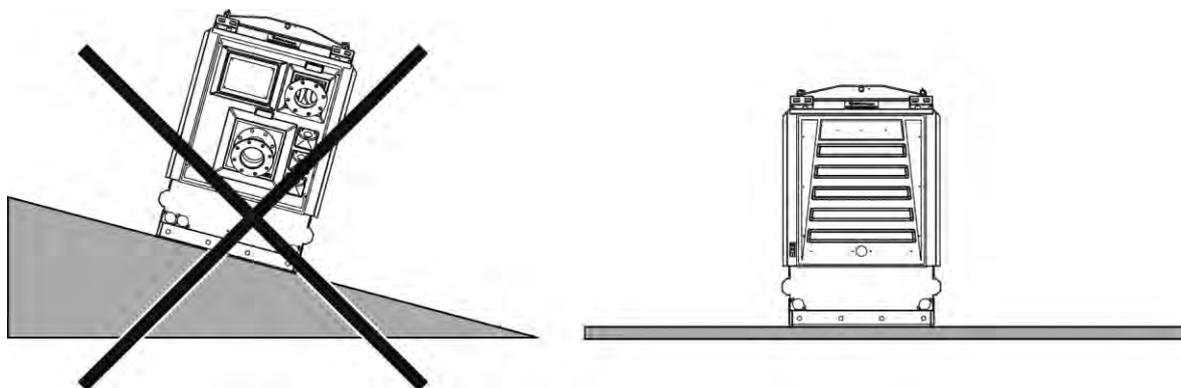
The pump set may only be connected by an authorised person.

#### Note

Because many different versions of the pump set are available, only general instructions are provided. See the specification sheet for the particular pump set for technical data. Contact BBA Pumps if you have any questions or concerns.

- Place the pump set on a flat surface capable of supporting the load.



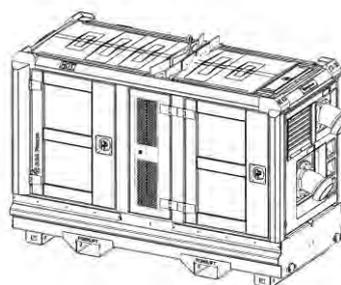


- Ensure there is sufficient space around the pump set for operation and maintenance activities.

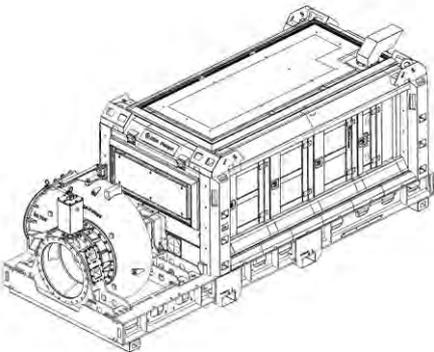
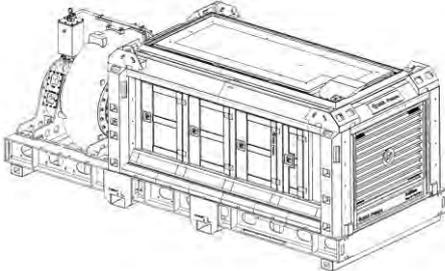
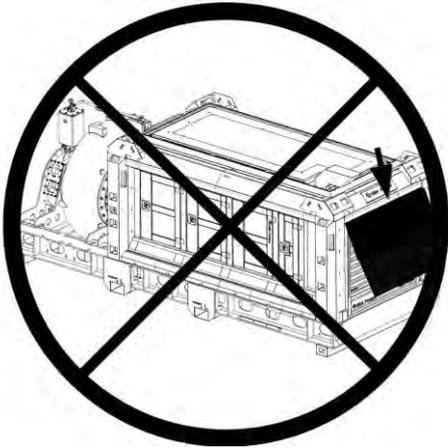
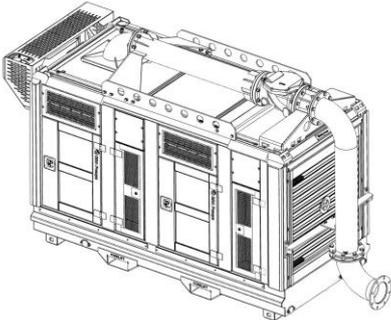


**WARNING**

Ensure nothing is covering any of the air channels of the pump set, because the pump set use the air channels to dissipate heat. The diesel drive pump set also uses the air channels for the intake of combustion air and exhaust of combustion gases.



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- When pumping hot liquids, ensure that there is sufficient air circulation to prevent bearings and lubricants from overheating.
- Ensure that there is sufficient free space for cool air to flow in and hot air to flow out. Maintain at least 2 m (6.6 ft) of clearance.
- Ensure that the area has adequate ventilation.
- Always prevent water from entering the pump set through the air ducts in the enclosure as a result of environmental factors (such as on board a ship or under a conveyor belt).
- Prevent high ambient temperature and humidity.
- Avoid dusty conditions and locations where corrosion or erosion can occur.
- Install the prescribed safeguard(s) in the correct manner.
- If a pump set is set to automatic level control or is equipped with a remote control, the management must provide adequate safety measures and notifications that the pump set can start at any time.
- You may not create additional back pressure on the exhaust system by extending or narrowing it. Discuss the possibilities with BBA Pumps.
- Pay attention to the IP protection class of electrical components. In the case of an electric drive: do not exceed the ratings of the electric motor in terms of insulation class and protection class.
- If welding on or around the pump set, read section 'Welding on pump set' first.
- It is not permitted to mount components on or to the pump set that could affect the pump set's electrical system. An example is an antenna, which could result in lightning damage.

### **Diesel**

- If equipped with a diesel engine, make sure the exhaust gases are discharged outdoors.
- For placement of a diesel drive pump set, see also chapter 'Pump set with diesel engine drive'.

### **Electric**

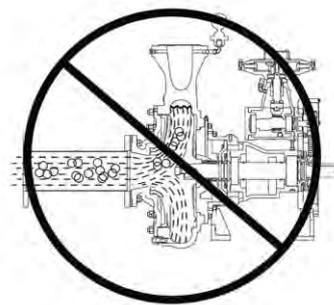
- For placement of an electric drive pump set, see also chapter 'Pump set with electric drive'.
- Connect an electric drive pump set in conformance with local regulations. The cables must be dimensioned in accordance with the specifications.
- When installing electric pump sets, ensure that the cable is laid safely and responsibly and avoid unnecessary lengths of cable.
- In the case of an electric motor not supplied by BBA Pumps, follow the installation guidelines provided with the motor.
- Do not exceed the ratings of the electric motor in terms of insulation class and protection class.

## 5.2 Manure pump installation and operating instructions

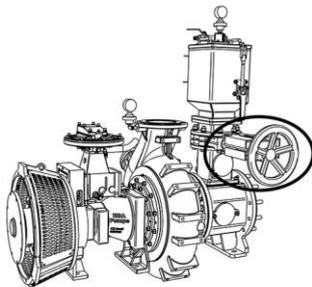
- Always mix the manure in the basin before pumping.
- Avoid foam, air and gas formation during manure pumping.
- Add sufficient water to the manure prior to or during the pumping process.
- The maximum liquid velocity of manure in the suction line is 2.5 m/s.
- Preferably fill the manure pump using a filling pump (pre-pressure).
- Check the pump curves at different speeds beforehand to determine the operating point.
- Always ensure sufficient back pressure on the discharge side during the pumping process.
- If the manure pump is equipped with its own vacuum system, close the float box if there will be pre-pressure (e.g. when using a filling pump).



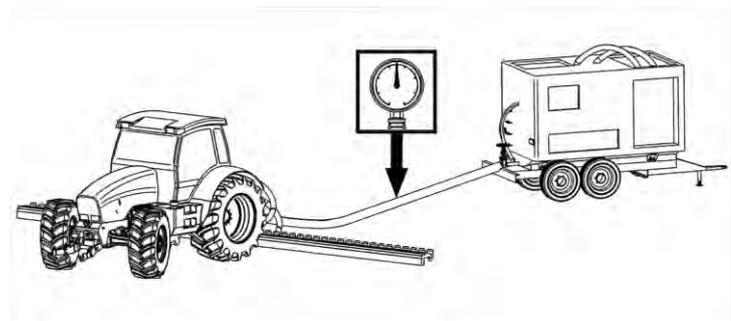
Avoid air bubbles



Avoid foam and gas formation



Valve to close the float box



Ensure sufficient back pressure on the discharge side

### 5.3 Placement in an area with a potentially flammable or explosive atmosphere

The standard pump set is not suitable for placement in a potentially flammable or explosive atmosphere. In some cases, after consultation with BBA Pumps and implementation of the prescribed measures, written approval may be provided by BBA Pumps for use of the pump set in the specified situation.



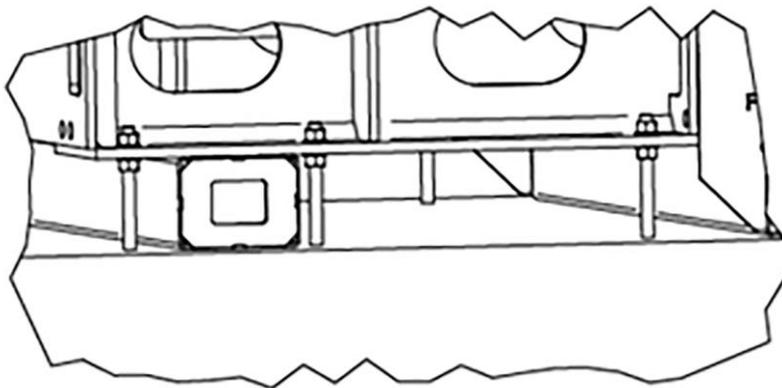
#### **DANGER**

**Failure to follow the guidelines for use of the pump set in a potentially flammable or explosive atmosphere can create an extremely dangerous situation.**

### 5.4 Aligning the pump

After the pump set has been installed correctly, the final alignment must be checked and corrected if necessary. This does not apply to pump sets with an SAE motor flange connection. Make sure that after alignment, the protective cover is always fitted properly.

Fasten the pump set in place, with anchor bolts for example. After fastening, the alignment must be checked again.



### 5.5 Welding on pump set

Welding on the pump set and/or components such as the pump trailer or a steel pontoon on which the pump set is installed can result in major damage and/or consequential damage.

If you nevertheless plan to weld on or around the pump set, please contact the BBA Pumps service department for advice on how to proceed.

Damage and/or consequential damage to the pump, motor or electrical components caused by welding near or on the pump set is never covered by the standard factory warranty.

## 5.6 Piping guidelines – general

The lines must comply with the following guidelines:

- Select the diameter and length of the suction and delivery lines as well as those of any additional components such that the inlet pressure remains above the minimum allowable value. The operating pressure must not exceed the maximum allowable value.
- The diameters of the lines must be equal to or greater than the connection sizes on the pump.
- If possible, the transition between various pipe diameters must be made with a transition angle of approx. 8 degrees.
- The pipe must be properly aligned with the pump connection.
- It must be possible to connect the flanges of the lines and pump together without putting any of the parts under stress.
- In the case of vibration and/or hot liquids, install expansion elements in the pipes.
- Support the pipes directly in front of the pump set. The weight of the pipes and fittings may not be supported by the pump set.
- The shut-off valves must be of a type that allows straight-line flow, such as in a globe valve. The internal diameter of the shut-off valve must be the same as that of the pipe.
- If there is a possibility that a backflow of liquid could cause the pump to turn in the opposite direction when stopped, a non-return valve or shut-off valve must be placed in the piping to prevent this.
- Install measurement instruments in the piping for monitoring during operation.
- If applicable, connect the pump set to a suitable safety system. This is left to the judgement of the designer of the installation.
- Insulate or shield hot pipes.
- Observe specific regulations that pertain to the suction and delivery lines.
- Thoroughly clean all parts that come into contact with the transported liquid before putting the pump set in operation.
- Make sure that the delivery line is depressurised before disconnecting it.
- If a pump gets more than 2 mWc of pre-pressure, please contact BBA Pumps.
- If the resistance in the delivery line is insufficient for the operating range of the pump set, install a valve in the delivery line, as close as possible to the pump. This manually creates more back pressure and prevents pump damage due to cavitation.
- For quick couplings, check the O-ring for damage before use.
- For quick couplings of size DN150 or greater, lubricate the O-rings with tyre grease or green soap.
- For flanged pipes, ensure that the flanges and contact surfaces are smooth and straight. This is to prevent leaks. Install flange pipes with gaskets that have bolt holes (with the same DN size as the flanges).
- For flange connections, always use bolts of the correct size and use all bolt holes.
- Always tighten the bolted connections in a criss-cross pattern, and then check all bolted connections again to ensure that the pipe is airtight.
- When the temperature is below freezing, you must heat the pipes and fittings during operation or drain them when not in use.



### WARNING

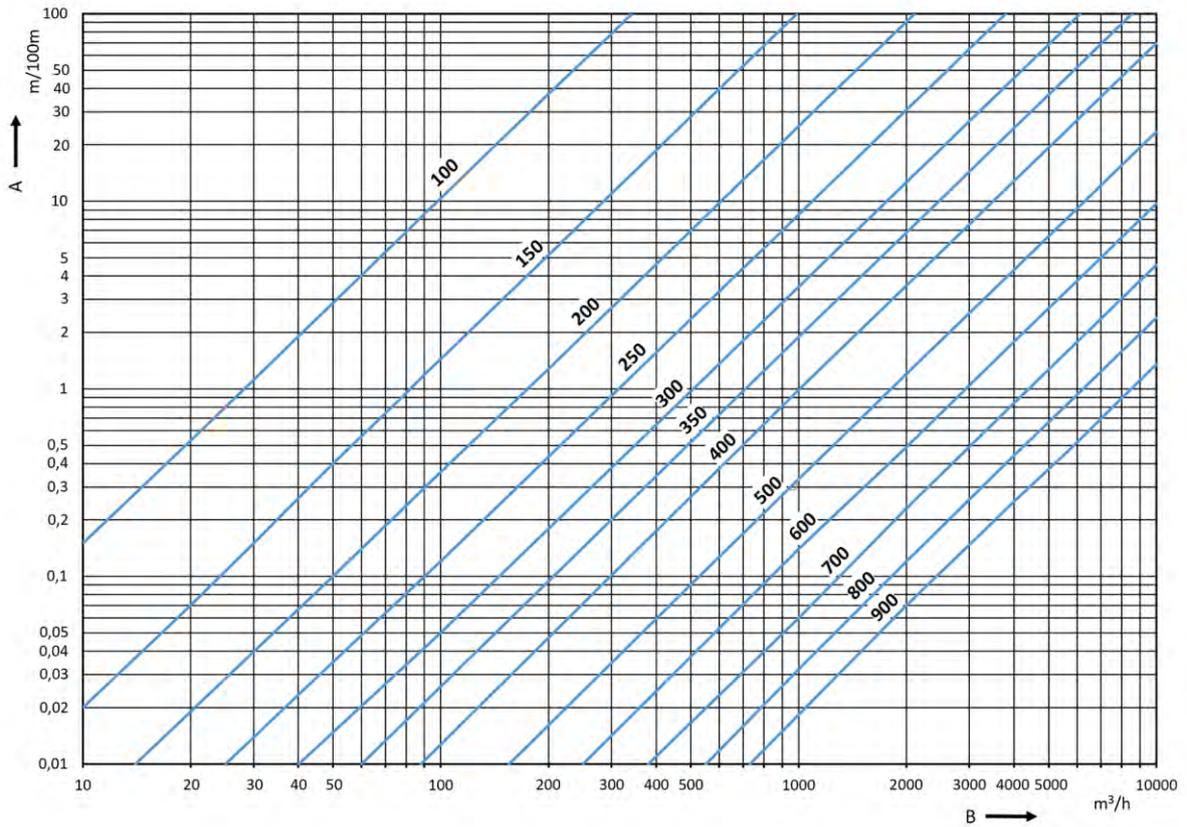
**The piping system designer is responsible for the properly functioning pump installation (pump set + piping system)**

**Failure to follow the guidelines can result in an excessive load on the pump set and/or pipes, which can cause severe damage to the pump set and/or pipes.**

**Possible leakage of liquid can lead to a dangerous situation.**

Pipes causes resistance, as shown in the table below. Nomogram for the calculation of pipe resistances; valid for liquids with a viscosity of 1 cSt (e.g. water).

Nomogram



The values shown on the lines in the graph are the pipe diameters in mm.

A: Piping resistance in metres per 100 m of pipe:

B: Volume flow

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The fittings that are used also have resistance. The table below shows the resistance of the fittings converted to the equivalent length of straight pipe (smooth steel pipe).

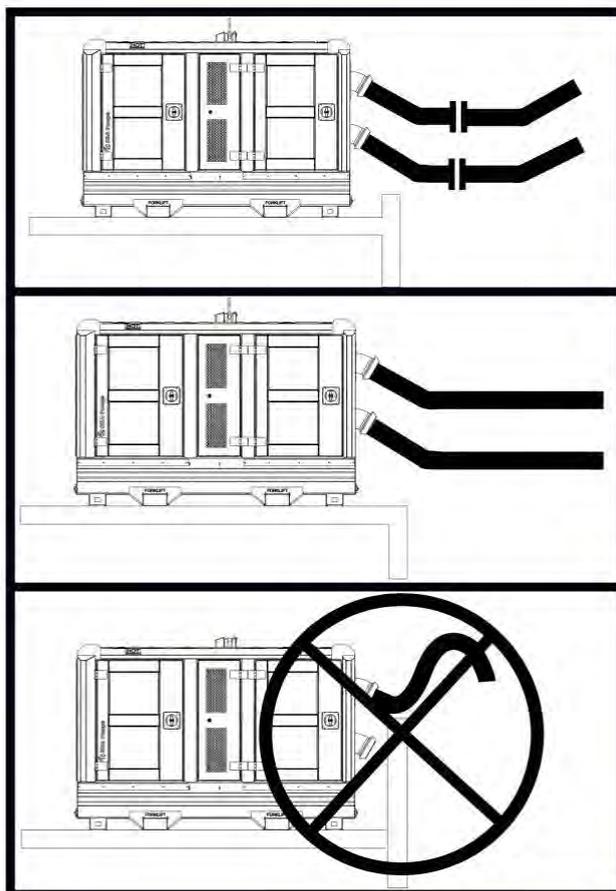
Internal pipe diameter		Additional distance:											
		Bends				Tee		Shut-off valves				Non-return valve	
		90°		45°				Gate		Globe			
mm	inch	m	ft	m	ft	m	ft	m	ft	m	ft	m	ft
75	3,0	2,0	6,4	1,1	3,7	5,0	16,2	0,5	1,7	25,5	83,7	6,4	20,9
100	3,9	2,5	8,2	1,5	4,9	6,7	22,0	0,7	2,3	34,0	111,5	8,5	27,9
125	4,9	3,1	10,3	1,9	6,2	8,1	26,7	0,9	2,8	42,5	139,4	10,6	34,9
150	5,9	3,7	12,1	2,3	7,4	10,0	32,8	1,1	3,6	51,0	167,3	12,7	41,7
200	7,9	5,0	16,4	3,0	9,8	13,5	44,3	1,4	4,6	68,0	223,1	17,0	55,8
250	9,8	6,2	20,3	3,8	12,3	16,5	54,1	1,8	5,7	85,0	278,9	21,0	69,6
300	11,8	7,5	24,6	4,5	14,8	20,0	65,6	2,1	6,9	99,5	326,4	25,5	83,7
350	13,8	8,8	28,7	5,3	17,2	22,8	74,6	2,4	7,7	119,0	390,4	29,8	97,6
400	15,8	10,0	32,8	6,0	19,7	26,0	85,3	2,7	8,8	136,0	446,2	34,0	111,5
500	19,7	12,5	41,0	7,5	24,6	32,5	106,6	3,4	11,0	170,0	557,7	42,5	139,4
600	23,6	15,0	49,2	9,0	29,5	39,0	128,0	4,0	13,2	204,0	669,3	51,0	167,3
700	27,6	17,5	57,4	10,5	34,5	45,5	149,3	4,7	15,4	238,0	780,8	59,5	195,2
800	31,5	20,0	65,6	12,0	39,4	52,0	170,6	5,4	17,6	272,0	892,4	68,0	223,1
900	35,4	22,5	73,8	13,5	44,3	58,5	191,9	6,0	19,8	306,0	1001	76,5	251,0

Figures in the table serve as indications only.

## 5.7 Suction line

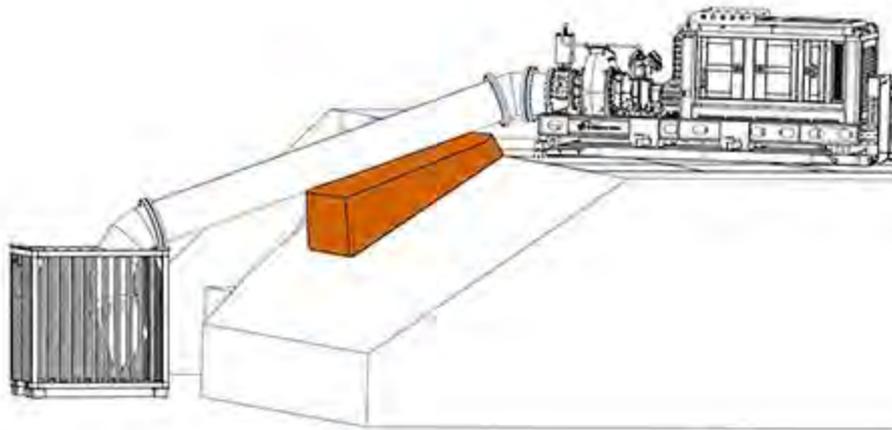
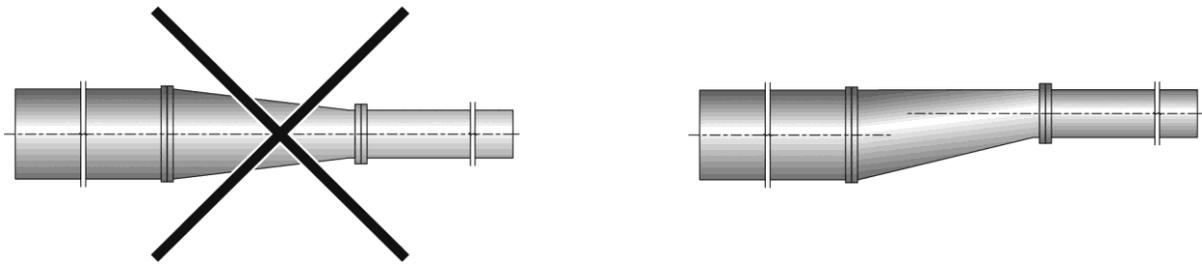
The suction pipe must meet the following requirements:

- Place the pump set as close as possible to the level of the liquid to be pumped.
- Make sure that the inlet of the suction line has the minimum required depth.
- Run the pipe so it slopes upwards toward the pump set to prevent the formation of air pockets.
- If the pipe tapers, the pipe must slope downward towards the pump. Remove the float box or place shut-off valves between the suction element and the float box.
- When connecting several different pumps to a suction line, always contact BBA Pumps for specific installation advice in order to prevent pump damage.

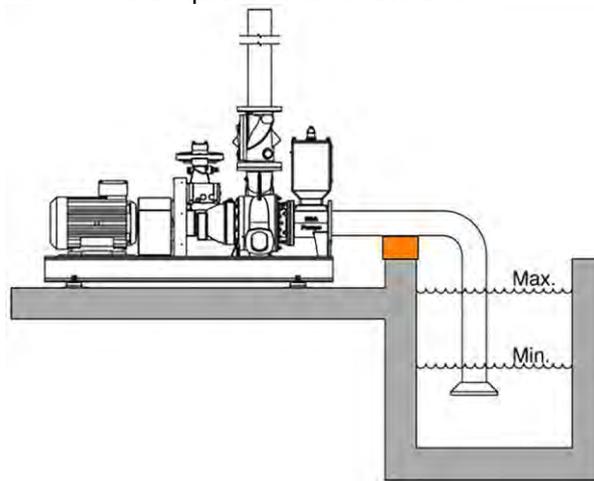


- Use the least possible number of bends.
- Bends must have the largest possible radius.
- The piping system must be completely airtight.
- When there is a change of diameter in the piping, use an eccentric reducer to prevent the accumulation of air.
- In the case of polluted liquids, always install a suction strainer or solids separation screen with a sufficiently large net opening area. The filtration particle size of the suction strainer must be equal to or less than the solids handling specification of the pump.

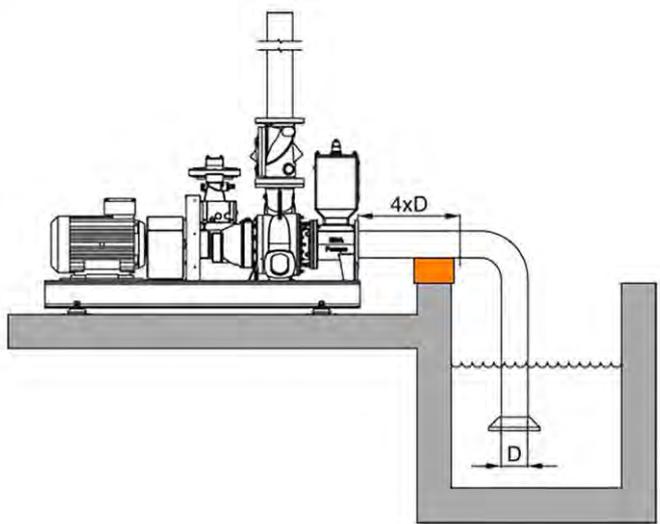
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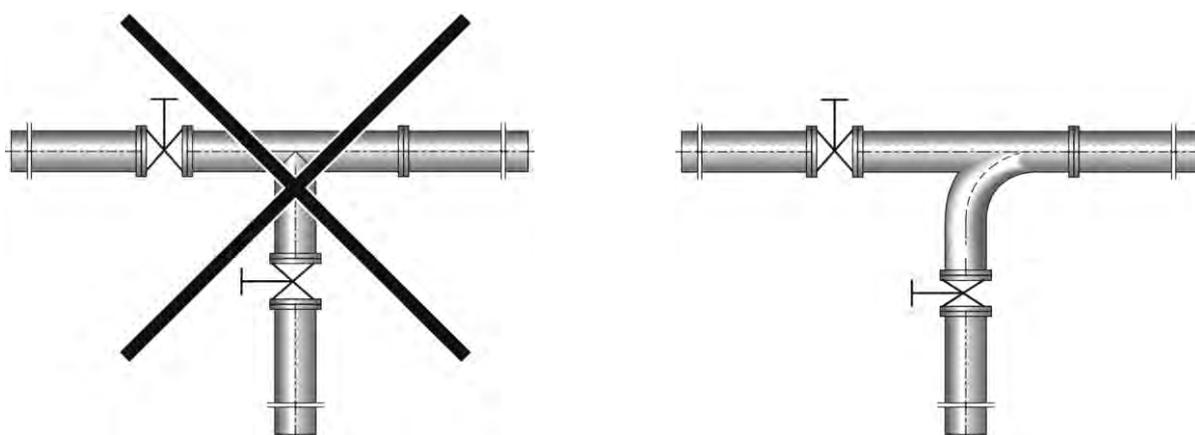
- Always make sure that the suction line is well supported (during the pumping process, the total weight increases enormously, so the forces on the pump are subject to change).
- Make sure that the liquid intake will remain sufficiently submerged beneath the liquid surface so no air can be drawn in even when the liquid is at its lowest level.



- Make sure that the suction line length between a bend and the pump is at least four times the pipe diameter. A bend prevents the smooth inflow of liquid to the pump impeller and can have a negative impact on the suction conditions.



- When a tee is installed, use one with an inflow bend.



- Do not install a foot valve when pumping high viscosity liquids. The foot valve causes extra pipe losses.
- In some situations, the liquid temperature may be so high that the pump needs pre-pressure to operate within the NPSH curve.



**WARNING**

In all cases in which pre-pressure is desired you must contact BBA Pumps for advice. Pre-pressure in excess of 2 mWc may only be applied with written permission from BBA Pumps.



**WARNING**

Piping with an inadequate diameter, an excessively long suction line or a clogged suction strainer can cause the piping losses to increase to the point that the available NPSH (NPSHa) falls below the required NPSH (NPSHr). This causes cavitation. Cavitation is detrimental to the pump and adversely affects the function of the pump set.

**Recommended diameter of the suction line**

Maximum flow rate in suction pipe= 4 m/s

m <sup>3</sup> /h	(L/sec)	3" 75	4" 100	6" 150	8" 200	10" 250	12" 300	14" 350	16" 400	18" 450	20" 500	24" 600	28" 700	32" 800	36" 900
50.4	14	3.17	1.78	0.79	0.45	0.29	0.20	0.15	0.11	0.09	0.07	0.05	0.04	0.03	0.02
57.6	16	3.62	2.04	0.91	0.51	0.33	0.23	0.17	0.13	0.10	0.08	0.06	0.04	0.03	0.03
64.8	18	4.07	2.29	1.02	0.57	0.37	0.25	0.19	0.14	0.11	0.09	0.06	0.05	0.04	0.03
72	20	4.53	2.55	1.13	0.64	0.41	0.28	0.21	0.16	0.13	0.10	0.07	0.05	0.04	0.03
90	25	5.66	3.18	1.41	0.80	0.51	0.35	0.26	0.20	0.16	0.13	0.09	0.06	0.05	0.04
108	30	6.79	3.82	1.70	0.95	0.61	0.42	0.31	0.24	0.19	0.15	0.11	0.08	0.06	0.05
144	40	9.05	5.09	2.26	1.27	0.81	0.57	0.42	0.32	0.25	0.20	0.14	0.10	0.08	0.06
180	50	11.32	6.37	2.83	1.59	1.02	0.71	0.52	0.40	0.31	0.25	0.18	0.13	0.10	0.08
216	60	13.58	7.64	3.40	1.91	1.22	0.85	0.62	0.48	0.38	0.31	0.21	0.16	0.12	0.09
252	70	15.84	8.91	3.96	2.23	1.43	0.99	0.73	0.56	0.44	0.36	0.25	0.18	0.14	0.11
288	80	18.11	10.19	4.53	2.55	1.63	1.13	0.83	0.64	0.50	0.41	0.28	0.21	0.16	0.13
324	90	20.37	11.46	5.09	2.86	1.83	1.27	0.94	0.72	0.57	0.46	0.32	0.23	0.18	0.14
360	100	22.64	12.73	5.66	3.18	2.04	1.41	1.04	0.80	0.63	0.51	0.35	0.26	0.20	0.16
403.2	112	25.35	14.26	6.34	3.57	2.28	1.58	1.16	0.89	0.70	0.57	0.40	0.29	0.22	0.18
432	120	27.16	15.28	6.79	3.82	2.44	1.70	1.25	0.95	0.75	0.61	0.42	0.31	0.24	0.19
504	140	31.69	17.83	7.92	4.46	2.85	1.98	1.46	1.11	0.88	0.71	0.50	0.36	0.28	0.22
576	160	36.22	20.37	9.05	5.09	3.26	2.26	1.66	1.27	1.01	0.81	0.57	0.42	0.32	0.25
648	180	40.74	22.92	10.19	5.73	3.67	2.55	1.87	1.43	1.13	0.92	0.64	0.47	0.36	0.28
720	200	45.27	25.46	11.32	6.37	4.07	2.83	2.08	1.59	1.26	1.02	0.71	0.52	0.40	0.31
792	220	49.80	28.01	12.45	7.00	4.48	3.11	2.29	1.75	1.38	1.12	0.78	0.57	0.44	0.35
864	240	54.32	30.56	13.58	7.64	4.89	3.40	2.49	1.91	1.51	1.22	0.85	0.62	0.48	0.38
936	260	58.85	33.10	14.71	8.28	5.30	3.68	2.70	2.07	1.63	1.32	0.92	0.68	0.52	0.41
1008	280	63.38	35.65	15.84	8.91	5.70	3.96	2.91	2.23	1.76	1.43	0.99	0.73	0.56	0.44

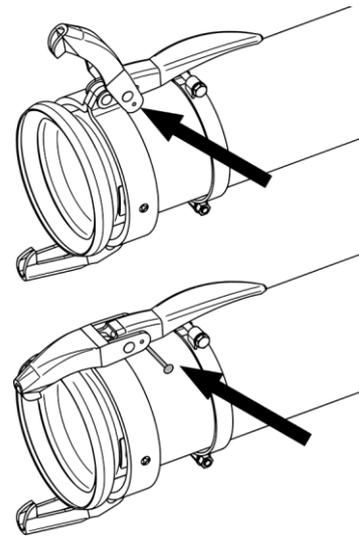
1080	300	67.91	38.20	16.98	9.55	6.11	4.24	3.12	2.39	1.89	1.53	1.06	0.78	0.60	0.47
1152	320	72.43	40.74	18.11	10.19	6.52	4.53	3.33	2.55	2.01	1.63	1.13	0.83	0.64	0.50
1224	340	76.96	43.29	19.24	10.82	6.93	4.81	3.53	2.71	2.14	1.73	1.20	0.88	0.68	0.53
1296	360	81.49	45.84	20.37	11.46	7.33	5.09	3.74	2.86	2.26	1.83	1.27	0.94	0.72	0.57
1368	380	86.01	48.38	21.50	12.10	7.74	5.38	3.95	3.02	2.39	1.94	1.34	0.99	0.76	0.60
1440	400	90.54	50.93	22.64	12.73	8.15	5.66	4.16	3.18	2.52	2.04	1.41	1.04	0.80	0.63
1620	450	102	57.30	25.46	14.32	9.17	6.37	4.68	3.58	2.83	2.29	1.59	1.17	0.90	0.71
1800	500	113	63.66	28.29	15.92	10.19	7.07	5.20	3.98	3.14	2.55	1.77	1.30	0.99	0.79
1980	550	124	70.03	31.12	17.51	11.20	7.78	5.72	4.38	3.46	2.80	1.95	1.43	1.09	0.86
2160	600	136	76.39	33.95	19.10	12.22	8.49	6.24	4.77	3.77	3.06	2.12	1.56	1.19	0.94
2340	650	147	82.76	36.78	20.69	13.24	9.20	6.76	5.17	4.09	3.31	2.30	1.69	1.29	1.02
2520	700	158	89.13	39.61	22.28	14.26	9.90	7.28	5.57	4.40	3.57	2.48	1.82	1.39	1.10
2700	750	170	95.49	42.44	23.87	15.28	10.61	7.80	5.97	4.72	3.82	2.65	1.95	1.49	1.18
2880	800	181	102	45.27	25.46	16.30	11.32	8.32	6.37	5.03	4.07	2.83	2.08	1.59	1.26
3060	850	192	108	48.10	27.06	17.32	12.03	8.83	6.76	5.34	4.33	3.01	2.21	1.69	1.34
3240	900	204	115	50.93	28.65	18.33	12.73	9.35	7.16	5.66	4.58	3.18	2.34	1.79	1.41
3420	950	215	121	53.76	30.24	19.35	13.44	9.87	7.56	5.97	4.84	3.36	2.47	1.89	1.49
3600	1000	226	127	56.59	31.83	20.37	14.15	10.39	7.96	6.29	5.09	3.54	2.60	1.99	1.57
3960	1100	249	140	62.25	35.01	22.41	15.56	11.43	8.75	6.92	5.60	3.89	2.86	2.19	1.73
4320	1200	272	153	67.91	38.20	24.45	16.98	12.47	9.55	7.55	6.11	4.24	3.12	2.39	1.89
4680	1300	294	166	73.56	41.38	26.48	18.39	13.51	10.35	8.17	6.62	4.60	3.38	2.59	2.04
5040	1400	317	178	79.22	44.56	28.52	19.81	14.55	11.14	8.80	7.13	4.95	3.64	2.79	2.20
5400	1500	340	191	84.88	47.75	30.56	21.22	15.59	11.94	9.43	7.64	5.31	3.90	2.98	2.36
5760	1600	362	204	90.54	50.93	32.59	22.64	16.63	12.73	10.06	8.15	5.66	4.16	3.18	2.52
6120	1700	385	216	96.20	54.11	34.63	24.05	17.67	13.53	10.69	8.66	6.01	4.42	3.38	2.67
6480	1800	407	229	102	57.30	36.67	25.46	18.71	14.32	11.32	9.17	6.37	4.68	3.58	2.83
6840	1900	430	242	108	60.48	38.71	26.88	19.75	15.12	11.95	9.68	6.72	4.94	3.78	2.99
7200	2000	453	255	113	63.66	40.74	28.29	20.79	15.92	12.58	10.19	7.07	5.20	3.98	3.14

### Locking

If there is a high risk of lines being disconnected by vandals, the line couplings must be locked. There are holes in the handles

for the placement of locking pins.

If these are not present, straps must be placed around the handles so they cannot be lifted.

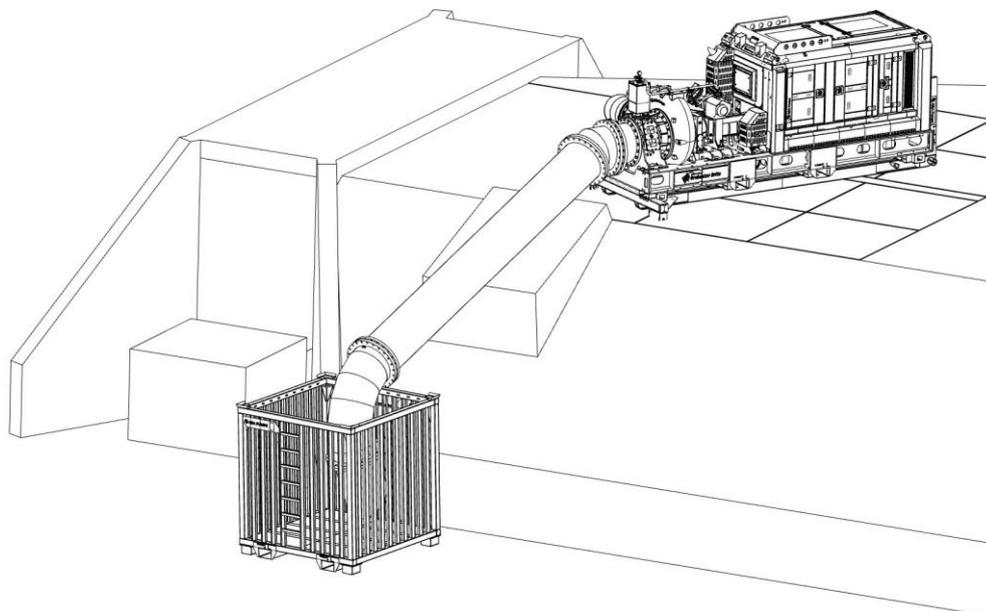


## 5.8 Suction strainer

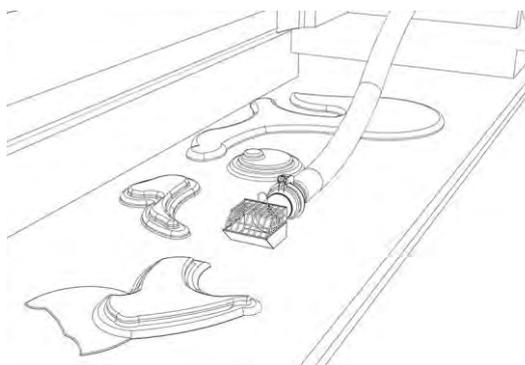
When pumping polluted liquid or liquid that may contain solid particles, install a suction strainer at the suction opening.

- When selecting the suction strainer, carefully consider the mesh width so pipe losses are kept to a minimum. The net opening area of the suction strainer must be at least three times the cross-sectional area of the suction line.
- In the case of polluted liquids, always install a suction strainer with a sufficiently large net opening area.  
The filtration particle size of the suction strainer must be equal to or less than the solids handling specification of the pump.
- Install the suction strainer such that maintenance and cleaning are possible.
- Ensure that the liquid being drawn in has the expected viscosity and can easily flow through the suction strainer.
- See the technical specifications of the pump set for the solids handling capacity.
- Make sure the suction line does not suck sand, stones etc. from the bottom, i.e. always use a specially designed BBA Pumps basket strainer or, for large-volume pumps, the mobile suction strainer.

Mobile suction strainer



Basket strainer



## 5.9 Delivery line

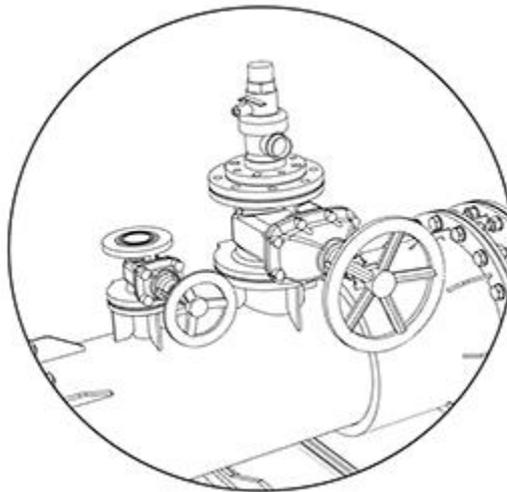
- The designer of the installation is responsible for including the required safeguards, such as protection against overpressure.
- To prevent pipe losses, use the fewest number of bends possible.
- In the case of a long delivery line or if there is a non-return valve in the delivery line, install a bypass line with a shut-off valve directly after the pump. Connect the bypass line to the suction pipe or suction point.



### WARNING

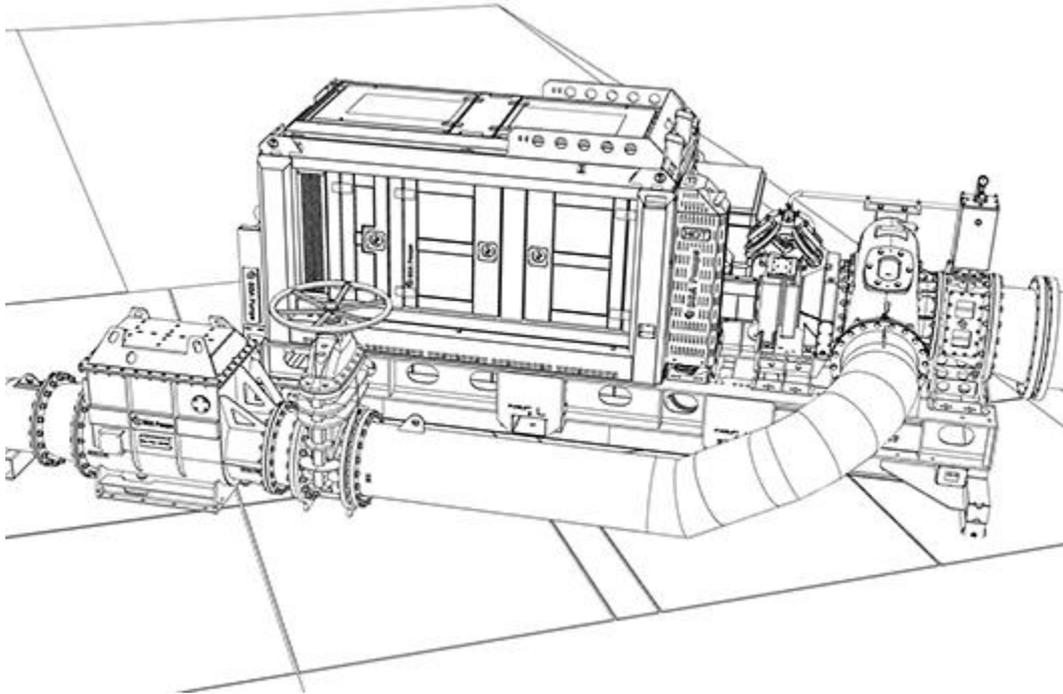
Prevent sudden closure of the delivery line that would cause water hammer.

- If there is a risk of water hammer, install a bypass, accumulator or pressure protection in the delivery line. See example below.

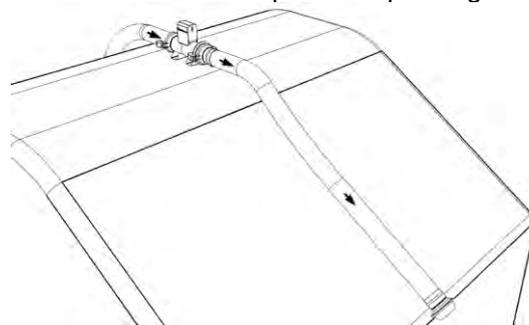


- Make sure the delivery line is as short as possible.
- Make sure the delivery line has the correct diameter so it does not cause unnecessary pressure loss.
- Use as few flat coiled hose as possible in the delivery line. This increases the risk of kinking, which results in pressure build-up. Such hoses are also at risk of being flattened during work at a construction site.
- When installing several of the same pumps to a delivery line, make sure that non-return valves are fitted so that, if the pump stops, the water cannot flow back through the pump.
- Make sure the pump never pumps against a closed delivery line, as this can result in dangerous pressures in the delivery line.
- Before disconnecting a delivery line, make sure it is no longer pressurised.
- Make sure you are familiar with local regulations concerning discharge of the pumped liquid.
- Check that the pipes/hoses and fittings are suitable for the maximum system pressure.
- When connecting several different models of pumps with differing pump curves to a delivery line always contact BBA Pumps for specific installation advice in order to prevent pump damage.

- Make sure the delivery line is well supported so that no unnecessary forces are exerted on the pump set and/or connection elements.



- Install the delivery line in such a way that there is room for expansion/contraction due to temperature differences in order to prevent pump or pipe damage.
- In the case of large-volume pumps, the delivery line must run at least one metre uphill after the non-return valve in order to put sufficient back pressure on the non-return valve for optimum operation of the dry prime function.
- Make sure the delivery line is always fitted with a drain provision.
- If the piping system runs downhill again after reaching the highest point, always install a breather valve at the highest point in the line in order to prevent siphoning and delivery line damage.



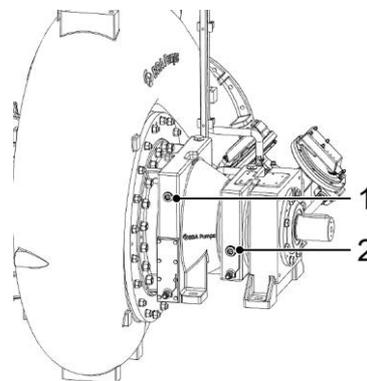
## 6 Pump – general

### 6.1 Preparation and steps for starting the pump set

#### Note

In the case of a separate pump, it must first be connected to the system in accordance with the instructions from BBA Pumps. For instructions, contact BBA Pumps.

1. Check the oil levels of the vacuum pump bearings, pump seal (1) and main pump bearings (2).
2. If applicable, the pump is now adequately warmed up (whether it is necessary to warm up the pump depends on the liquid to be pumped and the ambient conditions).
3. If barrier fluid is used, check:
  - the presence of barrier fluid
  - its correct pressure and circulation.For more information, see the technical manual for the API Plan 54.
4. Completely open the suction and delivery shut-off valves.
5. In the case of a bypass line, open the shut-off valve in the bypass line.
6. Check whether the non-return valve is closed (if present).
7. Check the direction of rotation of the pump.



### 6.2 Starting



#### WARNING

Pumps must never be operated with a closed delivery shut-off valve. Heating of the liquid beyond design limits can cause damage to the pump.



#### WARNING

Ensure that backflowing liquid when the pump is stationary does not cause the pump to rotate in the opposite direction. Such a situation can damage the mechanical shaft seals that are designed to work in one direction of rotation only. If this situation can occur, a non-return or shut-off valve must be installed to prevent it.



#### WARNING

If vibration occurs during starting, stop the pump immediately and eliminate the cause before starting again.

#### Note

When starting a diesel driven pump set, it must be started at a minimum speed when cold. If the diesel engine is at operating temperature, the speed can be increased to the desired rpm. This ensures that the pipes will be filled gradually and smoothly.

1. Check that the pump is stationary before starting. Check that all safeguards are properly connected.
2. Start the drive motor.
3. In the case of a bypass line, close the shut-off valve in the bypass line when the pump builds up pressure.
4. If the pump set is used for pumping bentonite, for example, check that the inlet and outlet for the flush connections and the barrier fluid are open.
5. Regularly check the packings for leaks.
6. Regularly check the safeguards on the pump set.
7. Avoid sudden closing of the valves, which causes water hammer.
8. Check the suction of the liquid (vacuum).
9. Check that the vacuum pump does not receive any liquid through the hose connected to the float chamber.
10. Check the pipes/hoses and the shaft seal for leaks.
11. Check the pump for proper operation.

### 6.3 Monitoring during operation

1. Always ensure that the operating point is as close as possible to BEP (best efficiency point) in the pump curve at any desired speed.
2. Specifically for diesel-driven pumps, the motor must be adequately loaded; at least 60% is recommended and preferably higher. If this is not feasible, always choose a smaller model pump set.
3. Check electrically driven pumps for sufficient cooling of the motor and switch cabinet. For example, running at too low a frequency can cause cooling problems.
4. During operation, check the pump regularly for correct operation, smooth and vibration-free running, abnormal noises and leaks.
5. Avoid situations in which the pump runs dry for more than five minutes.
6. Under optimum conditions, mechanical shaft seals permit very little or barely visible (vaporous) leakage to pass.
7. Check regularly for leaks at packings.
8. Prepare a good service plan.
9. Check the oil levels.
10. Check for oil leaks.
11. If mechanical shaft seal is leaking: stop the pump.
12. Do not expose the pump to pressures exceeding those for which the pump is intended, based on the pump curve.
13. Prevent exposure of the pump to temperatures below freezing if it is filled with liquid.
14. Make sure the liquid supply to the pump is steady and air-free.
15. Ensure the pump does not pump against a closed shut-off valve.



#### **WARNING**

**In the event of a fault or incorrect operation, stop the pump. Determine and correct the cause before restarting the pump.**

## 6.4 Shutting down and restarting

### Shutting down



#### WARNING

Make sure that all the drained liquid is collected in a proper manner and disposed of in accordance with local regulations. Leakage of environmentally harmful liquids can be extremely damaging to the environment. Do everything necessary to prevent this.



#### WARNING

If there is danger of freezing, drain the pump completely. Drain the liquid from the drip tray, if present.

### Note

If a non-return valve is present and there is sufficient back pressure in the delivery line, the delivery shut-off valve can remain open.

### Note

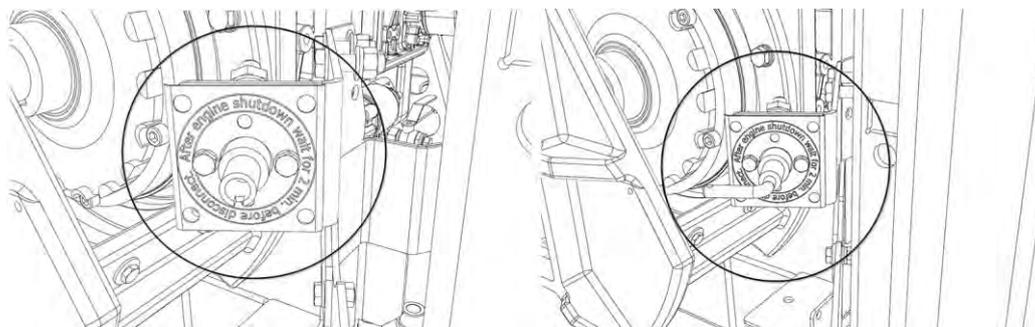
If the pump is taken out of operation for a longer period, completely drain the pump and perform the preservation procedure. See section 'Draining the pump when there is a danger of freezing'.

1. Switch off the drive motor. Make sure the pump set comes to a gentle stop and that no water hammer can occur in the piping system. If possible, always slow the motor gradually.
2. The following applies specifically to diesel-driven pumps: the earth switch may only be switched off after two minutes (the motor must automatically run through and complete a program).
3. If it is necessary to prevent the liquid from solidifying or hardening, drain the pump while the liquid is still liquefied, see section 'Draining the pump when there is a danger of freezing'.
4. Close the delivery shut-off valve.
5. Close the suction shut-off valve.



#### WARNING

The earth switch may only be switched off after two minutes (the motor must automatically run through and complete a program).



## Restarting



### WARNING

Ensure that backflowing liquid when the pump is stationary does not cause the pump to rotate in the opposite direction. Such a situation can damage the mechanical shaft seals that are designed to work in one direction of rotation only. If this situation can occur, a non-return or shut-off valve must be installed to prevent it.

Only switch on again when the pump shaft is stationary. Follow the starting instructions.

## 6.5 Draining pump set (when there is a danger of freezing)

Make sure a pump is drained when there is a danger of freezing.



### WARNING

Take the necessary precautionary measures in the case of hot, volatile, flammable and hazardous liquids.



### WARNING

Ensure that all the drained liquid is collected in a proper manner and disposed of in accordance with local regulations.

Do not simply allow the water to drain onto the ground, as this could cause the ground to become slippery.

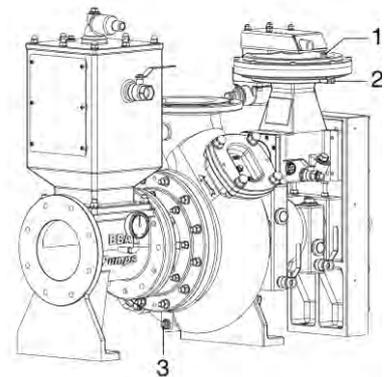


### WARNING

Leakage of environmentally harmful liquids can be extremely damaging to the environment. Do everything necessary to prevent this.

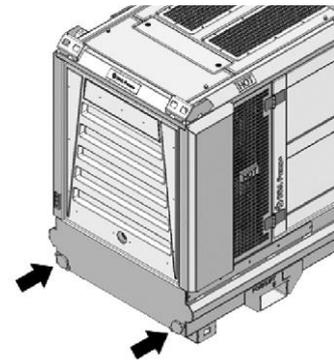
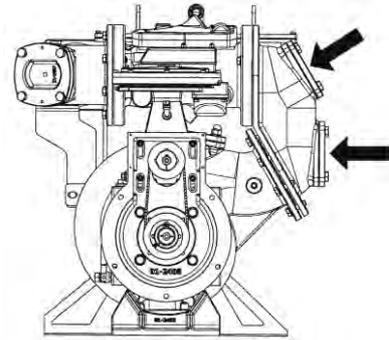
### Draining

1. Stop the pump.
2. Take measures to prevent unauthorised starting.
3. Allow the pump set to cool down if the pumped liquid allows it.
4. Shut off the delivery and suction lines as close to the pump set as possible.
5. Place a suitable drain pan under the drain plugs.
6. Remove the drain plug (3). In the case of an older pump set, also the other drain plugs (1 and 2).



### Draining congealing liquids

1. Open the inspection/cleaning covers.
2. Flush the passages and chambers in the pump housing, intermediate housing, float chamber and non-return valve. Use the correct flushing liquid, compatible with the technical characteristics of the liquid to be pumped. For more information, consult the MSDS (Material Safety Data Sheet) for the liquid.
3. Dispose of the drained liquid in a responsible manner in accordance with local regulations, company rules and the MSDS for the liquid.
4. Switch on the pump briefly to eliminate any condensed water that may be present.
5. Install the cleaning cover with a new gasket.
6. Install the drain plugs with new sealing rings.
7. If the pump set has a drip tray, drain it via the drain plugs.
8. Close the drain plugs of the drip tray. Always use the correct elastomers for sealing (original BBA Pumps parts).



### Note

For liquids that congeal at temperatures below the operating temperature, close the suction and delivery lines and drain the pump set immediately after shutting down the pump set.

## 6.6 Cardan driveshaft

### Note

If the pump set is installed in a piping system where there is a possibility that the pump will turn while the engine/motor is at a standstill, the cardan driveshaft must be disconnected to prevent damage to the gearbox.

## 6.7 Free shaft end pump

A free shaft end pump is delivered 'bare', without drive system, frame, enclosure or control panel. The free shaft end pump must be mounted to the frame/enclosure securely, safely and in a technically proper manner, with the corresponding drive. Ask the manufacturer for installation instructions.



### WARNING

The manufacturer of the free shaft end pump is not responsible for possible injuries to the user and third parties or any kind of possible damage that results from incorrect and/or improper installation of the pump.

## 6.8 Optional items



### WARNING

It is not permitted to make changes to the pump set without written permission from BBA Pumps. As described in the BBA Pumps warranty book, any change or modification to the pump set will void the warranty. Please refer to the BBA Pumps warranty book for all warranty conditions. It can be found at [www.bbapumps.com](http://www.bbapumps.com).

### Spark arrestor

A spark arrestor is available as an option on diesel-driven pumps. The spark arrestor must be cleaned during every service. The spark arrestor is cleaned as follows:

1. Stop the diesel engine and allow the exhaust system to cool.
2. Unscrew the plug from the soot trap.
3. Start the diesel engine.



### WARNING

Make sure the particulates are captured in accordance with prevailing standards. Particulates pose a health hazard.

### Cold climate package

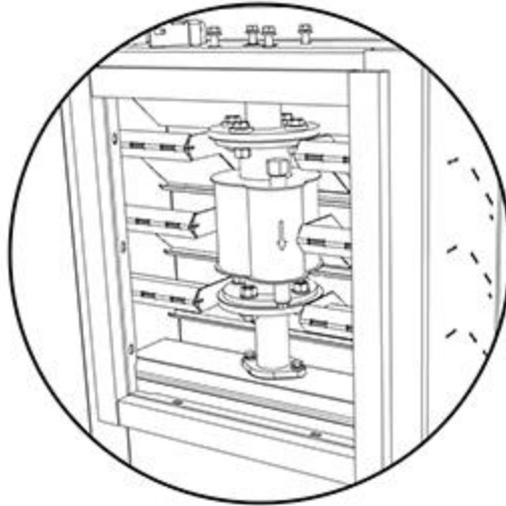
A cold climate package is available as an option for pumps used in areas with low ambient temperatures down to -30 °C (-22 °F). In many cases, BBA Pumps uses a Webasto coolant heater. This heater has its own combustion engine. Be sure to use the correct fuel.

In the event of a strange noise or smoke, immediately take the coolant heater out of operation by turning off the Webasto with the switch. Check the coolant heater for damage to fuel and liquid lines every month. The coolant heater must be run for at least ten minutes once a year and checked by a specialist once every two years.

If the pump set is equipped with a BBA Pumps cold climate package, the capacity of the engine cooling system will be increased. Keep this in mind when replacing or changing the coolant.

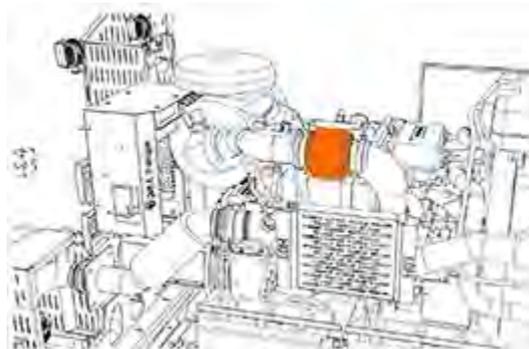
## Pumps BA serie

### Spark arrestor



### Automatic overspeed shutdown

An overspeed shutdown valve is available as an option for diesel-driven pumps that need to be protected against 'runaway'. This can happen if the diesel engine receives an unregulated supply of fuel or starts to run on its own engine oil. If the pump set is equipped with this, it is important to check at each service that the air filter is properly attached and that the hoses are 100% tight. Check the specification sheet for deviating warranty conditions.



### Pull-up frame

A hooklift or cable pull-up frame is available as an option for mobile pumps. As many different systems are used worldwide, the pump set user will have discussed the specific details when placing the order. Main concerns, such as safety and locks during loading/unloading and transport, are known to the user. BBA Pumps is never responsible for accidents caused by incorrect use.

Please contact BBA Pumps for information about dimensions of the various pull-up frames.

**Battery charger**

- A battery charger is available as an option. The pump set is fitted with a battery charger, which is continuously connected to the battery.
- Although the batteries are charged by the diesel engine's alternator, it may be desirable to have a battery charger that can be connected to mains power as required.
- Since AGM batteries require a higher charging voltage, there are two types of battery chargers available for battery charging.

**WARNING**

**The battery charger must be disconnected from the battery during maintenance work or when welding on the pump set.**

**Pressure sensor**

- A pressure sensor (transducer) is available as an option. With a pressure sensor, an electronically controlled diesel engine or pump with variable-frequency drive is infinitely variable in speed and will automatically start and stop when the liquid level is high or low.
- The pressure sensor is set to the correct value to optimise operation and communication by BBA Pumps at the factory.
- The pressure sensor is made for use in water. For use in other liquids, contact BBA Pumps.

**WARNING**

**When using a pressure sensor (transducer), it is important that the pump set switches on not more frequently than four times per hour.**

**WARNING**

**When using a pressure sensor (transducer), the pump may start automatically. Therefore, always switch off the power when working on the pump set.**

Pressure sensor



## Pumps BA serie

### Autostart adaptor

- For the pumps in North America, it is possible to use other types of automatic level control via an adaptor (see drawing).
- When disconnecting the floats, the standard yellow plugs (2) must remain connected. Ensure that the plugs are connected correctly.



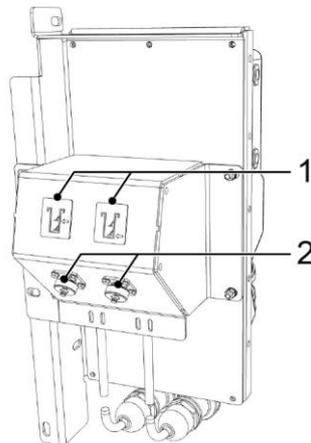
#### WARNING

When using the floats, it is important that the pump set does not switch on more than four times per hour.



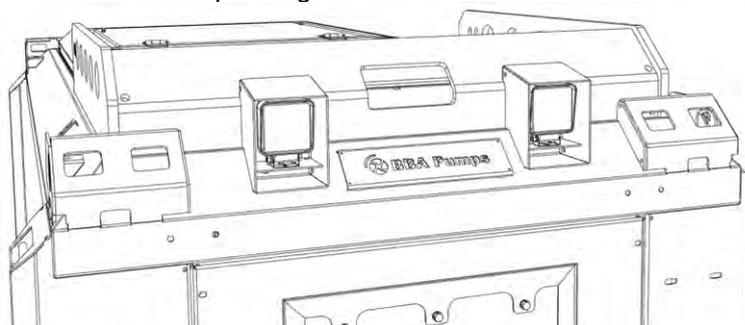
#### WARNING

When using a remote control, the pump may start automatically. Therefore, always switch off the power when working on the pump set.



### Lighting

- If the pump set is equipped with interior and/or exterior lighting, there is an operating switch on the dashboard; see the LC40/LC45 operating manual.



### Stack light

- A stack light (red/yellow/green) is available as an option. The stack light is mounted inside a protective guard. The green lamp is lit during operation, the yellow lamp is lit in the event of a fault or fault message, and the red lamp is lit if the pump set switches itself off due to a fault/safety issue.

**Telematics**

- If the pump set is equipped with a telematics system (linQ), you automatically have access to the online user manual via the interface.

**Trailer**

- It is possible to have the pump set mounted on a trailer at the factory. There are many different trailer possibilities, such as 80 or 100 km/h versions with fixed or adjustable drawbar and 16 km/h trailers for towing with an agricultural vehicle. Or covered trailers in which a pump set is constructed.
- A separate manual is available for trailers. It can be downloaded from [www.bbapumps.com](http://www.bbapumps.com).

**WARNING**

The user is responsible for ensuring that the trailer complies with the local regulations.

**Additional battery pack**

- An external battery pack is available as an option for greater capacity.

**WARNING**

Installation of an additional battery pack on the pump set by anyone other than BBA Pumps voids the warranty of the electrical system and relieves BBA Pumps of all liability for consequential damage that may occur in connection with the additional battery pack.

**Solar panels**

- If the pump set is fitted with one or more solar panels mounted by BBA Pumps, please observe the following points:
  - Install the pump set with the solar panels facing south.
  - Clean the solar panels regularly with tap water and a soft brush.
  - Never spray on or around solar panels with a pressure washer.
  - Solar panels must not come into contact with other hard objects.
  - Check the battery terminals and cabling regularly.

**WARNING**

Do not install a solar panel or any other electrical component without written consent from BBA Pumps. Ensure professional connection and cabling. This is to prevent malfunctions in the electrical system of the pump set.

## 7 Pump set with diesel engine drive

### 7.1 Connection general (diesel engine) – BA series

When using a pump set with a combustion engine, the engine supplier's instructions must be available; see also [www.bbapumps.com](http://www.bbapumps.com). Contact BBA Pumps immediately if this manual is not present.

Irrespective of these operating instructions, the following instructions must be observed for all combustion engines:

- Observe all applicable local safety instructions.
- If a pump set is set to automatic level control or is equipped with a remote control, the user must provide adequate safety measures and notifications that the pump set can start automatically.
- Separate operating instructions for the remote control are included with the pump set.
- Shield the engine exhaust pipe to prevent accidental contact.
- The starting system must automatically disengage when the engine is started.
- The minimum and maximum engine rpm set by BBA Pumps may not be changed.
- Before starting, check the following:
  - Engine coolant level, if applicable
  - Coolant leakage, if applicable
  - Oil level of motor, pump, vacuum pump and gearbox (if present)
  - AdBlue ® level (if present)
  - AdBlue ® lines for leakage (if present)
  - Fuel tank level
  - Fuel lines for leaks
  - External fuel tank (if present)
  - Whether the earth switch is switched on (if present)
  - Check that the float(s)/pressure sensor of the automatic level control is properly adjusted
- Bleed the fuel system after filling an empty tank and after replacing fuel filters.



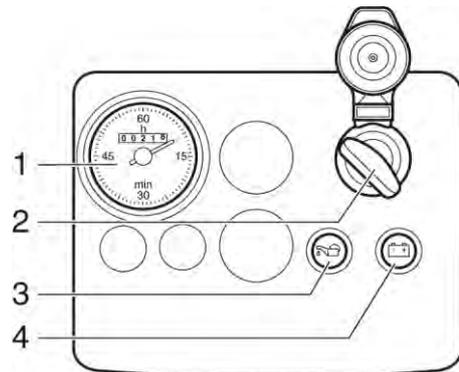
#### **WARNING**

**Only fuels prescribed by the engine manufacturers may be used. Always check this in the original user manual for the drive engine (it is available for download at [www.bbapumps.com](http://www.bbapumps.com)). Use of fuel that does not meet the required specifications may cause severe engine damage.**

## 7.2 Hatz control panel

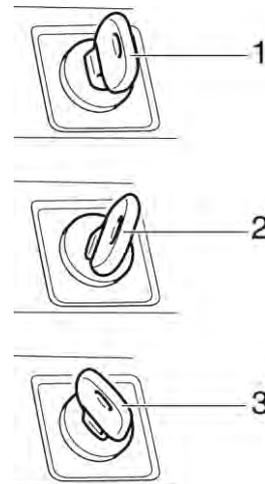
If the pump set is equipped with a standard Hatz control panel.

1. Hour counter
2. Ignition switch
3. Oil pressure warning light
4. Battery charge warning light



The ignition switch has three positions:

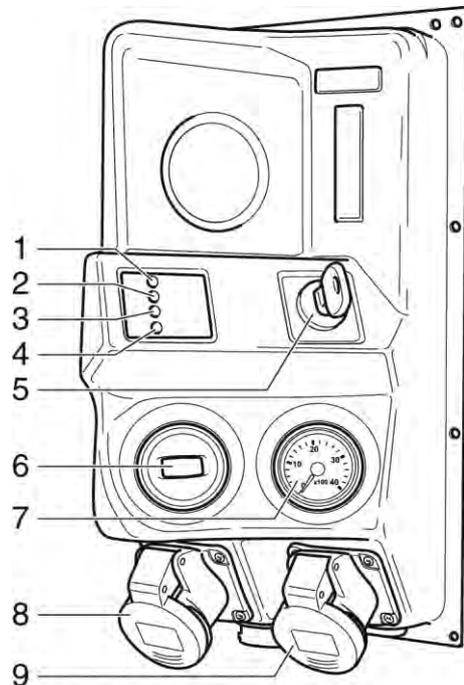
- Position (1): Insert the ignition key into the key switch. The pump set is switched off.
- Position (2): Turn the ignition switch past position (2) to start the pump set. During operation the ignition switch is in position (2).
- Position (3): Turn the key switch to position (3) to start the pump set. Once back in position (1) the ignition key can be removed from the key switch.



### 7.3 LC20 control panel

If the pump set is equipped with a LC20 control panel.

1. Auto stand-by LED (green)
2. Glow plug LED (yellow)
3. Oil pressure LED (red)
4. Temperature LED (yellow)
5. Ignition switch
6. Hour counter
7. Tachometer
8. Float low
9. Float high

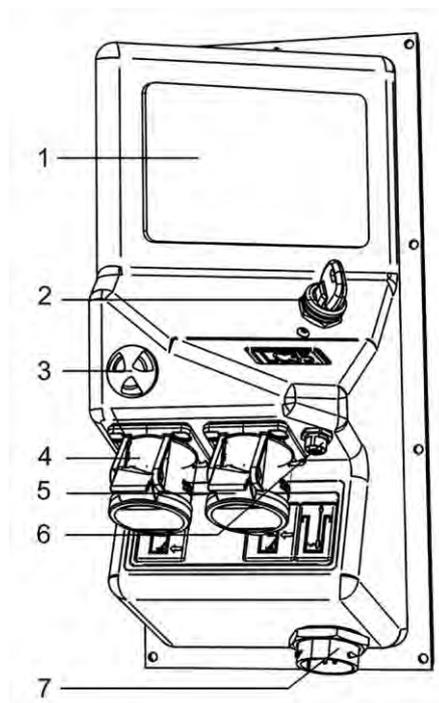


- If the Auto standby LED (green) is on, the ignition switch is in the ‘auto’ start position and the system can be started.
- When the glow plug LED (yellow) is on, the system is being pre-heated. When the LED goes out, the engine can be started.
- The hour counter indicates how long the pump has been in service. These hours are also important for ensuring timely maintenance of the pump set.
- For the float connection, see section ‘Use of floats’.

## 7.4 LC35 control panel

If the pump set is equipped with a LC35 control panel.

1. Display
2. Ignition switch
3. Buzzer
4. Float low
5. Float high
6. Level sensor connection
7. ECU cable connection



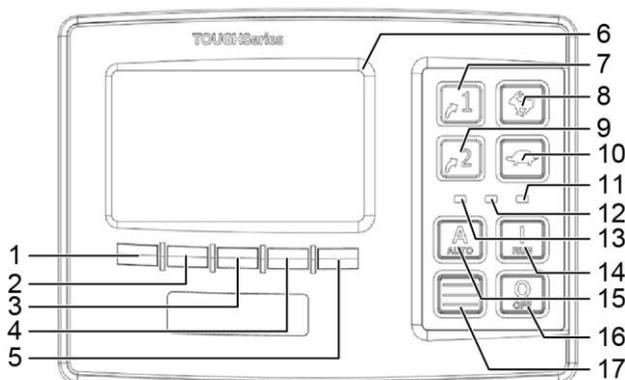
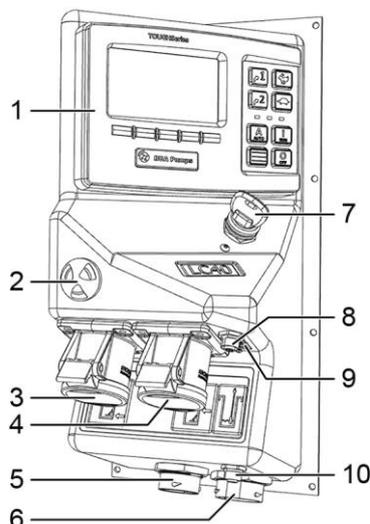
### Note

The detailed operating manual for the LC35 control panel can be downloaded from [www.bbapumps.com](http://www.bbapumps.com).

## 7.5 LC40 control panel

If the pump set is equipped with a LC40 control panel.

1. Display
2. Buzzer
3. Float low
4. Float high
5. External connection
6. ECU cable connection
7. Ignition switch
8. Level sensor connection
9. USB plug
10. Modbus connection



- |                              |                                    |
|------------------------------|------------------------------------|
| 1. Menu button 1             | 10. TORTOISE: RPM down             |
| 2. Menu button 2             | 11. Fault (red)                    |
| 3. Menu button 3             | 12. DEF (AdBlue) level low (blue)  |
| 4. Menu button 4             | 13. Pump in autostart mode (green) |
| 5. Menu button 5             | 14. RUN: Start                     |
| 6. Display                   | 15. AUTO: autostart mode           |
| 7. Hotkey autostart switches | 16. OFF: stop                      |
| 8. HARE: RPM up              | 17. Quick Access Menu              |
| 9. Hotkey line graph         |                                    |

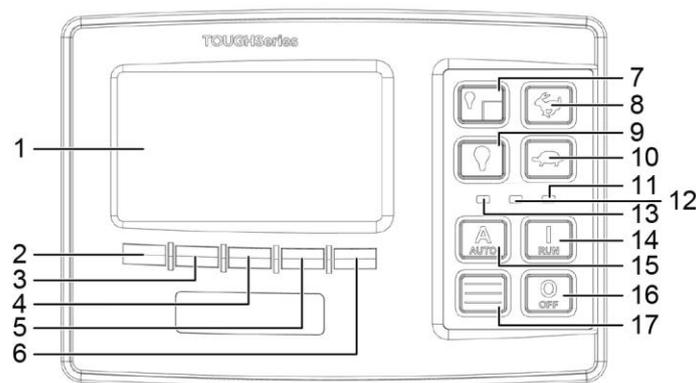
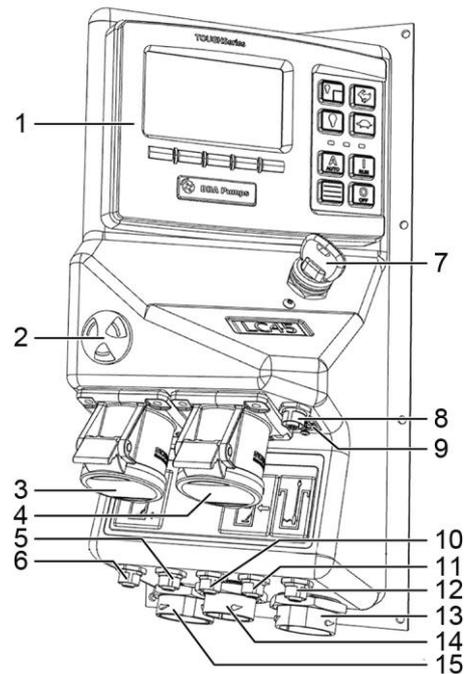
### Note

The detailed operating manual for the LC40 control panel can be downloaded from [www.bbapumps.com](http://www.bbapumps.com).

## 7.6 LC45 control panel

If the pump set is equipped with a LC45 control panel.

1. Display
2. Buzzer
3. Float low
4. Float high
5. Sensor 2
6. Sensor 3
7. Ignition switch
8. Level sensor connection
9. USB plug
10. Sensor 4
11. Sensor 5
12. Modbus connection
13. ECU cable connection
14. External connection 1
15. External connection 2



- |                   |                                    |                                   |
|-------------------|------------------------------------|-----------------------------------|
| 16. Display       | 22. Interior light button          | 28. DEF (AdBlue) level low (blue) |
| 17. Menu button 1 | 23. HARE: RPM up                   | 29. AUTO: autostart mode          |
| 18. Menu button 2 | 24. Exterior light button          | 30. RUN: Start                    |
| 19. Menu button 3 | 25. TORTOISE: RPM down             | 31. Quick Access Menu             |
| 20. Menu button 4 | 26. Pump in autostart mode (green) | 32. OFF: stop                     |
| 21. Menu button 5 | 27. Fault (red)                    |                                   |

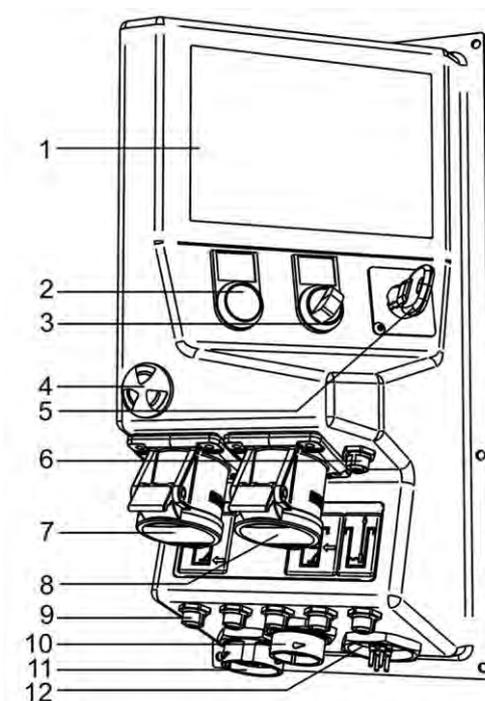
**Note**

The detailed operating manual for the LC45 control panel can be downloaded from [www.bbapumps.com](http://www.bbapumps.com).

## 7.7 LC50 control panel

If the pump set is equipped with a LC50 control panel.

1. Display
2. Interior light
3. Exterior light
4. Buzzer
5. Ignition switch
6. Level sensor connection
7. Float low
8. Float high
9. Sensor
10. External connection
11. External connection
12. ECU cable connection

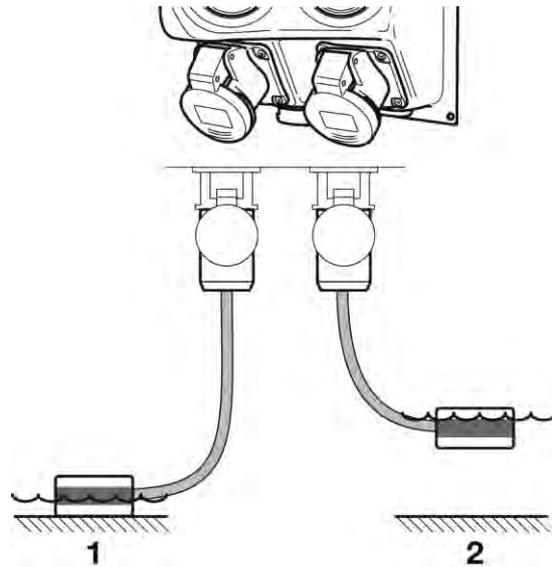


### Note

The detailed operating manual for the LC50 control panel can be downloaded from [www.bbapumps.com](http://www.bbapumps.com).

## 7.8 Use of floats

- The floats used are identical and suitable for standard BBA Pumps control panels. The right-hand connection switches on the pump set when the maximum level is reached (2). The left-hand connection switches the pump set off when the minimum level is reached (1).
- The float switches are made for use in water. For use in other liquids, contact BBA Pumps.



### Note

When float switches are used it is important that the pump set cycle on and off no more than four times per hour. Keep this in mind when positioning the float switches.



#### WARNING

When using floats, the pump may start automatically. Therefore, always switch off the power when working on the pump set.

## 7.9 Connecting additional fuel supply

### Auxiliary fuel tank (optional)



#### WARNING

When using an external fuel tank, the user is responsible for working in accordance with local regulations.



#### WARNING

Never place the external tank near the air inlet and discharge side of the pump set.



#### WARNING

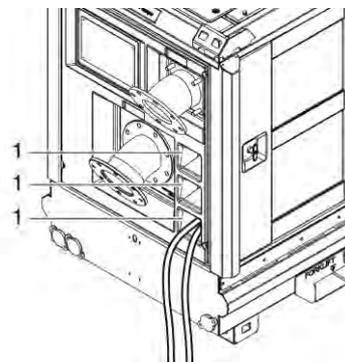
Install the pump set to allow easy access for filling the fuel and urea (AdBlue®) tanks in order to prevent environmental pollution due to spills during filling.



### WARNING

Make sure the external fuel tank is as close as possible to the pump set (maximum 10 metres). See also chapter 'Connecting additional fuel supply'.

- Remove the ignition key.
- Turn off the earth switch.
- Press the emergency stop button.
- Bring the supply and return hoses into the pump set enclosure through one of the lead-throughs (1).
- Lay both hoses to the connection points inside the enclosure and connect the hoses.
- After connecting, check for fuel leaks.



### WARNING

Connection of the external fuel tank must be done by the user. Checking for leaks is the user's responsibility.



### WARNING

Make sure that, in the event of a leak, no fuel can get inside or outside the pump set.



### WARNING

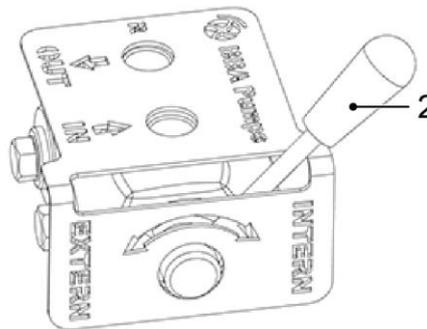
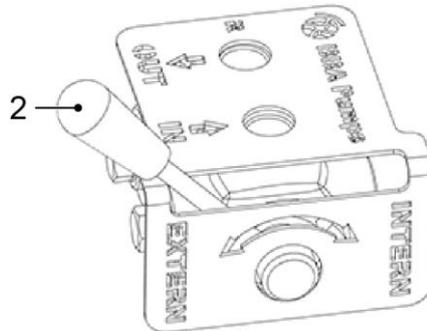
Leakage of environmentally harmful liquids can be extremely damaging to the environment. Do everything necessary to prevent this.

### Note

After connecting, secure the hoses in the enclosure. Take measures to prevent them from rubbing against sharp parts.

**Selector lever (optional)**

- Connect the fuel supply hose to the connection point under 'IN'.
- Connect the fuel return hose to the connection point under 'OUT'.
- Set the lever to 'EXTERN' to use the fuel from the external fuel tank.
  
- Set the lever to 'INTERN' to use fuel from the internal fuel tank.



**Note**

**If the fuel hoses from the external tank are not connected, always fit the original sealing plugs to prevent leaks.**

Use the correct diameter fuel hoses from the external tank to the connection point in the pump set.

Avoid unnecessary resistance in the supply and return hoses.

Brand	Type	10 metre external hose to tank
Hatz	1D series	1/2" version
Hatz	H50 series	1/2" version
Perkins	404 series	1/2" version
Perkins	854 series	3/4" version
Perkins	904 series	3/4" version
Volvo Penta	5 to 13 litres	3/4" version
Volvo Penta	16 litres	1" version

Table of connection sizes for fuel hoses

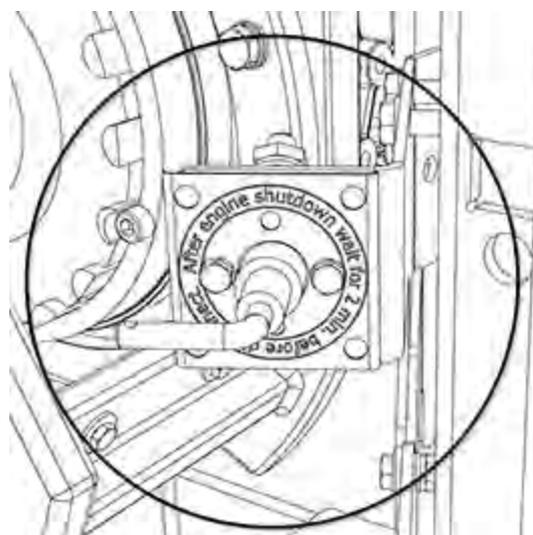
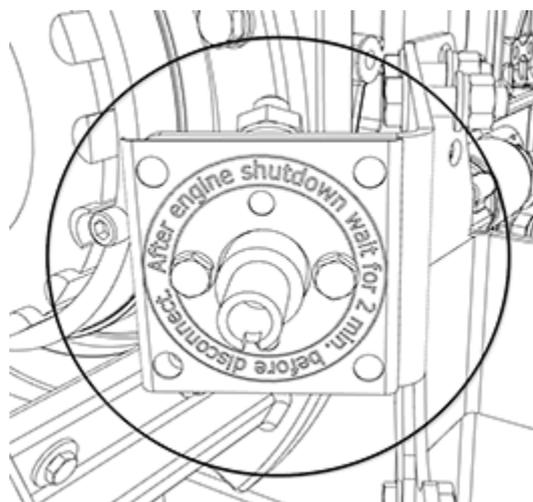
### Bleeding fuel systems of electronically controlled diesel engines

1. Set the fuel handle (2) to the desired position (INTERN or EXTERN).
2. Make sure there is sufficient fuel in the selected tank.
3. Visually inspect the fuel lines for routing and leakage.
4. Turn the ignition switch to the ignition position; the electric self-priming fuel pump usually starts running. (Some electronic diesel engines still have a manual pump, in which case they must be primed with the manual pump).
5. The electric booster pump may switch off after some time. In that case, turn the ignition switch to 0 and turn it on again; the self-priming fuel pump will switch on again.
6. Error code SPN94 may appear on the screen. If this happens, continue bleeding the lines. Once the fuel has been drawn in, set the ignition switch to 0 and then to 1 again; the code will disappear.

## 7.10 Starting (diesel) – BA series

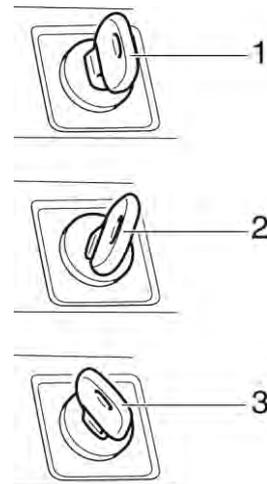
### General

1. Check the pump type (type plate) and the characteristics of the pump set, such as: speed, operating pressure, power consumption, operating temperature, direction of rotation, NPSH etc.
2. Check whether the pump set has been installed in accordance with the instructions. Pay particular attention to the space around the pump set. Ensure that the pump set can draw in sufficient fresh air.
3. Check whether the prescribed safety provisions are in place.
4. Connect the lines; see chapter 'Installing the pump set'.
5. Fill and bleed the pump; see chapter 'Pump – general'.
6. Perform the daily maintenance.
7. Move the fuel selection lever to the desired position, if present.
8. Make sure there is sufficient fuel in the selected fuel tank.
9. Bleed the fuel system, if necessary.
10. Carry out the general actions for starting the pump set; see chapter 'Pump – general'.
11. Switch on the earth switch, if present. It is located near the control panel:  
Insert the earth switch key into the earth switch.  
Turn the earth switch key a quarter turn clockwise.
12. Select the desired operating mode with the ignition switch on the control panel.



**LC20 control panel**

- The ignition switch has three positions:
  - Position (1): Insert the ignition key. The pump set is switched off.
  - Position (2): Turn the ignition switch past position (2) to start the pump set. During operation the ignition switch is in position (2).
  - Position (3): Autostart. This means that the pump set will switch itself on at certain times. These switch-on times can be set by the user using two floats. If the pump is set to 'autostart', the floats must be connected to the control panel. A wireless remote control is available as an option. If the wireless remote control has been supplied, position (3) is used for the wireless remote control. The manual for the remote control is provided separately.

**Important!**

If the engine cuts out immediately after starting or switches off on its own during operation, this may indicate that the protection is responding to a fault signal from the engine protection. This can be recognised by the indicator light on the control panel.

After stopping the engine, this indicator light remains lit for approx. 12 seconds.

Then the electrical system will switch off automatically.

If the ignition switch is turned back to position (1) and then immediately to position (2), the corresponding indicator light will light up again.

Before making any further starting attempts, investigate the cause of the problem.

The indicator light goes out the next time the engine is started.

**Note**

**Due to a switch-on delay, it may take some time before the engine starts.**

**WARNING**

The control panel is equipped with an automatic starting system, and therefore the engine can start or stop at any time. The engine may start without warning. It is the user's responsibility to provide labels and audible/visible warnings to alert people that the pump set is about to start. Always use a safety procedure (lock out/tag out) before performing maintenance. Do not configure programmable functions when the ignition switch is in the 'on' position.

For explanations of how to start up all other control panels and descriptions of their operation, download the comprehensive operating manual from the [www.bbapumps.com](http://www.bbapumps.com) website.

**Note**

**Specifically for diesel-driven pumps, the engine must be sufficiently loaded. The recommendation is at least 60% and preferably higher. If this is not feasible, always choose a smaller model pump set.**

### Note

In the case of engines with a particulate filter and/or SCR silencer, regular checks must be performed to ensure that the engine is properly loaded and that there are no active engine faults.

### Note

It is also important that the urea tank (AdBlue ®) is refilled on time.

### Note

If the engine has an active fault and/or the urea (AdBlue ®) tank is not at the correct level, the diesel engine will not regenerate properly.

### Note

If the engine does not regenerate properly, the particulate filter or DOC will clog up with soot, and eventually the engine will not be able to regenerate manually. In this case, a specialist must come to the pump set to regenerate the engine. Clogging of the particulate filter must be prevented at all times.

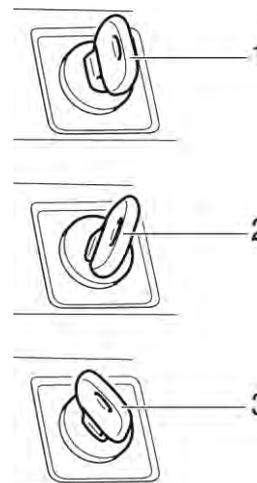
### Note

If the pump set is equipped with a particulate filter and/or SCR system, we recommend using a telematics system (InQ). This way, you will be informed of the status of any pump set fault, at any time, no matter where you are.

## 7.11 Shutting down (Diesel) – BA series

### LC20 control panel

1. If possible, reduce the engine speed to idle.
2. Set the ignition switch to position (1). For the Hatz control panel, the ignition switch must be in position (3).
3. Observe whether the installation comes to a gradual, smooth stop.
4. Carry out the general actions for stopping the pump set; see chapter 'Pump – general'.

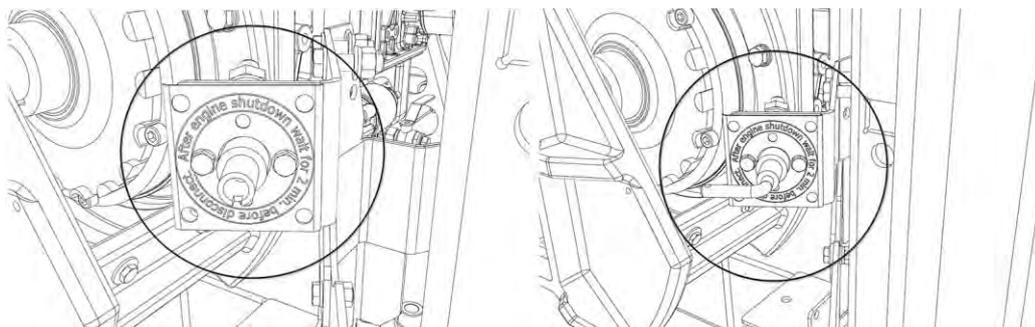


For explanations of how to start up all other control panels and descriptions of their operation, download the comprehensive operating manual from the [www.bbapumps.com](http://www.bbapumps.com) website.



### WARNING

The earth switch may only be switched off after two minutes (the motor must automatically run through and complete a program).



**Note**

The ignition switch is not a start or stop switch and is only intended to prevent unexpected activation.

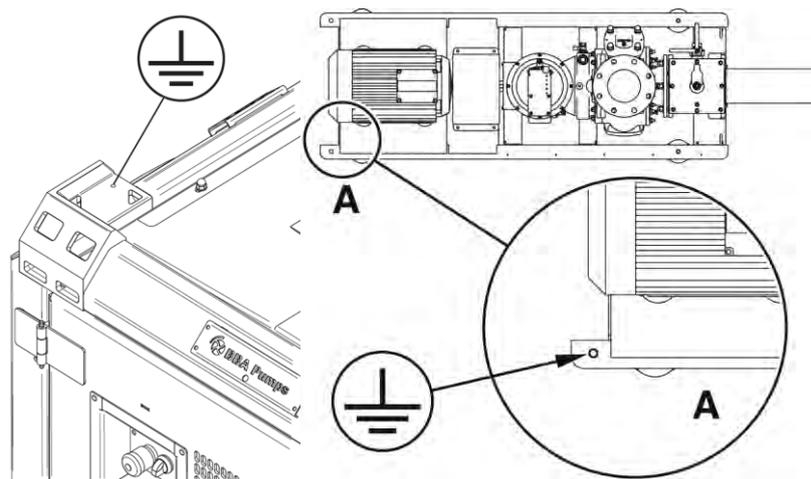
**Note**

If the ignition switch is turned to the 'off' position, the pump set will stop immediately.

## 8 Pump set with electric drive

### 8.1 Connection general – BA series

- Take any necessary measures to ensure that the electrical connections and cables cannot be damaged.
- The voltage and frequency must be checked in advance and must match the motor specifications. These data are indicated on the type plate.
- Use of the motor without an overload protection switch is not permitted.
- For frequency-controlled motors, ensure sufficient starting torque and, at low speeds, sufficient cooling of the motor. Install an independently operating fan if necessary.
- The user must ensure proper earthing (A) in accordance with locally applicable guidelines, regulations, standards and laws.



- Check whether the motor connection matches the mains voltage. See the type plate for the motor.
- Check the direction of rotation of the pump.

## 8.2 Electrical connection

### Motors up to 3 kW (4 hp)

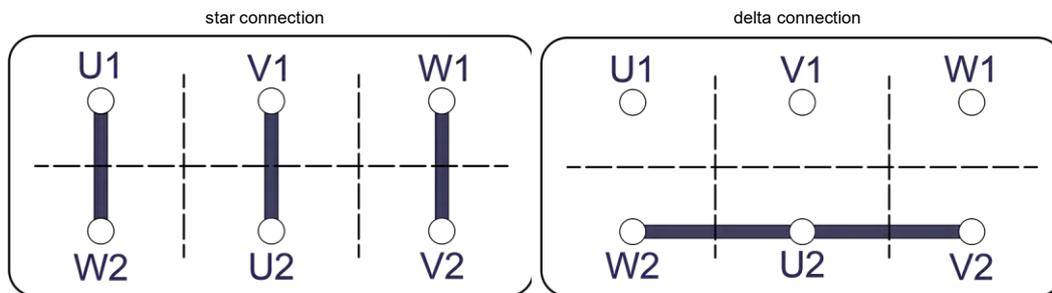
The type plate is labelled 230V/400V.

This means the winding voltage of the motor may not exceed 230V. The 400V indicates the voltage between the phases. 3x400V is three-phase electric power. This means that the motor must be connected in **STAR** configuration.

### Motors of 3 kW (4 hp) or more

The type plate is labelled 400V/690V.

This means the winding voltage of the motor may not exceed 400V. Because the maximum voltage is 400V, this motor must be connected in **DELTA** configuration.



## 8.3 Safeguards

Provide the pump set with the prescribed and desired safeguards.

Possible protection measures include:

- temperature
- overpressure
- underpressure
- direction of rotation
- oil level
- overload
- etc.

It is not permitted to use a motor without a motor protection switch.

To protect the motor against overload, a thermal motor protector or thermal magnetic motor protector must be installed.

Use the nominal power rating of the motor when setting the protector.

## 8.4 Electric motors

It may be possible to obtain permission for use of the pump set in a high risk area, by seeking approval from BBA Pumps.

Examples of situations that involve high risk include:

- Pumping of highly flammable liquids
- Dusty environment
- Environment with explosive gases in the vicinity

The risk category is defined in accordance with the ATEX Directive. In such situations, choosing the right pump set is very important.

Take measures to ensure that the electrical connections and cables cannot be damaged.

The voltage and frequency must be determined in advance and match the specifications for the winding configuration of the motor. This information can be found on the type plate.

For explosion-safe motors the data from the motor type plate must match the temperature class of the flammable/explosive gas/liquid.

### Isolating switch

In order to be able to carry out work on the pump set safely, the isolating switch must be placed as close as possible to the pump set in direct view of the technician.

It is recommended that an earth leakage circuit breaker also be installed. The installation must be protected against inadvertent starting. The switching equipment must comply with the local regulations.

## 8.5 Checking the direction of rotation

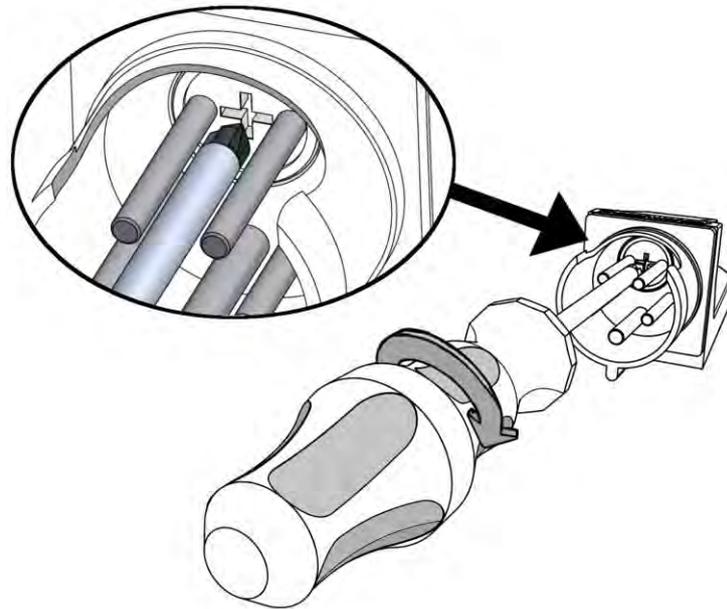


### WARNING

**This test may only be performed by authorised personnel with the appropriate training.**

Check whether the direction of rotation of the motor matches that of the pump. Most pump sets with an advanced control panel have a direction of rotation warning lamp or fault indicator as standard. To check the direction of rotation the motor must be switched on briefly. The motor must not be allowed to reach the normal operating speed.

If the direction of rotation is incorrect, the connection on the terminal board must be changed or, if a phase reversal plug is present, the pins of the plug must be reversed.



## 8.6 Commissioning

Proceed as follows when putting a pump set with electric drive into operation:

- Check the pump type (see type plate) and the characteristics of the pump set, such as: speed, operating pressure, power consumption, operating temperature, direction of rotation, NPSH, ATEX coding etc.
- Check whether the electrical system has been installed in compliance with local regulations. Also check whether the required measures have been taken to completely eliminate danger to the user.
- Check whether the motor connection matches the mains voltage.
- Check the setting of the motor protection.
- Connect the suction and delivery lines.
- Fill and bleed the pump (only necessary if there is no vacuum system present).

## 8.7 Pump set without control panel (DOL)

For a DOL (Direct Online) delivery, the electric BBA pump set is delivered bare, without lockable compartment or control panel. For correct connection, installation instructions are available; please contact BBA Pumps. To prevent damage to the pump, the user must provide a proper and safe method of starting the motor and an emergency stop connection.



### WARNING

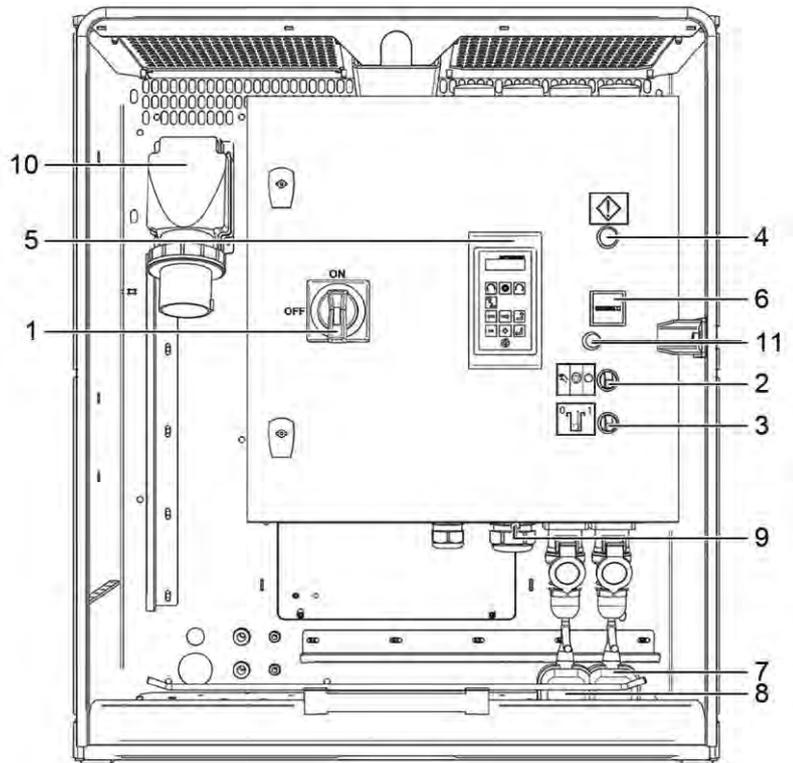
**The pump manufacturer is not responsible for possible injuries to the user and third parties. Nor is the manufacturer liable for possible damage to the pump, in whatever form, as a result of faulty and/or incompetent connection of the control panel and emergency stop to the pump.**

## 8.8 Control panel soft starter – BA series

The pump set has a control panel equipped with a soft starter. The design of this panel differs per pump set.

The actual control panel may therefore differ from the illustration.

1. Main switch
2. Control switch
3. Level sensor switch
4. Fault lamp (red)
5. Display
6. Hour counter
7. High level float (right)
8. Low level float (left)
9. Level sensor connection
10. Rubber button
11. Plug/socket power supply (up to 63A-5P)
12. Reset button

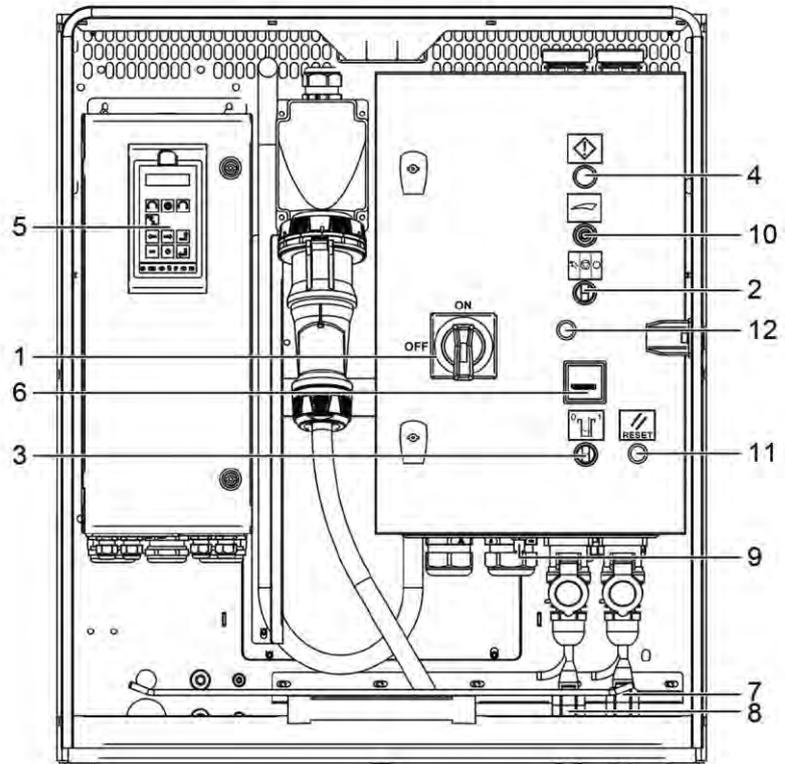


## 8.9 Control panel variable-frequency drive – BA series

The pump set has a control panel equipped with a variable-frequency drive. The design of this panel differs per pump set.

The actual control panel may therefore differ from the illustration.

1. Main switch
2. Control switch
3. Level sensor switch
4. Fault lamp (red)
5. Display
6. Hour counter
7. High level float (right)
8. Low level float (left)
9. Level sensor connection
10. Potentiometer
11. Reset button
12. Rubber button



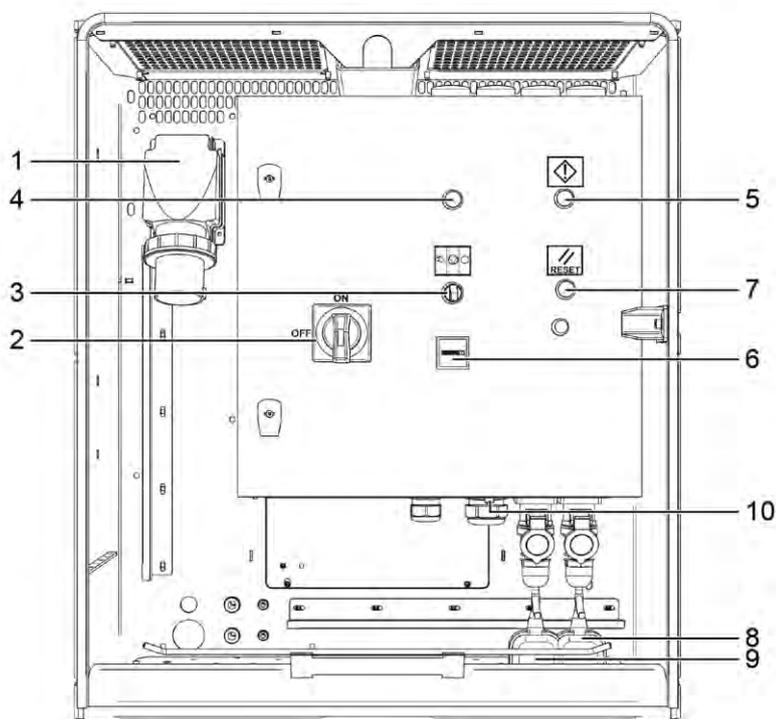
### WARNING

After connecting the power supply and switching on the main switch, wait 10 seconds before starting the pump set. The system must first complete a start-up procedure.

## 8.10 Control panel star/delta – BA series

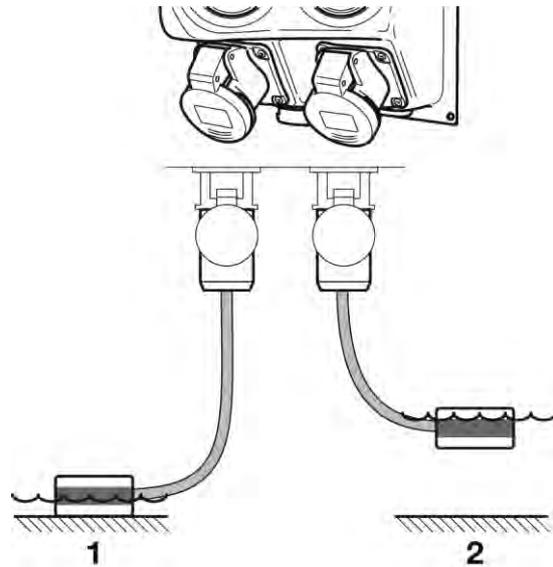
The pump set has a control panel equipped with a star/delta switch. The design of this panel differs per pump set. The actual control panel may therefore differ from the illustration.

1. Plug/socket power supply (up to 63A-5P)
2. Main switch
3. Control switch
4. Direction of rotation warning lamp
5. Fault lamp (red)
6. Hour counter
7. Reset button
8. High level float (option)
9. Low level float (option)
10. Connection



## 8.11 Use of floats

- The floats used are identical and suitable for standard BBA Pumps control panels. The right-hand connection switches on the pump set when the maximum level is reached (2). The left-hand connection switches the pump set off when the minimum level is reached (1).
- The float switches are made for use in water. For use in other liquids, contact BBA Pumps.



### Note

When float switches are used it is important that the pump set cycle on and off no more than four times per hour. Keep this in mind when positioning the float switches.



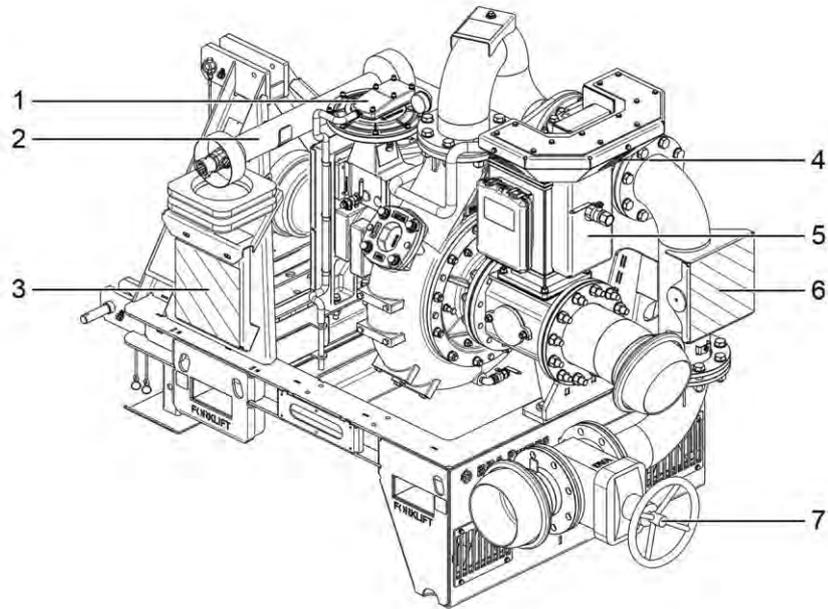
### WARNING

When using floats, the pump may start automatically. Therefore, always switch off the power when working on the pump set.

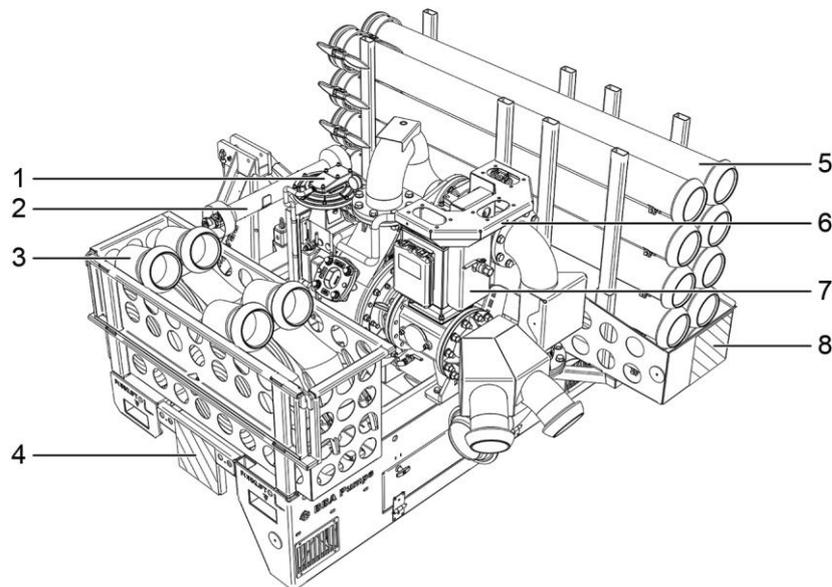
## 9 Tractor-driven pump

### 9.1 Functional description

1. Vacuum pump
2. PTO shaft
3. Safety sign
4. Work lights
5. Float chamber
6. Safety sign
7. Manual shut-off valve



Tractor pumps are optionally available with an accessory rack (3) and pipe rack (8). In the drawing, the pipe rack is filled with HDPE pipes (5).



Tractor-driven pumps are available in different sizes and versions. Optionally, a tractor pump can also be mounted on a trailer.

The centrifugal pump is driven via a PTO shaft connected to the tractor's power take-off (PTO). The frame under the centrifugal pump is fitted with attachment points so the tractor can easily connect to the mobile pump.

The size and bolt strength of the linkage are DIN ISO standardised. Always check that the tractor's three-point linkage category matches the pump's attachment points. The categories range from 0 to 4.

Tractor's are sometimes limited in terms of speed range, available power and maximum permissible weight. Always check the pump specifications and tractor data.

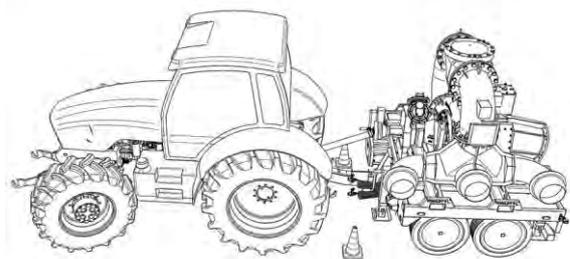
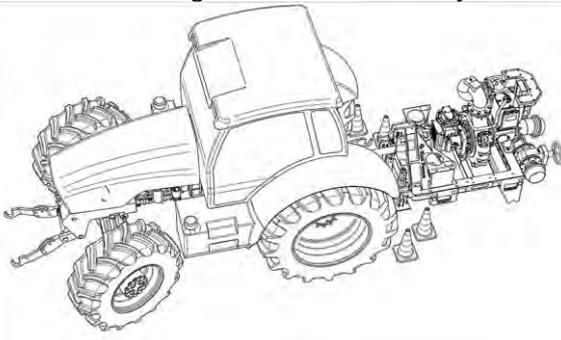
#### Note

**The tractor and pump must always be connected together via the three-point linkage and the three-point trestle (frame of tractor pump) during running or pumping.**

## 9.2 Safety

### Safety measures during power take-off (PTO) operation

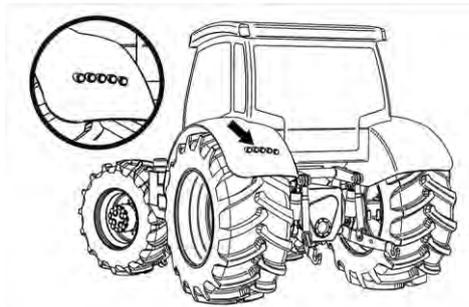
1. Before starting the tractor, carefully read the instructions for the power take-off (PTO), tractor and pump.
2. Wearing hearing protection is mandatory if the operator is going to be in the vicinity of the tractor and pump during operation.
3. Before starting the tractor pump, the work area extending two metres from the PTO shaft must be cordoned off along both sides with safety cones.



4. Do not enter the danger zone around the PTO shaft. Do not wear clothes with parts that could get caught on the shaft. Contact can cause very serious accidents.
5. Approaching the rotating PTO shaft is prohibited. Before entering the PTO shaft operating area, make sure the tractor engine is switched off and the key is removed from the tractor ignition and in the operator's possession.
6. Before carrying out maintenance and repairs, make sure the tractor engine is switched off, the key is removed from the tractor control panel and in the operator's possession, and that all rotating parts have come to a stop. Then disconnect the PTO shaft from both the pump and the tractor.
7. The plastic protective covers at each end and around the middle of the PTO shaft must never be removed.

## Pumps BA serie

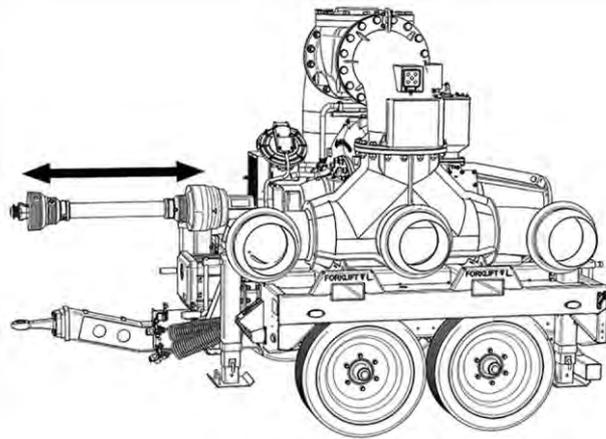
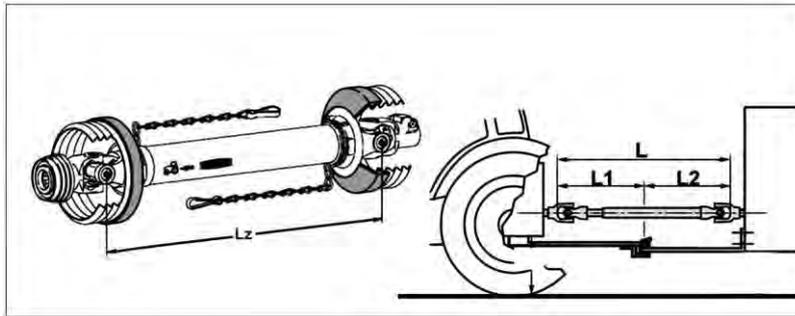
8. Never use the PTO shaft without all of its protective covers in place. Also check the presence and operation of the guards on the tractor and pump. Before operating the PTO, any damaged or missing parts of the PTO shaft must be replaced with original spare parts.
9. The safety provisions on the tractor and the operating pump must form an integrated whole with the PTO shaft protection. All rotating parts must be shielded.
10. Only accessories/parts supplied by the manufacturer may be used.
11. Before attaching the PTO drive, check that the PTO drive is equipped with the safety provisions that may be required for the operating pump. If present, the safety provisions must only be installed on the pump side.
12. Check that the PTO shaft protection is correctly integrated with the tractor and pump shields.
13. During use of the pump and PTO shaft, the maximum speed must not be exceeded. The standard PTO shaft is intended for use at a maximum speed of 1000 rpm.
14. Ensure that the operating area of the PTO shaft is always adequately illuminated during installation and operation. This can be done using the lights on the tractor, for example.
15. It is forbidden to use the PTO shaft without anti-rotation chains and without having correctly attached them to the PTO shaft, tractor and pump.
16. The PTO shaft must not be used as a support or step.
17. The anti-rotation chain must not be used to hold or move the PTO shaft when it is detached from the tractor and/or pump.



On some tractors, the PTO can be switched off using control buttons on the rear mudguard.

### 9.3 Commissioning

- For installation of the piping system, see the chapter on piping guidelines.
- Check that the PTO shaft length corresponds to all working conditions required by the pump and that the minimum overlap of the telescopic tubes during operation is never less than 50% of the shaft length.
- Never adjust the height of the three-point linkage when the PTO shaft is connected to the pump set.



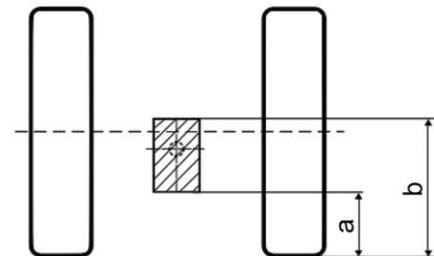
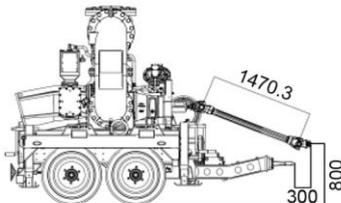
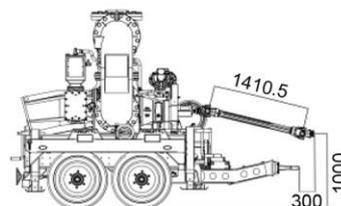
PTO height tractor

$H_{min} = 800 \text{ mm}$

$H_{max} = 1000 \text{ mm}$

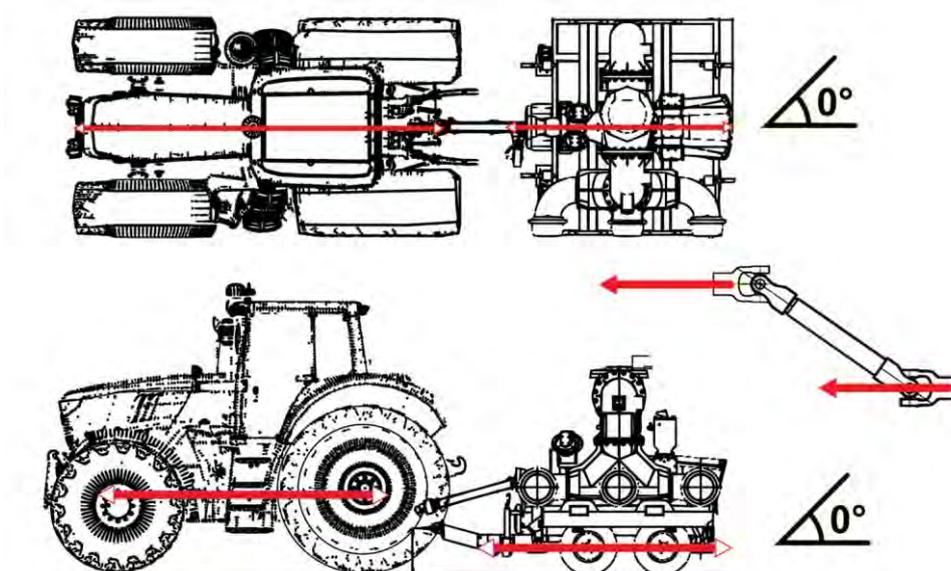
$a = H_{min}$

$b = H_{max}$



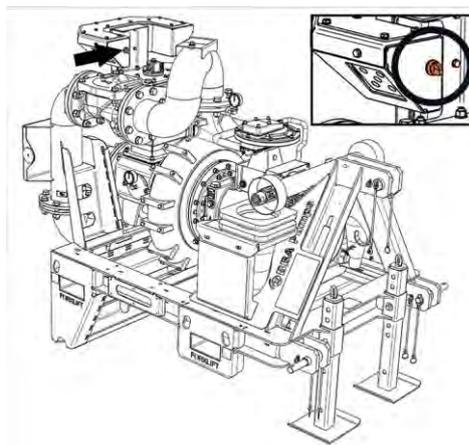
## Pumps BA serie

- Install the tractor pump, PTO shaft and tractor in a straight line, as shown in the drawing.



- When engaging and disengaging, always increase and reduce speed slowly. Never exceed the maximum speed; always check the information on the specification sheet.

If the tractor pump is equipped with work lighting, connect the lighting plug to the tractor. Switch the work lighting on/off using the switch at the rear.



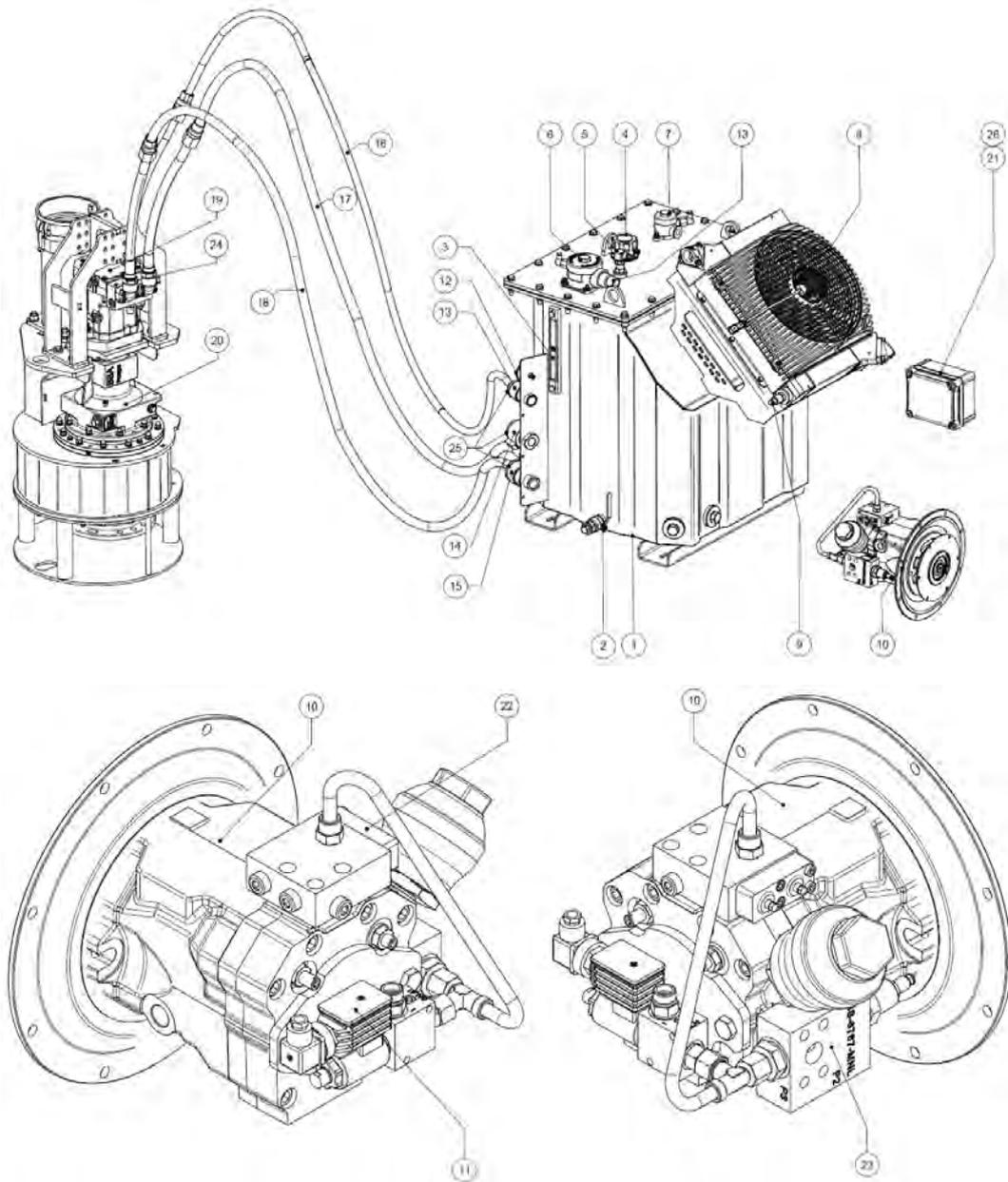
### WARNING

The driver and their management are responsible for ensuring that the tractor combination with tractor-driven pump is compliant with local regulations before it is driven on public roads.

## 10 Submersible pump with hydraulic drive

### 10.1 Functional description

#### Hydraulic section



## Pumps BA serie

1. Oil tank
2. Drain cock
3. Sight glass
4. Combined filler cap/breather filter
5. Combined oil level/temperature protection switch
6. Oil return filter with electronic contamination indicator
7. Bleed-off oil filter with electronic contamination indicator
8. Oil cooler
9. Oil cooler temperature switch
10. Hydraulic pump
11. PWM controller for pump activation
12. Pressure gauge, operating pressure
13. Quick coupling, bleed-off connection
14. Quick coupling, return connection
15. Quick coupling, pressure connection
16. Hose, bleed-off
17. Hose, return
18. Hose, pressure
19. Hose, feed
20. Submersible pump
21. Electrical junction box
22. Maximum operating pressure limiting valve
23. Primary safety valve
24. Anti-cavitation valve
25. Dust covers
26. Fuses F1 & F2

To guarantee optimal operation of the hydraulic system, it is equipped with various safeguards, which are explained in more detail below:

### **Secondary safety valve**

- If the maximum operating pressure is exceeded, the secondary safety valve adjusts the stroke plate of the adjustable hydraulic pump to a smaller stroke volume until the maximum operating pressure is reached.

### **Primary safety valve**

- The primary safety valve is set approximately 10 bar higher than the secondary safety valve and is triggered if there is a high peak pressure in the system or if the secondary safety valve fails.

### **Anti-cavitation valve**

- The hydraulic motor is equipped with an anti-cavitation valve, which can draw additional oil after the hydraulic motor has been stopped, to prevent sudden standstill after shutdown.

### **Hydraulic return oil temperature**

- If the return oil reaches a temperature of 50 °C/122 °F ( $\pm 5$  °C/ $\pm 41$  °F), the cooling fan of the oil cooler is activated.

**Combined oil, level, temperature switch**

- This safety provision is included to monitor the level and temperature of the hydraulic oil. It is triggered if the level falls below the sight glass or the temperature exceeds 80 °C/176 °F. The display of the LC controller then indicates fault code SPN 2602 FMI14. The diesel engine will shut down when this fault code occurs.

**Oil filters with electronic contamination indicators**

- If the hydraulic oil filters become severely contaminated, this protection is triggered. The display of the LC controller then indicates fault code SPN 702 FMI14. The diesel engine will not shut down when this fault code occurs, but a message will be displayed.

**Dust cap**

- To prevent dirt from entering the system, the supplied dust cap and dust plug must be fitted immediately after disconnecting the quick couplings.

**Fuses**

- To protect the electrical system, two fuses are fitted in the junction box (21). F1 protects the cooling fan, F2 protects the PWM controller that switches on the hydraulic pump. For a detailed electrical diagram, contact your BBA Pumps contact person.

**Open system**

The hydraulic system works on the 'open system' principle.

The diesel engine drives the variable displacement hydraulic pump that draws oil from the oil tank. The pump, which increases the pressure, is connected to the hydraulic motor by hoses and quick couplings. The hydraulic motor drives the submersible pump.

The oil that returns from the hydraulic is first cooled by the oil cooler before it flows to the tank through the return filter.

**Cooling and lubrication**

The housings of the hydraulic pump and hydraulic motor are automatically flushed during operation to ensure cooling and lubrication of the moving parts. The oil for this comes from the return line, which is routed into the housing. The oil is then drained off via the bleed-off connection. This oil first flows through the filter and then into the tank.

**WARNING**

**If pressure builds up, this can cause serious damage to the hydraulic pump and motor. This can damage the shaft seal and release oil into the environment. Full connection of the bleed-off oil line is therefore required.**

**To avoid damage to the pump, heating up of the pump and generation of sparks, the pump must never run without liquid for more than five minutes.**

## 10.2 Hydraulic oil requirements

Use hydraulic oil whose suitability for high-pressure hydraulic systems has been confirmed by the manufacturer.

Prescribed oil: HLP mineral oil meeting the requirements of DIN-51524-2.

For the use of other oils, please contact BBA Pumps.

To select the correct viscosity of the hydraulic oil, information on the operating temperature of the system during normal operation is required. The optimum viscosity range during operation is 15 to 30 mm<sup>2</sup>/s (cSt). A viscosity below 10 mm<sup>2</sup>/s (cSt) greatly reduces the life of the pump, and the pump may be severely damaged.

### Note

**The temperature of the return oil depends greatly on the pump pressure and speed. The unit switches off if the oil in the hydraulic tank exceeds a temperature of 80 °C/176 °F. Contact the oil supplier or BBA Pumps if this happens.**



### WARNING

**Hydraulic oils with different viscosity indexes must not be mixed, and mineral oils and biodegradable oils must not be mixed.**

## 10.3 Pipes, assemblies and connections

Hose assemblies and pipes required to connect the hydraulic power pack to the hydraulic system largely determine the safety of the hydraulic system. These parts are supplied by BBA Pumps, but a number of safety requirements must be met when they are replaced or disconnected.

Hose assemblies and/or pipes must meet the following requirements:

- Hydraulic pipes must consist of seamless precision steel tubes as specified in ISO 10763, Recommended Practices for Hydraulic Pipe Assemblies.
- Hose assemblies must be suitable for the specified working pressure in accordance with ISO / TR 17165-2.
- All burrs must be removed from hydraulic pipes, and pipes must be flushed in accordance with ISO 28521: 2009, IDT and dried.
- Oxidised and rusty pipes must be acid-washed and then neutralised before being flushed and dried.

If the aforementioned requirements are not met, BBA Pumps cannot be held responsible for any damage to the hydraulic system or any injury to operators, technicians and/or bystanders.



### WARNING

**Danger of hydraulic injection! Exposure to a liquid under pressure can cause the liquid to enter the bloodstream.**

The standard length of hydraulic hoses between the submersible pump and hydraulic drive is 15 metres. Always check the specification sheet of the pump set for maximum permissible hose length if you intend to use extensions. This is to prevent damage associated with the limiting of maximum pressure in the hydraulic system.

## 10.4 Hydraulic hoses and pipes

Always use certified hoses between the power pack and the submersible pump (pressure, return and leak-off hoses). Check the inspection date before use. The aforementioned points also apply to the three hoses on the submersible pump and the main hose from the hydraulic pump to the coupling in the enclosure.

Never change the connections.

The new hydraulic hoses and pipes must be of the same length and quality as those supplied as standard.



### **DANGER**

**If hydraulic hoses and pipes are installed unprofessionally, they may burst. The resulting force produces a risk of injury.**



### **WARNING**

**Hydraulic hoses under pressure may whip back and forth violently.**

If hydraulic hoses are damaged, hydraulic fluid under high pressure and at high temperatures will spray out immediately.

Hydraulic hoses located within one metre of the control panels and control elements of the hydraulic unit or work area must be covered by the owner.

All hydraulic pipes, hoses and threaded connections must be checked regularly for tightness and any visually detectable damage. Repair any damage immediately. Escaping hydraulic fluid can result in injuries and burns. Regular checks are prescribed as part of the machine safety inspection. Burst hoses and pipes are a danger to the environment and people.

### **Note**

**BBA Pumps is not liable for damage caused by the use of worn or defective parts.**



### **WARNING**

**Do not repair damaged hydraulic hoses; they must be replaced. Replace damaged or saturated hydraulic hoses immediately!**

### **Note**

**Even if no external damage is visible, hydraulic hoses must be replaced every six years (including a maximum storage time of two years). The time frame must be calculated from the date of manufacture printed on the hose. Even hoses and pipes that have been properly stored and exposed to the permissible loads are subject to natural ageing. This means that their shelf life and operational life are limited.**

### 10.5 Before start-up

The start-up process includes all the work that must be carried out before the hydraulic power pack and submersible pump are started. The start-up is divided into stages:

1. Checking the oils and coolant
2. Checking the installation
3. Filling the hydraulic oil
4. Cold start – functional testing of the machine

Follow the instructions for initial start-up or start-up after lengthy interruptions.



#### **DANGER**

**Do not start the machine until all the safety provisions are installed and functioning.**

#### **Filling the hydraulic oil**

The hydraulic power pack is delivered without hydraulic oil as standard. It must be filled in accordance with the procedure below before it is used for the first time. Failure to follow this procedure can lead to severe damage that will not be reimbursed by BBA Pumps.

If the hydraulic oil level has dropped significantly, the cause of the oil loss must first be investigated. Eliminate the reason for the oil loss.

#### **Note**

**Only use hydraulic oil with the correct specifications; see 'Hydraulic oil requirements'.**



#### **WARNING**

**Never fill the hydraulic fluid tank to the brim. There must be empty space in the tank to ensure trouble-free operation and to allow for oil expansion. Check the oil level in the level indicator; it should be 3/4 full.**

Check the specification sheet for the volume of the hydraulic tank. (The HPU HA-60 has a capacity of 225 litres).

Oil filling procedure:

1. Open the hatch in the roof where the tank is installed.
2. Use the filling point (4) to fill the hydraulic system.
3. Top-up the hydraulic fluid with oil filtered to  $\leq 10 \mu\text{m}$ .
4. During filling, check the level on the indicator.
5. Close the filling point (4) of the hydraulic fluid tank.
6. Check that the hydraulic pump and hydraulic motor are filled with oil.

#### **Note**

**Before using the hydraulic power pack and submersible pump, the assembly and operation of the components must be checked.**



**WARNING**

The hydraulic power pack and submersible pump may only be used if they are in perfect condition. It is forbidden to use the hydraulic power pack and submersible pump if there are defects that endanger operational safety. Before each use, check the operational safety according to the following list:

- Visual inspection
- After all checks have been carried out and no defects found, the hydraulic power pack and submersible pump may be put into operation.
- If defects are found, inform the management.
- Repeat these checks after every repair.

**Visual inspection**

Perform the following checks:

- Check the hydraulic power pack and submersible pump for visible damage.
- Check that the hydraulic power pack and submersible pump are correctly installed and adequately secured.
- Check that all the packing and installation material, as well as tools, have been removed from the hydraulic power pack and submersible pump.

**Checking the hydraulic system**



**DANGER**

Work on the hydraulic system, its components and pipes may only be carried out by authorised, qualified personnel with the necessary knowledge of the system concerned.



**WARNING**

Adjustment of equipment may only be carried out by BBA Pumps service. The values specified in the data sheet (e.g. hydraulic pressures etc.) are maximum allowable values.

Perform the following checks:

- Check that all hydraulic connections are correctly connected.
- Check that there are no leaks at hydraulic control valves.
- Check the hydraulic lines to ensure they are correctly, firmly and completely connected.

**Note!**

Contact with hydraulic fluid can result in injuries and burns. Damaged hydraulic hoses or pipes may not be repaired; they must always be replaced with original parts.

### Checking hydraulic oil level

Check the hydraulic oil level indicator located on the side of the hydraulic oil tank.

The hydraulic oil level must be visible 3/4 of the way up in the indicator. If there is not enough hydraulic oil in the indicator, top up the oil. Only use the type of hydraulic oil specified; see section 'Hydraulic oil requirements'.

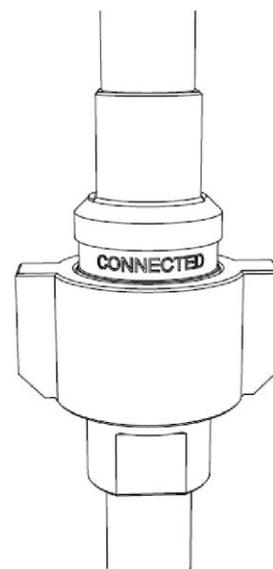
### Coupling of hoses



#### WARNING

**Exercise caution when connecting and disconnecting the hydraulic hoses. If malfunctions occur in the hydraulic system as a result of contamination or inadequately connected quick couplings, resulting liability or warranty claims will not be honoured.**

1. Remove the dust caps from the connections.
2. Check the condition of the connections. Cleanliness of the connections is a prerequisite for safe operation of the system.
3. Connect the hoses to the marked connections, making sure they engage fully. When properly connected, the text 'connected' is visible.
4. Immediately screw the protective caps onto the quick couplings and hydraulic hoses.



#### Note

**If quick couplings are not fully connected, dangerous situations may result.**

**Always ensure that quick couplings are fully connected in order to prevent severe damage to the hydraulic system.**

#### Note

**It is also necessary to fit the hydraulic connections and hoses with the appropriate dust protection caps during disconnection.**



**WARNING**

When laying the hydraulic hoses between the hydraulic power pack and the pump, make sure the hoses are not kinked or compressed (torsion and crushing can deteriorate the hydraulic hoses) and cannot come into contact with sharp objects.



**WARNING**

Protect the hydraulic hoses from external thermal, mechanical and chemical damage. Always use hose protection ramps in traffic areas.



**WARNING**

Lay hydraulic lines as carefully as possible so that there is no danger of tripping.



**WARNING**

Risk of injury from hydraulic hoses. When laying hydraulic hoses, bear in mind that the jerky movement of hydraulic hoses can pose a danger to people and objects.



**WARNING**

Hydraulic oil is toxic. Leaking hydraulic fluid must be collected and/or absorbed with a binder.

### Filling and bleeding hoses

The hydraulic hoses between the power pack and the submersible pump are not filled with hydraulic oil at the factory. It is important that this is done before the first start-up.

Hose filling procedure:

1. Make sure the diesel engine is off and secured to prevent it from being switched on.
2. Connect the quick connector of the pressure hose to the quick connector on the power pack.
3. Connect the other quick coupling of the pressure hose to the quick coupling of the return hose.
4. Connect the other connection of the return hose to the return quick coupling on the power pack.
5. Start the diesel engine; see 'Starting' in chapter 'Pump set with diesel engine drive'.
6. The engine now runs at 1000 rpm and the hydraulic pump runs at stand-by pressure of about 15 bar.
7. Run the diesel engine for two minutes and then switch it off.
8. The pressure and return hoses are now filled and bled and can be disconnected.
9. Connect the hoses to the submersible pump.

The leak-off oil hose does not need to be filled and bled.

### 10.6 Starting the hydraulic system

1. Make sure that all necessary checks/tasks have been carried out as described above.
2. Place the submersible pump securely in a well or cellar and make sure it is at least 3/4 under water.
3. Start the diesel engine; see 'Starting' in chapter 'Pump set with diesel engine drive'.
4. The engine now runs at 1000 rpm and the hydraulic pump runs at stand-by pressure of about 15 bar.
5. Slowly increase the speed of the power pack to 1100 rpm. From 1100 rpm, the hydraulic pump is switched on and hydraulic pressure is built up.
6. Within 30 seconds, the power pack will deliver its maximum hydraulic output at the current speed.
7. Check that the submersible pump is pumping liquid.
8. Increase the speed of the power pack until the desired speed of the submersible pump is reached.

#### Working in automatic mode

It is possible to run the hydraulic power pack with automatic level control. See chapter 'Pump set with diesel engine drive'.

#### Monitoring during operation

Carry out the following checks on the hydraulic system while the machine is running:

- Check the operating pressure. For the values of the operating pressure, see the specification sheet.
- Check for temperature differences and leaks.
- Check for any strange noises or vibrations.
- Check whether the start, operating and stop conditions are met.

#### Note

**In addition to the diesel engine, functions of the hydraulic section are also monitored via sensors. If a fault occurs, an acoustic alarm sounds and a fault code is displayed on the control panel.**

The combined level and temperature monitors monitor the level and temperature of the hydraulic oil in the tank. If the oil level is too low or a temperature higher than 80 °C/176 °F is reached, the pump set switches off immediately.

Contamination sensors are placed on the hydraulic filters that generate a fault code in the event of too much contamination (increasing return pressure). The diesel engine does not switch off.

#### Note

**If the fault code is ignored for too long, excessive return pressure may develop, from both the main return system and the leak-off oil. If this signal is ignored for too long it can cause severe damage to the hydraulic system.**

#### Note

**Cold hydraulic oil causes a higher return pressure, and therefore this signal is not active during the first hour after every start-up. It is therefore possible that a fault message will not appear until the first hour after start-up.**

# 11 Maintenance

## 11.1 General

When maintenance is insufficient, incorrect and/or not performed regularly this can lead to malfunctions of the pump set, danger to the user, high repair costs and lengthy breakdowns. BBA Pumps is not responsible for damage and accidents that result from failure to follow the instructions.

Only the operations described in this manual may be performed. Other work must be carried out by BBA Pumps employees or authorised service personnel who are familiar with the operation and maintenance instructions of the pump set.

To guarantee reliable operation, installed backup pumps must be operated briefly once a week. In the event of defects, the manufacturer must be notified/informed.

### Parts

The use of operating fluids, spare parts, accessories and special equipment not tested and approved by BBA Pumps is prohibited. Such parts may affect the safety of the pump set and lead to danger for the operating personnel and damage to the pump set.

For parts, see [www.bbapumps.com](http://www.bbapumps.com) or contact the BBA Pumps parts department.

### Manual for the drive motor

Depending on the drive motor used, the manual for the drive motor concerned may be enclosed with this user manual, which can also be downloaded from [www.bbapumps.com](http://www.bbapumps.com). The manual for the drive motor contains detailed information about the procedures that are to be followed and the associated safety instructions. Read the supplied manual carefully and follow the procedures and safety instructions.

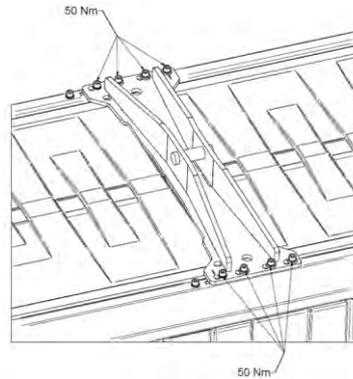
## 11.2 Safety instructions during maintenance, repair and inspection

- Use personal protective equipment as necessary.
- Before starting, stopping, inspecting, repairing and/or performing maintenance work on the pump, always secure the doors and, if necessary, the roof panels to prevent them from falling closed.
- Work on the pump set is only permitted when it has been taken out of operation. To put it out of operation, follow the prescribed procedure.
- Protect the drive motor against unintended and unauthorised activation throughout the duration of the work activities.
- When opening the pump follow all the instructions for handling the pumped liquid, such as protective clothing, no smoking etc. For more information, consult the Material Safety Data Sheet (MSDS) for the liquid to be pumped.
- Only remove the protective guards when the pump is stationary.
- Maintenance work on the electrical system may only commence after the power supply has been disconnected and may only be performed by personnel who have been trained and authorised to do so.
- When the work is complete, all the protective guards must be installed and the protection system must be activated.
- Use only original parts or parts provided or approved by the pump supplier for repairs.
- Maintenance and/or repairs may only be carried out after the liquids and hot parts of the pump set have cooled to a temperature between 5 °C and 30 °C (41 °F and 86 °F).
- Only remove protective blankets over hot parts once the pump set has cooled down completely.
- Only remove the particulate filter (if present) when the entire unit has cooled.

## Pumps BA serie

- Never try to disconnect fuel or injector lines from the fuel system while the diesel engine is running. Modern diesel engines run with extremely high pressure in the fuel system.
- The pump set must first be completely switched off, stopped and secured against being switched on again before the suction line is disconnected from the suction side of the pump unit.

### Assembly and disassembly of lifting beam



When mounting the lifting eye, tighten the bolts with 50 Nm torque.

### 11.3 Protecting diesel-driven pump sets against accidental start-up

- Stop the engine and remove the key from the ignition, if applicable. Take the key with you.
- If applicable, switch off the earth switch for the engine. Take the key for the earth switch with you.
- If it is not possible to do this, remove the earth cable from the batteries.
- Place a sign near the ignition switch, earth switch or disconnected battery terminal that reads: 'Do not switch on – work in progress!'

### 11.4 Protecting electrically driven pump sets against accidental start-up

- Switch off the isolating switch at the pump set.
- Switch off the main switch of the pump set.
- Block the main switch, and lock it with a padlock if possible, to prevent unintended activation. Take the key for the lock with you.
- If the aforementioned is not possible, remove the fuse concerned from the pump set.
- If the aforementioned is not possible, remove the power cable from the pump set.
- Place a sign near the main switch or pump fuse holder with the text: 'Do not switch on – work in progress!'

### 11.5 Maintenance instructions

- Clean the pump set before starting the work. Keep the work area clean.
- Use the correct tools and ensure that they are in good condition. Use them in the proper manner.
- Replace damaged bolts, nuts and/or parts with damaged threads with new parts of the same fastener class.
- Replace used seals or tape. Only replace the flat and filled seals under the plugs with original seals from BBA Pumps.

## 11.6 Daily maintenance of pump set

- Check for leaks from the pump and pipes.
- Check the shaft seal for leaks.
- Check the pressure and temperature of the barrier fluid and/or flush water, if applicable.
- Check the oil level of:
  - the bearings of the vacuum pump
  - the bearings of the pump
  - the shaft seal
  - the gearbox (if present)
- Check the operation of the non-return valve in the vacuum system.
- Check the function of the float in the vacuum system.
- If present, check the contamination of the basket strainer and/or filter.
- If the pump set is equipped with a roof panel with rain gutters, check for blockage of the drain hoses for the rain gutters on both sides. These hoses lead to the centre door posts of the pump set.  
These hoses must be cleaned if they are blocked.

### Note

Despite the automatic stop system, check the oil level of the diesel engine after every 8 to 15 hours of operation.

## 11.7 Other maintenance of pump set – BA series

### Every 6 months or 500 hours

- Check the tension of the drive belt of the vacuum pump ( $\pm 7$  mm or a little over 0.26 inch).
- Check the parts of the electrical system for visible damage.
- For diesel-driven pump sets, check the battery for fluid level and corrosion on the terminals.
- Change the oil in the vacuum pump bearings.\*\*
- Change the oil in the pump bearings.\*\*
- Change the oil of the mechanical shaft seal.
- Lubricate the hinges of the pump set with a grease gun, if applicable.

\*\*First replacement after 250 hours.

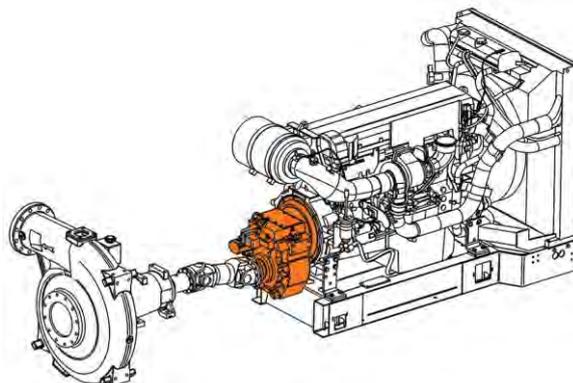
- Lubricate NMD bearing block with 25 cm<sup>3</sup> grease per grease nipple, type Shell Alvania EP2.



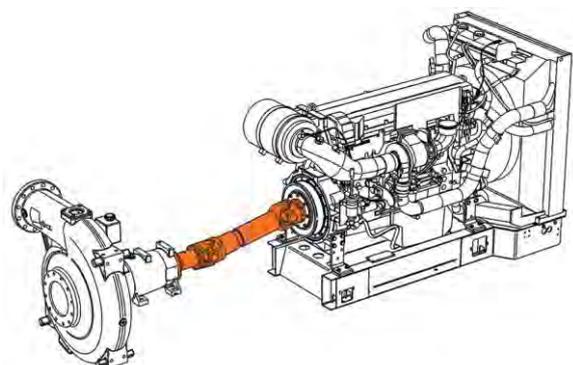
## Pumps BA serie

### Every 12 months or 1000 hours

- Change the oil of the shaft seal.
- Check the condition of the float box valve seat, and check the cone.



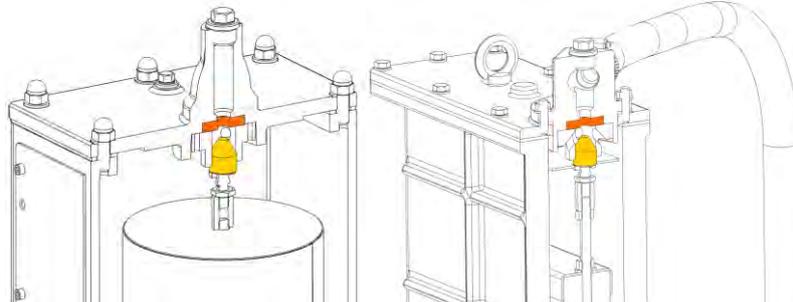
Check that the pump set is provided with a gearbox.



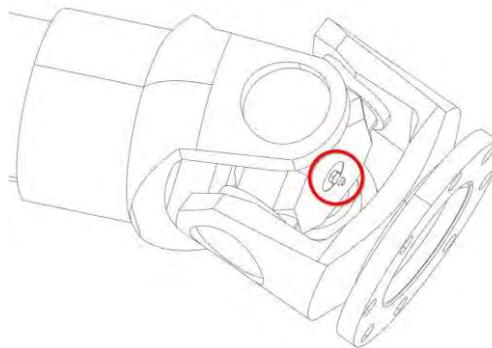
Check that the pump set is provided with a cardan driveshaft.

If present on pump set:

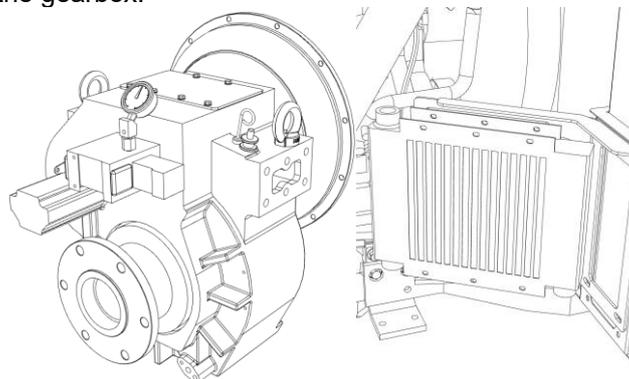
- Check vacuum system sensor of large-volume pumps for corrosion.
- Check flexible coupling between vacuum pump and motor (if present).



- Lubricate cardan driveshaft with grease DIN 51825-KP2 K-20 until grease comes out of the seals.



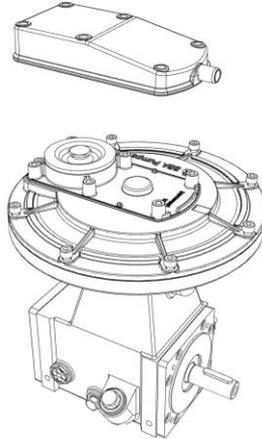
- Lubricate BA-C bearing block with 33 cm<sup>3</sup> (2.01 in<sup>3</sup>) grease per grease nipple, type Shell Alvania EP2.
- Check large-volume BBA non-return valve gland packing for leakage.
- Change oil in the gearbox (first change after 100 hours).
- Clean oil cooler for the gearbox.
- Change oil filter for the gearbox.



## 11.8 Other maintenance or every 1500 hours

### General

- Check the discharge silencer on the cover of the vacuum pump for contamination.



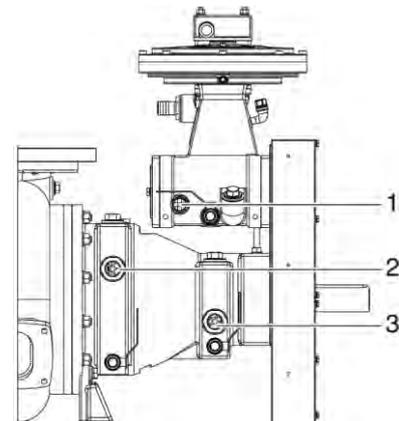
- For diesel-driven pump sets, check the charging voltage of the alternator.
- Replace the gland packing of the BBA large-volume non-return valve once every two years.
- Change the motor oil and bearing block oil of the pump and vacuum pump of the DriveOn pump sets every 1500 hours.

### Check the oil level of the shaft seal

- Check the oil level with the pump stopped.
- The level is correct when the gauge glass (2) is 3/4 full.
- The colour of the oil may range from transparent to grey.

#### Note

Due to slight leakage of the seal, the level may rise. This is not a problem until oil escapes from the vent. If this occurs, the shaft seal must be replaced by an authorised technician.



#### WARNING

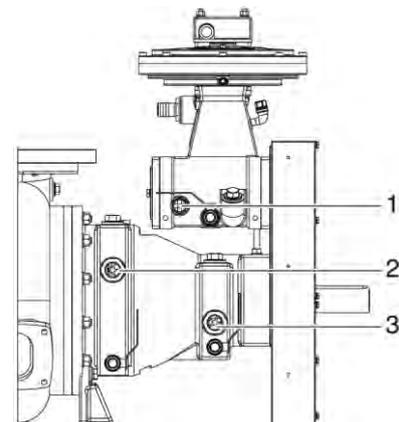
Oil leaks can cause serious damage to the environment. Do everything necessary to prevent oil leakage.

**Check oil level of bearings for vacuum pump and pump.**

- Check the oil levels with the pump stopped.
- The level is correct when the gauge glasses (1 and 3) are 3/4 full.
- The oil may not be discoloured.

**Note**

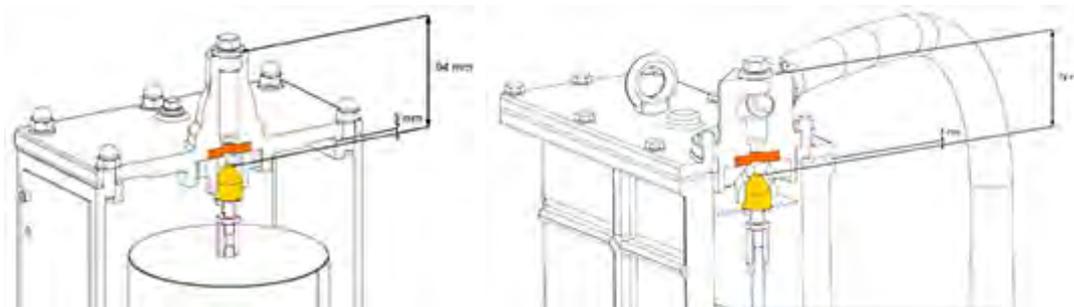
**When the oil has become grey/white in colour, this indicates a leak and the pump must be switched off immediately to prevent damage to the bearings. If this occurs, the parts must be replaced by an authorised technician.**



**Check the operation of the float**

Check whether condensation is coming out of the silencer of the vacuum pump.

If there is condensation, a qualified technician must check the sealing/adjustment of the float.



## 11.9 Oil change table – BA pumps

### BA series

Pump type	Oil chamber shaft seal	Bearing block	Oil chamber NMC	Interval (hours)	DriveOn oil sumps Interval (hours)
			<i>for electric pumps</i>	<i>or every 12 months</i>	<i>or every 12 months</i>
MP50 vacuum pump	-	0.6L 10W40	0.6L 10W40	500	1500
MP100 vacuum pump	-	0.9L 10W40	0.9L 10W40	500	-
BA55	1.2L ISO-VG 32	0.5L 10W40	-	500	-
BA75	1.2L ISO-VG 32	0.5L 10W40	-	500	-
BA80H	2.5L ISO-VG 32	1.2L 10W40	2L 10W40	500	-
BA80H NMD	1.2L ISO-VG 32	Grease lubricated	-	500	-
BA100K	2.5L ISO-VG 32	1.2L 10W40	2L 10W40	500	1500
BA100E	2.5L ISO-VG 32	1.2L 10W40	2L 10W40	500	1500
BV110	2.5L ISO-VG 32	1.2L 10W40	2L 10W40	500	1500
BA110H	2.5L ISO-VG 32	1.2L 10W40	2L 10W40	500	-
BA150E/KS	2.5L ISO-VG 32	1.2L 10W40	2L 10W40	500	1500
BA150E/KS NMD Sub	2.5L ISO-VG 32	Grease lubricated*	-	500	-
BV150	2.5L ISO-VG 32	1.2L 10W40	2L 10W40	500	1500
BA160H	2.5L ISO-VG 32	1.2L 10W40	2L 10W40	500	-
BA180E/KS	2.5L ISO-VG 32	1.2L 10W40	2L 10W40	500	1500
BA200E/KS	2.5L ISO-VG 32	1.2L 10W40	2L 10W40	500	-
BA210H	2.5L ISO-VG 32	1.2L 10W40	-	500	-
BA220E	4.2L ISO-VG 32	3.7L 10W40	-	500	-
BA220H	4.2L ISO-VG 32	3.7L 10W40	-	500	-
BA300E	4.2L ISO-VG 32	3.7L 10W40	-	500	-
BA350E/K	4.2L ISO-VG 32	3.7L 10W40	-	500	-
BA400G	4.5L ISO-VG 32	3.7L 10W40	-	500	-
BA500G	7L ISO-VG 32	7L 10W40	-	500	-
BA600G	7L ISO-VG 32	7L 10W40	-	500	-
BA700G	7L ISO-VG 32	7L 10W40	-	500	-

\* grease nipple is not factory fitted.

**Note**

If '15W40' is cast into your bearing block, you can also use 15W40. Mixing oils with different properties/specifications is not recommended.

**BA-C series**

Pump type	Run-dry reservoir	Bearing block	Oil chamber NMC	Interval (hours)	
	<i>filled to top of sight glass</i>	<i>grease-lubricated</i>	<i>for electric pumps</i>	<i>or every 12 months</i>	
BA-C80 up to BA-C400	ISO-VG 32	33 cm <sup>3</sup> Shell Alvania EP2	-	1000 hours	-
BA-C500 and BA-C600	ISO-VG 32	50 cm <sup>3</sup> Shell Alvania EP2	-	1350 hours	-

**Note**

The oil tables apply at temperatures between -10 °C (14 °F) and +50 °C (122 °F).

**WARNING**

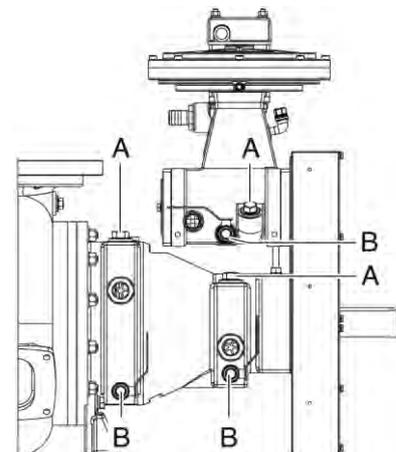
Use the same type of oil that the bearing was originally supplied with. Different types of oil cannot be mixed with each other and when mixed can cause serious damage to the bearing and the pump.

**Note**

Consult the oil supplier for a product that meets the established specification and to determine the miscibility of the oils.

**Oil change BA pumps**

1. Remove the fill plugs (A).
2. Place a suitable drain pan under the drain plug or valve (B).
3. Remove the plug or open the valve.
4. Allow the oil to drain thoroughly.
5. Re-install the drain plug with a new sealing ring or close the valve.
6. Fill the chamber with the prescribed oil until the gauge glass is 3/4 full.
7. Re-install the fill plug with a new sealing ring.
8. Dispose of the oil in a responsible manner.

**WARNING**

The maximum oil level must always be visible in the sight glass. An excessively high oil level can cause damage to the pump. Standard maximum 3/4 (75%) in gauge glass.

## 11.10 Maintenance work for the BA hydraulic power pack with submersible pump

### 11.10.1 Preventive maintenance

Periodic maintenance is specialist work. In many cases, special equipment is required to ensure the correct settings. Preferably have this maintenance carried out by BBA Pumps. A distinction is made between daily and preventive maintenance. Daily maintenance must be carried out before the start of work. Preventive maintenance must be carried out after the machine has been used for a certain number of operating hours.

#### Safety during maintenance

Before carrying out maintenance, you must be familiar with all the safety recommendations, provisions and procedures, as described in chapter 'Safety'.

Use only oils/coolants and original spare parts approved by BBA Pumps.



#### WARNING

Please contact BBA Pumps if problems cannot be solved with this information.

Interval	City	Activity/ assembly
After the first 100 hours of operation	Hydraulic oil tank – return filter	Change filter
	Hydraulic oil tank – leak-off oil filter	Change filter

## Preventive maintenance

In addition to the maintenance of the diesel engine, the hydraulic system requires the following maintenance:

Interval	City	Activity/assembly
Daily	Power pack	Visual inspection – for damage and defects
Daily	Hydraulic hoses and connections	Visual inspection – check for leaks and tightness of connections
Daily	Hydraulic tank	Check hydraulic oil level
1000 hours of operation	Hydraulic tank	Replace the breather filter
1000 hours of operation	Hydraulic tank	Replace the oil return filter
1000 hours of operation	Hydraulic tank	Replace the leak-off oil filter
1000 operating hours / every two years	Hydraulic system	Change the hydraulic oil
Annually	All the hose connections	Have the hose connections checked and, if necessary, replaced by a specialist to ensure safe operation of the system and operators.

## Hydraulic oil filters

The TEF320 10 VG (HPU60) return line filter is integrated into the hydraulic fluid tank. The TEF55 10 VG (HPU60) leak-off oil filter is integrated in the hydraulic fluid tank.

See also chapter 'Functional description'.

Procedure for replacing the return line filter or leak-off oil filter:

1. Switch off the HPU and wait a few minutes. This allows the oil to flow back into the tank.
2. Open the filter cover by turning it anti-clockwise.
3. Remove the cover and the filter element.
4. Check the filter for larger particles. If larger particles are present, some components of the hydraulic system may be seriously damaged.
5. Replace the filter element. Check that the part number of the new filter element is the same as that of the old filter element.
6. Clean the filter housing and the filter head.
7. Check the new filter for mechanical damage, especially at the seals.
8. Check the O-rings. Always replace the O-rings.
9. Moisten the seals, O-ring and threads of the filter head and housing with fresh hydraulic oil.
10. Carefully insert the new filter element into the filter housing, paying attention to the bottom and top.
11. Place the filter cover and tighten by turning clockwise.
12. Switch on the HPU and monitor the oil level, topping up as required.
13. Check the filter for leaks.

## Pumps BA serie

The breather filter must be replaced every 1000 operating hours.

Procedure:

1. Loosen and remove the cap by turning it to the left.
2. Remove the filter element.
3. Fit the new strainer element.
4. Fit the cap and tighten.

### Changing the hydraulic oil

For the volume of the hydraulic oil tank, see the specification sheet for the pump set.

In addition to preventive hydraulic oil changes, we recommend that an oil analysis be carried out regularly to determine the right time for changing the hydraulic oil. Depending on the result of the oil analysis, the hydraulic oil must be replaced.

Please note that high operating temperatures and use in exceptionally humid conditions reduce the service life of hydraulic oils.

To change the oil, first remove the oil from the tank, cooling unit, pump and hydraulic motor housing. It is not necessary to change the oil in the high-pressure circuit. Check the hydraulic components for contamination during every oil change. The hydraulic components must be disassembled and flushed separately if they are contaminated.

Fill the hydraulic system again, in accordance with the instructions for filling the hydraulic system.



#### **WARNING**

**Observe the guidelines when handling hydraulic oil.**

Perform the following procedure to remove the hydraulic oil from the oil tank:

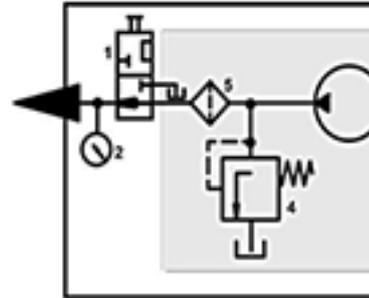
1. Remove the drain plug from the drain connection at the bottom of the HPU.
2. Connect a drain hose to the drain connection.
3. Slowly open the drain cock and allow all the oil to flow into a suitable container.
4. Close the drain cock, remove the hose and refit the drain plug.

### Filling the hydraulic system

A filling pump is used to fill the hydraulic power pack.

A filling pump consists of:

1. A shut-off valve
2. A high-pressure gauge
3. A gear pump with a flow rate of about 5 litres/min.
4. A pressure relief valve set at a minimum of 5 bar
5. A fine filter of at least 10 µm or better



Only fill the hydraulic system with filtered hydraulic oil that meets the requirements stated in section 'Hydraulic oil requirements'.

#### Note

**The cleanliness of the oil must, at a minimum, meet the requirements of cleanliness category 20/18/15 in accordance with ISO 4406 and must, at a minimum, meet the requirements of this category throughout the entire service life.**



**WARNING**  
Avoid spilling oil at all times.



**WARNING**  
Avoid contact with oil at all times.

Perform the following procedure to fill the hydraulic system with hydraulic oil using a filling pump:

1. Connect the filling pump to the drain connection.
2. Switch on the filling pump.
3. Fill the hydraulic fluid tank to 3/4 of the visual oil level indicator.
4. Check the system for leaks.
5. Remove the filling pump.
6. Remove any spilled hydraulic oil.

#### Note

**Spilled hydraulic oil may not be reused. Dispose of the oil in accordance with local and national environmental regulations.**

The DIN 200 standard, part 5, establishes a limit of six years for the service life of rubber hydraulic hoses (minus the time the hose material was in storage), but regular inspection of the hoses is necessary and depends on their use.

## Pumps BA serie

Despite the six-year service life limit, a hose should be replaced immediately in any of the following situations:

- Damage to the outer jacket that penetrates to the steel insert.
- Hardening of the hose material.
- Cracks in the outer jacket.
- Deformations that do not correspond to the natural shape of the hose.
- Blisters or bumps on the hose.
- Seepage at couplings.
- Corrosion of the hose couplings.
- Couplings partly coming out of the hose.

### **Note**

**The hydraulic system must be checked annually by a specialist to ensure that it operates safely and continues to do so.**

### **11.10.2 Recommendations for maintenance**

Observe the following recommendations when carrying out maintenance on your machine (and also during normal operation):

- Always keep the machine clean.
- Repair damaged or worn parts immediately.
- Ensure that all fastenings are tight after maintenance.
- Do not use defective equipment.
- Follow the safety instructions in this manual.
- Follow the safety instructions applicable to your location.
- Always use original BBA Pumps parts for repair and maintenance.

### **Note**

**External factors such as weather, temperature conditions, working conditions or locations may affect the service life or condition of essential parts of the equipment. In these circumstances, additional maintenance may be required.**

## 11.11 Cleaning the pump set internally and externally

### Cleaning the pump set internally

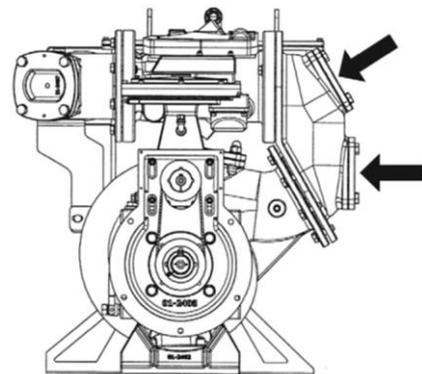


#### WARNING

Take the necessary precautionary measures in the case of hot, volatile, flammable and hazardous liquids.

Drain the pump; see section 'Draining the pump set'.

Remove the inspection/cleaning covers.



### Cleaning the pump set externally

A pressure washer may be used, but only in accordance with the following instructions:

1. Never clean a pump set that is in operation.
2. Switch off the pump set before cleaning.
3. In the case of an electric drive, switch off the main switch of the electrical system. For this, see section 'Securing the electrically driven pump set against accidental start-up'.
4. Allow the pump set to cool down before cleaning.
5. Maintain distance between the spray nozzle and the part being cleaned.
6. To prevent penetration of water, never spray directly towards bearings or seals.
7. Never spray directly towards connection boxes, connectors, outlets and other electrical connection components.
8. Check the protection rating of the electrical components. Use a cleaning method appropriate to the protection rating.



#### WARNING

Failure to follow the guidelines above can lead to dangerous situations and cause damage (possibly severe) to the pump set.



#### WARNING

Take the necessary personal protective measures during cleaning, such as those concerning protective clothing, safety goggles etc. Also be especially careful in the case of hot, volatile, flammable and hazardous liquids. Adapt the protective measures accordingly.



#### WARNING

Leakage of environmentally harmful liquids can be extremely damaging to the environment. Do everything necessary to prevent this.

## 11.12 Cleaning the particulate filter (if applicable)

On diesel-driven BA100K D193 pumps, the particulate filter is available as an option. If a particulate filter is fitted, it can be found behind the closable cover (see drawing). For cleaning the particulate filter:



### WARNING

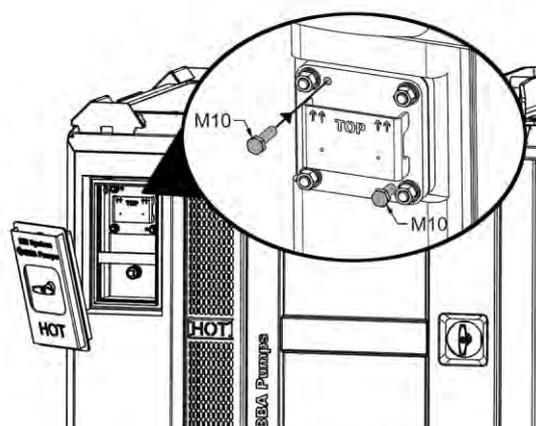
The exhaust system and the particulate filter are hot when the engine has run; the temperature can be as high as 500 °C. Allow the exhaust system and particulate filter to cool before removing them.



### WARNING

Particulates are hazardous to your health.

1. Turn the T-latch one turn and remove the cover.
2. Remove the four bolts.
3. Carefully pull the particulate filter out of the frame with two pulling-off screws.
4. Clean the particulate filter.
5. Install new seals on the particulate filter pipe.
6. Slide the particulate filter into the frame.
7. Fit the four bolts.
8. Fit the cover and screw the T-latch closed.



### Note

Diesel-driven pumps with engine power ratings of 19 kW and above sold in Europe, and in some other countries, are delivered with a particulate filter to meet the applicable emission requirements. These are original aftertreatment systems from the engine suppliers. The system regenerates at regular intervals to burn off the particulates before the particulate filter becomes restricted. During regeneration a symbol and message appear on the screen of the control panel. See the LC40-LC45 operating manual at [www.bbapumps.com](http://www.bbapumps.com) for more information.

## 11.13 Battery maintenance

### General

For proper operation and for the safety of people and the environment, the starter battery must be checked regularly for proper condition. This must be checked during inspection or maintenance work on the pump installation. Indicate the inspection date on the sticker of the battery.

BBA Pumps installs the following batteries:

- 70-80 Ah Calcium / Calcium (Lead sulphuric acid)
- 50-230 Ah AGM (Absorbed Glass Mat)

### Maintenance

A modern battery requires little maintenance to provide a long service life. Nevertheless, maintenance is not entirely unnecessary and the following should be observed:

#### Case

- Keep the battery cover clean and dry. Grease on the cover can trap moisture, forming a conductive path between the positive and negative terminals.  
The consequence is a short circuit, through which the battery is discharged outside the electrical system. The consequence is a lower state of charge of the battery, and therefore a shorter service life.
- Check the entire battery for bursts or cracks and replace if necessary.

#### Battery terminals

- Current is drawn from a battery via the lead terminals. The connection between the cable ends and the battery poles forms the 'interface' between battery and electrical system. It is therefore very important that the contact surface between them is as large as possible and clean. The build-up of lead sulphate (white powder) disrupts this contact and negatively affects both charging and discharging. Because lead sulphate is an insulator, it blocks the transfer of current, which leads to a loss of voltage during a high current discharge (the starter motor turns more slowly) and an increase in voltage during charging (the battery charges more slowly). The following measures can reduce these problems:
  1. If lead sulphate is present, thoroughly clean both the terminals and the cable ends with a steel wire brush.
  2. Coat the terminals with acid-free vaseline. Any pits in which moisture and lead sulphate can accumulate are filled, and excess vaseline is forced out so that good contact is guaranteed.

#### Electrolyte level of lead-acid batteries

- Although the water consumption ('gassing') of modern batteries is very low, various external conditions such as high temperatures and voltage accelerate this process.
- Therefore, a battery will always consume water, even if there is no possibility to top it up. Water consumption results in increased concentration of the electrolyte.
- Because the quantity of electrolyte is of direct influence on the capacity of the battery, it should be as high as possible.  
However, a specific gravity of 1.280 kg/l is the highest concentration at which a battery can function without damage: dilute sulphuric acid at a concentration above 1.300 kg/l causes deterioration of the grids of the positive plates and accelerates the corrosion process.  
It is therefore important to check the electrolyte level from time to time (if possible) and to top it up with demineralised water if necessary.
- Ensure that the battery plates are completely covered by the liquid at all times. The liquid level must be at least 10 mm above the plates.



**DANGER**

Dry battery plates pose a high risk of explosion! Make sure the battery is not completely or excessively topped up. For the correct level, always check the level indicator on the battery.

**Checking the state of charge (lead acid + AGM)**

- For an indication of the battery's state of charge, measure the terminal voltage with a digital multimeter (1 mV resolution) at an ambient temperature of approximately 20 °C/68 °F.
- If the exact voltage is known, determine the charge status using the table below.

Voltage	State of charge	Status	Required action
<b>AGM</b>			
13 volts	100%		No action required
12.8 volts	75%		No action required
12.5 volts	50%		Battery must be charged
12.2 volts	25%		Battery needs urgent recharging
<12.0 volts	0%		Battery is no longer usable

**Testing the battery condition (lead acid + AGM)**

- Always ensure that a battery is charged before performing this test.
- A battery condition tester can be used to measure the condition of the battery.
- The cold cranking current (CCA) value is stated on every battery.
- After the correct data has been entered, the tester analyses the condition of the battery.
- After the analysis, the tester indicates whether the battery is still usable or whether it is 'worn out' internally, for example because it was discharged too deeply or has a defective cell.

**Charging a battery**

**Battery charger**

- Always use the correct settings on the battery charger, for the correct battery type.
- Refer to the battery charger's instructions.

**Charge status of lead-acid battery**

Lead-acid and AGM batteries last longest when fully charged. When a lead-acid battery is (partially) discharged for a long time, there is a chance of sulphation.

This may be part of the reason the battery can no longer be charged and therefore appears to no longer be good.

**Note**

**Before charging, always read the instructions for the type of battery charger to be used.**

**WARNING**

Starting with jumper cables can cause damage to the electrical system and/or the control unit of the diesel engine. Always check in the original manual from the diesel engine manufacturer whether it is permissible to start the pump set via jumper cables and what the procedure is.

**Replacing a battery****Removing a battery**

Always refer to the manual for special instructions. Before removing the old battery, note where the positive terminal is and mark the polarity on the positive cable, to prevent incorrect installation of the new battery.

1. Switch off all electrical consumers and the earth switch.
2. Remove the earth cable from the minus pole. This prevents damage to the wiring and/or the battery that could otherwise occur if a tool were to contact an earthed part.
3. Remove the battery terminal from the positive terminal.
4. Remove the battery retainer and battery.
5. Clean the minus terminal and the plus terminal.

**Installing a new battery**

The battery must be placed horizontally in the battery box. Before installation, check that there are no foreign objects in the battery box that could damage the bottom of the battery.

The battery retainer should be tightened until it is secure, but not so tight that it will damage the case or cover of the battery.

The following tightening torques may be used: 3.39 – 5.65 Nm.

1. Connect the positive cable clamp first and lightly coat it with acid-free vaseline.
2. Only then should you connect the negative cable clamp and lightly coat it with acid-free vaseline.

**Note**

**Prevent short-circuits during the work.**

## 11.14 Shipping the pump set

If the pump set is sent to the supplier for major maintenance, repair or overhaul, the following conditions must be met:

- The pump set must be drained and thoroughly cleaned internally.
- All compartments of the drip tray under the pump set and motor must be drained before transport.



### **WARNING**

**Leakage of environmentally harmful liquids can be extremely damaging to the environment. Do everything necessary to prevent this.**

- For compliance with the safety and environmental regulations, the shipment must be accompanied by a 'Declaration of no objection'.

## 12 Troubleshooting table – BA series dry prime pumps



### WARNING

In the event of faults or abnormal operation, immediately switch off the pump/motor to prevent a dangerous situation or damage to the pump set.

Problem	Possible cause	Solution
No flow while the pump is running	Leak in the suction line (sucking in air).	Check the line for leaks and prevent the system from sucking in 'false air'.
	The suction strainer and/or suction line are blocked.	Clean the suction strainer and/or suction line.
	Inlet of the suction line is not sufficiently submerged.	Make sure the inlet is sufficiently submerged.
	Air pocket in the suction line.	Adjust the suction line according to installation instructions.
	Vacuum pump does not draw in air.	Inspect the condition of the vacuum system.
	Non-return valve does not seal sufficiently.	Inspect the non-return valve for contamination.
	Rubber coupling between the pump and motor is defective.	Replace the rubber coupling.

## Pumps BA serie

Problem	Possible cause	Solution
Insufficient flow while the pump and drive are running	Leak in the suction line (sucking in air).	Check the line for leaks and prevent the system from sucking in 'false air'.
	The suction strainer and/or suction line are blocked.	Clean the suction strainer and/or suction line.
	A vortex near the inlet of the suction line is drawing in air.	Submerge the suction line deeper into the water or use the skippy ball method.
	The wear plate or wear ring is worn out.	Readjust or replace the wear parts.
	Foreign object in the impeller.	Clean the impeller.
	The impeller is damaged.	Replace the impeller.
	Gas or air is released from the liquid.	Make the liquid flow slower/smoothier.
	Pump speed too low.	Increase the speed of the drive.
	Incorrect direction of rotation (only for electrically driven pumps).	Change the direction of rotation (only for electrically driven pumps).

Problem	Possible cause	Solution
Cavitation noise in the pump.	The suction height exceeds the pump's NPSHr.	Please contact BBA Pumps to discuss the possibilities.
	Improperly installed suction line.	See the installation tips in the manual or at <a href="http://www.bbapumps.com">www.bbapumps.com</a> .
	Liquid speed too high on the suction side.	Recommended maximum suction speed is 4 m/s.
	Gas or air is released from the liquid.	Make the liquid flow slower/smoothier.
	The pump is running too far from BEP in the performance curve.	See the performance curve or specification sheet for the pump concerned.

Problem	Possible cause	Solution
Pump is demanding abnormal amount of power (drive is overloaded).	Pump speed is too high.	Reduce the speed.
	Incorrect direction of rotation <i>(only for electrically driven pumps)</i> .	Change the direction of rotation <i>(only for electrically driven pumps)</i> .
	The shafts are not properly aligned.	Align the pump set.
	Rotating parts are rubbing against stationary parts.	Make sure it is properly adjusted and realign if necessary.
	Insufficient lubrication in the bearing housing, possibly due to a leak; can be identified by rising operating temperature.	Carry out the service plan thoroughly.
	In the application, the pump does not function properly.	Change the piping system to match the instructions or use another type of pump.
	The liquid has a higher specific gravity or viscosity than the pump is designed for.	Install the correct pump type with sufficient spare motor power.

**Note**

For other faults of the pump or drive, contact the service department of BBA Pumps BV or DISTRIMEX Pompen & Service BV.

## 13 Troubleshooting table – BA series hydraulic power packs with submersible pump



### WARNING

In the event of faults or abnormal operation, immediately switch off the pump/motor to prevent a dangerous situation or damage to the pump set.

Problem	Possible cause	Solution
Oil leakage points in the hydraulic system.	Hose connections are loose.	Tighten the hose connections.
	Hoses or seals damaged.	Replace hoses or seals.
Hydraulic pump does not work.	Fault in the pump circuit.	Have qualified personnel perform troubleshooting and repairs.
Submersible pump does not work or functions incorrectly.	Hydraulic fluid level too low.	Check hydraulic fluid level. Top up hydraulic fluid if necessary.
	Leakage points in the hydraulic system.	Check connections and hoses for leaks. Have the malfunction corrected by a specialist.
	Fault in one of the working circuits.	Have the malfunction corrected by a specialist.
Hydraulic system has no power / low power.	Hose connections are loose.	Tighten the hose connections.
	Hoses or seals damaged.	Replace hoses or seals.
	Pressure relief valve opens too soon.	Have the malfunction corrected by a specialist.
	Hydraulic pump is worn out or defective.	Have the pump inspected/replaced by a specialist.
Noise in the hydraulic system	Hydraulic pump is sucking in air.	Check hydraulic fluid level. Have the malfunction corrected by a specialist.
	Hydraulic pump is not pumping enough oil.	Check hydraulic fluid level. Top up hydraulic fluid if necessary.

Specific SPN fault codes for hydraulic functions.

<b>Fault code</b>	<b>Possible cause</b>	<b>Solution</b>
SPN 2602 FMI 14	Hydraulic fluid level too low.	Check hydraulic fluid level. Top up hydraulic fluid if necessary.
	Hydraulic fluid temperature too high.	Check the operation of the oil cooler.
SPN 702 FMI 14	Return line filter severely clogged. Leak-off oil filter severely contaminated.	Change hydraulic oil filters; see chapter 'Replacing hydraulic oil filters'. Change hydraulic oil filters; see chapter 'Replacing hydraulic oil filters'.

After the fault has been corrected, the fault message will automatically disappear again after the system has been restarted and has run for some time.

## 14 Disposal

If the pump set is scrapped and dismantled at the end of its service life, the regulations for waste disposal applicable at the time and place of dismantling must be observed.

The pump set is constructed of common materials.

At the time of construction there were waste disposal methods available for these materials.

At the time of construction there were no special risks known for persons responsible for the disassembly work after careful cleaning of the pump set.

Observe the environmental regulations in force at the time of disassembly to prevent environmental pollution.

Prior to beginning disassembly, complete the following tasks:

- Drain the pump set and clean internally; see chapter 'Maintenance'.
- For a diesel-driven pump set, follow the guidelines of the diesel engine manufacturer; see [www.bbapumps.com](http://www.bbapumps.com).
- Remove the fuel from the fuel tank.
- Drain the coolant.
- Keep the liquids separate and submit them to a collection centre authorised for their disposal.
- Remove the battery from the pump set.
- Remove the AdBlue ® from the AdBlue tank.

## 15 Declaration of Conformity BA

### Declaration of conformity

within the meaning of Supply of Machinery (Safety) Regulations 2008, Appendix II 1 B

Manufacturer: **BBA Pompen & Buizen BV, Zutphensestraat 242, 7325 WV Apeldoorn, The Netherlands**

Product: **Pump**  
Pump type: BA series pump without drive  
Product no. pump: listed on the type plate on the pump  
Series no. pump: listed on the type plate on the pump

Herewith we declare that the mentioned above pump is in accordance with the regulations of:

- Supply of Machinery (Safety) Regulations 2008, as last altered

The pumps comply with the following harmonized standards:

- EN 809:1998+A1:2009/AC:2010
- ISO 12100:2010
- ISO 14120:2015

#### Note:

After installation, the incomplete pump may not be put into operation until it has been fully complied with the provisions of the Supply of Machinery (Safety) Regulations 2008 and the Electrical Equipment (Safety) Regulations 2016, and that all national laws and regulations are also complied with.

J. Bruin BBA Pompen & Buizen BV



Managing Director  
Apeldoorn, 15-02-2022

### Declaration of conformity

within the meaning of Supply of Machinery (Safety) Regulations 2008, Appendix II 1 A

Manufacturer: **BBA Pompen & Buizen BV, Zutphensestraat 242, 7325 WV Apeldoorn, The Netherlands**

Product: **Pump**  
Pump type: BA series pump with diesel engine  
Product no. pump: listed on the type plate on the pump  
Series no. pump: listed on the type plate on the pump

Herewith we declare that the mentioned above pump is in accordance with the regulations of:

- Supply of Machinery (Safety) Regulations 2008, as last altered
- Electrical Equipment (Safety) Regulations 2016, as last altered

The pumps comply with the following harmonized standards:

- EN 809:1998+A1:2009/AC:2010
- ISO 12100:2010
- ISO 13850:2015
- ISO 14118:2017
- ISO 14120:2015

J. Bruin BBA Pompen & Buizen BV



Managing Director  
Apeldoorn, 15-02-2022

## Declaration of conformity

within the meaning of Supply of Machinery (Safety) Regulations 2008, Appendix II 1 A

Manufacturer: **BBA Pompen & Buizen BV, Zutphensestraat 242, 7325 WV Apeldoorn, The Netherlands**

Product: **Pump**  
Pump type: BA series pump with electric motor  
Product no. pump: listed on the type plate on the pump  
Series no. pump: listed on the type plate on the pump

Herewith we declare that the mentioned above pump is in accordance with the regulations of:

- Supply of Machinery (Safety) Regulations 2008, as last altered
- Electrical Equipment (Safety) Regulations 2016, as last altered
- Electromagnetic Compatibility Regulations 2016, as last altered

The pumps comply with the following harmonized standards:

- EN 809:1998+A1:2009/AC:2010
- ISO 12100:2010
- ISO 13850:2015
- ISO 14118:2017
- ISO 14120:2015

J. Bruin BBA Pompen & Buizen BV



Managing Director  
Apeldoorn, 15-02-2022

## Declaration of conformity

within the meaning of Supply of Machinery (Safety) Regulations 2008, Appendix II 1 B

Manufacturer: **BBA Pompen & Buizen BV, Zutphensestraat 242, 7325 WV Apeldoorn, The Netherlands**

Product: **Pump**  
Pump type: BA series DOL with electric motor  
Product no. pump: listed on the type plate on the pump  
Series no. pump: listed on the type plate on the pump

Herewith we declare that the mentioned above pump is in accordance with the regulations of:

- Supply of Machinery (Safety) Regulations 2008, as last altered
- Electrical Equipment (Safety) Regulations 2016, as last altered
- Electromagnetic Compatibility Regulations 2016, as last altered

The pumps comply with the following harmonized standards:

- EN 809:1998+A1:2009/AC:2010
- ISO 12100:2010
- ISO 14120:2015

### Note:

After installation, the incomplete pump may not be put into operation until it has been fully complied with the provisions of the Supply of Machinery (Safety) Regulations 2008, and that all national laws and regulations are also complied with.

J. Bruin BBA Pompen & Buizen BV



Managing Director  
Apeldoorn, 15-02-2022

**CALIFORNIA  
Proposition 65 Warning**

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

**THE NETHERLANDS**

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