

Operating Instructions

B-Series



P u m p s f o r r e s u l t s





Operating instructions

B-Series and B-Ex-Series

English

Caution: These operating instructions
contain extra information for ATEX pumps.
Read them thoroughly!



IIA Certificate:

Declaration of conformity

within the meaning of EC Machinery Directive 2006/42/EC, annex II 1 B

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

Product: **Pump, B series**

We hereby declare that the above pump is in accordance with the provisions of:

- the Machinery Directive (Directive 2006/42/EC, as last amended)
- the Low Voltage Directive (Directive 2014/35/EC, as last amended)
- the EMC Directive (Directive 2014/30/EU, as last amended)

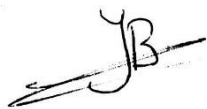
The pump complies with the following harmonized standards:

- NEN-EN 809:1998+A1:2009/C1:2010
- NEN-EN ISO 12100:2010
- NEN-EN 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 Machinery Directive (Directive 2006/42/EC).

J. Bruin BBA Pompen & Buizen BV



Managing Director
Apeldoorn, 27-05-2021

IIA Certificate:

Declaration of conformity

within the meaning of EC Machinery Directive 2006/42/EC, annex II 1 B

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

Product: **Pump, B series EX**

We hereby declare that the above pump is in accordance with the provisions of:

- the Machinery Directive (Directive 2006/42/EC, as last amended)
- the Low Voltage Directive (Directive 2014/35/EC, as last amended)
- the EMC Directive (Directive 2014/30/EU, as last amended)
- the ATEX 114 Directive (Directive 2014/34/EU, as last amended)

The pump complies with the following harmonized standards:

- NEN-EN 809:1998+A1:2009/C1:2010
- NEN-EN 13463-3:2005
- NEN-EN ISO 12100:2010
- NEN-EN ISO 14120:2015

Notified Body

- Lloyds Nederland BV
- Document Nr: 177904 rev.2

Note:

After installation, the incomplete pump may not be put into operation until it has been fully complied with the provisions of the Machinery Directive (Directive 2006/42/EC).

J. Bruin BBA Pompen & Buizen BV



Managing Director
Apeldoorn, 27-05-2021

Contents

| | |
|---|----|
| 1 Extra points for attention for ATEX pumps..... | 7 |
| 2 Introduction | 8 |
| 2.1 Instructions for use..... | 8 |
| 2.1.1 Safety symbols..... | 9 |
| Safety | 10 |
| 2.2 Warrantee..... | 12 |
| 3 . General | 12 |
| 3.1 Description of pump..... | 13 |
| 3.2 Application..... | 13 |
| 3.3 Working of the pump | 14 |
| 3.4 Type indication | 16 |
| 3.4.1 Pump series..... | 16 |
| 3.4.2 Construction size | 16 |
| 3.4.3 Shaft seal..... | 17 |
| 3.4.4 Material type:..... | 20 |
| 3.4.5 Construction form..... | 21 |
| 3.4.6 Drive gear | 21 |
| 3.4.7 Elastomers | 21 |
| 3.4.8 Options..... | 21 |
| 3.4.9 Structure..... | 22 |
| 4 Installation..... | 23 |
| 4.1 General..... | 23 |
| 4.2 Receipt | 24 |
| 4.3 Transport and storage..... | 24 |
| 4.4 Intermediary storage | 25 |
| 4.5 Preservation (inside) | 25 |
| 4.5.1 Control of preservation | 25 |
| 4.5.2 Removal of the preservative | 25 |
| 4.6 General operating instructions for centrifugal pumps..... | 25 |
| 4.7 Construction..... | 25 |
| 4.8 Place of installation..... | 26 |
| 4.8.1 Space around the pump..... | 26 |
| 4.8.2 Installation outdoors | 26 |
| 4.8.3 Installation indoors | 26 |
| 4.9 Spaces with danger of fire or explosion..... | 27 |
| 4.10 Protection against extreme temperatures | 27 |
| 4.11 Base..... | 28 |
| Setup | 29 |
| 4.12 Radial load shaft end..... | 29 |
| 4.13 Direction of rotation..... | 30 |
| Safety devices | 30 |
| 5 Piping system | 31 |
| 5.1 forces..... | 31 |
| 5.2 Piping | 31 |
| 5.3 Suction line | 32 |
| 5.4 Pressure line | 34 |
| 5.5 Self-priming operation | 34 |
| 5.6 Valves | 35 |
| 5.7 Water shock..... | 35 |
| 5.8 Suction strainer | 36 |
| 6 Mechanical shaft seal | 37 |
| 6.1 Mechanical shaft seal without cooling B and BE | 37 |
| 6.1.1 Single mechanical shaft seal with cooling..... | 37 |

| | |
|--|----|
| 6.1.2 Single mechanical shaft seal without cooling..... | 37 |
| 6.1.3 Single mechanical shaft seal with cooling..... | 37 |
| 6.1.4 Double mechanical shaft seal with Back to Back setup | 37 |
| 6.2 Circulation systems: API 610/682 | 38 |
| 6.2.1 Plan 2 | 38 |
| 6.2.2 Plan 11 | 39 |
| 6.2.3 Plan 12 | 39 |
| 6.2.4 Plan 21 | 39 |
| 6.2.5 Plan 31 | 39 |
| 6.3 Piping rinsing and sealing liquid..... | 39 |
| 6.4 Cooling liquid for seal..... | 40 |
| 7 Instructions for the assembly..... | 41 |
| 7.1 Base for pump/pump unit..... | 42 |
| 7.2 Electric motors | 43 |
| 7.3 Operating switch | 44 |
| 7.4 Motor protection | 44 |
| 7.5 Connection | 44 |
| 7.6 Earthing..... | 45 |
| 7.7 Combustion motors | 45 |
| 7.8 Variable speed gears | 46 |
| 7.9 Shaft coupling | 46 |
| 7.10 Alignment..... | 46 |
| 7.11 Protective cover..... | 47 |
| 7.12 Belt drive..... | 47 |
| 8 Bringing into operation | 48 |
| 8.1 General..... | 48 |
| 8.2 Cleaning the pump | 48 |
| 8.3 filling the pump..... | 49 |
| 8.4 preparation of the starting of the pump/pump unit, electrically driven..... | 49 |
| 8.4.1 Main pipe | 49 |
| 8.4.2 Suction line | 49 |
| 8.4.3 Pressure line..... | 50 |
| 8.4.4 Characteristics..... | 51 |
| 8.4.5 Electrical installation | 51 |
| 8.4.6 Drive gear | 51 |
| 8.4.7 Direction of rotation | 51 |
| Shaft seal..... | 52 |
| 8.4.8 Alignment | 53 |
| 8.4.9 Protection..... | 53 |
| 8.5 starting..... | 53 |
| 8.5.1 On actually starting the pump unit go through the following check-list | 53 |
| 8.6 Switching off..... | 54 |
| 8.7 Restarting | 54 |
| 8.8 Checks during operation | 55 |
| 9 Failures | 56 |
| 9.1 Malfunction check-list | 57 |
| 10 Reuse and scrapping..... | 62 |
| 11 Maintenance | 63 |
| 11.1 General..... | 63 |
| 11.2 Preparation | 64 |
| 11.3 Tools | 64 |
| 11.4 Switching off..... | 64 |
| 11.5 Motor protection | 65 |
| 11.5.1 Electric motor | 65 |
| 11.5.2 Diesel motor..... | 65 |

| | |
|--|----|
| 11.6 Preservation..... | 65 |
| 11.7 external cleaning | 65 |
| 11.8 Electrical installation..... | 66 |
| 11.9 Draining the pump | 66 |
| 11.10 Specific parts..... | 67 |
| 11.10.1 Bolts and nuts | 67 |
| 11.10.2 Flat seals and tape..... | 67 |
| 11.10.3 Synthetic and rubber parts | 67 |
| 11.10.4 Suction strainer filter | 67 |
| 11.10.5 Rolling bearings..... | 68 |
| 11.10.6 Further lubrication | 68 |
| 11.10.7 Recommended greases..... | 69 |
| 11.10.8 Recommended oils..... | 69 |
| 11.10.9 Mechanical shaft seal..... | 70 |
| 11.11 Back pull out | 70 |
| 11.12 Spacer coupling..... | 70 |
| 11.13 Overhaul advice | 70 |
| 12 Summary of instructions for ATEX pumps..... | 73 |
| 13 safety devices. | 77 |
| 13.1 Summary of safety devices to be used | 77 |
| 13.2 Temperature monitoring: | 77 |
| 13.3 Coolant monitoring. | 78 |
| 13.4 Overpressure protection. | 78 |
| 13.5 Underpressure protection. | 78 |
| 13.6 Electric motor safety devices. | 79 |
| 13.7 The regulation must suffice with regard to the following requirements. | 79 |
| 14 Remarks/notes | 80 |

1 Extra points for attention for ATEX pumps.

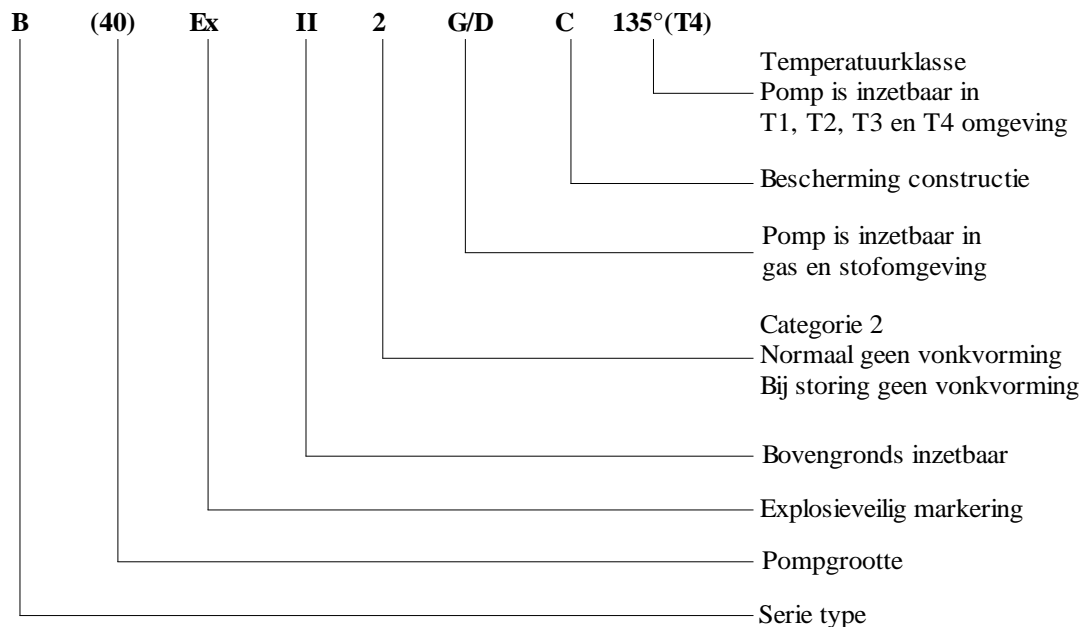
These operating instructions contain extra information for ATEX pumps in the B-Series. The most important information for ATEX pumps is summarised in section 12.

The operating instructions must always be read before the pump is installed, started up or before any maintenance or other activities take place.

You can recognise an ATEX pump by the following mark:



An ATEX B-series pump has the following coding:



Atex Coding

| II Aboveground | | | <u>Max. surface temperature</u> | <u>Temperature class</u> |
|--|--|--|-------------------------------------|------------------------------|
| Category 1 | Category 2 | Category 3 | | |
| <ul style="list-style-type: none"> Normally no sparking or hot surface With an expected malfunction no sparking With a rare malfunction no sparking | <ul style="list-style-type: none"> Normally no sparking With an expected malfunction no sparking | <ul style="list-style-type: none"> Normally no sparking | 450°C | T1 |
| | | | 300°C | T2 |
| | | | 200°C | T3 |
| | | | 135°C | T4 |
| | | | 100°C | T5 |
| | | | 85°C | T6 |
| Suitable for: | Suitable for: | Suitable for: | | |
| Gas/G = Zone 0, 1 en 2 | Gas/G = Zone 1 and 2 | Gas/G = Zone 2 | | |
| Dust/D = Zone 20, 21 and 22 | Dust/D = Zone 20, 21 and 22 | Dust/D = Zone 22 | | |

2 Introduction

These standard operating instructions apply for the standard versions of the B- and B(Ex)-series.

2.1 Instructions for use

The information published in these operating instructions is based on the most recent information. It is provided with the reservation of subsequent changes. We reserve the right to at any time change the construction and/or design of our products, and this without any obligation to adapt goods supplied earlier by us.

These operating instructions contain useful and important information for the good functioning and maintenance of your pump. They also contain important instructions for bringing the equipment into use and for during the operation of the pump. Instructions are also provided to prevent possible accidents or serious damage, and to allow the safe and problem-free working of your pump. Read the operating instructions thoroughly before operating the pump. Become familiar with the working and operation of your pump, and carefully comply with the information and instructions. In this respect we emphasise the importance of training (by the supplier) in correctly working with the pump. It is important for these operating instructions to be kept in a set place in the vicinity of the pump.

For information concerning setting, maintenance activities or repairs you are requested to contact our service department. In that case always mention the type of pump and serial number.

Distrimex Pompen & Service BV

Tel : +31 (0)314 368 444

Fax : +31 (0)314 33 50 47

2.1.1 Safety symbols

Safety instructions included in the operating instructions which if not complied with can cause dangers to persons, the work area, environment or the machine are given the following symbols:



This symbol refers to the obligation of the user to comply with the summarised conditions.



This symbol warns of and describes the danger that can arise when the conditions concerning electricity are ignored. Not complying with the instructions can lead to death or serious physical injury.



This symbol refers to the possibility of danger that originates for the user and/or the environment when the instructions are not complied with.



This symbol refers to instructions that assure the safe working of the pump/pump (unit) and/or the protection of the pump/pump (unit).



This symbol refers to an extra aspect for attention with ATEX pumps.

Safety

Marks on the pump:

Always note the marks on the pump (the arrow showing the direction of rotation or symbols marking the liquid connections). Make sure that these signs are and remain readable.

Target group for these operating instructions:

The following persons must have read and understood all the operating instructions:

- Operating personnel and personnel responsible for the working of the pump unit;
- Personnel responsible for the installation and bringing into use of the pump and pump unit;
- Personnel responsible for periodic maintenance and inspection.

The company management must ensure that all maintenance, inspection and assembly activities are carried out by competent and qualified personnel. Their responsibility and whoever who is to supervise this must be precisely established by the company management.

If the personnel have insufficient knowledge, the company management must ensure good training that is provided by the supplier or producer of the pump.

The company management must also ensure that the contents of this manual are fully understood by both technical and service personnel, as well as persons responsible for ordering spare parts. In the following sections they will find the necessary information about the identification of pump types, variants and spare parts.

Dangers associated with non-compliance with safety instructions:

Non-compliance with the safety and operating instructions will lead to the invalidity of any form of guarantee.

Non-compliance with the safety instructions can, for example, have the following consequences:

- Danger to persons due to electrical, mechanical and chemical influences.
- Failure of the specified maintenance and service procedures.
- Failure of the most important functions of the machine/installation.
- Danger to the environment due to the leakage of hazardous substances.

Safety-conscious working:

The safety instructions mentioned in the operating instructions must be complied with at all times. Locally prevailing safety instructions are also of the utmost importance. The company management is responsible for compliance with all prevailing safety instructions.

Impermissible actions:

The safe operation of the pump supplied is only guaranteed if it is used as intended and specified. This pump was designed based on the specified operating conditions

Safety instructions during the operation of the pump:

- The limit values of the area of application as mentioned in this manual must be respected.
- When cold or hot parts of the pump could cause danger they must be protected against inadvertent contact.
- Protective devices for moving parts (e.g. shaft coupling) may not be removed during the operation of the pump/pump unit.
- All leaking dangerous (explosive, toxic or hot) liquids (for example originating from the mechanical shaft seal) must be removed to prevent any risk to persons or the environment. Local regulations must also be complied with.
- Dangers resulting from the use of electricity must be avoided (see the standards and regulations of the local electricity supplier).
- Pumps with a motor output of over 11 kW may never run against a closed valve. This causes danger of explosion.

Safety instructions during maintenance, checks and repairs:

- Working on the pump/pump unit is only permitted when it has been put out of operation.
- To put an installation out of use follow the procedure described in these operating instructions, for example the machine may no longer be under pressure and it must have fully cooled.
- Pumps and pump (units) pumping dangerous media must be cleaned and neutralised beforehand.
- Protect the drive motor during the whole working time against both inadvertent and unauthorised switching on.
- When opening the pump follow all instructions for using the medium involved (for example protective clothing, smoking ban, etc.).
- With repairs, in the interest of safety, parts supplied by the supplier or approved by him must always be used.
- Modifications to the machine or the application are only possible after consultation with the suppliers.
- The reliability of the pump/pump unit is only guaranteed when the pump is used for the application and in the way it was intended on delivery.
- At the end of the activities all safety devices and protective equipment must again be installed and made operative.
- Before restarting the pump/pump unit read the operating instructions through.

Specific instructions for working with centrifugal pumps:

The pumps may only be used for the purpose for which they were sold. If you want to change the medium you must ask the manufacturer/supplier if the pump is also suitable for the new medium.

This particularly applies for aggressive, toxic and/or media that are dangerous in other ways, and with applications where an ATEX pump needed is.

Criteria for the suitability of the pump include:

- The construction of seals, in particular the mechanical shaft seal.
- The resistance of the material that comes into contact with the medium.
- The resistance of the material against the pressure and temperature of the medium.

Noise emission with centrifugal pumps (general):

Because the pump with or without drive gear is usually used as an installation component, permanent installation on delivery is usually not applicable.

Noise measurements are therefore carried out on a random basis by us and our manufacturers (distance of 1 metre/1.6 metre height).

The measured values are usually below 70 dB(A)

No account is taken of the drive gear or piping with the measurements. The cavitation-free operation and setup/installation of the pump according to the instructions is assumed.



Whoever works in an environment with a noise level of 85 dB(A) or more must take personal protective measures.

2.2 Warrantee

We draw your attention to the fact that any guarantee becomes inapplicable and you must indemnify us against any product liability claims from third parties if:

- Service and maintenance has not taken place according to the instructions, repairs were carried out by personnel other than our own personnel, or carried out without our prior written permission.
- Modifications to the pump or pump (unit) have been made without our prior written permission.
- Not original BBA Pompen parts or lubricants other than specified have been used without our prior written permission.
- The pump or pump (unit) has been used improperly, incorrectly, negligently or not in accordance with the original nature and/or application.

With respect to drive gear and other external components (not parts of the pump itself) BBA Pompen consents to the guarantee assessment of the supplier concerned.

All parts subject to wear are excluded from the guarantee.

The general terms of delivery in your possession are also applicable.

3 . General

In this section we will describe the following points:

- description of pump
- application
- working of the pump/pump unit

- type indication

3.1 Description of pump

BBA self-priming centrifugal pumps are highly suitable for pumping clean and soiled liquids.

The pumps are provided with an open rotor and a wear plate that can be quickly changed.

Because few turning parts come into contact with the liquid, wear to the pump remains limited.

Large cleaning covers are also applied. The pumps have a modular construction and can be provided as: standard modular cast iron with as options bronze and stainless steel.

It is possible to assemble different kinds of elastomers. It is also possible to assemble a large number of different mechanical shaft seals. The shaft is provided as standard with C45 steel with optional stainless steel.

The pumps can supplied as a bearing support design, and as a large number of pumps in a single block and add-on design.

3.2 Application

The B-Series is used if one or more of the aspects below are required:

- self-priming
- large dirt passage
- wear-resisting

The B-Series is used in sectors including the following:


- industry
- shipping
- building work
- waste water
- the environment
- waterboards
- irrigation projects
- agrarian companies
- horticulture



The B-Series is not designed for the food industry, but can be used when there are no special requirements from hygienic standards. The materials used for the selected pump variant must in any event always be checked beforehand for their suitability for the foodstuff concerned.

The B-Series is suitable for pumping viscous liquids to 50 mm²/s (cst).

The maximum liquid temperature is 180 degrees (in ATEX zones the max. temperature depends on the zone and category). This is also dependent on for example: material types, liquid, working pressure, and setup of pump, see technical information.

| | | | |
|---|--|---|-----------------------------------|
|  | | Extra point(s) for attention with ATEX pumps. | |
| | | The maximum permissible liquid temperature in ATEX zones. | |
| | | Category 2/3 zone | Maximum liquid temperature |
| | | T1 | 180°C |
| | | T2 | 180°C |
| | | T3 | 120°C |
| | | T4 | 65°C |

For correct use of the pump attention must be devoted to materials, the environment (ATEX zone), liquid, viscosity, temperature, working pressure, number of revolutions etc.

- The application and area of use are limited depending on the selected pump version. This was selected in consultation between the user and supplier based on the information the supplier disposed of at the time of the purchase.
- The supplier is not responsible for damage to the pump/pump unit that is the consequence of missing and not specified information at the time of purchase (such as, for example the composition of the liquid, environment, temperature, number of revolutions, quantity and size of the solid components, etc.).
- The pump/pump unit may under no circumstances be used for another application than that for which it was originally purchased and installed.
- The changing of the application may only take place after consultation with, and with the written agreement of BBA Pompen BV.

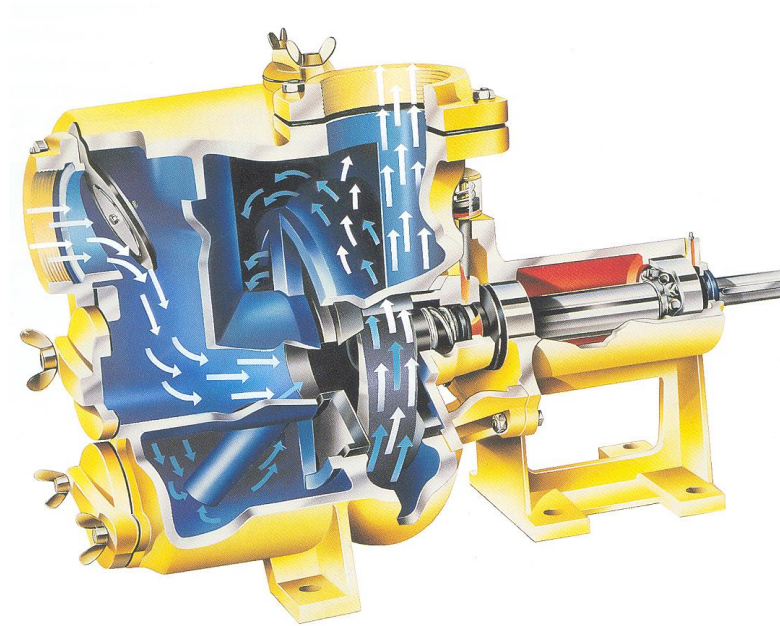
3.3 Working of the pump

The self-priming centrifugal pump distinguishes itself from the normally priming centrifugal pump by its air processing capacity. The pump housing of a self-priming pump is constructed so that a part of the pumped liquid flows back to the suction side. When air is drawn this is mixed with the liquid in the pump housing. The mixture of air and liquid can be pumped through the rotor. The mixture will be separated after leaving the rotor. The air is removed through the pressure line, while the heavier water returns through a type of return pipe in the pump housing and falls to the suction side. This process continues until all air has been pumped out of the suction line. The pump then forces out the water that was drawn in through the pressure line.

A condition for starting this process is that before the pump is started up the pump housing is fully filled with liquid. Filling can take place through the inspection cover on top of the pump. The big advantage of a self-priming centrifugal pump is that no separate vacuum pump is needed to pump the air out of the suction line.

The disadvantage, however, is that the performance of a self-priming centrifugal pump is usually lower than that of a normally priming centrifugal pump. This is because a part of the pumped liquid in the pump housing is returned to the suction side.

The drawing below is a cross-section of a self-priming centrifugal pump. The arrows show the course of the liquid and the air in the pump housing. The dark arrows represent the liquid and the white arrows the air.



B100 BVGS working drawing in start-up phase.

- air: white arrows
- liquid: dark arrows

3.4 Type indication

| | | | | | | | | | |
|--------------------|----------|------------|-----------|----------|----------|------------|-----------|-----------|--------------|
| Type: (example) | B | 200 | BV | G | S | +MC | +V | +M | +BF67 |
| Coding: | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

1. Pump series
2. Construction size
3. Shaft seal
4. Material type
5. Construction form
6. Drive gear
7. Elastomers
8. Options
9. Structure

3.4.1 Pump series

B. B-Series, self-priming waste water pump

B-Ex II 2GD c 135°C (T4) B-Series, self-priming waste water pump
Pump according to ATEX specification in a certain temperature category.

Zone 2, temperature class T4= 135°C

B°-Ex II 3GD c 135 C (T4) B-Series, self-priming waste water pump
Pump according to ATEX specification in a certain temperature category.

Zone 3, temperature class T4= 135 °C

B-Ex II 2GD c 200°C (T3) B-Series, self-priming waste water pump
Pump according to ATEX specification in a certain temperature category.

Zone 2, temperature class T3= 200°C

B°-Ex II 3GD c 200 C (T3) B-Series, self-priming waste water pump
Pump according to ATEX specification in a certain temperature category.

Zone 3, temperature class T3= 200 °C

(For an exact description see "section I")

3.4.2 Construction size

B40, B30-180, B45, B50, B55, B60-180, B60-220, B65, B70, B70-250, B85, B95, B100, B125, B140, B150, B156, B200, B250 and B300

3.4.3 Shaft seal

| | |
|----------------|--|
| B | Silicon carbide (sic)/Silicon carbide (sic) elastomers FPM (Viton®). |
| BE | Silicon carbide (sic)/Silicon carbide (sic) elastomers EPDM . |
| B+W | Silicon carbide (sic)/Silicon carbide (sic) elastomers FPM (Viton®), <i>sealing water</i> . |
| BE+W | Silicon carbide (sic)/Silicon carbide (sic) elastomers EPDM , <i>sealing water</i> . |
| BV | Silicon carbide (sic)/Silicon carbide (sic) elastomers, FPM (Viton®), grease-cooled <i>With the exception of B150, B200, B250 and B300 these have standard oil cooling.</i> |
| BEV | Silicon carbide (sic)/Silicon carbide (sic) elastomers EPDM , glycerin/antifreeze. |
| BV+W | Silicon carbide(sic)/Silicon carbide(sic) elastomers, FPM (Viton®), grease-cooled, <i>sealing water.</i> <i>With the exception of B150, B200, B250 and B300 these have standard oil cooling.</i> |
| BEV+W | Silicon carbide (sic)/Silicon carbide (sic) elastomers EPDM , glycerin/antifreeze, <i>sealing water</i> . |
| BU | Silicon carbide (sic)/Silicon carbide (sic) elastomers FPM (Viton®), oil-cooled |
| BEU | Silicon carbide (sic)/Silicon carbide (sic) elastomers EPDM , glycerin/antifreeze. |
| BU+W | Silicon carbide(sic)/Silicon carbide (sic) elastomers FPM (Viton®), oil-cooled, <i>sealing water</i> . |
| BEU+W | Silicon carbide (sic)/Silicon carbide(sic) elastomers EPDM , glycerin/antifreeze, <i>sealing water</i> . |
| BS | Silicon carbide (sic)/Silicon carbide (sic) elastomers FPM (Viton®), water-cooled |
| BES | Silicon carbide (sic)/Silicon carbide (sic) elastomers EPDM , water-cooled |
| BSW | Silicon carbide(sic)/Silicon carbide(sic) elastomers FPM (Viton®), <i>sealing water</i> |
| BESW | Silicon carbide(sic)/Silicon carbide(sic) elastomers EPDM , <i>sealing water</i> |
| BSW+U | BSW + oil cooling |
| BESW+U | BESW + glycerin/antifreeze. |
| TW | Silicon carbide (sic)/Silicon carbide (sic) elastomers FPM (Viton®), <i>Standard grease-cooled. With the exception of B150, B200, B250 and B300 these have standard oil cooling.</i> |
| TW + W | Silicon carbide (sic)/Silicon carbide(sic) elastomers FPM (Viton®), <i>sealing water</i> . <i>Standard grease-cooled. With the exception of B150, B200, B250 and B300 these have standard oil cooling.</i> |
| T1W | Coal/Ceramic/elastomers Nitrile , grease-cooled, only available as standard with B40, B45 and B50. |
| T1W + W | Coal/Ceramic/elastomers Nitrile , grease-cooled, only available as standard with B40, B45 and B50, <i>sealing water</i> . |
| T2W | Coal/Ceramic/elastomers, FPM (Viton®), grease-cooled, only available as standard with B40, B45 and B50. |
| T2W + W | Coal/Ceramic/elastomers, FPM (Viton®), grease-cooled, only available as standard with B40, B45 and B50, <i>sealing water</i> . |

| | |
|--------------------------|--|
| T3W | Hard metal/Hard metal/elastomers FPM (Viton®). Standard grease-cooled. <i>With the exception of B150, B200, B250 and B300 these have standard oil cooling.</i> |
| T3W + W | Hard metal/Hard metal/elastomers FPM (Viton®), sealing water . Standard grease-cooled. <i>With the exception of B150, B200, B250 and B300 these have standard oil cooling.</i> |
| T4W (120) | Silicon carbide (sic)/Silicon carbide(sic), elastomers PTFE , grease-cooled. <i>With the exception of B150, B200, B250 and B300 these have standard oil cooling.</i> |
| T4W+ W (120) | Silicon carbide (sic)/Silicon carbide(sic), elastomers PTFE , grease-cooled, sealing water . <i>With the exception of B150, B200, B250 and B300 these have standard oil cooling.</i> |
| T4W (130) | Silicon carbide (sic)/Silicon carbide(sic), elastomers, PTFE , grease-cooled. <i>With the exception of B150, B200, B250 and B300 these have standard oil cooling.</i> <u>Not available for B40.</u> |
| T4W (130) | Silicon carbide (sic)/Silicon carbide(sic), elastomers, PTFE , grease-cooled. <i>With the exception of B150, B200, B250 and B300 these have standard oil cooling.</i> <u>Not available for B40.</u> |
| T4W + W (130) | Silicon carbide (sic)/Silicon carbide(sic), elastomers, PTFE , grease-cooled, sealing water . <i>With the exception of B150, B200, B250 and B300 these have standard oil cooling.</i> <u>Not available for B40.</u> |
| T5W (120) | Silicon carbide (sic)/Silicon carbide (sic), elastomers, FPM (Viton®) grease-cooled. <i>With the exception of B150, B200, B250 and B300 these have standard oil cooling.</i> |
| T5W+ W (120) | Silicon carbide (sic)/Silicon carbide (sic), elastomers, FPM (Viton®) grease-cooled, sealing water . <i>With the exception of B150, B200, B250 and B300 these have standard oil cooling.</i> |
| T10W (130) | Silicon carbide (sic)/Silicon carbide(sic), elastomers, FPM (Viton®) grease-cooled. <i>With the exception of B150, B200, B250 and B300 these have standard oil cooling.</i> <u>Not available for B40.</u> |
| T10W + W (130) | Silicon carbide (sic)/Silicon carbide(sic), elastomers, FPM (Viton®), grease-cooled, sealing water . <i>With the exception of B150, B200, B250 and B300 these have standard oil cooling.</i> <u>Not available for B40.</u> |
| T6W (120) | Coal/ceramic/elastomers PTFE , grease-cooled. <i>With the exception of B150, B200, B250 and B300 these have standard oil cooling.</i> |
| T6W+ W (120) | Coal/ceramic/elastomers PTFE , grease-cooled, sealing water . <i>With the exception of B150, B200, B250 and B300 these have standard oil cooling.</i> |
| T7W (130) | Coal/ceramic/elastomers, PTFE , grease-cooled. <i>With the exception of B150, B200, B250 and B300 these have standard oil cooling.</i> <u>Not available for B40.</u> |
| T7W + W (130) | Coal/ceramic/elastomers, PTFE , grease-cooled, sealing water . <i>With the exception of B150, B200, B250 and B300 these have standard oil cooling.</i> <u>Not available for B40.</u> |
| T8W (120) | Coal/ceramic/elastomers, FPM (Viton®) grease-cooled. <i>With the exception of B150, B200, B250 and B300 these have standard oil cooling.</i> |

| | |
|--------------------------------|--|
| T8W+ W (120) | Coal/ceramic/elastomers, FPM (Viton®) grease-cooled, <i>sealing water</i> <i>With the exception of B150, B200, B250 and B300 these have standard oil cooling.</i> |
| T9W (130) | Coal/ceramic/elastomers, , FPM (Viton®) grease-cooled. <i>With the exception of B150, B200, B250 and B300 these have standard oil cooling.</i> <i><u>Not available for B40.</u></i> |
| T9W + W (130) | Coal/ceramic/elastomers, FPM (Viton®) grease-cooled, <i>sealing water</i> . <i>With the exception of B150, B200, B250 and B300 these have standard oil cooling.</i> <i><u>Not available for B40.</u></i> Back to Back mechanical seal. |
| B-BTW | Part 1: Silicon carbide (sic)/Silicon carbide (sic) elastomers FPM (Viton®). Part 2: Silicon carbide(sic)/Silicon carbide(sic) elastomers, FPM (Viton®). Version in consultation with BBA Pompen. |
| B-BTW + W | Part 1: Silicon carbide(sic)/Silicon carbide(sic) elastomers. FPM (Viton®). Part 2: Silicon carbide(sic)/Silicon carbide(sic) elastomers, FPM (Viton®). <i>sealing water</i> . Version in consultation with BBA Pompen. |
| Cartex | Version in consultation with BBA Pompen BV. |

3.4.4 Material type:

With the B-Series the bearing support is standard:

The following parts are among those that can be composed from the materials

Cast iron, G

Bronze, B

Stainless steel, K

| |
|------------------------------|
| DIN 1691. GG-20 |
| DIN 1561. EN-GJL-250 |
| Work material no. EN-JL 1050 |

Pump housing.

Rotor.

Wear plate.

Cleaning covers(s).

Intermediate housing

Connecting flanges.

G (Cast iron)

| |
|------------------------------|
| DIN 1691. GG-20 |
| DIN 1561. EN-GJL-250 |
| Work material no. EN-JL 1050 |

With the exception of pump housings of B95, B125, B140, B150, B156, B200, B250 and B300. These are manufactured from 37 steel, the remaining parts of the pumps mentioned are made of cast iron.

| | |
|-----------------|-----------|
| Pump shaft | C 45 |
| Fixing material | Steel 8.8 |

B (Bronze)

| |
|------------------|
| Aluminium bronze |
| CuAl10Ni2Mn1 |

With the exception of pump housings of B95, B125, B140, B150, B156, B200, B250 and B300.

| | |
|-----------------|---------------------|
| Pump shaft | STAINLESS STEEL 316 |
| Fixing material | A4 |

K (Stainless steel)

| |
|----------------------------------|
| DIN 1.4408. stainless steel 316C |
| EN 10213-4 GR |
| A351 Gr. CF8M |

With the exception of pump housings of B95, B125, B140, B150, B156, B200, B250 and B300.

These are manufactured of:

| |
|------------------------------------|
| DIN 1.4401. STAINLESS STEEL 316 |
| X5 CrNiMo 17 12 2 |

or

| |
|------------------------------------|
| DIN 1.4436. STAINLESS STEEL 316 |
| X5 CrNiMo 17 13 3 |

| | |
|-----------------|---------------------|
| Pump shaft | STAINLESS STEEL 316 |
| Fixing material | A4 |

3.4.5 Construction form

| | |
|-----------------------|---|
| MC | Single block to 3 kW 230/400V. From 4 kW 400/690V. (<i>Single block is motor with special shaft and extension flange B14a or B5</i>) |
| MM | Single block single-phase 230V. (<i>Single block is motor with special shaft and extension flange B14a or B5</i>) |
| S | Free shaft end, with bearing support. |
| N | Standard pump, (<i>Pump is provided with extension flange for a standard motor with B5 extension flange</i>) |
| T | Tractor pump, left-turning. (only B300L). |
| R | PTO drive gear. (<i>Pump provided with reduction or accelerating gear unit with splain connection</i>) |
| MP (1, 2 or 3) | Pump attached to vacuum pump MP (1, 2 or 3). |

3.4.6 Drive gear

| | |
|-------------|---|
| S/MC | Bearing support pump assembled with B3 motor on base. |
| N/MC | Standard pump assembled with B5 motor. |
| HA | Pump assembled with Hatz diesel engine. |
| DE | Pump assembled with Deutz diesel engine. |
| LO | Pump assembled with Lombardini diesel engine. |
| LI | Pump assembled with Lister diesel engine. |
| IS | Pump assembled with Isuzu diesel engine. |

3.4.7 Elastomers

| | | |
|-----------|----------------|--|
| N | NBR. | Trade names: Perbunan®, Hycar, Buna-N, Butacril, ISRN Butakon-A. |
| v | FPM, Viton®. | Trade names: FPM, Fluorel, Technoflon. |
| Nd | EPDM. | |
| T | Teflon. | Trade names: PTFE, Tuffrapp®, |
| K | FFKM, Kalrez®. | Trade names: Chemraz®. |
| X | Special. | |

3.4.8 Options

| | |
|------------|---|
| F | DIN Flanges. |
| FK | DIN Flanges stainless steel. |
| BI | Bronze rotor CuAl10Ni2Mn1, DIN 1.4408. Stainless steel 316 shaft. |
| BII | Bronze rotor CuAl10Ni2Mn1, wear plate CuAl10Ni2Mn1 and DIN 1.4408. Stainless steel 316 shaft. |
| KI | DIN 1.4408. Stainless steel 316 rotor and shaft. |
| KII | DIN 1.4408. Stainless steel 316 rotor, wear plate and shaft. |
| Z | Zinc anodes. |
| Vr | Cooling channel seal provided with grease reservoir with a spring. |
| Or | Cooling channel seal provided with oil reservoir |
| SP | Purge line connection. (According to plan 2, 11, 12, 21 or 31) |
| M | Cutter. |
| W1 | 1 Channel rotor. |
| W2 | 1 Channel rotor DIN 1.4401. Stainless steel 316. |
| 2 | 2-disc rotor. |
| 4 | 4-disc rotor. |
| S2 | Double wear plate. |
| S3 | Filler plate and wear plate. |

E8 3 drill holes, 8mm, in rotor.

3.4.9 Structure

| | | |
|-----------------|------------------|------------------------------------|
| TR (no.) | Trailer version. | No. indicates type trailer. |
| BF (no.) | Beam base. | No. indicates type of beam base. |
| VP | Foot plate | |
| TF (no.) | Tank base | No. gives type tank base. |
| Gl (F) | Noise encasing | Letter indicates type of encasing. |

4 Installation

In this section we describe how the pump/pump unit must be installed.

- general
- receipt
- transport and storage
- intermediary storage
- preservation inside
- general operating instructions for centrifugal pumps
- construction
- place of installation
- fire- and explosion-dangerous spaces
- protection against extreme temperatures
- base
- setup
- radial load of shaft end
- direction of rotation
- safety devices

4.1 General

In this section you can find the instructions for the installation of the pump/pump unit. Everyone concerned with the setup of the pump/pump unit must have read these instructions before starting the installation work.

Together with the instructions you will find useful and important information to enable you to install the pump in the correct and safe way.



Not complying with the instructions in the operating instructions can cause danger to the user and the environment and/or serious damage to the pump or the pump unit.

BBA Pompen BV is not responsible for accidents or damage caused by not respecting the instructions in this manual. In this case any entitlement to damage compensation also becomes inapplicable.




Always keep these instructions for use in the vicinity of the pump or pump (unit).

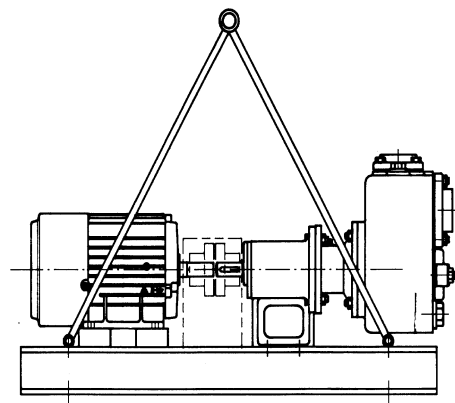
It is absolutely necessary that the marks applied to the pump or pump (unit) (e.g. the arrow plate that indicates the direction of rotation) are complied with and kept readable.

4.2 Receipt

Check the pump/pump unit on receipt for any damage during transport, and check whether the dispatch fully corresponds to the dispatch note. In the event of damage or if the dispatch is incomplete, this must be immediately reported to the carrier. This must be immediately noted this on the freight documentation.

| | | Extra point(s) for attention with ATEX pumps. |
|---|------------|--|
|  | T1. | Make sure that the pump (unit) is mechanically well shielded during transport. |

4.3 Transport and storage



With the movement of the complete pump/pump unit by crane, the hoisting must belts must be applied by qualified persons according to the prevailing rules for good hoisting practice. The hoisting equipment and hoisting belts must be sufficiently strong to move the pump (unit). The hoisting eye of the motor may not be used for moving the pump/pump unit. Because of the amount of available versions only general instructions can be given here. This is normally sufficient for experienced installation technicians and competent transporters. When in doubt or if there are questions, detailed information about the pump/pump unit can be requested. See technical specifications B-Series.



Never proceed under loads to be moved. Only entrust the movement of the equipment to personnel trained for that purpose.

Consult the technical information for weights, and use the correct transport and hoisting equipment to move the pump. When hoisting fasten the straps as shown on the illustration (also see technical specifications B-Series”).

4.4 Intermediary storage

Pumps can be provided with preservation agents on delivery. Their effective life amounts to between 6 - 12 months. With long intermediary storage or putting out of use the pumps must be treated inside with a preservative. When present, connections for rinsing, circulation or cooling must also be closed. All not painted parts and the rotating parts must be provided with a coat of preservative. The choice of preservative depends on the materials and the application. The pumps must be stored covered and well ventilated. Temperatures below freezing point and high air humidity must be avoided.



If the pump is not immediately to be taken into use, one must once a week manually turn the pump shaft and have it make a complete rotation.

4.5 Preservation (inside)

Shut off the suction flange imperviously. Fill the pump with preservative and slowly turn the rotating parts by hand. Then shut off the delivery flange imperviously.

4.5.1 Control of preservation

Every 3 months the level of the liquid must be checked and the rotating parts manually turned to prevent seizing. Top up preservative as necessary.

4.5.2 Removal of the preservative

Before the pump is brought into use the pump must be thoroughly rinsed. Make sure that the rinsing agent does not arrive in the environment! When adding preservative again the old preservative must first be removed.



Make sure that the preservative does not leak from the pump during transport and manoeuvring. A leaking pump/pump unit can cause dangerous situations.

4.6 General operating instructions for centrifugal pumps

Because of the amount of available versions and pumping principles only general instructions can be given here. These are normally sufficient for experienced installation technicians. When in doubt always consult your supplier and/or ask for detailed information about the pump unit.

4.7 Construction

Centrifugal pumps can be supplied with or without diesel/electric motor, with shared, rigid or flexibly coupled pump and motor shaft, in horizontal or vertical versions, in a number of material designs, in a number of construction sizes and with different seals. The pumps are supplied as normally priming and self-priming versions.

4.8 Place of installation

Make sure that the operating equipment for the pump/pump unit is always accessible and also remains so during the operation of the machine. Make sure that the pump/pump unit is mechanically well shielded and that it is installed without power connected.

4.8.1 Space around the pump

Keep sufficient space around the pump/pump unit to be able to operate, inspect, insulate and maintain it. With the disassembly of the bearing support (*Back pull out system*) and the pump housing sufficient space must be left at the front of the pump.

4.8.2 Installation outdoors

The pump/pump unit may only be installed outdoors when the construction of the pump/pump unit allows this. The distance from the cooling-air inlet of the motor to the wall must be sufficient to ensure the unimpeded supply of air. Installation in places where corrosion or erosion can occur or where there is much dust must be avoided. The limit values of the electric motor concerning the insulation class and protection class must be strictly respected. When electrical power is supplied from other side, the relative operating instructions must be complied with.

Note the applicable protection class of the pump/pump unit.

4.8.3 Installation indoors

The space in which the pump/pump unit is placed must be sufficiently ventilated. A too high ambient temperature or air humidity can unfavourably influence the operation of the motor. The distance from the cooling-air inlet of the motor to the wall must be sufficient to ensure the unimpeded supply of air. Installation in places where corrosion or erosion can occur or where there is much dust must be avoided. The limit values of the electric motor concerning the insulation class and protection class must be strictly respected. When electrical power is supplied from other side, the relative operating instructions must be complied with. Note the applicable protection class of the pump/pump unit, such as for example with use of a high-pressure sprayer.



**Opening
without danger:**


In the case of pumping volatile and/or dangerous liquids the dangers of these substances must be taken into account when opening.



**Protection
against other
dangers:**

In the case of hot liquids being pumped it is the responsibility of the employer to warn against hot surfaces if employees can come into contact with them.

4.9 Spaces with danger of fire or explosion

| | |
|---|--|
|  | Extra point(s) for attention with ATEX pumps. Integrated explosion safety: For the case of an internal explosion, which is excluded to the extent possible, it is the responsibility of the user to decide if technical measures (such as quick-acting valves) must be taken to prevent and/or limit the explosion. |
|---|--|



When flammable and/or explosive products are being used, provide the pump (unit) with good earthing and connect the different components of the pump (unit) through earth bridges. This limits the danger resulting from the presence of static electricity.



Use explosion-free or explosion-proof motors according to prevailing local regulations, and for the pump (unit) use suitable protective covers and suitable couplings provided with a certificate for the zone concerned.

4.10 Protection against extreme temperatures

The temperature in and around the pump/pump unit can increase depending on the liquid pumped.



From 70°C the user must apply the necessary protective equipment and warning against contact with the pump.




When fitting guards make sure that air circulation remains possible. The bearing and bearing grease in the bearing housing will then not overheat.

4.11 Base

Centrifugal pumps can in principle be fixed on a foot, on a base, with a mounting flange in or on a tank, or directly in a piping system. There are only limitations with respect to the size of the pump/pump unit and the load-bearing capacity of the connected parts. An installed position with motor downwards is only allowed with written approval from BBA Pompen BV. The base must be flat, must be provided with sufficient fastening points, and must be able to withstand the load. With a pump unit with flexible coupling the pump and motor shaft are aligned by BBA Pompen BV.

After the pump/pump unit has definitively been placed on the base, alignment must always be checked. If pumps provided with an extra foot under the pump housing are used for higher liquid temperatures, the bolts with which this foot is fixed to the base may only be lightly tightened to allow the expansion of the pump.

| | | Extra point(s) for attention with ATEX pumps. |
|---|------------|--|
|  | K8. | <p>Make sure you choose the right coupling.</p> <ul style="list-style-type: none"> • The coupling must be sufficient for the power and number of revolutions. * • The coupling must itself be (Ex), and be able to be used in the appropriate zone and temperature category. * • The certificate for the coupling must be present. * • Follow the instructions of the manufacturer (see technical specifications B-Series). |
| | K9. | <p>Ensure the correct design and material choice for the protective cover.</p> <ul style="list-style-type: none"> • No dangerous dust accumulation may take place. A design open at the bottom is preferred. * • The protective cover must fit widely around the coupling in case of dents, and to make no contact with any dust layer on the inside of the protective cover. For cat. 2: choice of material no more than 7.5% magnesium (see EN 13463-1, 8.2) * |
| | P3. | Make sure that the pump (unit) is mechanically well shielded while operating. |
| | P4. | Make sure that the pump is installed without any stresses. |

* With an Ex-pump (unit) supplied by BBA Pompen these aspects are ensured for the application indicated by the client with the associated indicated medium.

Setup

Install the pump horizontal on the pump feet. Other positions have an influence on draining, filling, operation of the mechanical shaft seal, etc. For any installation methods other than horizontal contact:

Distrimex Pompen & Service BV

Tel : +31 (0)314 368 444

Fax : +31 (0)314 33 50 47



Drive gear:

When the pump is supplied with a free shaft end the user is himself responsible for the drive gear and its assembly with the pump.

On delivery of a pump unit the standard operating instructions must be present. Contact the supplier if these are not present.



When the pump is supplied with free shaft end the user must also fit guards to shield turning parts.

These guards must be made of the correct material.

4.12 Radial load shaft end

The shaft end of the pump shaft may be loaded in the radial direction with the maximum radial force (F_r) mentioned in the table (see technical specifications B-Series). This force is calculated on the maximum allowed turning torque and the maximum working pressure of the pump with the pulley diameter mentioned.

With direct drive with flexible coupling this force is amply sufficient when the pump and drive gear are well aligned.

A belt drive can be used from the B40. The allowed radial force may then be greater, but it must be calculated case by case on the basis of working pressure, driving torque and size of the belt pulley. In this case contact.

For information concerning setting, maintenance activities or repairs you are requested to contact our service department:


Distrimex Pompen & Service BV

Tel : +31 (0)314 368 444

Fax : +31 (0)314 33 50 47

4.13 Direction of rotation

The direction of rotation must correspond with the rotation direction arrow on the pump.

| | | |
|---|--------------------------|--|
| | | Extra point(s) for attention with ATEX pumps. |
|  | P7. BI. | Make sure that direction of rotation arrow is present. Ensure direction of rotation protection (electrical/mechanical). |



Dangers relating to the software:

It is the responsibility of the employer to ensure that the safety measures (such as the direction of rotation protection) and the resulting action (such as the stoppage of the pump) are appropriately included in the safety circuit.

To check the direction of rotation the motor must be briefly switched on. The motor may then not reach operating speed. With an incorrect direction of rotation the connection on the terminal board must be changed.


Safety devices

Make sure that if a safety device must be applied, the appropriate safety device is actually applied: “Technical specifications B-Series”.

The operating instructions describe when a safety device must be applied.

Safety devices can be applied for aspects such as:

- Temperature
- Overpressure
- Underpressure
- Direction of rotation
- Oil level
- Overloading
- etc.

| | | |
|---|--|---|
| | | Extra point(s) for attention with ATEX pumps. |
|  | | If a safety device is applied it must be suitable for the environment in which the pump is located. |



Dangers relating to the software:

It is the responsibility of the employer to ensure that the safety measures (such as the direction of rotation protection) and the resulting action (such as the stoppage of the pump) are appropriately included in the safety circuit.

5 Piping system

This section describes how the pump/pump unit must be connected to the piping system.


- forces
- piping
- suction line
- pressure line
- self-priming operation
- valves
- water shock
- suction strainer

5.1 forces

Too great forces and moments on the flanges through the piping lead to mechanical damage to the pump/pump unit. Connect the piping in the following way to fit the pump/pump unit:

- in line
- against the flanges
- parallel to the flanges
- without gap

See technical specifications B-Series. Also take account of additional forces and moments as a result of thermal expansion when pumping hot liquids. Use expansion joints when necessary. After the connection of the piping check that the rotating parts can still freely move.

| | | |
|---|------------|---|
|  | P4. | Extra point(s) for attention with ATEX pumps. Make sure that the pump is free of stresses, including the coupling of the diesel/electric motor. |
|---|------------|---|

5.2 Piping

The diameters of the piping must at least correspond with the connecting sizes of the pump. Joints must if possible provide a joint angle of approx. 8 degrees. The piping must be bracketed and fixed immediately before the pump. The weight of the piping and appendages may not weigh on the pump/pump unit. Piping loads resulting from temperature variations or vibrations of the piping can be accommodated by the use of appropriate expansion joints. The connection of measurement instruments is required for control of the pump during operation. Before operation all parts carrying liquids must be thoroughly cleaned.



Protection against other dangers:

In the case of hot liquids being pumped it is the responsibility of the employer to warn against hot surfaces if employees can come into contact with them.

When pumping viscous liquids pressure losses in the suction and pressure line can be great. Associated components in the piping system (valves, bends, suction strainer, filters, foot valve, etc.) will further increase the pressure losses.



The diameter and length of suction and pressure lines and extra components must therefore be selected so that the pump can operate above the minimum allowed inlet pressure (NPSH available graphs on request), within the maximum permitted working pressure and within the installed motor capacity.

5.3 Suction line

The suction line must:


- Be as short as possible.
- Run up to the pump so no air pockets can originate. If this is not possible a vent opening must be fitted at the highest point of the pipe.
- With tapering the pipe must descend to the pump.
- Have as few as possible bends, and bends with a large radius.
- Have a wide as possible passage.
- With different diameters eccentric reducing pieces must be fitted or air can remain in the higher piping part.
- There may be absolutely no signs of leaks.
- With not self-priming pumps, if the liquid does not flow to the pump a foot valve with wide passage must be provided.
- With soiled liquids, as necessary a suction strainer or dirt catching grill must be provided with the passage adapted to the passage in the pump.
- If the liquid flows to the pump, the pump must have a suction line valve to be able to make repairs without first having to empty the whole suction line.
- At the inlet the piping must be sufficiently submerged in the liquid so that also with the lowest position of the liquid no air will be drawn in.
- No bend may be present immediately before the suction flange of the pump, particularly if there is little difference between the available and required NPSH. This bend causes an irregular flow to the rotor and can unfavourably influence suction.

For some examples of piping systems and other aspects see “Technical Specifications B-Series”.



A too small diameter, a too long suction line or a too small or blocked suction strainer can increase piping losses in such a way that the available NPSH (NPSHa) is lower than the required NPSH (NPSHr). This causes pump cavitation. This is harmful to the pump and proper operation.

(For advice on suction line dimensions and suction strainer passage, see the section “Technical specifications”)

| | | Extra point(s) for attention with ATEX pumps. |
|---|--|---|
|  | K2. K4. K5. K6c. K7. P2a. P2b. P3. P4. G2. B4b. | <p>Ensure a correct suction line in relation to the NPSH curve.</p> <p>Ensure a good pipe diameter.</p> <p>Ensure a good inflow opening in the suction line.</p> <p>Use the correct packing.</p> <p>Make sure that dirt particles in piping systems cannot cause blockages.</p> <ul style="list-style-type: none"> • Fit a filter if necessary. <p>Prevent dirt particles in the medium</p> <ul style="list-style-type: none"> • With volatile, flammable liquids only a clean, filtered medium may be used. <p>Prevent dirt particles larger than the dirt passage of the rotor from arriving in the suction line and pump.</p> <p>Make sure that the pump (unit) is mechanically well shielded while operating.</p> <p>Make sure that the pump is installed without any stresses.</p> <p>Make sure that liquid supply to the pump is smooth and oxygen-free.</p> <p>Protect pump against underpressure.</p> <ul style="list-style-type: none"> • Only required when pumping volatile liquid. • Determine the max. underpressure on the basis of the NPSH line, see technical specifications B-Series. • <u>(Only with Cat. 2 pumps)</u> |



Dangers in connection with the software:

It is the responsibility of the employer to ensure that the safety measures (such as protection with underpressure) and the resulting action (such as the stoppage of the pump) are appropriately included in the safety circuit.



Integrated explosion safety:

For the case of an internal explosion, which is excluded to the extent possible, it is the responsibility of the user to decide if technical measures (such as quick-acting valves) must be taken to prevent and/or limit the explosion.

When using a suction strainer or filter continuously check the piping losses in the suction line. Check that the inlet pressure at the suction flange of the pump is still sufficiently high (see NPSH graphs).


For closing the suction line for assembly or repair activities there must be a valve near the pump (see section “Technical specifications”). The valve may not be used for the regulation of the pump, and must be fully open during operation.

With self-priming pumps provided with a separate suction bend the latter may never be removed or turned.

5.4 Pressure line

For closing the pressure line for assembly and repair activities there must be a valve near the delivery flange.

The valve can be used to regulate the volume flow.

| | | Extra point(s) for attention with ATEX pumps. |
|---|--|--|
|  | P1. M5. M6. B4a | Do not expose the pump to higher pressures than which pump is suitable according to the curve. Fit the correct packing. Check the resistance list to ensure that assembled elastomers are suitable for the pumped medium. * Protect the pump against overpressure. Set the max. pressure to 10% above the original pump curve. <ul style="list-style-type: none"> • Only required when pumping volatile liquid. • Or with a dangerous liquid. • <i>(Only with Cat. 2 pumps)</i> |

* With an Ex-pump (unit) supplied by BBA Pompen these aspects are ensured for the application indicated by the client with the associated indicated medium.



Dangers relating to the software:

It is the responsibility of the employer to ensure that the safety measures (such as protection with overpressure) and the resulting action (such as the stoppage of the pump) are appropriately included in the safety circuit.

5.5 Self-priming operation

With self-priming operation, at the start-up of the pump sufficient liquid must be present in the pump to fill the internal pump slots and “dead” spaces so the pump can build up a pressure difference.

With liquids with low viscosity therefore install either a foot valve with the same or larger diameter as the suction valve, or set the pump without foot valve in U-form (see technical specifications B-Series). This U-form can also be used if the liquid temperature is so high that the pump needs pre-pressure with respect to the NPSH line (see technical specifications B-Series).

A foot valve is not recommended with highly viscous liquids because of additional piping losses.



To remove the air and gases present in the suction line and pump, the counterpressure on the delivery side must be limited. With self-priming operation therefore start the pump with empty and open pressure line so the air or gases can escape at low counterpressure.

With long piping or with the presence of a non-return valve in the pressure line, a bypass-pipe with valve can be fitted close to the pump on the delivery side. This is opened with suction and the air or the gases will be removed at low counterpressure. Do not lead this bypass back to the suction side of the pump, but e.g. to the supply tank (see section, technical specifications B-Series).

5.6 Valves

Provide valves on the suction and delivery side to be able to isolate the pump for maintenance. The valves must have a straight open passage that can be fully opened to the size of the pipe passage (e.g. slide or ball valves).



Integrated explosion safety:

For the case of an internal explosion, which is excluded to the extent possible, it is the responsibility of the user to decide if technical measures (such as quick-acting valves) must be taken to prevent and/or limit the explosion.




When the pump is in operation these valves must always be fully open.

5.7 Water shock

Avoid the sudden shutting off of the pressure line, for example: a lorry driving over a pressure line or the sudden closing of valves so a water shock originates.

If there is a danger of water shock, fit a bypass, accumulator or a pressure safety device.

| | | Extra point(s) for attention with ATEX pumps. |
|---|--------------------------|--|
|  | PI. B4a | <p>Do not expose the pump to higher pressures than which pump is suitable according to the curve.</p> <p>Protect the pump against overpressure. Set the max. pressure to 10% above the original pump curve.</p> <ul style="list-style-type: none"> • Only with volatile and flammable liquids. • Or with a dangerous liquid. • <u>(Only with Cat. 2 pumps)</u> |




Dangers relating to the software:

It is the responsibility of the employer to ensure that the safety measures (such as protection with overpressure) and the resulting action (such as the stoppage of the pump) are appropriately included in the safety circuit.

5.8 Suction strainer

Foreign components can seriously damage the pump. Their penetration can be prevented by fitting a suction strainer in the installation.

| | | Extra point(s) for attention with ATEX pumps. |
|---|-------------|---|
|  | P2a. | Prevent dirt particles in the medium (only clean filtered medium allowed). • Only with volatile and flammable liquids. |
| | P2b. | Prevent dirt particles larger than the dirt passage of the rotor from arriving in the suction line and pump. |

With the choice of suction strainer take account of the size of the perforations so piping losses remain limited. The net passage of the suction strainer must at be least 3 times greater than the passage in the suction line.

Install the suction strainer in such a way that its maintenance and cleaning is possible.

Also make sure that the liquid has the correct viscosity and can flow smoothly through the suction strainer.

Heat the suction strainer if necessary.

For the maximum permissible grain size (see technical specifications B-Series).



Opening without danger:

In the case of pumping volatile and/or dangerous liquids the dangers of these substances must be taken into account when opening or cleaning.



Protection against other dangers:

In the case of hot liquids being pumped it is the responsibility of the employer to warn against hot surfaces if employees can come into contact with them.

6 Mechanical shaft seal

In this section we describe the mechanical shaft seals that can be used in a pump:

- mechanical shaft seal versions
- circulation systems API 610/682
- piping rinsing sealing liquid
- cooling liquid for seal

6.1 Mechanical shaft seal without cooling B and BE

This mechanical shaft seal is not lubricated or cooled.

6.1.1 Single mechanical shaft seal with cooling

, e.g.: oil, grease, water, glycerin or antifreeze. *B, B+W, B.., B..+W, TW, TW+W, T..W en T..W+W versions.*

For the lubrication and cooling of the contact surfaces, after the mechanical shaft seal a pressureless fluid reservoir can be provided through a drill hole, see technical specifications B-Series. An example is clean water. Make sure that the materials and elastomers are resistant to the coolant.

6.1.2 Single mechanical shaft seal without cooling

, along with rinsing of the contact surfaces of the mechanical shaft seal (sealing water) *B+W version.*

This mechanical shaft seal is not lubricated or cooled. The mechanical shaft seal is provided with sealing water. Connect the sealing water according to the drawing, see technical specifications B-Series. The sealing liquid must circulate at 1 to 2 bar overpressure with respect to the pressure in the pump housing.

6.1.3 Single mechanical shaft seal with cooling

, e.g.: oil, grease, water, glycerin or antifreeze. *Along with rinsing of the contact surfaces of the mechanical shaft seal (sealing water). B+W, B..+W, TW+W, T..W+W versions.*

For the lubrication and cooling of the contact surfaces, after the mechanical shaft seal a pressureless fluid reservoir can be placed through a drill hole, see technical specifications B-Series. An example is clean water. Make sure that the materials and elastomers are resistant to the coolant.


This mechanical shaft seal is also provided with sealing water. Connect the sealing water according to the drawing, see technical specifications B-Series. The sealing liquid must circulate at 1 to 2 bar overpressure with respect to the pressure in the pump housing.

6.1.4 Double mechanical shaft seal with Back to Back setup

.B-BTW, B-BTW+W or Cartex.

This is available but may only be chosen with written permission from BBA Pompen BV. On delivery of a pump/pump unit the standard operating instructions augmented with information about the used mechanical shaft seal must be present. Contact the supplier if these are not present.

| | | |
|--|--|--|
| | | Extra point(s) for attention with ATEX pumps. |
|--|--|--|

| | | |
|---|------------|---|
|  | M6. | Check the resistance list to ensure that assembled elastomers are suitable for the pumped medium. * |
| | M8. | Ensure the good assembly of the mechanical shaft seal as indicated by the supplier (see technical specifications B-Series). * |
| | P5. | Ensure the correct coolant for the mechanical shaft seal. Ignition temp. of cooling water must be at least 50 K above the max. surface temp. of the pump * (EN 13463-5:2003 §4.5). |
| | P6. | Ensure the correct coolant for the medium to be pumped. |
| | B2b | Choice of seal only to be determine after consultation with the supplier.* <ul style="list-style-type: none"> • With extra guarantee against leakage • Only when pumping volatile liquid. • Apply safety device for coolant presence. |
| | B5 | Protect pump against temperature! <ul style="list-style-type: none"> • (Only with Cat. 2 pumps) |

* With an Ex-pump (unit) supplied by BBA Pompen these aspects are ensured for the application indicated by the client with the associated indicated medium.



Dangers relating to the software:

It is the responsibility of the employer to ensure that the safety measures (such as protection against temperature) and the resulting action (such as the stoppage of the pump) are appropriately included in the safety circuit.

The seal must be replaced in the following situations:

- If a seal leak occurs.
- If the seal develops heat.
- If the seal is exposed to a too high pressure
- If the seal is exposed to a too high temperature.
- If interaction has taken place with auxiliary liquid.
- If the pump has run dry for a protracted period
- If bearing surfaces of the seal show signs of running marks.
- If the pump bearings are worn.
- If different liquid is pumped to that for which the pump was originally purchased.
- If the seal has been damaged by a foreign object in the liquid.

6.2 Circulation systems: API 610/682

The B-Series optionally has the following systems:

- plan 2
- plan 11
- plan 12
- plan 21
- plan 31

6.2.1 Plan 2

The pump is prepared for the possible application of a plan system. On the delivery side in the pump housing and at the place of contact surfaces of the mechanical shaft seal a hole is made for a system possibly to be assembled later (see technical specifications B-Series).

6.2.2 Plan 11

The pump is provided with a pipe assembled between the pump delivery side and the place of the contact surfaces of the mechanical shaft seal. The contact surfaces are rinsed by the medium originating from the delivery side of the pump. The pipe is provided with a small throttle, see technical specifications B-Series.

6.2.3 Plan 12

The pump is provided with a pipe assembled between the pump delivery side and the place of the contact surfaces of the mechanical shaft seal. The contact surfaces are rinsed by the medium originating from the delivery side of the pump. The pipe is provided with a small throttle and a filter, see technical specifications B-Series.

6.2.4 Plan 21

The pump is provided with a pipe assembled between the pump delivery side and the place of the contact surfaces of the mechanical shaft seal. The contact surfaces are rinsed by the medium originating from the delivery side of the pump. The pipe is provided with a small throttle and a cooler, see technical specifications B-Series.

6.2.5 Plan 31

The pump is provided with a pipe assembled between the pump delivery side and the place of the contact surfaces of the mechanical shaft seal. The contact surfaces are rinsed by the medium originating from the delivery side of the pump. The pipe is provided with a small throttle and a cyclone, see technical specifications B-Series.

6.3 Piping rinsing and sealing liquid

With the installation of a sealing or rinsing liquid system always use the lowest opening as the inlet and the highest opening as the outlet if a two-sided connection is used. This allows the simpler removal of air or gases released.

Also use materials and elastomers which have good resistance to the medium to be pumped.

Make sure that the components of the sealing or rinsing liquid system are mechanically well shielded.

The client/end user is himself responsible for the connection of electronic components which are used for the sealing or rinsing liquid system.

After the assembly of components to the auxiliary system test to check that the system is fully leaktight.



Opening without danger:

In the case of pumping volatile and/or dangerous liquids the dangers of these substances must be taken into account when opening.




Protection against other dangers:

In the case of hot liquids being pumped it is the responsibility of the employer to warn against hot surfaces if employees can come into contact with them.




Not complying with the instructions in the operating instructions can cause danger to the user and the environment and/or serious damage to the pump or the pump set.

| | | |
|--|--|--|
| | | Extra point(s) for attention with ATEX pumps. |
|--|--|--|

| | | |
|---|-------------|--|
|  | K6b. | Ensure the correct auxiliary system for the seal. * |
| | | <ul style="list-style-type: none"> • Take account of the flow rate and pressures in the pump. • Mention the liquid auxiliary system on the name plate. • Take account of the interaction of auxiliary liquid with the medium to be pumped. |
| | M3. | |
| | M6. | Make sure that the packing is enclosed in the correct way. * |
| | | Check the resistance list to ensure that assembled elastomers are suitable for the pumped medium. * |
| | M9. | Ensure the good assembly of the auxiliary system as indicated by the supplier (see technical specifications B-Series). * |
| | P3. | |
| | P5. | Make sure that the auxiliary system is mechanically well shielded. |
| | P6. | Ensure the correct coolant for the mechanical shaft seal. * |
| | G9. | Ensure the correct coolant and temperature for the medium to be pumped. * |
| | G10. | Make sure that the mechanical shaft seal cooling/lubrication is in good working order. * |
| | B2a. | |
| | B2b. | Ensure sufficient coolant. Ensure regular checks for leakage and adjust if necessary. Choice of seal only to be determined after consultation with the supplier.* <ul style="list-style-type: none"> • With extra guarantee against leakage • Only when pumping volatile liquid. • Apply safety device for coolant presence. • (Only with Cat. 2 pumps) |

* With an Ex-pump (unit) supplied by BBA Pompen these aspects are ensured for the application indicated by the client with the associated indicated medium.

| | | |
|---|--|--|
|  | Dangers relating to the software: | It is the responsibility of the employer to ensure that the safety measures (such as coolant level protection) and the resulting action (such as the stoppage of the pump) are appropriately included in the safety circuit. |
|---|--|--|

6.4 Cooling liquid for seal.

Standard coolants:

| Elastomer seals | | Cooling liquid | |
|-----------------|--|----------------|-----------|
| Viton | | Oil | SAE 15W40 |
| | | Grease | EP 2 |
| | | Water | |
| EPDM | | Glycerin | |
| | | Water | |

Other coolants can only be used with the written permission of BBA Pompen.

Ensure the correct temperature of coolants for the medium to be pumped to prevent seal damage.

Regularly check the level of the cooling liquid reservoir before the pump is started up. Check at least once a day.

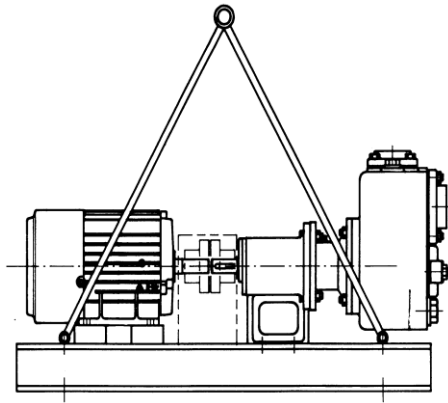
BBA Pompen BV is not responsible for accidents or damage caused by not respecting the instructions in this manual. In this case any entitlement to damage compensation also becomes inapplicable.

7 Instructions for the assembly

This paragraph offers some advice for assembly.

When the pump is supplied as a free shaft end version, the user is himself responsible for the assembly of the pump with drive gear. He must also take all measures to allow the pump (unit) to be correctly installed and work properly.

When BBA Pompen BV supplies a complete pump unit the user must consult the operating instructions. These contain instructions applicable for the pump (unit) specified.




With the movement of the complete pump/pump unit by crane, the hoisting must belts must be applied by qualified persons according to the prevailing rules for good hoisting practice.

The hoisting equipment and hoisting belts must be sufficiently strong to move the pump (unit). The hoisting eye of the motor may not be used for moving the pump/pump unit.

Because of the amount of available versions only general instructions can be given here.


This is normally sufficient for experienced installation technicians and competent transporters. When in doubt or if there are questions, detailed information about the pump/pump unit can be requested. See technical specifications B-Series.

| | | |
|---|------------|---|
|  | <i>TI.</i> | <p>Extra point(s) for attention with ATEX pumps.</p> <p>Make sure that the pump (unit) is mechanically well shielded during transport.</p> |
|---|------------|---|

7.1 Base for pump/pump unit

This pump/pump unit must be placed on a foot plate/base.

The foot plate and the base are to be positioned on a base foundation. This must be constructed in such a way (vibration-free, rigid, flat, hard, and horizontal) that the alignment of pump and drive gear remains guaranteed during the operation of the pump/pump unit.

| | | Extra point(s) for attention with ATEX pumps. |
|---|---|--|
|  | P3. P4. P8. P9. P10. K8. K9. | <p>Make sure that the pump (unit) is mechanically well shielded during operation.</p> <p>Make sure that the pump is installed without any stresses, including coupling and electric motor.</p> <p>Ensure a good connection between pump (unit) and ground (earthing).</p> <p>Ensure the good alignment of the pump and drive gear.</p> <p>Ensure the good fitting of the coupling on the pump shaft and drive gear. Make sure you choose the right coupling.</p> <ul style="list-style-type: none"> • The coupling must be sufficient for the power and number of revolutions. • The coupling must be EX, cat. 2 <p>Follow the instructions of the manufacturer. See technical specifications B-Series. Ensure the correct design and material choice of the protective cover.</p> <ul style="list-style-type: none"> • No dangerous dust accumulation may take place. A design open at the bottom is preferred. • The protective cover must fit widely around the coupling in case of dents, and to make no contact with any dust layer on the inside of the protective cover. • For cat. 2: choice of material no more than 7,5% magnesium (see EN 13463-1, 8.2 |



On delivery of a complete pump (unit) also consult the operating instructions supplied for the drive gear, coupling and any transmission.




Never proceed under loads to be moved. Only entrust the movement of the equipment to personnel trained for that purpose.

Consult the technical information for weights, and use the correct transport and hoisting equipment to move the pump/pump unit. When hoisting fasten the straps as shown on the illustration in the technical specifications B-Series.

7.2 Electric motors

Overview of motors useable in ATEX zones

| Environment | Environment | T1 | T2 | T3 | T4 |
|-------------|-------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| Gas | 3 | Ex II 3G EEx-nA-II-T3 | Ex II 3G EEx-nA-II-T3 | Ex II 3G EEx-nA-II-T3 | Ex II 2G Eex-d(e)-T4 |
| Gas | 2 | Ex II 2G EEx-e-II-T3 | Ex II 2G EEx-e-II-T3 | Ex II 2G EEx-e-II-T3 | Ex II 2G Eex-d(e)-T4 |
| Dust | 3 | Ex II 3D T125 °C | Ex II 3D T125 °C | Ex II 3D T125 °C | Ex II 3D T125 °C |
| Dust | 2 | Ex II 2D T125 °C Incl. PTC sensor | Ex II 2D T125 °C Incl. PTC sensor | Ex II 2D T125 °C Incl. PTC sensor | Ex II 2D T125 °C Incl. PTC sensor |

| Extra point(s) for attention with ATEX pumps. | | |
|---|-------------|--|
|  | K11. | Choose the correct E-motor (only with units). * |
| | B6. | <ul style="list-style-type: none"> Choose the correct power and number of revolutions, etc. The motor may not be too oversized. The motor must cut out when the pump requests more power as a result of a broken bearing, rotor malfunction, etc. EX-motor, cat. 2 |
| | B7. | Protect E-motor against overloading. * <ul style="list-style-type: none"> In the case of overloading the motor may not become too hot. This is the case with a Category 2 motor because the motor switches off in time. Protection of supplied power. |

* With an Ex-pump (unit) supplied by BBA Pompen these aspects are ensured for the application indicated by the client with the associated indicated medium.



Dangers relating to the software:

It is the responsibility of the employer to ensure that the safety measures (such as the protection of supplied power) and the resulting action (such as the stoppage of the pump) are appropriately included in the safety circuit.



Before connecting an electric motor to the mains, consult the relative prevailing local instructions from the electricity producer and standard EN 60204-1.

Have the connection of electric motors take place by personnel qualified for this.




Before the pump is electrically connected it must be filled with liquid. The dry running of the pump must be avoided at all times!



Work may only take place on the installation when all electrical power has been shut off. The installation must be protected against inadvertent switching on.

Take measures to ensure that the electrical connections and cabling cannot be damaged. The voltage and frequency must be matched beforehand and correspond with the information on the version of the motor winding. This is mentioned on the motor plate. Use of the motor without safety switch is not allowed. With motors protected against explosion the temperature class mentioned on the motor type plate must correspond with that of the flammable explosive gas.

| | |
|---|--|
|  | Extra point(s) for attention with ATEX pumps. Choose the correct electrical components for the relative category and zone e.g. motor swivels. |
|---|--|

7.3 Operating switch

To be able to carry out activities on the pump/pump unit safely, an operating switch must be present as near as possible to the machine. It is recommended to also fit an earth leakage switch. Work may only take place on the installation when all electrical power has been shut off. The installation must be protected against inadvertent switching on. The switching equipment must suffice with regard to the prevailing regulations.

7.4 Motor protection

Fit a thermal motor protection or thermal-magnetic motor protection switch to protect the motor against overloading or short-circuiting. Set the safety device to the motor's nominal current intensity.



Electrical appliances, connection terminals and parts of control systems can also still be live with a stoppage. Touching can cause death, serious physical injury or irreparable material damage.

7.5 Connection

With frequency controlled motors ensure a sufficiently high starting torque, and sufficient cooling of the motor at low speeds. Fit an autonomously working ventilator if necessary. For the wiring diagram see technical specifications B-series.

The type plate reads 230V/400V (motors to 3kW).


- This means the winding voltage of the motor, so the voltage that may pass through it, is max. **230V**. The **400V** stands for the voltage used between the phases. 3x400V is the power current. This means that the motor must therefore be connected in **STAR**, see technical specifications B-Series.

The type plate reads 400V/690V. (motors from 3 kW)

- This means the winding voltage of the motor may be max. 400V. Because we do not have a 690V mains, so 400V must be shown, this motor must be connected in **TRIANGLE**, see technical specifications B-series.

7.6 Earthing

Provide the pump/pump unit with earthing with a sufficiently large diameter, see technical specifications B-Series.

| | | |
|---|------------|---|
|  | P8. | Extra point(s) for attention with ATEX pumps. Ensure a connection between pump and ground (earthing). |
|---|------------|---|

7.7 Combustion motors

With use of a combustion motor in the pump (unit) the manual for this motor is part of the full delivery. Make immediate contact with the supplier of your pump/pump unit if this manual is not present.

Irrespective of these instructions for use, with all combustion motors the following must be complied with:

- The local safety instructions.
- Guard the outlet for the combustion gases against inadvertent contact.
- The starter must be automatically disconnected when the motor is started.
- The maximum and minimum motor speed set by us may not be changed.
- Check the following before starting:
 - Coolant level motor.
 - Oil level water pump.
 - Oil level vacuum pump.
 - Are drainage points of the water pump closed?
 - Is the fuel tank full?
 - Check optional extras (e.g. the belts of motor and vacuum pump).
- Make sure that the motor meets the set requirements if the pump unit is used in an explosion-dangerous environment:



Protection against other dangers:

In the case of hot liquids being pumped it is the responsibility of the employer to warn against hot surfaces if employees can come into contact with them.



Never run the motor in a closed space.

Never fill fuel while the motor is running.



Make sure you wear ear defenders, protective gloves and safety glasses.

7.8 Variable speed gears


Consult the instructions for use of the supplier of variable speed gears or reduction gearing.

7.9 Shaft coupling

Jolting loads occur during the operation of the pump/pump unit. Therefore choose the shaft coupling with sufficient spare capacity for the nominal motor torque. This can be, for example, 1.5 to 2 times the torque recommended for non-jolting continuous loads. For the B-Series preselection has already been made, see technical specifications B-Series.

Make sure that the coupling meets the set requirements. If the pump unit is used in an explosion-dangerous environment (ATEX zone), see technical specifications B-Series.

A bellows coupling must always be used with this application (ATEX environment).


| | | Extra point(s) for attention with ATEX pumps. |
|---|---------------------|---|
|  | P10. K8. | <p>Ensure the good fitting of the coupling on the pump shaft and drive gear. *</p> <p>Make sure you choose the right coupling. *</p> <ul style="list-style-type: none"> • The coupling must be sufficient for the power and number of revolutions. • The coupling must be EX, cat. 2 <p>Follow the instructions of the manufacturer. See technical specifications B-Series.</p> |

* With an Ex-pump (unit) supplied by BBA Pompen these aspects are ensured for the application indicated by the client with the associated indicated medium.


Check the elastomers of the coupling before the pump is started up.
If cracks are visible the coupling rubber must be replaced.

7.10 Alignment

Ensure the good alignment of the shafts. To do this proceed according to the conditions and instructions for use for the shaft coupling concerned. The alignment of the flexible coupling can be checked by placing a straight-edge or batten on the outside of the coupling and/or by measuring the play on the coupling halves in four places on the circumference. For the alignment of differing couplings reference is made to the specific instructions. A protective cover is to be fitted over the coupling to prevent contact with turning parts.

| | | Extra point(s) for attention with ATEX pumps. |
|---|------------|--|
|  | P9. | <p>Ensure the good alignment of the pump and drive gear.</p> |

7.11 Protective cover

| Extra point(s) for attention with ATEX pumps. | | |
|---|-------------|--|
|  | K9. | <p>Ensure the correct design and material choice of the protective cover. *</p> <ul style="list-style-type: none"> ○ No dangerous dust accumulation may take place. A design open at the bottom is preferred. ○ The protective cover must fit widely around the coupling in case of dents, and to make no contact with any dust layer on the inside of the protective cover. |
| | S10. | <p>For cat. 2: choice of material no more than 7.5% magnesium (see EN 13463-1, 8.2).</p> <p>Checking of alignment, damage to protective cover.</p> |

* With an Ex-pump (unit) supplied by BBA Pompen these aspects are ensured for the application indicated by the client with the associated indicated medium.



Operating the pump without a coupling protective cover is not allowed. If a protective cover is not supplied by the supplier, the owner himself must provide one.



Guarding moving parts:
Before starting the pump fit a protective cover over the coupling or belt drive. This must be in accordance with standard EN 953 (General requirements for the design and construction of guards).



If the pump is used in an explosion-dangerous space, the material of the protective cover must be suitable for the environment. When the protective cover comes into contact with coupling, pump motor shaft, coupling rubber or other turning parts the protective cover may not cause sparks.

With a rolling bearing temperature higher than 70°C the bearing support and the rolling bearings must be sufficiently cooled by well ventilated air. Take account here of the construction of the protective cover.

7.12 Belt drive

With a belt drive the shaft and bearings are put under extra load. Check if the loads on the shaft end are not exceeded. For the maximum permissible loads on the shaft end, see technical specifications B- series. If the driving forces are too great, the belt pulley must be placed on an intermediate shaft with its own bearings. Tighten the V-belt so that in the middle the belt can be pressed in a maximum of 1 cm, see technical specifications B-Series. Avoid too tight tension. This damages the shafts and the bearings. After setting up the pump/pump unit the alignment of the pump and motor belt pulley must be checked and adjusted again if necessary. Make sure that the pulleys are on one plane, see technical specifications B-Series. Before starting the pump fit a protective cover over the coupling or belt drive. In an explosive environment the belt drive must suffice with regard to the special requirements. For this see standard EN 13463-5.

8 Bringing into operation

In this section we describe how the pump/pump unit must be brought into operation.

- general
- cleaning the pump
- filling the pump
- preparation of the starting of the pump/pump unit, electrically driven
- starting
- switching off
- restarting
- checks during operation

8.1 General

When all preparations as described in the previous sections have been carried out the startup procedure can start.

Personnel responsible for the starting of the pump unit must be sufficiently informed about correct operation of the pump unit and the safety instructions.

This manual must always be made available to the personnel.



Only start the pump after all assembly, connection and repair work has ended.

Before starting the pump/pump unit always check for visible damage. Any damage or unforeseen changes must immediately be reported to the person in charge.

8.2 Cleaning the pump

The pump still contains residues of mineral lubricating oil (originating from testing and possibly preservatives). If these products are harmful to the liquid to be pumped, the pump must first be thoroughly cleaned. To do this proceed as follows:

- Disassemble cleaning covers.
- Remove the drain plugs on the underside.
- Place a tray under the pump so any residues of mineral oil are collected.
- Have the pump run fully empty.
- Rinse the pump.
- Replace the cleaning covers.




Opening without danger:

In the case of pumping volatile and/or dangerous liquids the dangers of these substances must be taken into account when opening.

8.3 filling the pump

To be able to work optimally with the pump, before starting the pump must be well filled with the liquid to be pumped.

- Open the filler cover(s) on the top of the pump.
- Completely fill the pump with the liquid to be pumped - the pump is vented at the same time.
- Close the filler cover(s).

| | | Extra point(s) for attention with ATEX pumps. |
|---|------------|---|
|  | G1. | Prevent the pump from being exposed to temperatures below freezing point if it is filled with liquid. |
| | G5. | Prevent the pump from dry running. |
| | G8. | Make sure that the pump is filled with liquid at the correct temperature. |
| | M6. | Check the resistance list to ensure that assembled elastomers are suitable for the pumped medium. * |

* With an Ex-pump (unit) supplied by BBA Pompen these aspects are ensured for the application indicated by the client with the associated indicated medium.

8.4 preparation of the starting of the pump/pump unit, electrically driven

With a new installation or after thorough maintenance of the pump/pump unit go through the following check-list:


8.4.1 Main pipe

- Have the suction and pressure lines been cleaned?
- Have the suction and pressure lines been checked for tightness?
- Is the suction line sufficiently protected against the penetration of foreign objects?

8.4.2 Suction line


The suction line must:

- Be as short as possible.
- Run up to the pump so no air pockets can originate. If this is not possible a filler or vent opening must be fitted at the highest point of the pipe.
- The pipe must descend to the pump if the pump receives a flow.
- Have as few as possible bends, and bends with a large radius.
- A wide as possible passage.
- With different diameters eccentric reducing pieces must be fitted or air can remain in the higher piping part.
- There may be absolutely no signs of leaks.
- With soiled liquids, as necessary a suction strainer or dirt catching grill must be provided with the passage adapted to the passage in the pump.
- Any slide valve in the suction line must be fully open.
- At the end the piping must be sufficiently submerged in the liquid so that also with the lowest position of the liquid no air will be drawn in.
- No bend may be present immediately before the suction flange of the pump, particularly if there is little difference between the available and required NPSH. This bend causes an irregular flow to the rotor and can unfavourably influence suction.

| | | Extra point(s) for attention with ATEX pumps. |
|---|--|---|
|  | K2. K4. K5. K6c. K7. P2a. P2b. P3. P4. G2. B4b. | <p>Ensure a correct suction line in relation to the NPSH curve.</p> <p>Ensure a good pipe diameter.</p> <p>Ensure a good inflow opening in the suction line.</p> <p>Use the correct packing. *</p> <p>Make sure that dirt particles in piping systems cannot cause blockages.</p> <ul style="list-style-type: none"> • Fit a filter if necessary. <p>Prevent dirt particles in the medium (only clean filtered medium allowed)</p> <ul style="list-style-type: none"> • Only with volatile, flammable liquids. <p>Prevent dirt particles larger than the dirt passage of the rotor from arriving in the suction line and pump.</p> <p>Make sure that the pump (unit) is mechanically well shielded while operating.</p> <p>Make sure that the pump is installed without any stresses.</p> <p>Make sure that liquid supply to the pump is smooth and oxygen-free.</p> <p>Protect pump against underpressure.</p> <ul style="list-style-type: none"> • Only required when pumping volatile liquid. • Determine the max. underpressure on the basis of the NPSH line, see technical specifications B-Series. • <u>(Only with Cat. 2 pumps)</u> |

8.4.3 Pressure line

- There may be absolutely no signs of leaks.
- Any slide valve(s) in the pressure line must be fully open.
- Make sure that no situations originate to cause a water shock, such as the sudden closing of the valve.

| | | Extra point(s) for attention with ATEX pumps. |
|---|---|--|
|  | K3. K4. K6c. P1. P3. P4. G6. G11. B4a. | <p>Ensure sufficient counterpressure on the delivery side so the pump does not run outside the curve.</p> <p>Ensure a good pipe diameter.</p> <p>Use the correct packing.</p> <p>Do not expose the pump to higher pressures than which the pump is suitable according to the curve.</p> <p>Make sure that the pump (unit) is mechanically well shielded while operating.</p> <p>Make sure that the pump is installed without any stresses.</p> <p>Make sure the pump does not pump against a closed valve.</p> <p>Prevent the sudden closing of valves so a water shock originates - fit a bypass if necessary.</p> <p>Protect the pump against overpressure. Set the max. pressure to 10% above the original pump curve.</p> <ul style="list-style-type: none"> • Only required when pumping volatile liquid. • Or with a dangerous liquid. • <u>(Only with Cat. 2 pumps)</u> |

* With an Ex-pump (unit) supplied by BBA Pompen these aspects are ensured for the application indicated by the client with the associated indicated medium.



Dangers relating to the software:


It is the responsibility of the employer to ensure that the safety measures (such as protection with overpressure) and the resulting action (such as the stoppage of the pump) are appropriately included in the safety circuit.


Integrated explosion safety:

For the case of an internal explosion, which is excluded to the extent possible, it is the responsibility of the user to decide if technical measures (such as quick-acting valves) must be taken to prevent and/or limit the explosion.

8.4.4 Characteristics

Check the type of pump (name plate) and the characteristics of the pump unit, such as: number of revolutions, working pressure, consumed power, operating temperature, direction of rotation, NPSH, etc.


| | | Extra point(s) for attention with ATEX pumps. |
|---|------------|---|
|  | K1. | Ensure a correct pump choice with respect to the liquid type with its technical properties and quantity. <ul style="list-style-type: none"> • With flammable, volatile liquids: ensure the correct choice of material for the rotor and wear plate. • Make sure that the pump housing, etc. is not adversely affected by the medium to be pumped. |

8.4.5 Electrical installation

Check whether the electrical installation is provided in accordance with the local prevailing instructions. Also check if the necessary measures have been taken to absolutely eliminate danger to the user.

8.4.6 Drive gear

Check whether the motor connection is in conformity with the mains voltage (check terminal cabinet). Check the setting of the motor protection.

| | | Extra point(s) for attention with ATEX pumps. |
|---|------------|---|
|  | B6. | Protect e-motor against overloading. <ul style="list-style-type: none"> • In the case of overloading the motor may not become too hot. This is the case with an EX-motor because the motor switches off in time. |
| | B7. | Protection of supplied power. |



Dangers relating to the software:

It is the responsibility of the employer to ensure that the safety measures (such as protection with overloading) and the resulting action (such as the stoppage of the motor) are appropriately included in the safety circuit.

8.4.7 Direction of rotation

Check whether the direction of rotation of the motor corresponds with the direction of rotation of the pump.

Check the direction of rotation of the pump unit. The direction of rotation of the motor can be reversed if necessary.

| | | Extra point(s) for attention with ATEX pumps. |
|---|-------------------------|--|
|  | B1. G3 | Ensure direction of rotation protection (electrical/mechanical). Ensure the correct direction of rotation |



Dangers relating to the software:

It is the responsibility of the employer to ensure that the safety measures (such as the direction of rotation protection) and the resulting action (such as the stoppage of the pump) are appropriately included in the safety circuit.

Shaft seal

Check the presence of sealing and/or rinsing water, as well as the pressure, temperature and connections. If the pump is provided with a sealing liquid and/ or rinsing water connection, this must be turned fully open in the supply line.

Check whether the mechanical shaft seal for the start-up of the pump needs a pre-pressure for any sealing liquid and/or rinsing water connection.

| | | Extra point(s) for attention with ATEX pumps. |
|---|-------------|---|
|  | K6a. | Ensure a correct mechanical shaft seal choice for the liquid to be pumped. * <ul style="list-style-type: none"> • The ignition temp. of the coolant must be at least 50 K above the max. surface temp. of the pump (EN 13463-5:2003 §4.5). • Provide a seal with extra guarantee against leakage when pumping volatile liquid. |
| | K6b. | Ensure a correct auxiliary system for the mechanical shaft seal. * <ul style="list-style-type: none"> • Take account of the flow and pressure in the pump. • Take account of the interaction of the auxiliary liquid with the medium to be pumped. |
| | | The auxiliary system must itself be EX, cat. 2. Here also note: * |
| | M6. | <ul style="list-style-type: none"> • What is the outside temp. of the auxiliary system? • Can the auxiliary system guard against the build-up of ignitable gas inside? |
| | M8. | Check the resistance list to ensure that assembled elastomers are suitable for the pumped medium. * |
| | M9. | Ensure the good assembly of the mechanical shaft seal as indicated by the supplier. |
| | P3. | Ensure the good assembly of the auxiliary system as indicated by the supplier *. |
| | P5. | Make sure that the pump (unit) is mechanically well shielded while operating. |
| | P6. | Ensure the correct coolant for the mechanical shaft seal. |
| | G9. | Ensure the correct coolant and temperature for the medium to be pumped. |
| | G10. | Make sure that the mechanical shaft seal cooling/lubrication is in good working order. |
| | S7. | |
| | B2a. | Ensure sufficient coolant. |
| | B2b. | If a leak occurs to the mechanical shaft seal: stop the pump. Ensure regular checks for leakage and adjust if necessary. Choice of seal only to be determined after consultation with the supplier.* <ul style="list-style-type: none"> • With extra guarantee against leakage • Only when pumping volatile liquid. |
| | B5. | <ul style="list-style-type: none"> • Apply safety device for coolant presence. • (Only with Cat. 2 pumps) Protect pump against temperature. <ul style="list-style-type: none"> • (Only with Cat. 2 pumps) |

* With an Ex-pump (unit) supplied by BBA Pompen these aspects are ensured for the application indicated by the client with the associated indicated medium.




Dangers relating to the software:

It is the responsibility of the employer to ensure that the safety measures (such as protection against temperature) and the resulting action (such as the stoppage of the pump) are appropriately included in the safety circuit.

8.4.8 Alignment

Check the alignment of the pump, motor and any reduction gearing.


| | | Extra point(s) for attention with ATEX pumps. |
|---|-------------|---|
|  | P3. | Make sure that the pump (unit) is mechanically well shielded while operating. |
| | P4. | Make sure that the pump is installed without any stresses. * |
| | | • Including coupling and electro-motor. |
| | P9. | Ensure the good alignment of the pump and drive gear. * |
| | P10. | Ensure the good fitting of the coupling on the pump shaft and drive gear. * |
| | S8. | Regularly check the coupling and elastomers of the coupling. |
| | S10. | Checking of alignment, damage to protective cover. |

* With an Ex-pump (unit) supplied by BBA Pompen these aspects are ensured for the application indicated by the client with the associated indicated medium.

8.4.9 Protection

Fit the necessary protective covers around the couplings and turning parts.

Check whether pumps of which the temperature can become higher than 70°C have sufficient protection against inadvertent contact.


| | | Extra point(s) for attention with ATEX pumps. |
|--|-------------|--|
|  | K9. | Ensure the correct design and material choice of the protective cover. * |
| | | • No dangerous dust accumulation may take place. A design open at the bottom is preferred. |
| | | • The protective cover must fit widely around the coupling in case of dents, and to make no contact with any dust layer on the inside of the protective cover. |
| | | For cat. 2: choice of material no more than 7,5% magnesium (see EN 13463-1, 8.2). |
| | P3. | |
| | S10. | Make sure that the pump (unit) is mechanically well shielded while operating. |
| | | Checking of alignment, damage to protective cover. |

8.5 starting

With a self-priming pump, during the venting of the suction line ("suction"), up to the time of the pump pumping liquid, no counterpressure may exist so the pump can eject the drawn air.

8.5.1 On actually starting the pump unit go through the following check-list

- Is the pump filled with liquid?
- Has the pump been sufficiently heated? (if necessary)
- Is there enough lubricant in the bearing support?
- Is the sealing liquid present at the correct pressure and can it freely circulate?
- Are the suction and discharge line valves fully open?
- Start the pump briefly and check the direction of rotation of the motor.
- Start the pump and check the suction of the liquid (vacuum).
- Check the number of revolutions of the pump.
- Check the pressure line and the shaft seal for any leaks.
- Check the pump for good operation.

| | | Extra point(s) for attention with ATEX pumps. |
|---|--------------------------|--|
|  | B5. G8. | Protect pump against temperature. • <i>(Only with Cat. 2 pumps)</i> Make sure that the pump is filled with liquid at the correct temperature. |



Dangers relating to the software:

It is the responsibility of the employer to ensure that the safety measures (such as protection against temperature) and the resulting action (such as the stoppage of the pump) are appropriately included in the safety circuit.



The pump may never run for a protracted period against a closed discharge line valve. Pumps with a motor capacity higher than 11 kW may never run against a closed valve. This causes danger of explosion. Impermissible heating up of the liquid can cause damage to the pump. If during start-up vibration occurs, one must immediately remedy this before again starting up.

8.6 Switching off

When switching off the pump/pump unit always proceed as follows:

- Switch the motor off.
- Disconnect the secondary piping (sealing or rinsing liquid).
- When the congealing of the liquid must be avoided, this must be from removed the pump while the liquid is still fluid.
- Close the valve in the pressure line. When a non-return valve is present and there is sufficient counterpressure in the pressure line, the discharge line valve can remain open.
- Switch off motor and ensure that the installation smoothly comes to a stop.
- Disconnect the secondary piping (sealing or rinsing liquid).
- Close the valve in the suction line.
- At temperatures below freezing point and/or with longer periods out of use, the pump must be fully drained and preserved.

8.7 Restarting

Switching on again is only allowed with stationary pump shaft.




Liquid flowing back with a stationary pump may not cause the opposite direction of rotation of the pump. This can result, among other things, in the mechanical shaft seals dependent on the direction of rotation being damaged. In the above cases a non-return valve or other valve must be fitted.

8.8 Checks during operation

Ensure the smooth and vibration-free running of the pump/pump unit. The dry running of the pump must absolutely be avoided. In optimal circumstances ensure mechanical shaft seals display only low or barely visible (vapours) leakage. Running against a closed valve for a longer period is not permitted.

The maximum permissible ambient temperature amounts to 40°C. The temperature of the bearings can, measured on the motor or pump housing, be up to 50°C above the ambient temperature (depending on the application and if the pump is fitted in an explosion dangerous space). It may not rise to above 85°C. Application for higher temperatures is only allowed after consultation with the supplier.


| | | Extra point(s) for attention with ATEX pumps. |
|---|------------|--|
|  | B5. | Protect pump against temperature. • <u>(Only with Cat. 2 pumps)</u> |



Dangers relating to the software:

It is the responsibility of the employer to ensure that the safety measures (such as protection against temperature) and the resulting action (such as the stoppage of the pump) are appropriately included in the safety circuit.

Again check the following points during operation:

| | | Extra point(s) for attention with ATEX pumps. |
|---|---|--|
|  | P1. G1. G2. G5. G6. G9. G10. G11. S1. S5b. S6. S7. B2a. S5a. | Do not expose the pump to higher pressures than which the pump is suitable according to the curve. Prevent the pump being exposed to temperatures below freezing point if it is filled with liquid. Make sure that liquid supply to the pump is smooth and oxygen-free. Prevent the pump from dry running. Make sure the pump does not pump against a closed valve. Make sure that the mechanical shaft seal cooling/lubrication is in good working order. Ensure sufficient coolant. Prevent the sudden closing of valves so a water shock originates. Regularly check the packing for leaks. Check the coolant level (according to EN 13463-5:2003 §5.4). Check for bearing leaks. If a leak occurs to the mechanical shaft seal: stop the pump. Ensure regular checks for leakage and adjust if necessary. Check the oil level (only with oil-lubricated bearings) |

To guarantee operating reliability the installed stand-by pumps must be brought into operation once a week by briefly switching on and off.

9 Failures



In the case of failures or abnormal operation of the pump immediately stop the pump and inform the supervisors. Find the cause of the malfunction and solve the problem before restarting the pump.



Opening without danger:

In the case of pumping volatile and/or dangerous liquids the dangers of these substances must be taken into account when opening.

Safety instructions during maintenance, repair and checks:

- Working on the pump/pump unit is only allowed when it has been put out of operation.
- To put an installation out of use follow the procedure described in these operating instructions, for example the machine may no longer be under pressure and it must have fully cooled.
- Pumps and pump (units) pumping dangerous media must be cleaned and neutralised beforehand.
- Protect the drive motor during the whole working time against both inadvertent and unauthorised switching on.
- When opening the pump/pump unit follow all instructions for using the medium involved (for example protective clothing, smoking ban, etc.).
- With repairs, in the interest of safety, parts supplied by the supplier or approved by him must always be used.
- Modifications to the pump/pump unit or the application are only possible after consultation with the suppliers.
- The reliability of the pump/pump unit is only guaranteed when the pump/pump unit is used for the application and in the way it was intended on delivery.
- At the end of the activities all safety devices and protective equipment must again be installed and made operative.
- Before restarting the pump read the operating instructions through.

9.1 Malfunction check-list

| Malfunction | Cause | Possible solution |
|-------------------------|---|---|
| Pump supplies no liquid | Pump is not fully filled | Fill pump housing with the correct liquid |
| | Gas or air is released from the liquid | Ensure the smooth flowing of the liquid |
| | Entrapped air in the suction line | Stop air entrapment to the extent possible |
| | Inlet of the suction line is insufficiently submerged | Further submerge suction line |
| | Foreign object in the rotor | Clean rotor |
| | Insufficient lubrication | Lubricate |
| | Manometric discharge head calculated too low | If possible position pump higher Choose other pump |
| | The suction head is too great or there is too little difference between the run-off height and the vapour pressure of the liquid (too low NPSH) | Position pump lower Choose other pump |
| | There is a blockage in the suction line | Cleaning |
| | There is blockage in the pressure line | Clean |
| | There is a leak in the suction line | Repair leak |

| Malfunction | Cause | Possible solution |
|-------------------------------------|---|---|
| Pump supplies insufficient capacity | Gas or air is released from the liquid | Ensure the smooth flowing of the liquid |
| | Entrapped air in the suction line | Stop air entrapment to the extent possible |
| | Inlet of the suction line is insufficiently submerged | Further submerge suction line |
| | Wrong direction of rotation | Change direction of rotation |
| | The wear plate or rotor are worn | Replace rotor or parts subject to wear |
| | The rotor is damaged | Repair or replace |
| | Manometric discharge head calculated too low | If possible position pump higher. Choose other pump. |
| | The suction head is too great or there is too little difference between the run-off height and the vapour pressure of the liquid (too low NPSH) | Position pump lower Choose other pump |
| | The number of revolutions is too low | Increase number of revolutions |
| | There is a blockage in the suction line | Clean |
| | The liquid has a higher density than the viscosity for which the pump is intended | Choose other pump. |
| | There is a leak in the suction line | Repair leak |

| Malfunction | Cause | Possible solution |
|-------------------------|---|--|
| Choose a different pump | Pump and suction line are not fully filled | Fill pump housing with the correct liquid |
| | Gas or air is released from the liquid | Ensure the smooth flowing of the liquid |
| | Entrapped air in the suction line | Stop air entrapment to the extent possible |
| | Inlet of the suction line is insufficiently submerged | Further submerge suction line |
| | The suction head is too great or there is too little difference between the run-off height and the vapour pressure of the liquid (too low NPSH) | Position pump lower Choose other pump |
| | There is a blockage in the suction line | Clean |
| | There is a leak in the suction line | Repair leak |

| Malfunction | Cause | Possible solution |
|------------------------------------|--|---|
| Pump requires a different capacity | Wrong direction of rotation | Change direction of rotation |
| | Foreign object in the rotor | Clean rotor |
| | The shafts are not precisely in line | Align unit |
| | The shaft is buckled | Replace shaft |
| | Turning parts run against stationary parts | Adjust and align as necessary |
| | The wear plates or rotor are worn | Replace rotor or parts subject to wear |
| | The rotor is damaged | Repair or replace |
| | The packing is not properly fitted | Assemble properly and replace any damaged packing. |
| | Ineffective lubrication or insufficient lubricant in the bearing housings, possibly as a result of a leak; noticeable at increased temperature | Follow service plan |
| | The pump does not work at the correct operating point | Adjust piping system if possible. Choose other pump |
| | The liquid has a higher density than the viscosity for which the pump is intended | Adapt temperature of liquid if possible. Choose other pump |

| Malfunction | Cause | Possible solution |
|----------------------------|---|--|
| Pump jolts and makes noise | Pump and suction line are not fully filled | Fill pump housing with the correct liquid |
| | Inlet of the suction line is insufficiently submerged | Further submerge suction line |
| | Foreign object in the rotor | Clean rotor |
| | The shafts are not precisely in line | Align unit |
| | The base is distorted by poor supports or has vibrated loose | Readjust unit, fix again firmly and align |
| | The shaft is buckled | Replace shaft |
| | Turning parts run against stationary parts | Adjust and align as necessary |
| | The bearings are worn | Replace bearings, follow service plan |
| | The wear plates or rotor are worn | Replace rotor or parts subject to wear |
| | The rotor is damaged | Repair or replace |
| | The shaft runs eccentrically with worn bearings or poor alignment | Replace and align bearings |
| | The turning parts are out of balance (vibrating) | Find imbalance |
| | Ineffective lubrication or insufficient lubricant in the bearing housings, possibly as a result of a leak; noticeable at increased temperature | Follow service plan |
| | Insufficient lubrication | Follow service plan |
| | The bearings are soiled | Replace bearings |
| | Rust formation in the bearings due to penetrated moisture | Replace bearings, prevent pump coming into contact and with moisture with large temperature differences. |
| | The suction head is too great or there is too little difference between the run-off height and the vapour pressure of the liquid (too low NPSH) | Position pump lower Choose other pump |
| | There is a blockage in the suction line | Clean |
| | The pump does not work at the correct operating point | Adjust piping system if possible. Choose other pump |

| Malfunction | Cause | Possible solution |
|--------------------------|---|--|
| Too much wear of packing | Purge line is blocked | Clean purge line |
| | The shafts are not precisely in line | Align unit |
| | The shaft is buckled | Replace shaft |
| | The bearings are worn | Replace bearings |
| | The shaft or bush is worn and/or the bearing surfaces of the mechanical shaft seal are damaged, or the elastomers are not resistant to the liquid | Completely replace mechanical shaft seal and check that the elastomers are resistant to the liquid |
| | The packing is not properly fitted | Assemble properly and replace any damaged packing |
| | The shaft runs eccentrically with worn bearings or poor alignment | Replace and align bearings |
| | The turning parts are out of balance (vibrating) | Find imbalance and remedy |
| | An incorrect type of packing has been used | Replace packing and check which elastomers are resistant to the specific liquid |

| Malfunction | Cause | Possible solution |
|------------------------------|--|--|
| Bearings wearing too quickly | The shafts are not precisely in line | Align unit |
| | The shaft is buckled | Replace shaft |
| | Turning parts run against stationary parts | Adjust and align as necessary |
| | The shaft runs eccentrically with worn bearings or poor alignment | Replace and align bearings |
| | The turning parts are out of balance (vibrating) | Find imbalance and remedy |
| | Ineffective lubrication or insufficient lubricant in the bearing housings, possibly as a result of a leak; noticeable at increased temperature | Follow service plan |
| | Insufficient lubrication | Follow service plan |
| | The bearings are soiled | Replace bearings, prevent dirt penetration |
| | Rust formation in the bearings due to penetrated moisture | Replace bearings, prevent pump coming into contact and with moisture with large temperature differences. |

| Malfunction | Cause | Possible solution |
|---------------------------------|--|--|
| Pump becomes warm and/or seizes | Purge line is blocked | Clean |
| | Turning parts run against stationary parts | Adjust and align as necessary |
| | The bearings are worn | Replace bearings |
| | The shaft runs eccentrically with worn bearings or poor alignment | Replace and align bearings |
| | The turning parts are out of balance (vibrating) | Find imbalance and remedy |
| | Ineffective lubrication or insufficient lubricant in the bearing housings, possibly as a result of a leak; noticeable at increased temperature | Follow service plan |
| | Insufficient lubrication | Follow service plan |
| | The bearings are soiled | Replace bearings, prevent dirt penetration |
| | Rust formation in the bearings due to penetrated moisture | Replace bearings, prevent pump coming into contact and with moisture with large temperature differences. |

| Malfunction | Cause | Possible solution |
|--------------------------|--|--|
| Drive unit is overloaded | Wrong direction of rotation | Change direction of rotation |
| | The shafts are not precisely in line | Align unit |
| | Turning parts run against stationary parts | Adjust and align as necessary |
| | The bearings are worn | Replace bearings |
| | The shaft runs eccentrically with worn bearings or poor alignment | Replace and align bearings |
| | The turning parts are out of balance (vibrating) | Find imbalance and remedy |
| | Ineffective lubrication or insufficient lubricant in the bearing housings, possibly as a result of a leak; noticeable at increased temperature | Follow service plan |
| | Insufficient lubrication | Follow service plan |
| | The bearings are soiled | Replace bearings, prevent dirt penetration |
| | Rust formation in the bearings due to penetrated moisture | Replace bearings, prevent pump coming into contact and with moisture with large temperature differences. |
| | The number of revolutions is too high | Reduce number of revolutions |
| | There is a blockage in the suction line | Clean |
| | The liquid has a higher density than the viscosity for which the pump is intended | Adapt temperature of liquid if possible. Choose other pump |

10 Reuse and scrapping

When the pump is taken out of use or reused, all liquids must be removed in the correct way from the pump. The parts must be thoroughly cleaned.



Opening without danger:

In the case of pumping volatile and/or dangerous liquids the dangers of these substances must be taken into account when opening.



**If necessary neutralise the pumped liquid and use the correct personal protection equipment.
Ensure the safe drainage of the liquids used to protect the environment.**

The scrapping of the pump must take place in accordance with local regulations.

11 Maintenance

In this section we describe the instructions for maintenance of the pump/pump unit

- general
- preparation
- tools
- switching off
- motor protection
- preservation
- external cleaning
- electrical installation
- draining
- specific parts
- back-pull out
- spacer coupling
- overhaul advice

11.1 General

Inappropriate, incorrect and/or not regularly carried out maintenance can lead to failures in the operation of the pump/pump unit, danger to the user, high repair costs and long-lasting unavailability. So follow the instructions in this section carefully.

BBA Pompen BV is not responsible for accidents or damage caused by not respecting these instructions.



Only have maintenance work carried out by qualified personnel. Always wear the necessary clothing for protection against high temperatures and harmful and/or aggressive liquids.

Have personnel read the whole user manual, and particularly point out the paragraphs concerning the work that has to be done.



Opening without danger:

In the case of pumping volatile and/or dangerous liquids the dangers of these substances must be taken into account when opening.

For information concerning setting, maintenance activities or repairs you are requested to contact our service department.

Distrimex Pompen & Service BV

Telephone : +31(0)55 368 18 30

Fax : +31(0)55 368 18 31

11.2 Preparation

Environment

Because some parts have narrow tolerances and/or may be vulnerable, maintenance must take place in a clean work environment.

Safety instructions during maintenance, repair and checks:

- Working on the pump is only allowed when it has been put out of operation.
- To put an installation out of use follow the procedure described in these operating instructions, for example the machine may no longer be under pressure and it must have fully cooled.
- Pumps and pump (units) pumping dangerous media must be cleaned and neutralised beforehand.
- Protect the drive motor during the whole working time against both inadvertent and unauthorised switching on.
- When opening the pump follow all instructions for using the medium involved (for example protective clothing, smoking ban, etc.).
- With repairs, in the interest of safety, parts supplied by the supplier or approved by him must always be used.
- Modifications to the machine or the application are only possible after consultation with the suppliers.
- The reliability of the pump/pump unit is only guaranteed when the pump/pump unit is used for the application and in the way it was intended on delivery.
- At the end of the activities all safety devices and protective equipment must again be installed and made operative.
- Before restarting the pump/pump unit read the operating instructions through.

11.3 Tools

For maintenance and repair work only use tools that are technically suitable and in good condition. Use them in the correct way.

11.4 Switching off

When switching off the pump/pump unit always proceed as follows:

- Switch the motor off.
- Disconnect the secondary piping (sealing or rinsing liquid).
- When the congealing of the liquid must be avoided, this must be from removed the pump while the liquid is still fluid.
- Close the valve in the pressure line. When a non-return valve is present and there is sufficient counterpressure in the pressure line, the discharge line valve can remain open.
- Switch off motor and ensure that the installation smoothly comes to a stop.
- Disconnect the secondary piping (sealing or rinsing liquid).
- Close the valve in the suction line.
- At temperatures below freezing point and/or with longer periods out of use, the pump must be fully drained and preserved.

11.5 Motor protection

Take sufficient measures to prevent the motor being able to be started while work is taking place on the pump/pump unit. This is particularly of importance with motors that are remotely started. Follow the procedure below:

11.5.1 Electric motor

- Switch the operating switch on the pump/pump unit to “off”.
- Switch the pump switch on the switch box to “off”.
- Secure the switch box or hang a warning sign on the switch box.
- Remove the fusing and take it to the assembly place.
- Only remove the protective cover over the coupling after the pump/pump unit has become fully stationary.

11.5.2 Diesel motor

- Switch the ignition key or turning knob at the pump/pump unit to “off”.
- Remove the battery cable from the battery.
- Secure the switch box or hang a warning sign on the switch box.
- Remove the fusing and take it to the assembly place.
- Only remove the protective cover over the coupling after the pump/pump unit has become fully stationary.

11.6 Preservation

When the pump/pump unit is not to be used for longer periods it must first be fully emptied. Then treat internal parts with a mineral oil. Shut off the suction flange imperviously. Fill the pump with preservative and slowly turn the rotating parts by hand. Then shut off the delivery flange imperviously. When present, connections for rinsing, circulation or cooling must also be closed. All not painted parts and the rotating parts must be provided with a coat of preservative. The choice of preservative depends on the materials and the application. The pumps must be stored covered and well ventilated. Temperatures below freezing point and high air humidity must be avoided.

11.7 external cleaning

Keep the surface of the pump as clean as possible. This simplifies maintenance and checks.



If the pump is cleaned this must be done with the correct cleaning material for the technical properties.

Make sure that during cleaning the resources used for this and the dirt particles are collected in an environmentally friendly way.



Avoid temperature shocks: do not spray water on a heated pump. Sudden cooling can crack the pump components.

Make sure that the cleaning agent does not penetrate the ball bearing space. With sealed bearings prevent the cleaning agent from damaging the rubber seals.

11.8 Electrical installation



Maintenance work on the electrical installation may only take place after the shutting off of the power and may only be carried out by personnel authorised to do so.



Before cleaning electrical appliances check they have a sufficiently high protection level.

Protection level IP54 means, for example, that the appliance is protected against dust and splashed water from all directions, but NOT against water jets (IP description, see section “Technical specifications”).

Only replace defective fusing with original fusing with the specified current intensity.

After each service check the parts of the electrical installation for visible damage and replace if necessary.

11.9 Draining the pump



Opening without danger:

In the case of pumping volatile and/or dangerous liquids the dangers of these substances must be taken into account when opening.


- Disconnect the pressure and suction line as close as possible to the pump/pump unit
- Take the necessary measures if the pump/pump unit may/cannot be stopped.
- Remove the pump/pump unit if possible from the installation, and shut the suction and pressure line off with blind plugs or flanges. If this is not possible, the back pull-out or front pull-out system can be used.
- Allow the pump/pump unit to cool down if the pumped liquid allows this.
- With liquids that solidify at temperatures lower than the working temperature, it is best to immediately drain the pump after stopping and isolating the pump/pump unit. Always wear protective clothing and safety glasses.
- Protect yourself by means of a protective cover if hot and/or aggressive liquid can spatter out of the pump while draining.
- Open the cleaning covers.
- Remove any drain plugs.
- Make sure that no liquid arrives in the environment.
- Rinse the spaces and chambers in the pump housing and intermediate housing. The rinsing of the pump must be done with the correct cleaning material for the technical properties.
- Replace the cleaning covers and stopper.

11.10 Specific parts

11.10.1 Bolts and nuts

Damaged bolts and nuts or parts with damaged screw thread must be removed or replaced as soon as possible with fixing material of the same fixing class.


When tightening, preferably use a torque wrench, see technical specifications B-Series.

| | | |
|---|------------|--|
| | | Extra point(s) for attention with ATEX pumps. |
|  | M4. | Make sure that nuts and bolts are assembled at the correct Nm. |

11.10.2 Flat seals and tape


Never apply already used seals or tape.

Replace the flat seals and filled seals under the stoppers with original BBA Pompen BV seals.

| | | |
|---|----------------------------|--|
| | | Extra point(s) for attention with ATEX pumps. |
|  | M3. M5. M6. | <p>Make sure that packing is enclosed in the correct way.</p> <p>Use new packing when servicing.</p> <ul style="list-style-type: none"> • Take account of pressures in the pump. • Take account of the interaction of packing with the medium to be pumped. <p>Check the resistance list to ensure that assembled elastomers are suitable for the pumped medium.</p> |


11.10.3 Synthetic and rubber parts

Do not expose synthetic or rubber (cables, hoses, seals) parts to the effects of oils, solvents and cleaning products or other chemicals unless they are specially suitable for this.

| | | |
|---|------------|--|
| | | Extra point(s) for attention with ATEX pumps. |
|  | M6. | Check the resistance list to see if assembled elastomers are suitable for the medium to be pumped. |

11.10.4 Suction strainer filter

The filter(s) and suction strainer(s) present in the installation must be regularly cleaned. With a soiled filter in the suction line the inlet pressure can become too low. A soiled filter in the pressure line causes the pump pressure to increase.


| | | |
|---|----------------------------|---|
| | | Extra point(s) for attention with ATEX pumps. |
|  | K7. K5. P1. | <p>Make sure that dirt particles in piping systems cannot cause blockages.</p> <p>Ensure a good inflow opening in the suction line.</p> <p>Do not expose the pump to higher pressures than which the pump is suitable according to the curve.</p> |


11.10.5 Rolling bearings

The B40, B30-180, B45, B50, B55, B60-180, B60-220, B65, B70, B70-250, B85, B95, B100, B125, B140 and B156 have grease-packed rolling bearings as standard for their working life of the seal type 2RS. These do not need further lubrication.

With pump sizes B150, B200, B250 and B300 the rolling bearings are provided with a multi-purpose lubricating grease of consistency class NLGI-2. This type of lubricating grease is suitable for rolling bearing temperatures to 120°C.

For higher operating temperatures the standard lubricating grease must be replaced by a high temperature grease, consistency class NLGI-3. This type of lubricating grease is suitable to 150°C to 180°C depending on the grease manufacturer. Before starting the pump check if there is sufficient lubricant in the bearing support, and if there are any lubricant leaks.

| | | |
|---|-----------------------------|--|
|  | K12. M7. B5. | Extra point(s) for attention with ATEX pumps. Choose the correct bearing (according to EN 13463-5:2003, 6.1). Assemble the pump parts according to instructions. Protect pump bearing support against temperature. • <u>(Only with Cat. 2 pumps)</u> |
|---|-----------------------------|--|


| | | |
|--|--|--|
|  | Dangers relating to the software: | It is the responsibility of the employer to ensure that the safety measures (such as protection against temperature) and the resulting action (such as the stoppage of the pump) are appropriately included in the safety circuit. |
|--|--|--|

Optional:

An oil-lubricated bearing can optionally be selected. When the pump is used in an environment where very high or low temperatures apply, it is recommended to consult the lubricating grease producer on the correct lubricating grease/lubricating oil and intervals for further greasing/lubrication.

11.10.6 Further lubrication

With pump sizes B150, B200, B250 and B300, every 5,000 running hours or every six months apply a small quantity of grease through the lubrication nipple at the bearing cover.

| | | |
|---|--------------------|---|
|  | S2. B5. | Extra point(s) for attention with ATEX pumps. Only with grease-lubricated bearings not greased for life: • Ensure a good lubrication schedule. If regular lubricated cannot take place: • Fit a temperature sensor at the bearing. |
|---|--------------------|---|

Oil-lubricated rolling bearings are lubricated from the bearing support, so this must contain sufficient oil. The oil level must always be checked before first putting into operation using the oil-level gauge. First oil replenishment after 250 hours. Then with normal use after approx. 4,000 operating hours or every six months.



Do not apply too much lubricating grease in the bearing.

After four lubrications the rolling bearing must be cleaned. The old grease must be removed and new lubricating grease provided



With further lubrication use the same type of lubricating grease with which the bearing was originally lubricated. Different grease types cannot be mixed, as mixed use can cause serious damage to the bearing and the pump.

Consult the supplier of the lubricating grease about the ability to mix greases. One can also work preventively by when changing to another grease type completely removing the old grease or assembling a new bearing.

With normal use rolling bearings must be replaced after approx. 10,000 operating hours or at the latest after two and a half years.

At high operating temperatures further lubrication must take place more frequently, being every 500 to 1,000 operating hours.

This is the case for operating temperatures above:

90°C for lubricating grease of consistency class NLGI-2;

120°C for lubricating grease of consistency class NLGI-3;

With extremely high loads when the grease loses much oil, lubrication must take place after each peak operation. This is preferably done while the pump is still running, but after the peak load has occurred.

11.10.7 Recommended greases

| Producer | NLGI-2 | NLGI-3 |
|-----------------|----------------------|---------------------------|
| BP | LS2 | LS3 |
| Chevron | Polyurea EP grease-2 | |
| Esso | BEACON 2 | BEACON 3 |
| | BEACON EP2 | UNIREX -N3 |
| Fina | LICAL EP2 | CERAN HV |
| | MARSON L2 | |
| Gulf | Crown Grease No. 2 | Crown Grease No. 3 |
| Mobil | Mobilux EP2 | |
| SKF | LGMT2 | LGMT3 |
| | | LGHQ3 |
| Shell | ALVANIA R2 | ALVARINA R3 |
| | DARINA GREASE R2 | |
| Texaco | Multifax EP-2 | |
| Total | MULTIS EP-22 | |

(consult grease/oil producer)


11.10.8 Recommended oils

| Temperature | Light/average load | Heavy and jolting load |
|--------------------|---|--|
| -30°C to 0°C | ISO VG 15, 22, 32 machine oil. | |
| 0°C to 50°C | ISO VG 15, 22, 32 bearing or turbine oil | ISO VG 15, 22, 46 bearing or turbine oil |
| 50°C to 80°C | ISO VG 46, 68, 100 bearing or turbine oil | ISO VG 68, 100, 150 bearing or turbine oil |
| 80°C to 110°C | ISO VG 150, 220 bearing oil | ISO VG 220, 320 bearing oil |

(consult grease/oil producer)

11.10.9 Mechanical shaft seal

Regularly check the sealing of the mechanical shaft seal. If it leaks excessively the pump/pump unit must be put out of use as soon as possible. The mechanical shaft seal must be replaced. Check (if applicable) the level of the mechanical shaft seal sealing liquid.

| | | Extra point(s) for attention with ATEX pumps. |
|---|-------------|---|
|  | M6. | Check the resistance list to ensure that assembled elastomers are suitable for the pumped medium. |
| | M8. | Ensure the good assembly of the mechanical shaft seal as indicated by the supplier. |
| | M9. | Ensure the good assembly of the auxiliary system as indicated by the supplier. |
| | K6d. | Ensure the correct choice of retaining ring. Retaining rings may contain no light-metals. The following materials are allowed: <ul style="list-style-type: none"> • Elastomers, etc. • PTFE • Graphite • Ceramics |
| | B5. | Protect pump against temperature! <ul style="list-style-type: none"> • <i>(Only with Cat. 2 pumps)</i> |

11.11 Back pull out


B-series pumps can be provided with a back-pull out system. This can be, for example, to maintain the mechanical shaft seal and bearing of the pump. Then the bearing support with intermediate housing, mechanical shaft seal, shaft and rotor can be disassembled from the pump housing as a whole, without the suction and pressure lines having to be disassembled.

11.12 Spacer coupling

In combination with the back-pull out system a spacer coupling must be used. As a result it is not necessary to disassemble the drive gear. For overall sizes and coupling choice, see technical specifications B-Series.

11.13 Overhaul advice

If a pump has to be fully checked and/or overhauled we advise sending it back to the supplier. This is unless there are sufficiently competent personnel and provisions available to carry out the overhaul according to the instructions on-site. In this case we request you to specifically ask us for the assembly and disassembly instructions. If not otherwise available these will be supplied in the original language. If the pump is returned for an overhaul we request you to drain and rinse it before sending. Also send a “non-opposition declaration” to meet safety and environmental protection requirements.

| | | Extra point(s) for attention with ATEX pumps. |
|---|-------------|--|
|  | M1. | Make sure that rotor nut is tightened at the correct Nm. |
| | M2. | Make sure that setting between rotor, wear plate and intermediate housing is correct. |
| | M3. | |
| | M4. | Make sure that packing is enclosed in the correct way. |
| | M5. | Make sure that nuts and bolts are assembled at the correct Nm. |
| | M6. | Use new packing when servicing. |
| | | Check the resistance list to ensure that assembled elastomers are suitable for the pumped medium. |
| | M7. | |
| | M8. | Assemble the pump parts according to instructions. |
| | | Ensure the good assembly of the mechanical shaft seal as indicated by the supplier. |
| | M9. | |
| | K6a. | Ensure the good assembly of the auxiliary system as indicated by the supplier. |
| | | Ensure a correct mechanical shaft seal choice for the liquid to be pumped. |
| | | <ul style="list-style-type: none"> • Correct lubricant • Control (by temperature monitoring) • Maintenance • The ignition temp. of coolant must be at least 50 K above the max. surface temp. of the pump (EN 13463-5:2003 §4.5). • Provide a seal with extra guarantee against leakage when pumping volatile liquids |
| | K6c. | Use the correct packing. |
| | | <ul style="list-style-type: none"> • Take account of pressures in the pump. • Take account of the interaction of packing with the medium to be pumped. |
| | K6d. | Ensure the correct choice of retaining ring. |
| | | Retaining rings may contain no light-metals. |
| | | The following materials are allowed: |
| | | <ul style="list-style-type: none"> • Elastomers, etc. • PTFE • Graphite • Ceramics |
| | K11. | Choose the correct electric motor (only with units). |
| | | Choose the correct power and number of revolutions, etc. The motor may not be too oversized. The motor must cut out when the pump requests more power as a result of a broken bearing, rotor malfunction, etc. |
| | | EX-motor, cat. 2 |
| | K12. | Choose the correct bearing (according to EN 13463-5:2003, 6.1): |
| | S1. | Regularly check the packing for leaks. |
| | S2. | Ensure a good lubrication schedule (only with oil-lubricated bearings). |
| | S3. | Regularly check for bearing play. |
| | S4. | Ensure a good service plan. |
| | S5a. | Check oil level (according to (EN 13463-5:2003 §6.2) (only with oil-lubricated bearings). |
| | S5b. | Check coolant level (according to EN 13463-5:2003 §5.4). |
| | S6. | Check for bearing leaks. |
| | S7. | If a leak occurs to the mechanical shaft seal: stop the pump. |
| | S8. | Regularly check the coupling and elastomers of the coupling. |
| | S9. | Ensure the correct spare parts. |
| | | <ul style="list-style-type: none"> • also ensure correct fitting, e.g. shaft and bush. |
| | S10. | Check alignment, damage to protective cover. |
| | | Regularly check the safety devices. |

If the malfunction cannot be solved, one must immediately stop the pump/pump unit and contact:

Distributormex Pompen & Service BV

Tel : +31 (0)314 368 444

Fax : +31 (0)314 33 50 47

12 Summary of instructions for ATEX pumps


| Code | Requirement | Supplementary remark | OK? |
|------|--|--|-----|
| | Choice (Selection) pump | | |
| K1 | Ensure a correct pump choice with respect to the liquid type with its technical properties and quantity. | <ul style="list-style-type: none"> • With flammable, volatile liquids: ensure the correct choice of material for the rotor and wear plate (according to EN 13463-5:2003 §5.2, note 2). • Make sure that the pump housing, etc. is not adversely affected by the medium to be pumped. | |
| K2 | Ensure a correct suction line in relation to the NPSH curve. | | |
| K3 | Ensure sufficient counterpressure on the delivery side so the pump does not run outside the curve. | | |
| K4 | Ensure a good pipe diameter. | | |
| K5 | Ensure a good inflow opening in the suction line. | | |
| K6a | Ensure a correct mechanical shaft seal choice for the liquid to be pumped. | <ul style="list-style-type: none"> • Correct lubricant • Checks (by temperature monitoring) • Maintenance • The ignition temp. of coolant must be at least 50 K above the max. surface temp. of the pump (EN 13463-5:2003 §4.5). • Provide a seal with extra guarantee against leakage when pumping volatile liquid. | |
| K6b | Ensure a correct auxiliary system for the mechanical shaft seal. | <ul style="list-style-type: none"> • Take account of the flow rate and pressures in the pump. • Take account of the interaction of auxiliary liquid with the medium to be pumped. • The auxiliary system must itself be EX, cat. 2. Here also note: <ul style="list-style-type: none"> • What is the outside temp. of the auxiliary system? • Can the auxiliary system guard against the build-up of ignitable gas inside? | |
| K6c | Use the correct packing | <ul style="list-style-type: none"> • Take account of pressures in the pump. • Take account of the interaction of packing with the medium to be pumped. | |
| K6d | Ensure the correct choice of retaining ring | <ul style="list-style-type: none"> • Retaining rings may contain no light-metals. • The following materials are allowed: <ul style="list-style-type: none"> • Elastomers, etc. • PTFE • Graphite • Ceramics | |
| K7 | Make sure that dirt particles in piping systems cannot cause blockages. | <ul style="list-style-type: none"> • Fit a filter if necessary | |
| K8 | Make sure you choose the right coupling. | <ul style="list-style-type: none"> • The coupling must be sufficient for the power and number of revolutions. • The coupling must be EX, cat. 2 • Follow the instructions of the manufacturer. | |

| Code | Requirement | Supplementary remark | OK? |
|------|---|--|-----|
| K9 | Ensure the correct design and material choice of the protective cover. | <ul style="list-style-type: none"> No dangerous dust accumulation may take place. A design open at the bottom is preferred: although more dust can blow in from below the dust can also more easily be removed. Better cooling for the coupling. The protective cover must fit widely around the coupling in case of dents, and to make no contact with any dust layer on the inside of the protective cover. For cat. 2: no more than 7.5% magnesium (see EN 13463-1, 8.2) | |
| K10 | Ensure a correct number of revolutions. | • | |
| K11 | Choose the correct electric motor (only with units) | <ul style="list-style-type: none"> Correct capacity and number of revolutions, etc. The motor may not be too oversized. The motor must cut out when the pump requests more power as a result of a broken bearing, rotor malfunction, etc. EX-motor, cat. 2 | |
| K12 | Choose the correct bearing (according to EN 13463-5:2003, 6.1): | <ul style="list-style-type: none"> Take account of the intended working life of the bearing. Protect against dust with retaining ring. Ensure earthing for the circulating flows. With oil-lubricated bearings: ensure the correct oil viscosity in relation to the outside temperature (and medium temperature). | |
| | Transport | | |
| T1 | Make sure that the pump is mechanically well shielded during transport. | | |
| | Assembly | | |
| M1 | Make sure that rotor nut is tightened at the correct Nm. | | |
| M2 | Make sure that setting between rotor, wear plate and intermediate housing is correct. | | |
| M3 | Make sure that packing is enclosed in the correct way. | | |
| M4 | Make sure that nuts and bolts are assembled at the correct Nm. | | |
| M5 | Use new packing when servicing | | |
| M6 | Check the resistance list to ensure that assembled elastomers are suitable for the pumped medium. | <ul style="list-style-type: none"> Also applies for mechanical shaft seal Also applies for auxiliary system Also applies for packing | |
| M7 | Assemble the pump parts according to instructions. | | |
| M8 | Ensure the good assembly of the mechanical shaft seal as indicated by the supplier. | | |
| M9 | Ensure the good assembly of the auxiliary system as indicated by the supplier. | | |

| Code | Requirement | Supplementary remark | OK? |
|------|--|---|-----|
| | Installation | | |
| P1 | Do not expose the pump to higher pressures than which the pump is suitable according to the curve. | | |
| P2a | Prevent dirt particles in the medium (only clean filtered medium allowed) | With volatile, flammable liquids only a clean, filtered medium may be used) | |
| P2b | Prevent dirt particles larger than the dirt passage of the rotor from arriving in the suction line and pump. | | |
| P3 | Make sure that the pump (unit) is mechanically well shielded while operating. | | |
| P4 | Make sure that pump is installed without any stresses. | Including coupling and E-motor. | |
| P5 | Ensure the correct coolant for mechanical shaft seal. | | |
| P6 | Ensure the correct coolant and temperature for the medium to be pumped. | | |
| P7 | Make sure the rotation direction arrow is present. | | |
| P8 | Connection between pump and ground (earthing). | | |
| P9 | Ensure the good alignment of the pump and drive gear. | | |
| P10 | Ensure the good fitting of the coupling on the pump shaft and drive gear. | | |
| | | | |
| | Startup/Use | | |
| G1 | Prevent pump being exposed to temperatures below freezing point if it is filled with liquid. | | |
| G2 | Make sure that liquid supply to the pump is smooth and oxygen-free. | | |
| G3 | Ensure the correct direction of rotation. | | |
| G5 | Prevent the pump for dry running. | | |
| G6 | Make sure the pump does not pump against a closed valve. | | |
| G8 | Make sure that the pump is filled with liquid at the correct temperature. | | |
| G9 | Make sure that the mechanical shaft seal cooling/lubrication is in good working order. | | |
| G10 | Ensure sufficient coolant | | |
| G11 | Prevent the sudden closing of valves so a water shock originates. | | |
| | | | |

| Code | Requirement | Supplementary remark | OK? |
|------|--|--|-----|
| | Service/Maintenance | | |
| S1 | Regularly check the packing for leaks. | | |
| S2 | Ensure a good lubrication schedule (only with oil-lubricated bearings). | | |
| S3 | Regularly check for bearing play. | | |
| S4 | Ensure a good service plan | | |
| S5a | Check oil level (according to (EN 13463-5:2003 §6.2) (Only with oil-lubricated bearings) | | |
| S5b | Check coolant level (according to EN 13463-5:2003 §5.4). | | |
| S6 | Check for bearing leaks. | | |
| S7 | If a leak occurs to the mechanical shaft seal: stop the pump. | | |
| S8 | Regularly check the coupling and elastomers of the coupling. | | |
| S9 | Ensure the correct spare parts | <ul style="list-style-type: none"> • also ensure correct fitting with shaft and bush | |
| S10 | Check alignment, damage to protective cover | | |
| S11 | Regularly check the safety devices on the pump (unit) | | |
| | | | |
| | Safety device | | |
| B1 | Ensure direction of rotation protection (electrical/mechanical). | | |
| B2a | Ensure regular checks for leakage and adjust if necessary. | This applies for: <ul style="list-style-type: none"> • the auxiliary system | |
| B2b | Choice of seal only to be determined after consultation with the supplier. <u>(Only with Cat. 2 pumps)</u> | <ul style="list-style-type: none"> • With extra guarantee against leakage. • Only when pumping volatile liquid. • Apply safety device for coolant presence. | |
| B4a | Protect the pump against overpressure. Set the max. pressure to 10% above the original pump curve. <u>(Only with Cat. 2 pumps)</u> | <ul style="list-style-type: none"> • Only required when pumping volatile liquid and/or dangerous liquid. • Or with a dangerous liquid. | |
| B4b | Protect pump against underpressure. The maximum suction head depends on the NPSH value indicated on the pump curve. <u>(Only with Cat. 2 pumps)</u> | <ul style="list-style-type: none"> • Only required when pumping volatile liquid. | |
| B5 | Protect pump against temperature. <u>(Only with Cat. 2 pumps)</u> | <ul style="list-style-type: none"> • Bearing temperature. • Mechanical shaft seal. | |
| B6 | Protect electric motor against overloading | <ul style="list-style-type: none"> • In the case of overloading the motor may not become too hot. This is the case with an ATEX motor. | |
| B7 | Protection of supplied power. | | |

13 safety devices.

| | Extra point(s) for attention with ATEX pumps. | |
|---|--|-----------------------|
|  | Always assemble the correct safety devices for the correct ATEX environment. | |
| | Environment | Type of sensor |
| | Gas | Ex II 2G T4 |
| | Dust | Ex II 2D T4 |

13.1 Summary of safety devices to be used

The table below summarises when which safety devices must be used:

| Safety device | Paragraph | Category 2 (zones 1, 21) | Category 3 (zones 2, 22) |
|---|------------------|--|--|
| Temperature monitoring In the intermediate housing | 13.2 | Always | Not required |
| Temperature monitoring at the ball bearing | 13.2 | Only with not lifelong lubricated greased bearings that are not regularly lubricated. | Only with not lifelong lubricated greased bearings that are not regularly lubricated. |
| Coolant monitoring | 13.3 | Only when pumping volatile liquid. | Not required |
| Overpressure protection | 13.4 | Only required when pumping volatile liquid and/or dangerous liquid. | Not required |
| Underpressure protection | 13.5 | Only when pumping volatile liquid. | Not required |
| Safety devices E-motor | 13.6 | Always | Always |
| Caution: safety control (drive) must suffice with regard to certain requirements. See paragraph 13.7 | | | |

13.2 Temperature monitoring:

Assemble a temperature sensor (PT100) in the intermediate housing (Only with Cat. 2 pumps).

If applicable: assemble a temperature sensor (PT100) with not lifelong lubricated greased bearing if this is not regularly lubricated.

The temperature sensor switches the pump off at the set temperature.

Set the sensor according to the table for the category:

| Temperature category. | Temperature. | Safe sensor setting | Maximum permissible liquid temperature |
|------------------------------|---------------------|----------------------------|---|
| T1 | 450°C | 370°C | 180°C |
| T2 | 300°C | 230°C | 180°C |
| T3 | 200°C | 140°C | 120°C |
| T4 | 135°C | 80°C | 65°C |

The same temperatures apply for category 3, but no temperature sensor needs to be fitted in the intermediate housing.

13.3 Coolant monitoring.

A supply reservoir must be assembled here. Level monitoring must be provided in this reservoir. If the level falls, this is a sign that one of the seals is leaking.

Only when pumping volatile liquid. **(Only with Cat. 2 pumps)**

13.4 Overpressure protection.

Here on the pressure side of the pump a sensor must be fitted which signals a too high pressure in the pump housing. This is only required when pumping volatile liquid and/or dangerous liquid.

Set the sensor to 10% above the peak in the original pump curve. **(Only with Cat. 2 pumps)**

13.5 Underpressure protection.


Protect pump against underpressure. The maximum suction head depends on the NPSH value shown on the pump curve. Only when pumping volatile liquid. **(Only with Cat. 2 pumps)**

13.6 Electric motor safety devices.

Protect electric motor against:

- direction of rotation
- overloading
- supplied power

13.7 The regulation must suffice with regard to the following requirements.

| | Extra point(s) for attention with ATEX pumps. |
|---|---|
|  | <p>1.5.1. Independent and reliable safety devices (see art.1.2 of the ATEX 95 for definition):</p> <ul style="list-style-type: none"> • Do the safety devices work independently of the other measuring and operating devices? • Is it sufficiently quickly signalled that a safety provision is no longer in working order? • Is the fail-safe principle applied (for electrical circuits)? • Do the operating provisions work directly on the control devices concerned, and not on the software? (This only applies in general). <p>With a malfunction to safe position:</p> <p>1.5.2. In the event of a failure in the safety devices does the appliance (or BS) go to the extent possible to a safe position?</p> <p>Dangers relating to the software:</p> <p>1.5.8. Was with the design of equipment, safety system and safety devices controlled by software particular account taken of dangers caused by errors in the program?</p> |

[illegible]

THE NETHERLANDS

BBA Pumps BV (head office)
Edisonstraat 12
7006 RD Doetinchem

+31 (0)314-368 436
info@bbapumps.com
www.bbapumps.com

NORTH AMERICA

BBA Pumps, Inc.
1133 Cainhoy Road
Wando, SC 29492

+1 843 849 3676
info@bbapumpsusa.com
www.bbapumpsusa.com

POLAND

BBA Pumps PL SP. z o.o.
ul. Żeromskiego 39A
PL-05-500 Piaseczno

+48 227138611
info@bbapumps.pl
www.bbapumps.pl



9700010002