Pressure Booster System

KSB Delta Macro

KSB Delta Macro F
KSB Delta Macro VC
KSB Delta Macro SVP

Installation/Operating Manual

Legal information/Copyright

Installation/Operating Manual KSB Delta Macro

Original operating manual

Subject to technical modification without prior notice.

Contents

Glossary

Accumulator

Pressure losses may occur in the piping downstream of the pressure booster system as a result of losses due to leakage. The accumulator serves to compensate for pressure losses and minimises the frequency of starts of the pressure booster system.

Certificate of decontamination

A certificate of decontamination is enclosed by the customer when returning the product to the manufacturer to certify that the product has been properly drained to eliminate any environmental and health hazards arising from components in contact with the fluid handled.

Dry running protection

Dry running protection devices prevent the pump from being operated without the fluid to be handled, which would result in pump damage.

Energy-saving mode

Setting designed to avoid the energetically inefficient operation of a pump at minimum water consumption.

Filling the accumulator

Function to fill a (discharge-side) accumulator; it prevents pump sets from starting if only a very small amount of water (e.g. caused by leakage) is required.

IE3

Efficiency class to IEC 60034-30: 3 = Premium Efficiency (IE = International Efficiency)

IE5

Efficiency class to IEC TS 60034-30-2:2016 = Ultra Premium Efficiency (IE = International Efficiency)

Manual mode

Direct operation on the power supply network, independently of the control unit.

Switchgear and controlgear assembly

Control cabinet with one or several control units / switchgears and electrical equipment.

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1 General

1.1 Principles

This operating manual is valid for the type series and variants indicated on the front cover.

The operating manual describes the proper and safe use of this equipment in all phases of operation.

The name plate indicates the type series, the main operating data and the serial number. The serial number uniquely describes the product and is used as identification in all further business processes.

In the event of damage, immediately contact your nearest KSB service facility to maintain the right to claim under warranty.

1.2 Software changes

The software has been specially created for this product and thoroughly tested. Making changes or additions to the software or parts of the software is prohibited. This does not, however, apply to software updates supplied by KSB.

1.3 Installation of partly completed machinery

To install partly completed machinery supplied by KSB refer to the sub-sections under Servicing/Maintenance.

1.4 Target group

This operating manual is aimed at the target group of trained and qualified specialist technical personnel. (⇨ Section 2.3, Page 10)

1.5 Other applicable documents

Table 1: Overview of other applicable documents

Document	Contents
Sub-supplier product literature	Operating manuals, logic diagram and other product literature of accessories and integrated machinery components

1.6 Symbols

Table 2: Symbols used in this manual

Symbol	Description
✓	Conditions which need to be fulfilled before proceeding with the step-by-step instructions
▷	Safety instructions
⇨	Result of an action
⇨	Cross-references
1. 2.	Step-by-step instructions
	Note Recommendations and important information on how to handle the product

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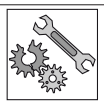
1.7 Key to safety symbols/markings

Table 3: Definition of safety symbols/markings

Symbol	Description
DANGER	**DANGER** This signal word indicates a high-risk hazard which, if not avoided, will result in death or serious injury.
WARNING	**WARNING** This signal word indicates a medium-risk hazard which, if not avoided, could result in death or serious injury.
CAUTION	**CAUTION** This signal word indicates a hazard which, if not avoided, could result in damage to the machine and its functions.
	**General hazard** In conjunction with one of the signal words this symbol indicates a hazard which will or could result in death or serious injury.
	**Electrical hazard** In conjunction with one of the signal words this symbol indicates a hazard involving electrical voltage and identifies information about protection against electrical voltage.
	**Machine damage** In conjunction with the signal word CAUTION this symbol indicates a hazard for the machine and its functions.

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2 Safety

DANGER

All the information contained in this section refers to hazardous situations.

In addition to the present general safety information the action-related safety information given in the other sections must be observed.

2.1 General

- This operating manual contains general installation, operating and maintenance instructions that must be observed to ensure safe operation of the system and prevent personal injury and damage to property.
- Comply with all the safety instructions given in the individual sections of this operating manual.
- The operating manual must be read and understood by the responsible specialist personnel/operators prior to installation and commissioning.
- The contents of this operating manual must be available to the specialist personnel at the site at all times.
- Information and markings attached directly to the product must always be complied with and kept in a perfectly legible condition at all times. This applies to, for example:
  - Arrow indicating the direction of rotation
  - Markings for connections
  - Name plate
- The operator is responsible for ensuring compliance with all local regulations not taken into account.

2.2 Intended use

- The pressure booster system must only be operated within the operating limits described in the other applicable documents.
- Only operate pressure booster systems which are in perfect technical condition.
- Do not operate partially assembled pressure booster systems.
- The pressure booster system must only handle the fluids described in the product literature of the respective design variant.
- Never operate the pressure booster system without the fluid to be handled.
- Observe the information on minimum flow rates specified in the product literature (to prevent overheating, bearing damage, etc).
- Observe the maximum flow rates indicated in the data sheet or product literature (to prevent overheating, cavitation damage, bearing damage, etc).
- Do not throttle the flow rate on the suction side of the pressure booster system (to prevent cavitation damage).
- Consult the manufacturer about any other modes of operation not described in the product literature.

2.2.1 Prevention of foreseeable misuse

- Never exceed the permissible operating limits (temperature, etc.) specified in the data sheet or product literature.
- Observe all safety information and instructions in this manual.

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2.3 Personnel qualification and personnel training

- All personnel involved must be fully qualified to install, operate, maintain and inspect the product this manual refers to.
- The responsibilities, competence and supervision of all personnel involved in transport, installation, operation, maintenance and inspection must be clearly defined by the operator.
- Deficits in knowledge must be rectified by means of training and instruction provided by sufficiently trained specialist personnel. If required, the operator can commission the manufacturer/supplier to train the personnel.
- Training on the pressure booster system must always be supervised by specialist technical personnel.

2.4 Consequences and risks caused by non-compliance with this manual

- Non-compliance with these operating instructions will lead to forfeiture of warranty cover and of any and all rights to claims for damages.
- Non-compliance can, for example, have the following consequences:
  - Hazards to persons due to electrical, thermal, mechanical and chemical effects and explosions
  - Failure of important product functions
  - Failure of prescribed maintenance and servicing practices
  - Hazard to the environment due to leakage of hazardous substances

2.5 Safety awareness

In addition to the safety information contained in this operating manual and the intended use, the following safety regulations shall be complied with:

- Accident prevention, health regulations and safety regulations
- Explosion protection regulations
- Safety regulations for handling hazardous substances
- Applicable standards, directives and laws

2.6 Safety information for the operator/user

- Fit protective equipment (e.g. contact guards) supplied by the operator for hot, cold or moving parts, and check that the equipment functions properly.
- Do not remove any protective equipment (e.g. contact guards) during operation.
- Eliminate all electrical hazards. (In this respect refer to the applicable national safety regulations and/or regulations issued by the local energy supply companies.)
- If shutting down the pump does not increase potential risk, fit an emergency-stop control device in the immediate vicinity of the pump (set) during pump set installation.

2.7 Safety information for maintenance, inspection and installation

- Modifications or alterations of the pressure booster system are only permitted with the manufacturer's prior consent.
- Use only original spare parts or parts authorised by the manufacturer. The use of other parts can invalidate any liability of the manufacturer for resulting damage.
- The operator ensures that maintenance, inspection and installation are performed by authorised, qualified specialist personnel who are thoroughly familiar with the manual.
- Carry out work on the pressure booster system during standstill only.
- The pump casing must have cooled down to ambient temperature.
- Pump pressure must have been released and the pump must have been drained.

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- When taking the pressure booster system out of service always adhere to the procedure described in the manual.
- Decontaminate pressure booster systems which handle fluids posing a health hazard.
- As soon as the work has been completed, re-install and/or re-activate any safety-relevant and protective devices. Before returning the product to service, observe all instructions on commissioning.
- Make sure the pressure booster system cannot be accessed by unauthorised persons (e.g. children).
- Prior to opening the device, pull the mains plug and wait for at least 10 minutes.

2.8 Unauthorised modes of operation

Always observe the limits stated in the product literature.

The warranty relating to the operating reliability and safety of the pressure booster system supplied is only valid if the equipment is used in accordance with its intended use. (⇨ Section 2.2, Page 9)

2.9 Electromagnetic compatibility (EMC)

2.9.1 Interference emission requirements

The EN 61800-3 EMC product standard is relevant for electric variable speed drives/ control systems. It specifies all pertinent requirements and refers to the relevant generic standards for complying with the EMC Directive.

Frequency inverters are commonly used by operators as a part of a system, plant or machine assembly. It should be noted that the operator bears all responsibility for the final EMC properties of the equipment, plant or installation.

A prerequisite or requirement for complying with the relevant standards or the limit values and inspection/test levels referenced by them is that all information and descriptions regarding EMC-compliant installation be observed and followed.

In accordance with the EMC product standard, the EMC requirements to be met depend on the purpose or intended use of the frequency inverter. Four categories are defined in the EMC product standard:

Table 4: Categories of intended use

Category	Definition	Limits to EN 55011
C1	Frequency inverters with a supply voltage under 1000 V installed in the first environment (residential and office areas).	Class B
C2	Frequency inverters with a supply voltage under 1000 V installed in the first environment (residential and office areas) that are neither ready to be plugged in/connected nor are mobile and must be installed and commissioned by specialist personnel.	Class A, Group 1
C3	Frequency inverters with a supply voltage under 1000 V installed in the second environment (industrial environments).	Class A, Group 2
C4	Frequency inverters with a supply voltage over 1000 V and a nominal current over 400 A installed in the second environment (industrial environments) or that are envisaged for use in complex systems.	No borderline/ boundary[1)]

The following limit values and inspection/test levels must be complied with if the generic standard on interference emissions applies:

1 An EMC plan must be devised.

Table 5: Classification of installation environment

Environment	Generic standard	Limits to EN 55011
First environment (residential and office areas)	EN/IEC 61000-6-3 for private, business and commercial environments	Class B
Second environment (industrial environments)	EN/IEC 61000-6-4 for industrial environments	Class A, Group 1

The frequency inverter meets the following requirements:

Table 6: EMC properties of the frequency inverter

Power [kW]	Cable length [m]	Category to EN 61800-3	Limits to EN 55011
≤ 11	≤ 5	C1	Class B

The EN 61800-3 standard requires that the following warning be provided for drive systems that do not comply with category C1 specifications:
This product can produce high-frequency interference emissions that may necessitate targeted interference suppression measures in a residential or office environment.

2.9.2 Line harmonics requirements

The product is a device for professional applications as defined by EN 61000-3-2. The following generic standards apply when establishing a connection to the public power grid:

- EN 61000-3-2
  for symmetric, three-phase devices (professional devices with a total power of up to 1 kW)
- EN 61000-3-12
  for devices with a phase current of between 16 A and 75 A and professional devices from 1 kW up to a phase current of 16 A.

2.9.3 Interference immunity requirements

In general, the interference immunity requirements for a frequency inverter hinge on the specific environment in which the inverter is installed.

The requirements for industrial environments are therefore higher than those for residential and office environments.

The frequency inverter is designed such that the immunity requirements for industrial environments and, thus, the lower-level requirements for residential and office environments, are met and fulfilled.

The following relevant generic standards are used for the interference immunity test:

- EN 61000-4-2: Electromagnetic compatibility (EMC)
  - Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test
- EN 61000-4-3: Electromagnetic compatibility (EMC)
  - Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test
- EN 61000-4-4: Electromagnetic compatibility (EMC)
  - Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test
- EN 61000-4-5: Electromagnetic compatibility (EMC)
  - Part 4-5: Testing and measurement techniques – Surge immunity test
- EN 61000-4-6: Electromagnetic compatibility (EMC)
  - Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields

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3 Transport/Storage/Disposal

3.1 Checking the condition upon delivery

1. On transfer of goods, check each packaging unit for damage.
2. In the event of in-transit damage, assess the exact damage, document it and notify KSB or the supplying dealer and the insurer about the damage in writing immediately.

3.2 Transport

DANGER

Pressure booster system tipping over

Risk of injury by falling pressure booster system!

- ▷ Never suspend the pressure booster system by its power cable.
- ▷ Observe the applicable local accident prevention regulations.
- ▷ Observe the information on weights, centre of gravity and fastening points.
- ▷ Use suitable and permitted transport equipment, e.g. crane, forklift or pallet truck.
- ▷ To transport the pressure booster system, suspend it from the lifting tackle as illustrated.

✓ Transport equipment / lifting equipment suitable for the corresponding weight has been selected and is on hand.

✓ If the control cabinet and pressure booster system need to be lifted separately from each other: Disconnect the power cables before lifting the pressure booster system / control cabinet.

1. Remove the packaging. Remove the caps from the connection openings.
2. Check for any in-transit damage.
3. Transport the pressure booster system to the place of installation.
4. Detach the pressure booster system from the pallet using a suitable tool.

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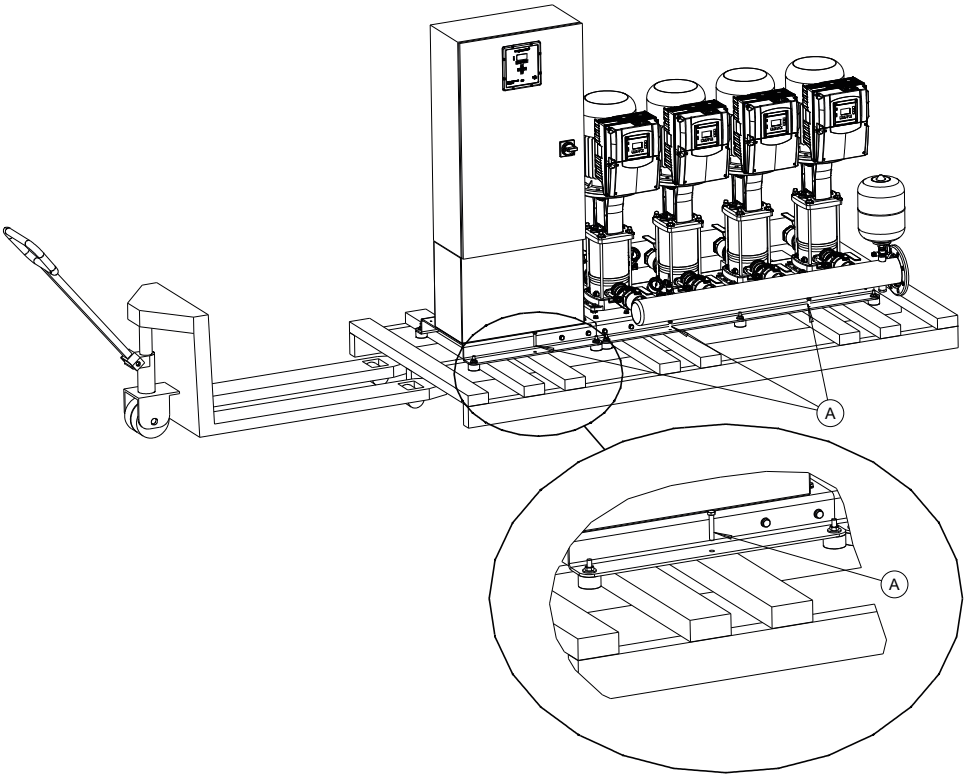

Fig. 1: Lifting the pressure booster system off the pallet

5. Undo the bolts (A) between the pressure booster system and the pallet.
6. Attach lifting equipment to the pressure booster system.
7. Separate the pressure booster system from the wooden skids with a suitable tool. Lift the pressure booster system off. Dispose of the wooden skids.
8. Carefully place down the pressure booster system at the site of installation.

Example: Lifting the pressure booster system and control cabinet separately

If the control cabinet is too large and cannot be placed on the baseplate of the pressure booster system, the pressure booster system and control cabinet have to be lifted separately.

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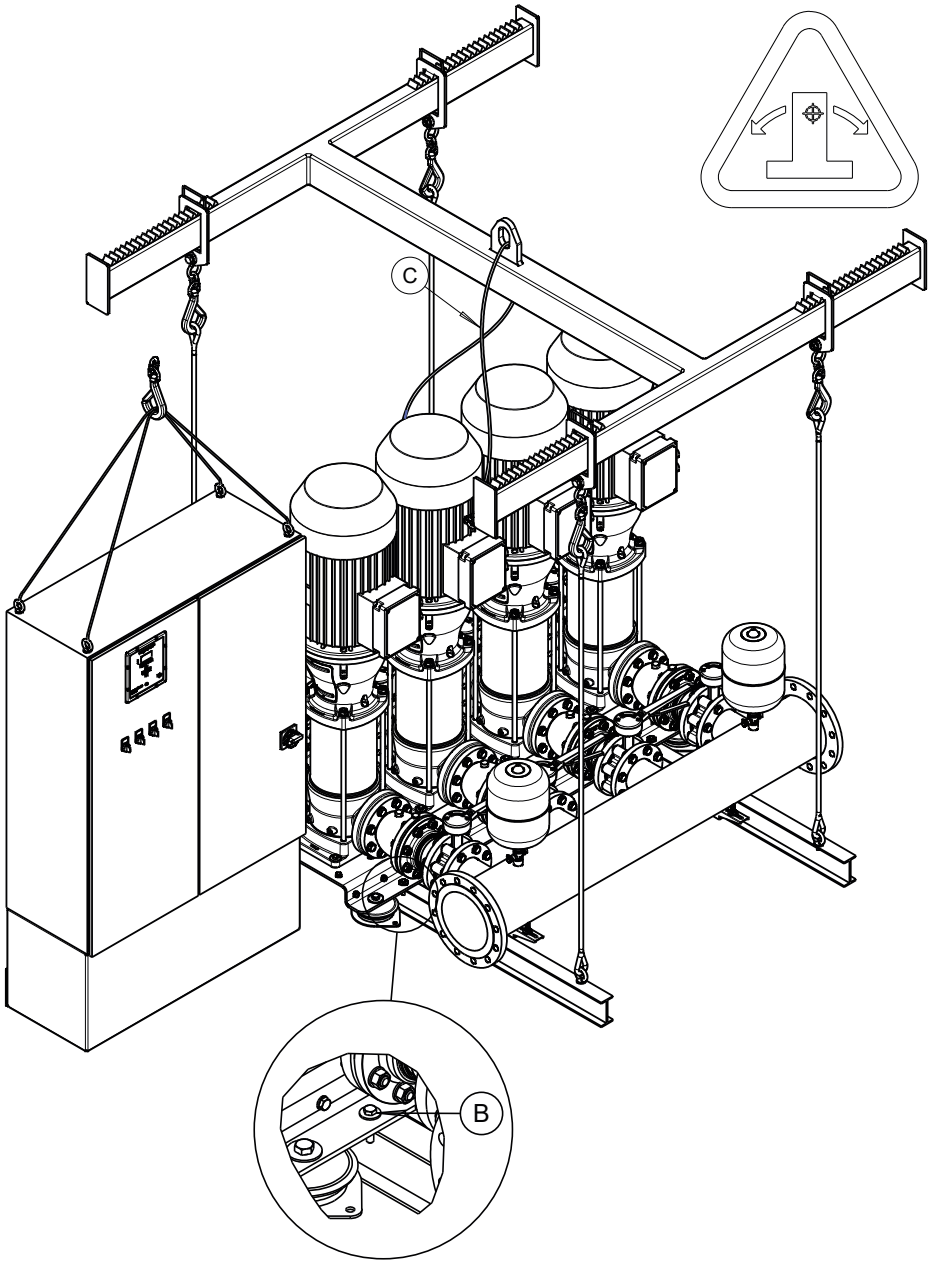

Fig. 2: Lifting the pressure booster system and control cabinet separately

✓ Before lifting the pressure booster system and control cabinet, disconnect the power cables.

1. Attach lifting beams to the lifting lugs (B) provided at the baseplate.
2. Use an anti-tilting device (C).

Example: Lifting the pressure booster system and control cabinet together on one baseplate

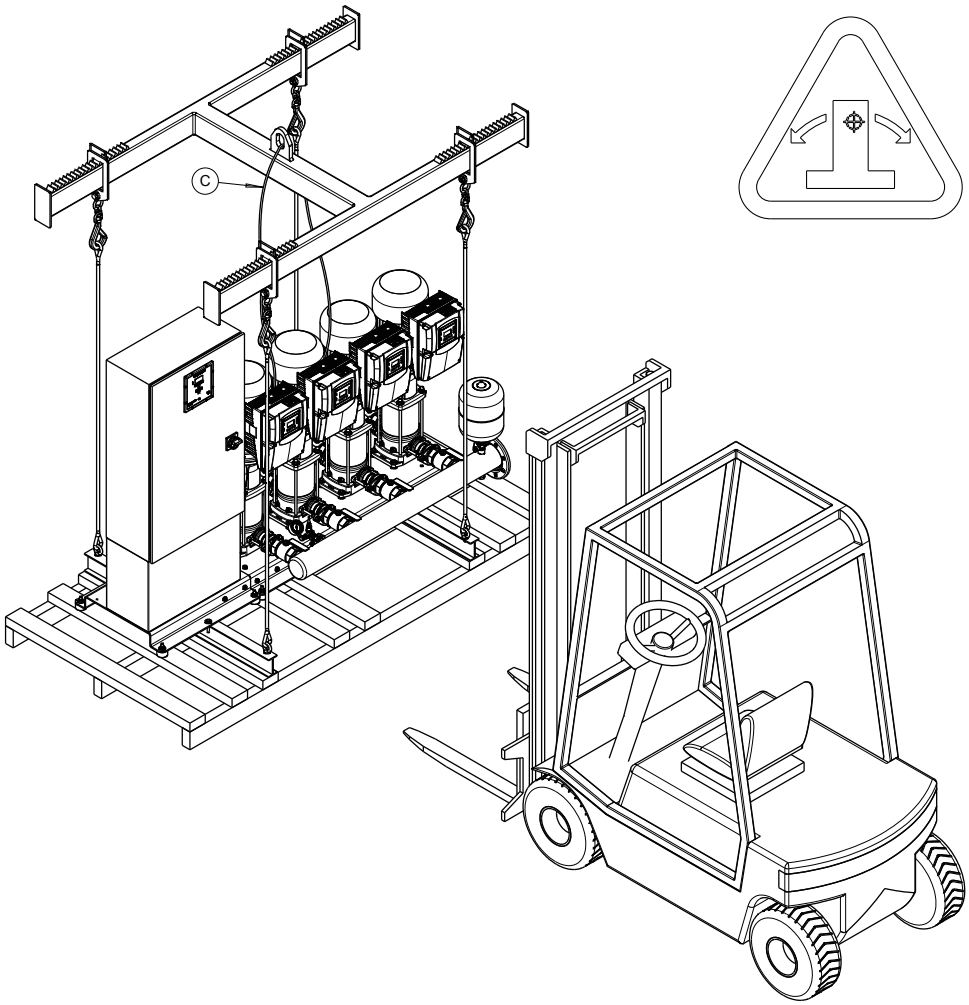

Fig. 3: Lifting the pressure booster system and control cabinet together on one baseplate

1. Use an anti-tilting device (C).

3.3 Storage/preservation

CAUTION

Damage during storage due to frost, moisture, dirt, UV radiation or vermin

Corrosion/contamination of pressure booster system!

- ▷ Store the pressure booster system in a frost-proof room. Do not store outdoors.

CAUTION

Wet, contaminated or damaged openings and connections

Leakage or damage of the pressure booster system!

- ▷ Only open the openings of the pressure booster system at the time of installation.

NOTE

Rotate the shaft by hand every three months, e.g. via the motor fan.

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If commissioning is to take place some time after delivery, the following measures are recommended when storing the pressure booster system:

Store the pressure booster system in a dry, protected room where the atmospheric humidity is as constant as possible.

Table 7: Ambient conditions for storage

Ambient condition	Value
Relative humidity	50 % maximum
Ambient temperature	0 °C to +40 °C

- Frost-free
- Well-ventilated

3.4 Return to supplier

1. Drain the pressure booster system as per operating instructions.
2. Always flush and clean the pressure booster system, particularly if it has been used for handling noxious, explosive, hot or other hazardous fluids.
3. If the pressure booster system has handled fluids whose residues could lead to corrosion damage in the presence of atmospheric humidity or could ignite upon contact with oxygen, the pressure booster system must also be neutralised and treated with anhydrous inert gas to ensure drying.
4. Always complete and enclose a certificate of decontamination when returning the pressure booster system. (⇨ Section 12, Page 81)
   Always indicate any safety and decontamination measures taken.

NOTE

If required, a blank certificate of decontamination can be downloaded from the following web site: www.ksb.com/certificate_of_decontamination

3.5 Disposal

⚠ WARNING

Fluids handled, consumables and supplies which are hot and/or pose a health hazard

Hazard to persons and the environment!

- ▷ Collect and properly dispose of flushing fluid and any fluid residues.
- ▷ Wear safety clothing and a protective mask if required.
- ▷ Observe all legal regulations on the disposal of fluids posing a health hazard.

1. Dismantle the pressure booster system.
   Collect greases and other lubricants during dismantling.
2. Separate and sort the pump materials, e.g. by:
   - Metals
   - Plastics
   - Electronic waste
   - Greases and other lubricants
3. Dispose of materials in accordance with local regulations or in another controlled manner.

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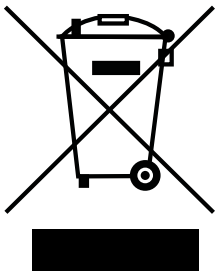

Electrical or electronic equipment marked with the adjacent symbol must not be disposed of in household waste at the end of its service life.

Contact your local waste disposal partner for returns.

If the used electrical or electronic equipment contains personal data, the operator is responsible for deleting it before the equipment is returned.

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4 Description

4.1 General description

- Pressure booster system

4.2 Product information as per Regulation No. 1907/2006 (REACH)

For information as per chemicals Regulation (EC) No. 1907/2006 (REACH), see http://www.ksb.com/reach.

4.3 Designation

Example: KSB Delta Macro SVP 3/1508

Table 8: Designation key

Code	Description	
KSB Delta Macro	Type series	
SVP	F	Fixed speed pressure booster system
	VC	Pressure booster system with cabinet-mounted variable speed system
	SVP	Pressure booster system with variable speed system and KSB SuPremE
3	Number of pumps	
15	Pump size	
08	Number of pump stages	

4.4 Name plate

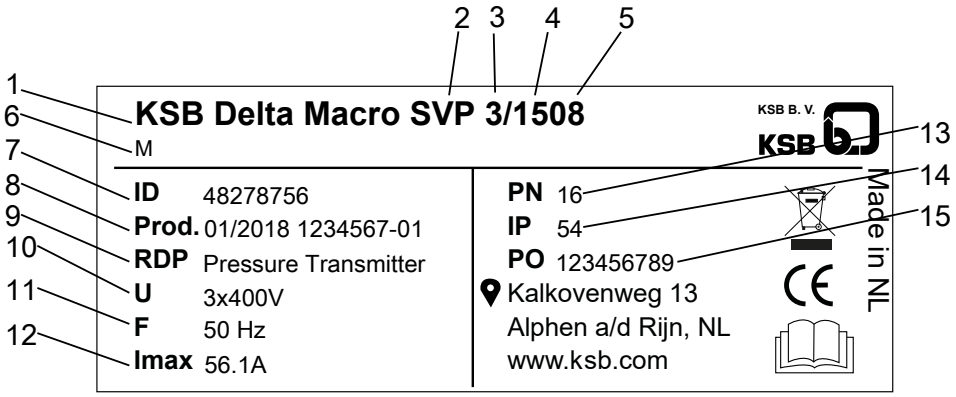

Fig. 4: Name plate (example)

1	Type series	9	Dry running protection
2	Design	10	Power supply voltage
3	Number of pumps	11	Power supply frequency
4	Size	12	Maximum current input
5	Number of pump stages	13	Max. operating pressure
6	Inlet conditions[2)]	14	Enclosure
7	Serial number	15	Order number
8	Month of production / year of production, consecutive number		

[2] M = Inlet side of pressure booster system connected to the municipal water supply, suction head operation, F = Pressure booster system with break tank arranged on same level as pump, suction head operation, L = Pressure booster system with break tank arranged at a lower level, suction lift operation

4.5 Design details

Design

- Compact system mounted on a common base frame
- 2 (F/SVP/VC) / 3 (F/SVP/VC) / 4 (F/SVP/VC) / 5 (SVP/VC) / 6 (SVP/VC) vertical high-pressure centrifugal pumps
- Hydraulic components made of stainless steel / brass
- Integrated dry running protection

KSB Delta Macro F:

- DOL starting
- Power contactor per pump
- Discharge-side gate valve per pump

For inlet conditions F and M only:

- Check valve per pump
- Suction-side gate valve per pump

KSB Delta Macro VC, SVP:

- With variable speed system
- One frequency inverter per pump

Installation

- Stationary dry installation

Drive

KSB Delta Macro F, VC:

- Electric motor
- Efficiency class IE3 to IEC 60034-30

KSB Delta Macro SVP:

- Magnetless synchronous reluctance motor
- Efficiency class IE5 to IEC 60034-30
- KSB SuPremE

Automation

- Control unit (IP54 enclosure)
  - Sheet steel housing: colour RAL 7035
  - BoosterControl Advanced
  - Control panel (display, keys, LEDs, service interface)
  - Lockable master switch (repair switch)
  - Motor protection switch per pump
  - Service interface for KSB ServiceTool
  - Three LEDs signalling the operating status
  - 2 volt-free contacts on terminals are provided for reporting warnings and alerts.
  - Manual-0-automatic selector switch per pump

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4.6 Configuration and function

Fig. 5: KSB Delta Macro

1	Control cabinet	4	Membrane-type accumulator
2	Control unit	5	Manifold
3	Pump	6	Baseplate

Design Fully automatic pressure booster system with two to six vertical high-pressure pumps (3) for ensuring the required supply pressure.

Function KSB Delta Macro F:

Two to six pumps are controlled and monitored by a microprocessor control unit (BoosterControl Advanced). The first pump is started up when the pressure falls below the set start-up pressure (setpoint – bandwidth). Additional pumps are sequenced in automatically in line with actual demand. When demand decreases, the pumps are sequenced out again as the stop pressure (setpoint + bandwidth) is reached. The pump that has been started up first will be stopped first. The pumps are automatically started up in a different order for each new cycle. The actual pressure is measured by an analog pressure transmitter. The function of this pressure transmitter is monitored (live-zero).
This ensures equal distribution of pump operating hours.

KSB Delta Macro VC, SVP:

Two to six pumps are controlled and monitored by a microprocessor control unit (BoosterControl Advanced). Each pump is operated on a frequency inverter and controlled by the control unit so as to ensure a constant discharge pressure of the pressure booster system.
As the demand increases or decreases, peak load pumps are started and stopped automatically. As soon as the demand increases again after one pump has been stopped, another pump which has not been in operation before is started up. When the last pump has been stopped and the demand increases again, the next pump in line is started up on a frequency inverter. The stand-by pump is also included in the alternating cycle.
The standard setting is for the pressure booster system to start automatically as a function of pressure. As long as the pressure booster system is in operation, the pumps are started and stopped as a function of demand (standard setting). In this way it is ensured that the individual pumps operate only in line with actual demand. If the demand drops towards 0, the pressure booster system slowly runs down to the stop point.

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If a pump has not been in operation for 24 hours, a test run is initiated for this pump.

4.7 Noise characteristics

The pressure booster system is available with different numbers and sizes of pumps. For the noise characteristics refer to the operating manual of the pump set. To calculate the expected total sound pressure level, add a defined value to the individual pump set's expected sound pressure level.

Table 9: Values for calculating the total expected sound pressure level

Number of pump sets	Value
	dB(A)
2	+ 3
3	+ 4,5
4	+ 6
5	+ 7
6	+ 7,5

Example Pressure booster system with 4 pump sets (value: + 6 dB(A))

Single pump = 48 dB(A)

48 dB(A) + 6 dB(A) = 54 dB(A)

The expected total sound pressure level of 54 dB(A) may develop when all 4 pump sets are running under full-load conditions.

4.8 Scope of supply

Depending on the model, the following items are included in the scope of supply:

Pressure booster system

- Two to six vertical high-pressure centrifugal pumps
- Discharge-side, direct-flow membrane-type accumulator, approved for drinking water
- 1 check valve and 2 shut-off valves per pump set to DIN / DVGW
- Pressure transmitter on the suction side and discharge side
- Pressure gauge
- Powder-coated / epoxy resin-coated steel baseplate

For Movitec 2B, Movitec 4B, Movitec 6B, Movitec 10B and Movitec 15B:

- With oval flange
- Pressure booster system with rubber feet

For Movitec 25B, Movitec 40B, Movitec 60B, Movitec 90B and Movitec 125B:

- With round flange
- Pressure booster system with level-adjustable feet and rubber pads

Control unit

- IP54 enclosure
- Control panel (display, keys, LEDs, service interface)
- Transformer for control voltage
- Motor protection switch per pump
- Lockable master switch (repair switch)
- Terminal strip/terminals with identification for all connections
- Circuit diagram and list of electric components
- Connection for analog or digital dry running protection equipment
- Remote ON/OFF input

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4.8.1 Inlet conditions, version M

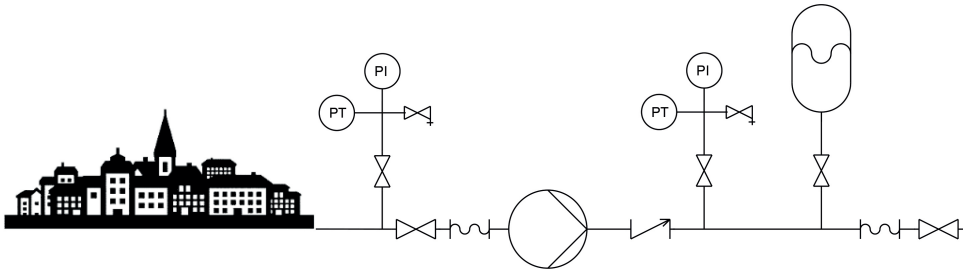

Fig. 6: M = Inlet side of pressure booster system connected to the municipal water supply, suction head operation

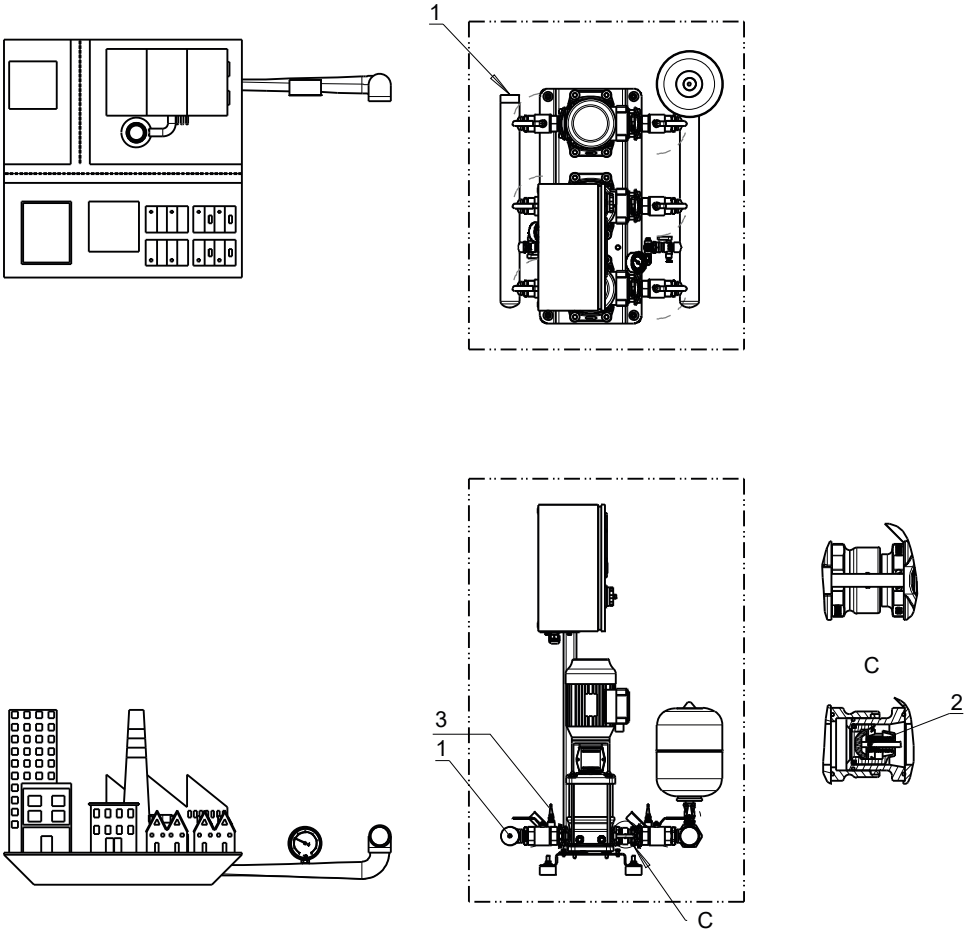

Fig. 7: Scope of supply for version M

1	Suction line (included in KSB's scope of supply)
2	Lift check valve (included in KSB's scope of supply)
3	Dry running protection (included in KSB's scope of supply)

4.8.2 Inlet conditions, version F

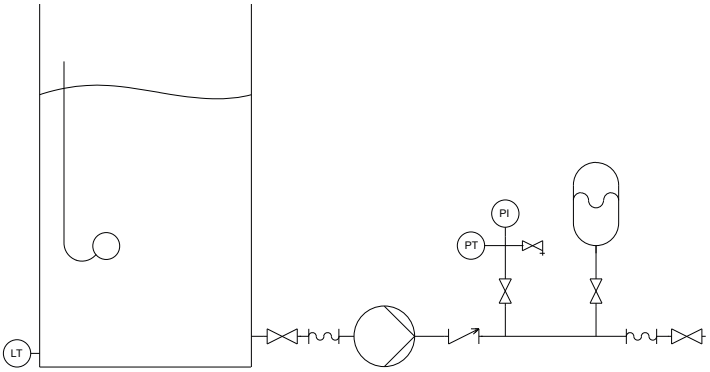

Fig. 8: F = Pressure booster system with break tank arranged on same level as pump, suction head operation

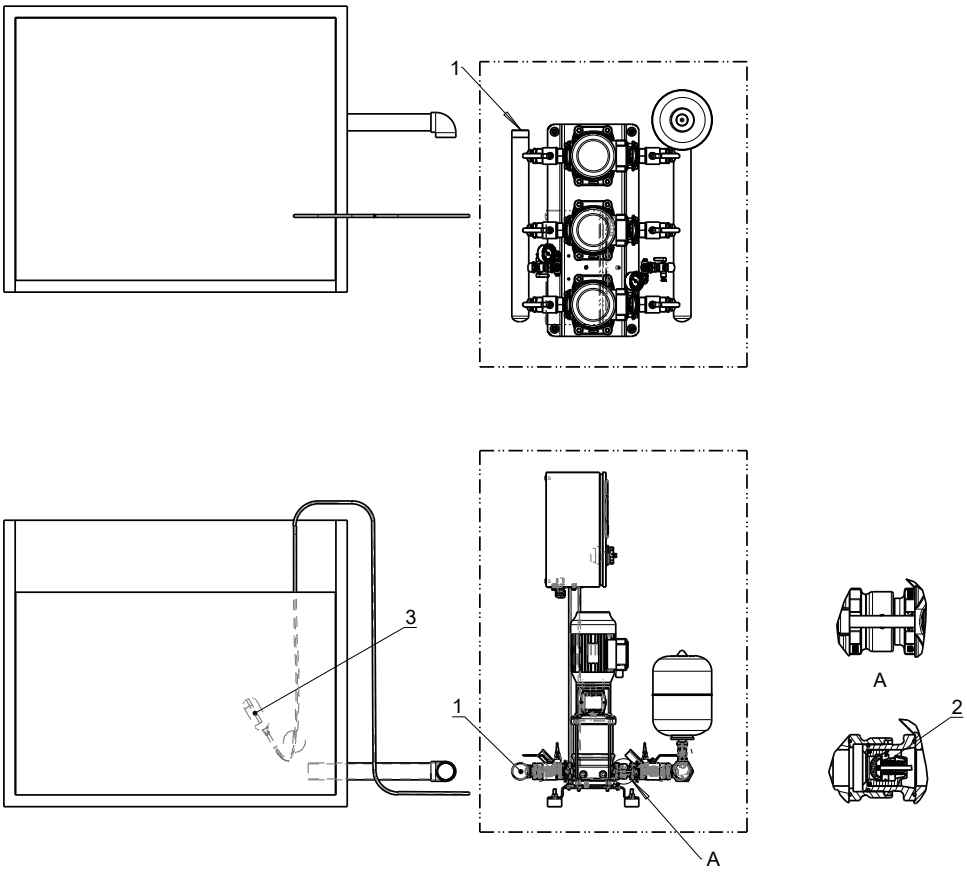

Fig. 9: Scope of supply, version F

1	Suction line (included in KSB's scope of supply)
2	Lift check valve (included in KSB's scope of supply)
3	Dry running protection (not included in KSB's scope of supply)

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4.8.3 Inlet conditions, version L

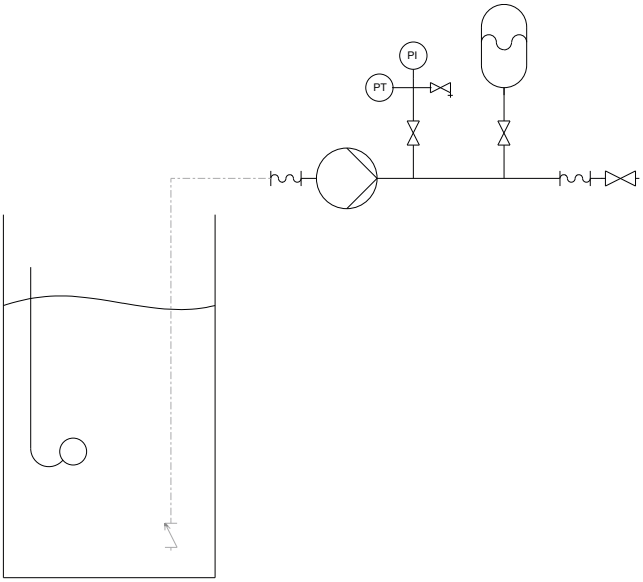

Fig. 10: L = Pressure booster system with break tank arranged at a lower level, suction lift operation

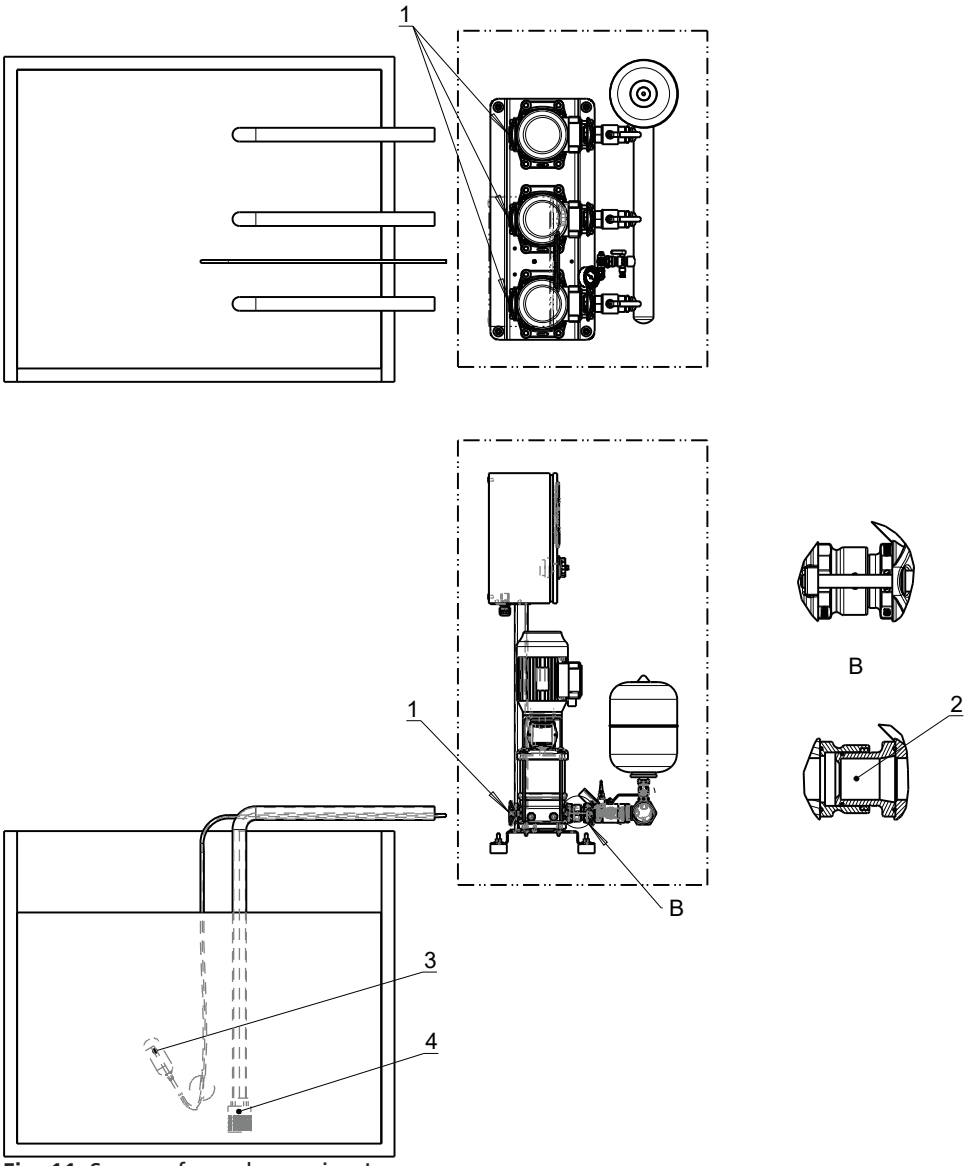

Fig. 11: Scope of supply, version L

1	Suction line (not included in KSB's scope of supply)
2	Lift check valve (not included in KSB's scope of supply)
3	Dry running protection (not included in KSB's scope of supply)
4	Foot valve (not included in KSB's scope of supply)

4.9 Dimensions and weights

For dimensions and weights refer to the outline drawing.

4.10 Terminal wiring diagram

For the terminal assignment refer to the circuit diagram.

4.11 Potential equalisation

A terminal marked with the earth symbol is provided at the power connection for connecting a PE conductor.

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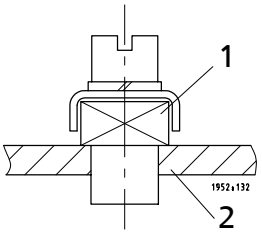

Fig. 12: PE connection

1	Earthing terminal	2	Location of power connection

5 Installation at Site

5.1 Installation

⚠ WARNING

Installation on mounting surfaces which are unsecured and cannot support the load

Personal injury and damage to property!

- ▷ Use a concrete of compressive strength class C12/15 which meets the requirements of exposure class X0 to EN 206-1.
- ▷ The mounting surface must have set and must be completely horizontal and even.
- ▷ Observe the weights indicated.

NOTE

Do not install pressure booster systems next to sleeping or living quarters.

NOTE

The anti-vibration mounts provide adequate insulation against solid-borne noise.

Before beginning with the installation check the following:

- All structural work required has been checked and prepared in accordance with the dimensions in the outline drawing.
- The pressure booster system can be operated on the power supply network in accordance with the data on the name plate.
- The place of installation is frost-free.
- The place of installation can be locked.
- The place of installation is well-ventilated.
- The place of installation is well-lit.
- A suitably dimensioned drain connection (e.g. leading to a sewer) is available.
- If expansion joints are used, take note of their creep resistance. Expansion joints must be easily replaceable.

The pressure booster system is designed for a maximum ambient temperature of 0 °C to 30 °C at a relative humidity of 60 %.

5.2 Installing the pressure booster system

⚠ WARNING

Top-heavy pressure booster system

Risk of personal injury by pressure booster system tipping over!

- ▷ Pressure booster systems awaiting final installation must be secured against tipping over.
- ▷ Firmly anchor the pressure booster system.

NOTE

To prevent the transmission of piping forces and solid-borne noise, installing expansion joints with length-limiters is recommended.

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For Movitec 25B, Movitec 40B, Movitec 60B, Movitec 90B and Movitec 125B:

✓ The pressure booster system's packaging has been removed.

✓ A suitable place of installation has been selected that meets the requirements.

✓ Sufficient clearance in all directions is provided for servicing work.

1. Mark out the anchoring holes on the floor as shown in the outline drawing.
2. Drill the holes (maximum diameter: 12 mm).
3. Insert plug fixings of appropriate size.
4. Place the pressure booster system in its correct installation position.
5. Use suitable bolts to firmly anchor the pressure booster system.

For Movitec 2B, Movitec 4B, Movitec 6B, Movitec 10B and Movitec 15B:

✓ The pressure booster system's packaging has been removed.

✓ A suitable place of installation has been selected that meets the requirements.

✓ Sufficient clearance in all directions is provided for servicing work.

1. Place the pressure booster system in its correct installation position.

5.3 Mounting the accumulator

CAUTION

Dirt in the pressure booster system

Damage to the pump sets!

▷ Clean the accumulator before filling it.

✓ The original operating manual of the pressure booster system is on hand.

1. Mechanically and electrically connect the accumulator in accordance with the original operating manual supplied.

5.4 Connecting the piping

CAUTION

Air pockets in suction line

Pressure booster system cannot prime!

▷ Lay the pipe with a continuously rising slope.

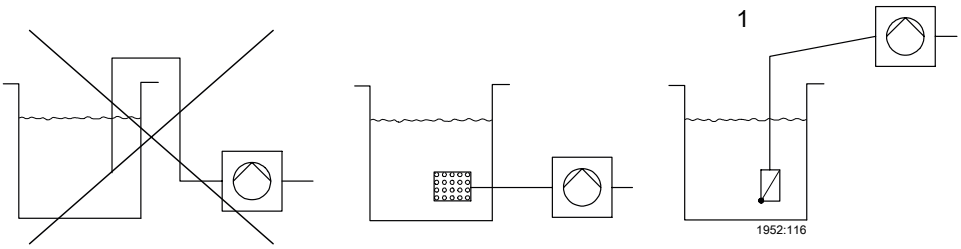

Fig. 13: Correct piping connection

1	Suction lift operation

1. Mechanically support the suction head line on site to provide for absorption of mechanical forces.
2. Install the piping without transmitting any stresses and strains.
3. Connect the piping to the distribution lines on the inlet side and discharge side.

5.4.1 Fitting an expansion joint (optional)

DANGER

Sparks and radiant heat

Fire hazard!

- ▷ Take suitable precautions to protect the expansion joint if any welding work is carried out.

CAUTION

Leaking expansion joint

Flooding of installation room!

- ▷ Do not apply any paint to the expansion joint.
- ▷ Keep the expansion joint clean.
- ▷ Regularly check for cracks or blisters, exposed fabric or other defects.

✓ Sufficient clearance in all directions is provided for checking the expansion joint.

✓ The expansion joint is not insulated along with the pipeline insulation.

1. The expansion joint has a length limiter with solid-borne sound insulation.
2. Install the expansion joint in the piping free of twist or distortion. Never use the expansion joint to compensate for misalignment or mismatch of the piping.
3. Evenly tighten the bolts crosswise. The ends of the bolts must not protrude from the flange.

5.4.2 Fitting the pressure reducer (optional)

NOTE

A pipe length of approximately 600 mm must be provided on the inlet side to accommodate a pressure reducer, if necessary.

NOTE

A pressure reducer must be installed if the inlet pressure fluctuation is too high for the pressure booster system to operate as intended or if the total pressure (inlet pressure and shut-off head) exceeds the design pressure.

The inlet pressure (p_{inl}) varies between 4 and 8 bar. A minimum pressure gradient of 5 m is required for the pressure reducer to function properly. This means that the pressure reducer must be mounted 5 m higher than the pressure booster system. The pressure drops by about 0.1 bar per metre of height difference. Alternatively, the pressure reducer can be subjected to a pressure of 0.5 bar.

Example

p_{inl} = 4 bar

Minimum pressure gradient = 5 m ≙ 0.5 bar

Downstream pressure: 4 bar - 0.5 bar = 3.5 bar.

✓ A minimum pressure gradient of 5 m is available.

1. Install the pressure reducer in the pipe on the inlet side.

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5.5 Electrical connection

DANGER

Electrical connection work by unqualified personnel

Danger of death from electric shock!

- ▷ Always have the electrical connections installed by a trained and qualified electrician.
- ▷ Observe regulations IEC 60364.

WARNING

Incorrect connection to the mains

Damage to the mains network, short circuit!

- ▷ Observe the technical specifications of the local energy supply companies.

NOTE

Installing a motor protection device is recommended.

NOTE

If a residual current device is installed, observe the operating manual for the frequency inverter.

Lightning protection

- Electrical installations must be protected against overvoltage (compulsory since 14 December 2018) (see DIN VDE 0100-443 (IEC60364-4-44:2007/A1:2015, modified) and DIN VDE 0100-534 (IEC 60364-5-53:2001/A2:2015, modified). Whenever modifications are made to existing installations, retrofitting a surge protective device (SPD) in accordance with VDE is mandatory.
- A maximum cable length of 10 metres should not be exceeded between the surge protective device (usually type 1, internal lightning protection) installed at the service entrance and the equipment to be protected. For longer cables, additional surge protective devices (type 2) must be provided in the sub-distribution board upstream of the equipment to be protected or directly in the equipment itself.
- The associated lightning protection concept must be provided by the operator or by a suitable provider commissioned by the operator. Surge protective devices can be offered for the control units on request.

Wiring diagram

The wiring diagrams are located in the control cabinet, which is where they must be stored.
The product literature of the switchgear and controlgear assembly supplied with the system includes a list of the electrical components installed. When ordering spare parts for electrical components, always indicate the number of the wiring diagram.

Terminal assignment

For the terminal assignment refer to the wiring diagram.

5.5.1 Sizing the power cable

Determine the cross-section of the power cable based on the total rated power required.

5.5.2 Connecting the pressure booster system

✓ The pressure booster system can be operated on the power supply network in accordance with the data on the name plate.

✓ The wiring diagram is available.

1. Connect terminals L1, L2, L3, PE and N in accordance with the wiring plan.
2. Connect the potential equalisation conductor on the baseplate to the terminal with the earthing symbol.

   ⇨ The earthing connection is located underneath the control cabinet. Optionally, a connection is located at the manifold.

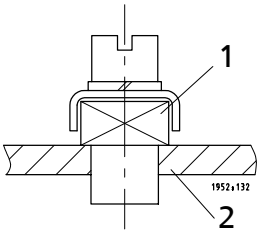

Fig. 14: Connecting the potential equalisation conductor

1	Earthing terminal	2	Baseplate

3. Connect the remote ON/OFF input. (⇨ Section 5.5.3, Page 32)
4. Connect the dry running protection device. (⇨ Section 5.5.4, Page 32)

5.5.3 Connecting the remote ON/OFF input

1. Establish the connection in accordance with the wiring diagram.

5.5.4 Connecting the dry running protection device

✓ The original operating manual of the dry running protection device is on hand.

1. Fit the dry running protection device in accordance with the supplied original operating manual. Connect it in the control unit in accordance with the supplied original operating manual.

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6 Commissioning/Start-up/Shutdown

6.1 Commissioning/Start-up

6.1.1 Prerequisites for commissioning/start-up

CAUTION

Pump set running dry

Damage to the pump set/pressure booster system!

- ▷ Use dry running protection. If the dry running protection terminal is disabled by means of a bridge, the operator shall assume responsibility for any dry running that might occur.

Ensure that the following requirements are met prior to commissioning/start-up:

- The pressure booster system has been properly connected to the electric power supply and is equipped with all protection devices.
- All relevant VDE standards and/or regulations applicable in the country of use are complied with.
- The dry running protection device has been installed. (⇨ Section 5.5.4, Page 32)

6.1.2 Priming and venting the pressure booster system

CAUTION

Foreign matter in the piping

Damage to the pump / pressure booster system!

- ▷ Before commissioning/starting up or functional check running the pressure booster system, make sure that there is no foreign matter in the pressure booster system or piping.

CAUTION

Operation without the fluid to be handled

Damage to the pump sets!

- ▷ Prime the pressure booster system with the fluid to be handled.

NOTE

Prior to its delivery, the pressure booster system will be tested hydraulically with water and then drained again. For technical reasons the presence of some residual water is unavoidable.

Prior to commissioning/start-up observe EN 806. After prolonged standstill periods, flushing or professional disinfection is recommended. For extensive or branched piping systems, flushing the pressure booster system can be restricted to a limited area.

NOTE

Minor leakage of the mechanical seals during commissioning is normal and will cease after a short period of operation.

Have commissioning carried out by specialist KSB staff.

- ✓ The original operating manual of the pump set is on hand.
- ✓ The pipe unions between the pump set and the piping have been re-tightened.
- ✓ Flange connections have been firmly tightened.

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- ✓ The cooling air inlet openings and cooling air outlet openings at the motor are unobstructed.
- ✓ All shut-off valves are open.
- ✓ The pre-charge pressure of the accumulator has been checked. (⇨ Section 8.3, Page 52)
- ✓ The minimum flow rate has been observed. (⇨ Section 6.2.5, Page 37)

1. Set the master switch to 0; unlock all motor protection switches (if applicable).
2. Provide connection to power supply.
3. Open the vent plugs at the pump set in accordance with the supplied original operating manual of the pump set.
4. Slowly open the inlet-side shut-off valve and prime the pressure booster system until the fluid to be handled escapes through the vent holes.
5. Close and slightly tighten the pump vent plugs.
6. Switch on all motor protection switches.
7. If fitted, set the manual-0-automatic selector switches to “automatic”.
8. Switch on the master switch.
9. Open the discharge-side valve.
10. When all pump sets have been run once, loosen the vent plugs again to let any remaining air escape while the pump is switched off.
11. Close the vent plug.
12. Check that the pump sets are running smoothly.
13. Close the discharge-side valve in order to verify whether the pump sets reach the maximum shut-off head.
14. Open the discharge-side valve.
15. Set the dry running protection device.

6.1.3 Dry running protection

Pressure booster systems are fitted with a pressure transmitter as dry running protection device.

A float switch whose volt-free contact closes the circuit in upper float position can be connected to the control system as dry running protection. Follow the float switch manufacturer's instructions on how to set the float switch levels.

6.1.4 Start-up

NOTE

The pressure booster system is factory-set to the data indicated on the name plate.

- ✓ The pressure booster system has been primed and vented. (⇨ Section 6.1.2, Page 33)

1. Switch on the master switch.

⇨ The indicator lamp lights up, indicating the system’s readiness for operation.

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6.1.5 Checklist for commissioning/start-up

Table 10: Checklist

Steps to be carried out	Action	Done
1	Read the operating manual.	
2	Compare the power supply data against the name plate data.	
3	Check the earthing system/take measurements.	
4	Check the mechanical connection to the water mains. Re-tighten the flange and pipe unions.	
5	Prime and vent the pressure booster system from the inlet side.	
6	Check the inlet pressure.	
7	Check whether all cables are firmly connected to the terminals inside the control unit.	
8	Compare the settings of the motor protection switches with the name plate data and re-adjust if necessary.	
9	Check the start-up pressure and the stop pressure; re-adjust if necessary.	
10	Test the proper function of the dry running protection equipment. If not fitted, make a relevant note in the commissioning report.	
11	After the pump sets have been running for 5 to 10 minutes, vent them again.	
12	Set all switches to automatic.	
13	Check the pre-charge pressure.	
14	Enter any deviations from the name plate or order documentation in the commissioning report.	
15	Complete the commissioning report together with the operator/user and instruct the operator/user as to the function of the unit.	

6.2 Operating limits

DANGER

Non-compliance with operating limits

Damage to the pump set!

- ▷ Comply with the operating data indicated in the data sheet.
- ▷ Avoid operation against a closed shut-off element.
- ▷ Never operate the pump set outside the limits specified below.

DANGER

Non-compliance with operating limits for the fluid handled

Explosion hazard!

- ▷ Never use the pump to handle different fluids which might react chemically with each other.
- ▷ Never use the pump to handle a flammable fluid with a fluid temperature above the ignition temperature.

6.2.1 Frequency of starts

To prevent high temperature increases in the motor and impermissible loads on the pump, motor, seals and bearings, do not exceed a certain number of starts per hour. See original operating manual of the pump sets.

6.2.2 Ambient temperatures

Observe the following parameters and values during operation:

Table 11: Permissible ambient conditions

Ambient condition	Value
Ambient temperature	0 °C to +30 °C
Relative humidity	50 % maximum

6.2.3 Maximum operating pressure

CAUTION

Permissible operating pressure exceeded

Damage to connections and seals!

- ▷ Never exceed the operating pressure specified in the data sheet.

The maximum operating pressure equals 16, 25 or 40 bar, depending on the design variant. See name plate.

6.2.4 Fluid handled

6.2.4.1 Permissible fluids to be handled

- Clean fluids not chemically or mechanically aggressive to the pump materials
- Drinking water
- Service water
- Cooling water

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6.2.4.2 Fluid temperature

Table 12: Temperature limits of the fluid handled

Permissible fluid temperature	Value
Maximum	+60 °C +25 °C to DIN 1988 (DVGW)[3)]
Minimum	0 °C

6.2.5 Minimum flow rate

Table 13: Minimum flow rate per pump in manual mode

Size	Minimum flow rate per pump
	[l/h]
Movitec 2B	200
Movitec 4B	400
Movitec 6B	600
Movitec 10B	1100
Movitec 15B	1600
Movitec 25B	2800
Movitec 40B	4600
Movitec 60B	6100
Movitec 90B	8500
Movitec 125B	12500

6.3 Shutdown

6.3.1 Stopping

1. Set the master switch to 0.
2. Set the manual-0-automatic selector switch to 0.

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[3] Applies to the handling of drinking water (Germany and the Netherlands only)

6.3.2 Measures to be taken for shutdown

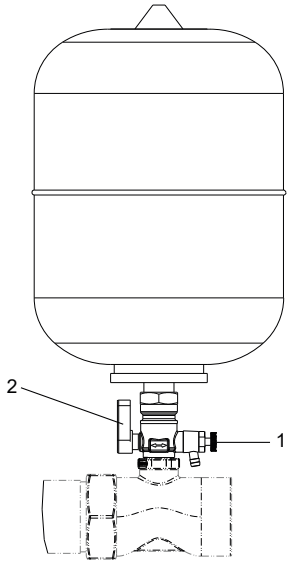

Fig. 15: Venting and draining the accumulator

1	Vent plug
2	Vent valve lever

✓ The pressure booster system has been switched off.

1. Turn the ball valve lever 2 by 45 degrees.
2. Open the vent plug 1 at the accumulator.
   ⇨ The pressure booster system is being vented and drained.
3. Close the vent plug 1 at the accumulator.
4. Turn the ball valve lever 2 back into open position (upwards).

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7 Operation

	**CAUTION** **Incorrect operation** Water supply is not assured! ▷ Make sure to comply with all local regulations, particularly the EC Machinery Directive and the EC Directive on Low-Voltage Equipment.

The pressure booster system is factory-set to the values specified by the customer or to standard values. Changes and re-sets can be made via the control panel.
(⇨ Section 7.7, Page 46)

7.1 Control panel

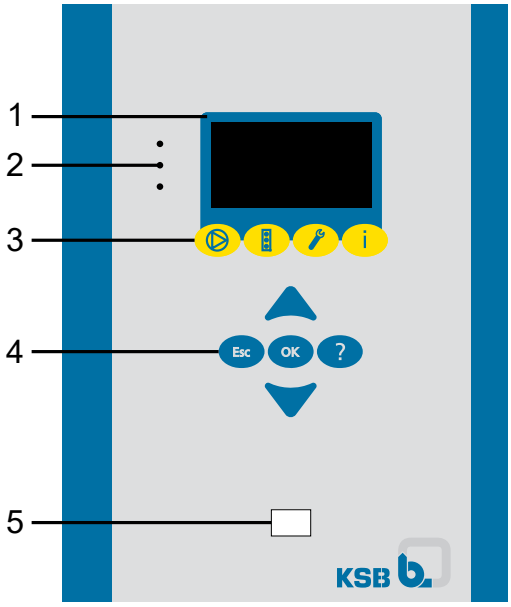

Fig. 16: Control panel

1	Display
2	LED display
3	Function keys
4	Navigation keys
5	Service interface

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7.1.1 Display

The display contains the following information:

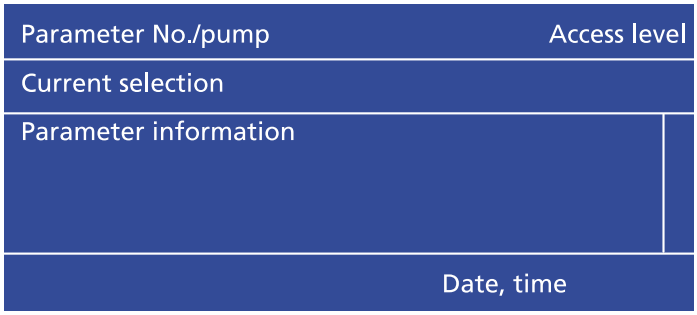

Fig. 17: Display elements

Table 14: Display elements and description

Display element	Description
Parameter No./pump	Shows the number of the parameter or pump selected The parameter No. indicates the path through the menu levels.
Current selection	Shows the current parameter in plain text
Parameter information	List of selectable parameters/parameter information
Level	Shows the current access level (⇨ Section 7.4, Page 43)
Date, time	Shows the set date and time

7.1.2 LEDs

The LED provides information on the operating status.

Table 15: LED description

LED	Description
Green	Trouble-free operation
Yellow	One or more warnings are active.
Red	One or more alerts are active.

7.1.3 Function keys

You can use the menu keys to access the elements at the first menu level directly.

Table 16: Assignment of menu keys

Key	Menu
	Operation
	Diagnosis
	Settings
	Information

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7.1.4 Navigation keys

For navigating through the menus and confirming settings:

Table 17: Control unit: Navigation keys

Key	Description
	**Direction keys:** ▪ Move up/down in the menu options ▪ Increase/decrease a numerical value ▪ Scroll up or down
	**Escape key:** ▪ Cancel an entry without saving it. ▪ Move up one menu level.
	**OK key:** ▪ On the start display: Open the quick menu. ▪ Confirm settings. ▪ Confirm a menu selection. ▪ When entering numbers: Go to the next digit.
	**Help key:** ▪ Displays a help text for each selected menu option.

7.1.5 Service interface

The service interface allows a PC/notebook to be connected via an RS232 cable. The service interface serves to parameterise and update the control unit.

7.2 Menu structure

Table 18: Menu overview

Main menu	Key	Submenu	Menu display
➡	Operation 	➡ General	▪ System pressure ▪ System load % ▪ RDP switch present/not present ▪ Inlet pressure ▪ Level content % ▪ Level height m ▪ Ambient temp. ▪ Digital inputs
		➡ Pumps	▪ Operating mode of pumps ▪ Display pump load ▪ Display thermal protection
		➡ Time and statistics	▪ Operating hours ▪ Service interval ▪ Current min. pump runtime
➡	Diagnosis 	➡ General	▪ Display messages ▪ Show history ▪ Acknowledge faults ▪ Clear history
➡	Settings 	➡ Control panel	▪ Basic settings ▪ CAN configuration ▪ Service interface ▪ Logo
		➡ Control unit	▪ Login ▪ Service
		➡ System configuration	▪ Number of pumps ▪ Configuration suction side ▪ Configuration operating mode
		➡ System settings	▪ Suction side ▪ Discharge side ▪ Configuration of frequency inverter
		➡ Pressure configuration	▪ Configuration setpoint ▪ Configuration dry running protection
		➡ Timer settings	▪ Functional check run ▪ Alternative setpoint
		➡ Time/date	
		➡ Program outputs	
		➡ Messages	
		➡ Main menu	
➡	Information 	➡ Control module	▪ Serial number ▪ Material number ▪ Firmware ▪ Parameter set ▪ Hardware version

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7.3 Quick menu

The Quick Menu allows access to the main parameters which may be required for adapting the pressure booster system to site conditions. Press OK to call up the Quick Menu from the start screen.

- PIN
- Proportional constant
- Integral constant
- Differential constant
- Setpoint
- Bandwidth
- Accumulator pressure
- Delta P correction (dynamic pressure compensation)
- High pressure alert
- Low pressure alert
- Minimum runtime
- Start delay
- Stop delay
- RDP delay
- High/low alert delay

7.4 Access levels

Various access levels have been defined to prevent unintentional or unauthorised access to the pressure booster system parameters.

"Standard" level Unless users log on to one of the other access levels, they will only have limited access to parameters.

"Customer" level Access level for expert users.
This level enables access to all the parameters required for commissioning. You must enter the password under (3-2-1-1) Login to gain access.
"C" is displayed.
If password protection is deactivated via parameter 3-2-1-2, this access level becomes the "Standard" access level.
The password is "7353".

"Service" level Access level for service personnel.
You must enter the password under (3-2-1-1) Login to gain access.
"S" is displayed.

"Factory" level Access level for the manufacturer only.
"F" is displayed.

NOTE

If no keys are pressed for ten minutes, the system will automatically return to the "Standard" access level.

7.5 Displaying and changing parameters

The parameter numbers reflect the navigation path of the menu. The first digit indicates the first menu level directly accessible via the four function keys.

Parameter list: (⇨ Section 10.2, Page 60)

Table 19: Example: Displaying and changing parameter 3-5-1 (setting setpoint)

-	Step 1: Logging in 1. Log in at Customer level (entering password). (⇨ Section 7.4, Page 43) ⇨ "C" is displayed.
	Step 2: Accessing menu 1. Press function key **Settings** (menu level 3-1). ⇨ 3-1 is displayed.
 	Step 3: Navigating 1. Press direction key until 3-5 is displayed. 2. Press OK to confirm selection. ⇨ 3-5-1 is displayed.
 	Step 4: Changing the parameter value 1. To change the parameter value, press OK a second time. 2. To change the numerical value, press the direction key. ⇨ Changes are made from left to right. The bar above the entry displays the value currently being entered in relation to the value range.
	Step 5: Confirming value 1. Press OK to confirm changed value. ⇨ The cursor moves to the next position (second position from the left).
	Step 6: Confirming value ✓ The parameter value has been successfully changed. 1. Press OK to save new parameter values.
	Step 7: Leaving the parameter menu 1. To leave the parameter menu, press ESC several times. ⇨ The main display is shown. ⇨ The new setpoint is active.

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7.6 Displaying and acknowledging warning and alert messages

The LEDs signal warning messages (yellow) and alert messages and transmit the signals to the relay outputs. The messages can be viewed and acknowledged in the menu.

Fault messages (⇨ Section 10.3, Page 76)

Table 20: Displaying and acknowledging fault messages

	Step 1: Accessing menu 1. Press function key **Diagnosis** (menu level 2-1). ⇨ 2-1-1 is displayed (displaying messages). ⇨ The current fault message is displayed.
	Step 2: Displaying fault message. 1. To display the fault message, press OK. ⇨ 2-1-2 is displayed (showing history). ⇨ Further information on the fault message is displayed.
	Step 3: Reading out further information on the fault message. 1. Press the direction key to read out further information on the fault message. ⇨ *Fault message* ⇨ *Fault occurred: date and time* ⇨ *Fault acknowledged: date and time* ⇨ *Fault dismissed: date and time*
	Step 4: Remedying and acknowledging a fault. ✓ The displayed fault has been remedied. 1. To acknowledge the fault message, press OK. ⇨ 2-1-3 is displayed (acknowledging faults). 2. Re-start the pressure booster system by switching it on and off via the master switch (reset). ⇨ All alerts are acknowledged at the same time. Resetting alerts causes the system to re-start.
	Step 5: Clearing history (optional). ✓ Logged in at Service level. 1. To delete fault history, press OK. ⇨ 2-1-4 is displayed (deleting history).
	Step 6: Leaving menu. 1. To leave menu, press ESC several times. ⇨ The main display is shown.

7.7 Saving and restoring settings

Saving settings

✓ Logged in at Customer level.

1. Call up parameter 3-2-2-4 (saving customer settings).
2. Select OK.

Restoring settings

Restoring factory settings

✓ Logged in at Customer level.

1. Call up parameter 3-2-2-1 (factory settings).
2. Select RESET OK.

⇨ Resets the pressure booster system's values and settings to factory-set defaults.

Resetting to saved settings

✓ Logged in at Customer level.

1. Call up parameter 3-2-2-3 (customer settings).
2. Select RESET OK.

⇨ Resets to settings saved on site.

Resetting to default settings

✓ Logged in at Factory level (for manufacturers only).

1. Select parameter 3-2-2-6 (default settings).
2. Select OK.

⇨ The control unit is reset to the pressure booster system type. No settings for pressure, dry running protection, etc.

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7.8 Operating modes

7.8.1 Manual mode

Manual mode is reserved for emergencies. Continuous manual operation would lead to waste of energy and water and cause the fluid handled and/or the pump set to overheat. The pump sets can be switched to manual mode depending on the pressure booster system design.

- **Standard design:** By selecting the appropriate setting via the manual-0-automatic selector switch every pump set is operated directly on the power supply network, independently of the control unit.

7.8.2 Energy-saving mode

CAUTION

Hunting (excessive starting/stopping) of pressure booster system

Damage to the pumps!

▷ Only activate the energy-saving mode if a sufficiently sized accumulator is fitted on the discharge side.

NOTE

No recommendation can be given for the parameters of the energy-saving mode. The values depend on the system installed and can only be defined at the operational pressure booster system installed on site.

In conjunction with a very large discharge-side accumulator, the energy-saving mode ensures that the pressure booster system runs at an energy-efficient operating point when required to supply very small amounts of water. If a very small amount of water is consumed, the pressure booster system fills the downstream accumulator and stops. Any small water volumes required can then be supplied from the accumulator.

✓ The accumulator has been filled. (⇨ Section 7.9.1, Page 48)

✓ Logged in at Service level.

1. Close the discharge-side shut-off valve slowly until only a single pump set is left running and delivering a small amount of water.
2. Read and record the pump load in parameter 1-1-2.
3. Activate parameter 3-5-4 (charging accumulator).
4. Set parameter 3-11-1 (energy-saving mode) to ON.
5. Set parameter 3-11-2 (direct OFF) to ON.
   The setting OFF *(flow detection)* should only be selected for difficult site conditions and by an expert. (⇨ Section 7.9.2, Page 48)
6. Enter the pump load value in parameter 3-11-3 (stop speed %).
7. Set parameter 3-11-4 (time Direct OFF) to define the time period the pump is to keep on running in order to charge the accumulator before stopping.
8. Adjust parameters 3-11-3 and 3-11-4 until the required stopping behaviour is obtained.

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7.9 Functions

7.9.1 Filling the accumulator

The energy-saving mode prevents the pump sets from starting if only a very small amount of water (e.g. caused by leakage) is required. The required fluid can be supplied from the accumulator (discharge-side accumulator).
(⇨ Section 7.8.2, Page 47)

✓ Logged in at Service level.

1. Select parameter 3-5-4 (charging accumulator).
2. Accumulator filling (setting setpoint).
3. Select parameter 3-11-4 (time Direct OFF).
4. Set the time period the pump is to keep on running in order to fill the accumulator before stopping.
   ⇨ The accumulator is being filled.
5. Set the setpoint to 0.
   ⇨ The function is disabled.

7.9.2 Setting flow detection

When one pump set is operated, the control unit checks the quantity of the fluid handled.
The pump set's speed is slightly lowered within a configurable time interval. If the actual value is within the bandwidth, the control unit triggers the filling of the accumulator and stops the pump set.

Setting the time interval

✓ Logged in at Service level.

1. Call up parameter 3-4-3-5-2 (time flow rate).
2. Set time [seconds].

Setting the bandwidth

✓ Logged in at Service level.

1. Call up parameter 3-4-3-5-1 (bandwidth flow rate).
2. Set the setpoint [%].

7.9.3 Setting Delta P (dynamic pressure compensation function)

The dynamic pressure compensation function is a dynamic flow rate-dependent set value re-adjustment. The system responds to decreasing flow rates by automatically increasing the set value to compensate the pressure losses in the piping.

Activating Delta P

✓ Logged in at Customer level.

1. Select parameter 3-5-10 (Delta Pdynamic pressure compensation).
2. Set setpoint.

7.9.4 Remote ON/OFF (optional)

The remote ON/OFF connection is an NC contact. When this contact is open, all pumps in operation switch off in succession after a configurable stop delay. A warning message is output (yellow LED). When this contact is closed, the pump sets start up again in line with demand. The warning message is cleared.

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7.9.5 Fire alert (optional)

The fire alert connection is an NC contact. When the contact is open, all pumps are started up in succession after a configurable start delay. An alert (red LED) is output. In this case, the dry running protection and/or remote ON/OFF functions, if enabled, are ignored.
When the contact closes, the pump sets will stop depending on demand. The alert is cleared.

7.9.6 Setting the ambient temperature monitoring device (optional)

If the configurable ambient temperature value is exceeded, a warning message is output. The ambient temperature is shown on the display. When the 24-hour average ambient temperature is too high, an alert (red LED) is output. Ambient temperature monitoring cannot be used in combination with the digital inputs for remote reset, setpoint changeover and functional check run.

✓ The temperature sensor Pt1000 is fitted and electrically connected.

1. Call up parameter 3-3-4 (WSD).
2. Set the water flow detection on the accumulator to TEMPERATURE.
3. Call up parameter 3-4-4-3 (ambient temperature).
4. Set the temperature [°C].

7.9.7 Enabling digital inputs (optional)

NOTE

This function cannot be used in conjunction with ambient temperature monitoring.

✓ The accumulator's water flow detection (WSD) function is deactivated.

✓ Logged in at Service level.

1. Call up parameter 3-3-4 (WSD).
2. Set water flow detection on accumulator to OFF.

⇨ WSD inputs 1 to 3 are available.

The following functions can be assigned via the digital inputs:

- Remote reset
  - Activated by pulse to terminals.
- Setpoint changeover (see parameter 3-5-9)
  - Activated by closing the contact, de-activated by opening the contact.
- Functional check run
  - Pulse-activated.

8 Servicing/Maintenance

8.1 General information/safety regulations

⚠ DANGER

Unintentional start-up of pressure booster system

Danger to life!

- ▷ De-energise the pressure booster system for any repair work or servicing work.
- ▷ Ensure that the pressure booster system cannot be re-energised unintentionally.

⚠ WARNING

Improper lifting/moving of heavy assemblies or components

Personal injury and damage to property!

- ▷ Use suitable transport devices, lifting equipment and lifting tackle to move heavy assemblies or components.

⚠ WARNING

Unqualified personnel performing work on the pressure booster system

Risk of personal injury!

- ▷ Always have repair and maintenance work performed by specially trained, qualified personnel.

CAUTION

Incorrectly serviced pressure booster system

Function of pressure booster system not guaranteed!

- ▷ Regularly service the pressure booster system.
- ▷ Prepare a maintenance schedule for the pressure booster system, with special emphasis on lubricants, shaft seals and pump couplings.

The operator ensures that maintenance, inspection and installation are performed by authorised, qualified specialist personnel who are thoroughly familiar with the manual.

- Observe the safety instructions and information.
- For any work on the pump (set) observe the operating manual of the pump (set).
- In the event of damage you can always contact KSB Service.
- A regular maintenance schedule will help avoid expensive repairs and contribute to trouble-free, reliable operation with a minimum of maintenance expenditure and work.
- Never use force when dismantling and reassembling the equipment.

8.1.1 Inspection contract

For all inspection work and servicing work to be carried out at regular intervals we recommend taking out the KSB inspection contract. Contact your service partner for details.

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8.2 Servicing/Inspection

8.2.1 Supervision of operation

CAUTION

Increased wear due to dry running

Damage to the pump set!

- ▷ Never operate the pump set without liquid fill.
- ▷ Never close the shut-off element in the suction line and/or supply line during pump operation.

CAUTION

Impermissibly high temperature of fluid handled

Damage to the pump!

- ▷ Prolonged operation against a closed shut-off element is not permitted (heating up of the fluid).
- ▷ Observe the temperature limits in the data sheet and in the section on operating limits.

While the pump is in operation, observe and check the following:

- If activated, check the functional check run.
- Measure the actual start-up pressure and stop pressure of the pump sets with a pressure gauge. Compare the values with the specifications on the name plate.
- Compare the pre-charge pressure of the accumulator with the recommended data. (⇨ Section 8.3, Page 52)
- Check the rolling element bearings for running noises.
  Vibrations, noise and an increase in current input occurring during unchanged operating conditions indicate wear.
- Monitor the functions of auxiliary connections, if any.

8.2.2 Maintenance schedule

Table 21: Overview of maintenance work

Maintenance interval	Servicing/maintenance work
At least once a year	Check the pump sets for smooth running. Check the mechanical seal for integrity.
	Check the shut-off elements, drain valves and check valves for proper functioning and tightness.
	If fitted, clean the strainer in the pressure reducer.
	If fitted, check the expansion joints for any wear.
	Verify the pre-charge pressure. Check the accumulator for integrity. (⇨ Section 8.3, Page 52)
	Check the automatic switching functionality.
	Check the cut-in levels and cut-out levels.
	Check the inflow, inlet pressure, dry running protection and pressure reducer.

8.3 Setting the pre-charge pressure

⚠ WARNING

Wrong gas

Danger of poisoning!

▷ Use only nitrogen to charge the accumulator.

CAUTION

Pre-charge pressure too high

Damage to the accumulator!

▷ Observe the manufacturer's product literature (see name plate or operating manual of the accumulator).

The accumulator's pre-charge pressure (p) must be lower than the set start-up pressure (p_E) of the pressure booster system.

The best storage volumes are achieved with the following settings (mean value):

- Value 0.9 at start-up pressure > 3 bar
- Value 0.8 at start-up pressure < 3 bar

Example 1 p_E = 5 bar

5 bar × 0.9 = 4.5 bar

With a start-up pressure of 5 bar the pre-charge pressure of the accumulator must be 4.5 bar.

Example 2 p_E = 2 bar

2 bar × 0.8 = 1.6 bar

With a start-up pressure of 2 bar the pre-charge pressure of the accumulator must be 1.6 bar.

Checking the pre-charge pressure

1. Close the shut-off elements fitted underneath the membrane-type accumulator.
2. Drain the membrane-type accumulator via the drain valve.
3. Remove and store the protective cap of the membrane-type accumulator valve.
4. Check the pre-charge pressure using suitable equipment (e.g. tyre pressure gauge).
5. Fit the protective cap of the membrane-type accumulator valve.

Filling the membrane-type accumulator

1. Remove and store the protective cap of the membrane-type accumulator valve.
2. Add nitrogen through the valve.
3. Fit the protective cap of the membrane-type accumulator valve.

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8.4 Resetting dry running protection

If no flow is detected on the suction side and the pressure on the pressure side drops below the set value, the flow monitor stops the pressure booster system (lack of water). Depending on the system design, dry running protection must be reset manually.

Pressure switch and pressure transmitter

If dry running protection devices are available in the form of pressure switches or pressure transmitters, the system is reset automatically (self-reset).

Flow monitor

To reset the dry running protection, set at least one pump set to manual mode.

Resetting via manual-0-automatic selector switch

1. Set the manual-0-automatic selector switch to manual for approx. 10 seconds.

Resetting via frequency inverter

✓ The original operating manual of the frequency inverter is on hand.

1. Set the pump set to manual mode for approx. 10 seconds via the frequency inverter's control unit. See the original operating manual of the frequency inverter.

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9 Trouble-shooting

9.1 Trouble-shooting: pressure booster system

⚠ WARNING

Improper work to remedy faults

Risk of injury!

- ▷ For any work performed to remedy faults, observe the relevant information given in this operating manual and/or in the product literature provided by the accessories manufacturer.

NOTE

Before performing any work on the pump's internal parts during the warranty period please always consult the manufacturer. Our after-sales service will be at your disposal. Non-compliance will lead to forfeiture of any and all rights to claims for damages.

If problems occur that are not described in the following table, consultation with the KSB service is required.

A Pressure booster system cuts out.
B Pressure fluctuations on the discharge side.
C Pressure booster system does not start up.
D Pump running but not delivering water
E Insufficient delivery of pressure booster system.
F Discharge-side pressure too low.
G Discharge-side pressure too high.
H Leakage at mechanical seal.
I Motor/pump overheated.
J Motor protection switch triggered.
K Pressure booster system does not stop.
L Excessive starting/stopping of pressure booster system.
M Motor overheated.

Table 22: Trouble-shooting

A	B	C	D	E	F	G	H	I	J	K	L	M	Possible cause	Remedy[4)]
✗	-	✗	-	-	-	-	-	-	-	-	-	-	Dry-running protection device not connected	Connect or bridge.
✗	-	✗	-	-	-	-	-	-	-	-	-	-	Mains supply interrupted	Check and remedy defect if possible.
✗	-	✗	-	-	-	-	-	-	✗	-	-	✗	Phase failure	Check individual phases and fuse.
✗	-	✗	-	-	-	-	-	-	✗	-	-	✗	Motor protection switch triggered or set incorrectly / pump seized.	Compare setting with the motor's rating plate data and set accordingly. Press reset key.
✗	-	✗	-	-	-	-	-	-	-	-	-	-	Control current fuse tripped.	Check control current fuse. Replace if required.
-	-	✗	-	-	-	-	-	-	-	-	-	-	Lack of water	Check inlet pressure.
-	-	✗	-	-	-	✗	-	-	-	-	-	-	Inlet pressure higher than specified in the purchase order	Fit pressure reducer; contact the manufacturer.

4 Before any work on pressure-retaining components, release the pump set pressure and de-energise the pump set.

A	B	C	D	E	F	G	H	I	J	K	L	M	Possible cause	Remedy[4)]
-	-	-	-	✗	✗	✗	-	✗	✗	✗	-	-	Incorrect power supply; incorrect speed.	Check the mains power supply.
-	✗	✗	✗	✗	✗	-	-	✗	-	-	✗	✗	Shut-off valves fully or partially closed	Check, open as necessary.
-	-	-	✗	✗	-	-	-	✗	-	✗	-	✗	Pump / piping not completely vented and/or primed.	Vent and prime.
-	-	-	✗	✗	✗	-	-	✗	✗	✗	-	✗	Check valve in bypass line defective	Replace.
-	-	-	-	-	✗	-	-	-	-	-	-	-	Insufficient inflow	Restore normal inflow. Connect accumulator.
-	-	-	-	-	✗	-	-	✗	✗	-	-	✗	Pump runs sluggishly.	Have pump repaired by a specialist.
-	-	-	-	-	-	-	✗	-	-	-	-	-	Defective mechanical seal	Replace.
-	-	✗	-	-	-	-	-	✗	-	-	-	✗	Incorrect pre-charge pressure of accumulator	Set correct pre-charge pressure. Replace membrane.
✗	-	✗	✗	-	-	-	-	-	✗	✗	-	-	Inlet-side pressure switch defective or set incorrectly.	Check the value set at the pressure switch; adjust if required.
-	-	-	-	-	-	-	-	✗	-	✗	✗	✗	Defective time relay or time set incorrectly.	Check time relay. Correct minimum operating time if required.
-	-	-	-	-	-	-	-	-	-	-	✗	-	System leaking.	Restore system integrity.
-	-	✗	-	-	✗	✗	-	-	-	✗	✗	-	Discharge-side pressure switch defective or set incorrectly.	Check the value set at the pressure switch; adjust if required.
✗	-	-	-	-	-	-	-	-	✗	-	-	-	Intermittent voltage fluctuations	Press reset/fault acknowledgement key.
-	-	-	✗	-	-	-	-	✗	✗	-	-	✗	Defective check valve	Check and replace if necessary.
-	-	-	✗	✗	✗	-	-	✗	-	✗	-	-	Pump running in the wrong direction of rotation.	Interchange two of the phases of the power supply.
-	-	-	✗	-	✗	-	-	-	-	✗	✗	-	Inlet pressure lower than specified in the purchase order	Connect suction-side inlet tank. Contact the manufacturer.
-	✗	-	-	-	✗	-	-	-	✗	✗	-	-	Water extraction higher than specified in the purchase order	Contact the manufacturer.

9.2 Trouble-shooting: frequency inverter

⚠ WARNING

Improper work to remedy faults

Risk of injury!

- ▷ For any work performed to remedy faults, observe the relevant information given in this operating manual and/or in the product literature provided by the accessories manufacturer.

If problems occur that are not described in the following table, consultation with the KSB service is required.

A Mains fuse rating too small for the nominal mains current.

B Motor does not start.

C Motor running unevenly.

D Max. speed not reached.

E Motor running at maximum speed only.

F Motor running at minimum speed only.

G No/faulty 24 V supply.

H Wrong direction of rotation of the motor.

I Fault message/protective tripping.

Table 23: Trouble-shooting

A	B	C	D	E	F	G	H	I	Possible cause	Remedy
-	✗	-	-	-	-	✗	-	-	No voltage	Check the mains voltage; check the mains fuses.
-	✗	-	-	-	-	-	-	-	No enable	Check enable via DIGIN-EN and system start.
✗	-	-	-	-	-	-	-	-	Mains fuse rating too small for frequency inverter input current	Check configuration/selection of mains fuse.
-	-	-	✗	-	-	-	-	-	No setpoint signal or setpoint set too low / drive overloaded and in i^2t control mode	Check setpoint signal and operating point.
-	-	-	-	✗	-	-	-	-	Process-related persistent control deviation (actual value smaller than setpoint) or no actual value (e.g. due to broken wire)	Check setpoint signal/actual value signal. Check operating point. Check controller setting.
-	✗	- -	-	-	-	-	-	✗	Permissible voltage range undershot/exceeded	Check mains voltage; supply frequency inverter with required voltage.
-	-	-	-	-	-	-	✗	-	Wrong direction of rotation setting	Change the direction of rotation.
-	-	✗	✗	-	-	-	-	✗	Frequency inverter overloaded	Reduce the power input by lowering the speed; check the motor/pump for blockages.
-	✗	-	-	-	-	-	-	✗	Short circuit in control cable/ pump blocked	Check/replace control cable connections. Remove the blockage manually.

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A	B	C	D	E	F	G	H	I	Possible cause	Remedy
-	-	✘	✘	-	-	-	-	✘	Temperature of power electronics or stator winding too high	Reduce the ambient temperature. ▪ Improve ventilation. ▪ Clean cooling fins. ▪ Ensure that the intake opening for the fans is not blocked. ▪ Ensure that the fans are working properly. ▪ Reduce the power input by changing the operating point (system-specific). ▪ Check the permissible load and, if necessary, use external cooling.
-	-	-	-	-	-	✘	-	✘	24 V supply overloaded	Disconnect frequency inverter from the power supply and eliminate the cause of the overload.
-	-	-	-	-	-	-	-	✘	Dry running	Check the hydraulic system and rectify the fault on the frequency inverter.
-	-	-	✘	-	✘	-	-	✘	Sensor signal error (e.g. broken wire)	Check sensor and sensor cable.
-	✘	✘	-	-	-	-	-	✘	Phase failure (drive)	Check motor connection and stator winding.

10 Related Documents

10.1 General drawings with list of components

10.1.1 KSB Delta Macro F/VC/SVP with Movitec 2B, 4B, 6B, 10B, 15B

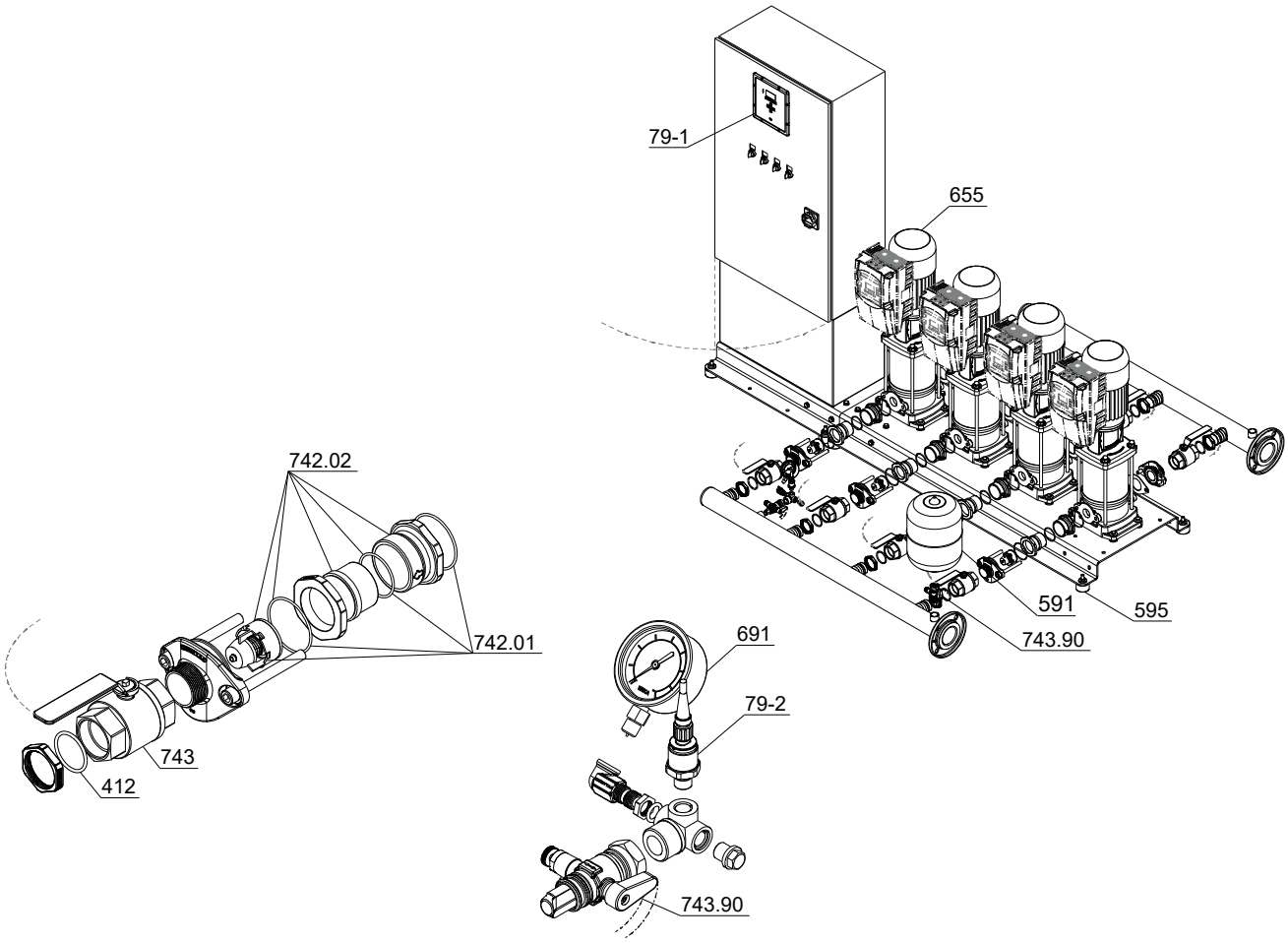

Fig. 18: KSB Delta Macro F/VC/SVP with Movitec 2B, 4B, 6B, 10B, 15B

Table 24: List of components

Part No.	Description	Part No.	Description
79-1	Automatic control unit	655	Pump
79-2	Measuring transducer	691	Pressure gauge
412	O-ring	742.01/.02	Lift check valve
591	Tank	743	Ball/plug valve
595	Anti-vibration pad	743.90	Ball valve

The individual parts of the pump set are shown in the product literature of the pump set.

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10.1.2 KSB Delta Macro F/VC/SVP with Movitec 25B, 40B, 60B, 90B, 125B

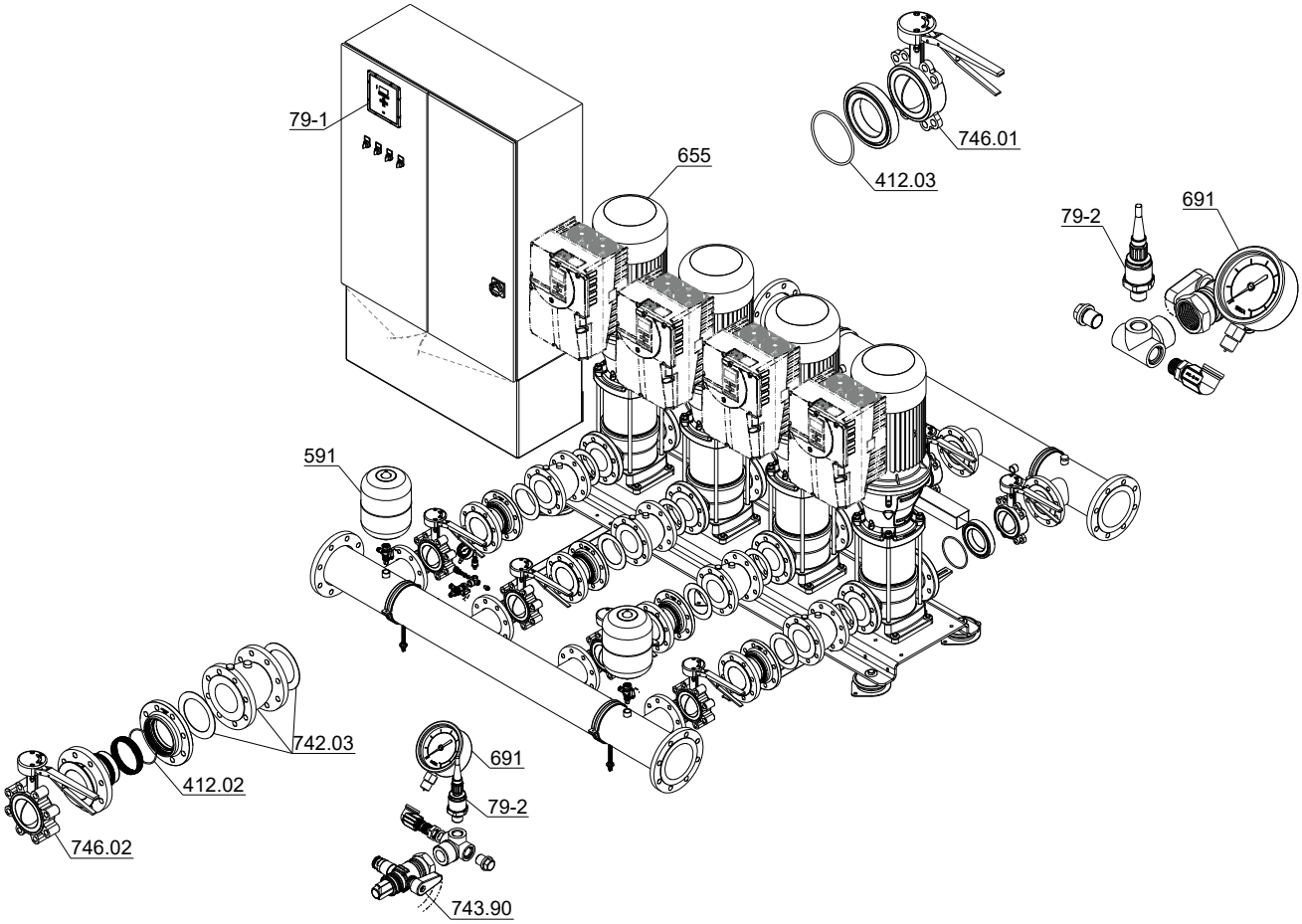

Fig. 19: KSB Delta Macro F/VC/SVP with Movitec 25B, 40B, 60B, 90B and Movitec 125B

Table 25: List of components

Part No.	Description	Part No.	Description
79-1	Automatic control unit	655	Pump
79-2	Measuring transducer	691	Pressure gauge
412.02/03	O-ring	742.01/.02/.03	Lift check valve
591	Tank	743.90	Ball valve
595	Anti-vibration pad	746.01/.02	Valve disc

The individual parts of the pump set are shown in the product literature of the pump set.

10.2 Parameter list

Table 26: Overview of parameters

Parameter	Description	Factory setting	Possible settings	Min. value	Max. value	Read access right	Write access right
1	Operation *Display of operating mode*	-	-	-	-	Everybody	Nobody
1-1	System *General operating status indicators*	-	-	-	-	Everybody	Nobody
1-1-1	System pressure *Displaying the measured system pressure*	-	-	-	-	Everybody	Nobody
1-1-2	System load *Displaying the total pump load in percent*	-	-	-	-	Everybody	Nobody
1-1-3	RDP switch *Detection of dry running protection via pressure switch is activated/ deactivated.*	-	Not available, available	-	-	Everybody	Nobody
1-1-4	Inlet pressure *Displaying the suction-side pressure*	-	-	-	-	Everybody	Nobody
1-1-5	Level content in % *Displaying the water level in inlet tank in percent*	-	-	-	-	Everybody	Nobody
1-1-6	Level height *Displaying the water level in the inlet tank*	-	-	-	-	Everybody	Nobody
1-1-7	Ambient temp. (WSD) *Displaying the measured ambient temperature if water flow detection is available*	-	-	-	-	Everybody	Nobody
1-1-8	Digital inputs *Displaying the status of the digital inputs*	-	-	-	-	Service	Service
1-1-9.2	Position suppl.valve *Position of supply valve*	Open	Open, closed	-	-	Everybody	Nobody
1-1-9.1	Position suppl.valve *Position of proportional supply valve 0 % ... 100 %*	0	0...100	0	100	Everybody	Nobody
1-1-10	Power down speed *Calculated stop speed if zero-flow detection is activated in energy-saving mode*	-	-	-	-	Service	Nobody
1-1-14	WSD pulses tank 1 *Water flow detection, number of fills in tank 1*	0	-	-	-	Everybody	Nobody
1-1-15	WSD pulses tank 2 *Water flow detection, number of fills in tank 2*	0	-	-	-	Everybody	Nobody
1-1-16	WSD pulses tank 3 *Water flow detection, number of fills in tank 3*	0	-	-	-	Everybody	Nobody
1-2	Pumps *Pump-relevant status information*	-	-	-	-	Everybody	Nobody
1-2-1	Operating mode *Setting the operating mode for each individual pump*	-	-	-	-	Everybody	Everybody
1-2-1.1.1	Pump number *Entering the pump number for which the operating mode is configured*	1	1.. 3	1	3	Everybody	Everybody

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Parameter	Description	Factory setting	Possible settings	Min. value	Max. value	Read access right	Write access right
1-2-1.2.1	Operating mode *Displaying the operating status of the pump*	1	Automatic, manual On (10 s), manual Off	-	-	Everybody	Everybody
1-2-2	Pump load *Displaying the pump load*	-	-	-	-	Everybody	Nobody
1-2-3	Thermal fail. flags *Bit-based display of status of all thermal fault inputs*	-	Not tripped Tripped	-	-	Service	Nobody
1-2-4	Running hours pump *Displaying the operating hours per pump*	-	-	-	-	Everybody	Nobody
1-2-5	Number of pumpstarts *Displaying the number of starts per pump*	-	-	-	-	Customer	Nobody
1-3	Time and statistics *Operating times and statistics*	-	-	-	-	Everybody	Nobody
1-3-1	Act runtime Op hours *Operating hours of the system*	0	-	-	-	Everybody	Nobody
1-3-2	Time to service *Time to next service interval*	0	-	-	-	Everybody	Nobody
1-3-3	Act Minimum Runtime *Current minimum pump runtime in seconds*	-	-	-	-	Everybody	Nobody
2	Diagnosis *Monitoring and diagnosis*	-	-	-	-	Everybody	Nobody
2-1	General *General monitoring functions*	-	-	-	-	Everybody	Nobody
2-1-1	Active Messages *Current messages for all available warnings/alerts*	-	-	-	-	Everybody	Customer
2-1-2	History *History of all warnings/alerts*	-	-	-	-	Everybody	Nobody
2-1-3	Acknowledge All *All messages are acknowledged*	-	-	-	-	Everybody	Everybody
2-1-4	Clear History *Deleting the message history*	-	-	-	-	Service	Service
3	Settings *Settings*	-	-	-	-	Everybody	Nobody
3-1	HMI *Control panel*	-	-	-	-	Everybody	Nobody
3-1-1	Basic settings *Basic settings for control panel*	-	-	-	-	Everybody	Nobody
3-1-1-1	Language *Language settings*	English	English, German, Dutch, French, Turkish	-	-	Everybody	Everybody
3-1-1-4	Contrast *Contrast*	13	5.. 20	5	20	Everybody	Everybody
3-1-1-2	Backlight *Configuring the illumination time of the display*	-	-	-	-	Everybody	Everybody
3-1-1-2-1	Mode *Illumination type of system display*	Timer-based	Always on, timer-based	-	-	Everybody	Everybody

Parameter	Description	Factory setting	Possible settings	Min. value	Max. value	Read access right	Write access right
3-1-1-2-2	Backlight Time *System display: setting the illumination time in seconds*	600	10.. 999	10	999	Everybody	Service
3-1-1-3	Displayed units *Selecting the units shown on the display. The measured values are converted in the device.*	-	-	-	-	Everybody	Nobody
3-1-1-3-1	Pressure *Units of measured pressure values*	kPa	kPa, bar, PSI, feet, mwc	-	-	Everybody	Service
3-1-1-3-2	Height *Units of tank fill level*	cm	cm, m	-	-	Everybody	Service
3-1-1-3-3	Temperature *Units of water flow detection temperature*	°C	°C, °F	-	-	Everybody	Service
3-1-2	Fieldbus *Field bus settings*	-	-	-	-	Nobody	Nobody
3-1-2-1	Fieldbus Type *Type of connected field bus module*	No module	No module, Profibus, Modbus	-	-	Nobody	Nobody
3-1-4	Logo *Setting the logo displayed*	-	-	-	-	Service	Nobody
3-1-4-1	Logo *Selecting the logo displayed*	No logo	KSB logo, dp logo, no logo	-	-	Service	Service
3-2	Device *Device-specific settings*	-	-	-	-	Everybody	Nobody
3-2-1	Login *Login*	-	-	-	-	Everybody	Nobody
3-2-1-1.1	PIN *Entering the user level and password*	-	-	-	-	Everybody	Nobody
3-2-1-1.1.1	Access Level *Selecting the login level*	User level	User level, service level, factory level	-	-	Everybody	Everybody
3-2-1-1.1.2	PIN acceptance *Prompt to enter PIN*	-	0.. 9999	0	9999	Everybody	Everybody
3-2-1-1.2	PIN *Entering the user level and password*	-	-	-	-	Factory	Nobody
3-2-1-1.2.1	Access Level *Selecting the login level*	User level	User level, service level, factory level, development level	-	-	Factory	Factory
3-2-1-1.2.2	PIN acceptance *Prompt to enter PIN*	-	0.. 9999	0	9999	Factory	Factory
3-2-1-2	Login required *Password entry required*	Yes	No, yes	-	-	Customer	Customer
3-2-2	Service *Service settings*	-	-	-	-	Customer	Nobody
3-2-2-1	Factory setting *Factory-set defaults*	-	Reset ok, no set available	-	-	Customer	Customer
3-2-2-2	Reset Srv Interval *Resetting the service interval*	-	OK, failed	-	-	Service	Service
3-2-2-3	Customer setting *Loading locally saved settings*	-	Reset ok, no set available	-	-	Customer	Customer

Parameter	Description	Factory setting	Possible settings	Min. value	Max. value	Read access right	Write access right
3-2-2-4	Save custom. setting *Saving the customer settings*	-	-	-	-	Customer	Customer
3-2-2-5	Save factory setting *Saving the factory settings*	-	-	-	-	Factory	Factory
3-2-2-6	Default setting *Resetting to default settings*	-	-	-	-	Service	Service
3-2-2-6.1.1	Reset default param. *Resetting to default settings*	default	Default, Hyamat K, Hyamat V, Hyamat SVP, HyaEco VP	-	-	Service	Service
3-2-2-7	Edit Pump Opera. hrs *Editing pump operating hours*	-	-	-	-	Service	Service
3-2-2-7.1.1	Pump number *Number of pump*	1	1.. 6	1	6	Service	Service
3-2-2-7.2.1	Hours *Hours*	0	0.. 500000	0	500000	Service	Service
3-2-2-7.2.2	Minutes *Minutes*	0	0.. 59	0	59	Service	Service
3-2-2-7.2.3	Seconds *Seconds*	0	0 59	0	59	Service	Service
3-2-2-8	Reset Sys. Oper. hrs *Resetting the operating hours*	-	OK, failed	-	-	Service	Service
3-2-3	Factory Test *Factory test*	-	-	-	-	Factory	Nobody
3-2-3-1	Factory Test *Factory test*	-	-	-	-	Factory	Factory
3-2-3-1.1.1	Test result *Test result*	Failed	Failed, passed	-	-	Factory	Factory
3-3	Configuration *System configuration*	-	-	-	-	Everybody	Nobody
3-3-1	Number of pumps *Maximum number of pumps used in system*	3	1.. 6	1	6	Everybody	Service
3-3-2	Inlet *General configuration, suction side*	Pressure switch	Pressure switch, pressure sensor, water flow detection, inlet tank/gate valve, inlet tank/ proportional valve	-	-	Everybody	Service
3-3-3	Discharge *General configuration, discharge side*	Cascade	Cascade (without frequency inverter), 1 jockey, 2 jockeys, floating frequency inverter, frequency inverter per pump	-	-	Everybody	Service

Parameter	Description	Factory setting	Possible settings	Min. value	Max. value	Read access right	Write access right
3-3-4	WSD *Configuring the water flow detection for the tank*	Off	Off, 1 tank, 2 tanks, 3 tanks, 1 tank + temp., 2 tanks + temp., 3 tanks + temp., temperature	-	-	Everybody	Service
3-3-5	Leakage detection *Activating leakage monitoring*	Off	On, off	-	-	Everybody	Service
3-3-6	MPO Functionality *Synchronous operation*	Off	Off, on	-	-	Service	Service
3-3-7	PumpMode int/ext *Setting for pump mode via HMI (internal) or switch (external)*)	Internal	Internal, external	-	-	Everybody	Service
3-4	System settings *Parameterisation of system*	-	-	-	-	Everybody	Nobody
3-4-1	Inlet *Suction-side parameterisation*	-	-	-	-	Everybody	Nobody
3-4-1-1	Sensor press. 4 mA *Analog measured value at 4 mA, suction side*	0	-100.. 1000	-100	1000	Everybody	Service
3-4-1-2	Sensor press. 20 mA *Analog measured value at 20 mA, suction side*	1000	0.. 9999	0	9999	Everybody	Service
3-4-1-3	Damp. Time Inlet *Damping time for smoothing measured value to compensate for measurement peaks*	200	100.. 2000	100	2000	Factory	Factory
3-4-1-4	Level config *Configuring inlet tank control*	-	-	-	-	Everybody	Service
3-4-1-4-1	0% level *Minimum water level at which no air enters into tank, in percent, from upper edge of inlet nozzle*	0	0.. 99	0	99	Everybody	Service
3-4-1-4-2	100% level *Maximum water level of inlet tank, in percent, from upper edge of inlet nozzle*	200	0.. 999	0	999	Everybody	Service
3-4-1-4-3	Sensor level *Distance of sensor positioned above tank floor to tank floor, in centimetres*	0	-100.. 999	-100	999	Everybody	Service
3-4-1-4-4	Low level shut down *System stop when dry running level reached*	10	0.. 99	0	99	Everybody	Service
3-4-1-4-5	Low level reset *Resetting the system when defined dry running level is reached*	15	0.. 99	0	99	Everybody	Service
3-4-1-4-6	Critical water level *Threshold of critical water level in inlet tank*	30	0.. 99	0	99	Everybody	Service
3-4-1-4-7	High water level *Threshold of high water level in inlet tank*	105	0.. 199	0	199	Everybody	Service
3-4-1-4-8	Threshold *1 or 2 extra signalling relay contacts for switching thresholds*	-	-	-	-	Everybody	Service

Parameter	Description	Factory setting	Possible settings	Min. value	Max. value	Read access right	Write access right
3-4-1-4-8-1	Threshold 1 ON *Inlet tank level for relay 1 energised in percent*	50	0...199	0	199	Everybody	Service
3-4-1-4-8-2	Threshold 1 OFF *Inlet tank level for relay 1 de-energised in percent*	50	0...199	0	199	Everybody	Service
3-4-1-4-8-3	Threshold 2 ON *Inlet tank level for relay 2 energised in percent*	40	0...199	0	199	Everybody	Service
3-4-1-4-8-4	Threshold 2 OFF *Inlet tank level for relay 2 de-energised in percent*	40	0...199	0	199	Everybody	Service
3-4-1-4-9	Supply valve ON/OFF *Position of inflow gate valve for filling inlet tank*	-	-	-	-	Everybody	Nobody
3-4-1-4-9-1	Level 1 open *Level for opening gate valve to start filling inlet tank*	70	0.. 99	0	99	Everybody	Service
3-4-1-4-9-2	Level 1 closed *Level for closing gate valve to stop filling inlet tank*	90	0.. 99	0	99	Everybody	Service
3-4-1-4-9-3	Level 1A open *Second level (timer-based) for opening gate valve to start filling*	40	0.. 99	0	99	Everybody	Service
3-4-1-4-9-4	Level 1A closed *Second level (timer-based) for closing gate valve to stop filling*	60	0.. 99	0	99	Everybody	Service
3-4-1-4-10	Supply valve prop. *Use of a proportional valve to fill inlet tank*	-	-	-	-	Everybody	Nobody
3-4-1-4-10-1	Level setpoint 1 *Level in inlet tank at which valve is completely closed*	80	0.. 99	0	99	Everybody	Service
3-4-1-4-10-2	Level setpoint 1A *Second level (timer-based) in inlet tank at which valve is completely closed*	40	0.. 99	0	99	Everybody	Service
3-4-1-4-10-3	Hysteresis *Setting the hysteresis for fully open valve*	15	0.. 99	0	99	Everybody	Service
3-4-1-4-10-4	Sample time *Measurement cycle for measuring to control proportional valve*	10	0.. 99	0	99	Everybody	Service
3-4-1-4-10-5	Analog output *Configuring the analog output*	4-20mA	4 - 20 mA, 0 - 20 mA	-	-	Everybody	Service
3-4-1-5	Auto. Setpoint Redu. *Automatic setpoint reduction in case of inlet pressure drop*	-	-	-	-	Everybody	Nobody
3-4-1-5-1	ASR function *Automatic setpoint reduction in case of inlet pressure drop*	Off	Off, on	-	-	Everybody	Service
3-4-1-5-2	Switch on point *Re-start point*	200	100.. 400	100	400	Everybody	Service
3-4-1-5-3	Inlet Set point *Entering the minimum inlet pressure setpoint*	100	0.. 400	0	400	Everybody	Service
3-4-1-5-4	Switch off point *Stop point*	90	0.. 100	0	100	Everybody	Service

Parameter	Description	Factory setting	Possible settings	Min. value	Max. value	Read access right	Write access right
3-4-1-5-5	Proportional const. *Proportional constant of PID controller*	3	0.. 10	0	10	Everybody	Service
3-4-1-5-6	Integral time *Integral constant of PID controller*	1	0.. 60	0	60	Everybody	Service
3-4-1-5-7	Differential time *Differential constant of PID controller*	0	0.. 99	0	99	Everybody	Service
3-4-1-5-9	Switch On time *Time to pump start*	5	0.. 60	0	60	Service	Service
3-4-1-5-10	Switch Off time *Time to pump stop*	5	0.. 60	0	60	Service	Service
3-4-2	Discharge *Discharge-side parameterisation*	-	-	-	-	Everybody	Service
3-4-2-1	Sensor press. 4 mA *Analog measured value at 4 mA, discharge side*	0	-100.. 1000	-100	1000	Everybody	Service
3-4-2-2	Sensor press. 20 mA *Analog measured value at 20 mA, discharge side*	1000	0.. 9999	0	9999	Everybody	Service
3-4-2-3	Pumps ON sensor fail *Number of pumps started up in the event of a sensor failure on the discharge side*	0	0.. 3	0	3	Everybody	Service
3-4-2-4	Max power *Limitation of maximum system power (n x 100 %, n = number of pumps)*	600	0.. 600	0	600	Everybody	Service
3-4-2-5	Max power ext. oper. *Limitation of maximum system power for operation on emergency power*	600	0.. 600	0	600	Everybody	Service
3-4-3	Variable freq. drive *Configuring the frequency inverters*	-	-	-	-	Everybody	Nobody
3-4-3-1	Communication *Configuring the communication protocol for the frequency inverter*	None	None, analog 4 - 20 mA, analog 0 - 20 mA, PumpDrive 1, PumpDrive 2, Danfoss VLT 2800, Danfoss MicroDrive, Danfoss AquaDrive	-	-	Everybody	Service
3-4-3-2	Proportional const. *Proportional constant of PID controller*	3	0.. 100	0	100	Everybody	Service
3-4-3-3	Integral time *Integral constant of PID controller*	1	0.. 60	0	60	Everybody	Service
3-4-3-4	Differential time *Differential constant of PID controller*	0	0.. 99,99	0	99,99	Everybody	Service
3-4-3-9	VFD Ramp-Up *Configuring the start ramp for frequency inverters in seconds*	3	0,1.. 999	0,1	999	Everybody	Service

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Parameter	Description	Factory setting	Possible settings	Min. value	Max. value	Read access right	Write access right
3-4-3-10	VFD Ramp-Down *Configuring the stop ramp for frequency inverters in seconds*	3	0,1.. 999	0,1	999	Everybody	Service
3-4-3-11	VFD min. frequency *Configuring the minimum frequency for frequency inverters in Hz*	30	0.. 50	0	50	Everybody	Service
3-4-3-12	VFD max. frequency *Configuring the maximum frequency for frequency inverters in Hz*	50	30.. 140	30	140	Everybody	Service
3-4-3-13	P nominal of VFD *Nominal power of frequency inverters*	1500	0.. 100000	0	100000	Everybody	Service
3-4-3-14	U nominal of VFD *Nominal voltage of frequency inverters*	400	0.. 500	0	500	Everybody	Service
3-4-3-15	F nominal of VFD *Nominal frequency of frequency inverters*	50	50.. 50	50	50	Everybody	Service
3-4-3-16	I nominal of VFD *Nominal amperage of frequency inverters*	4	0.. 450	0	450	Everybody	Service
3-4-3-17	RPM nominal of VFD *Nominal speed of frequency inverters*	2880	0.. 10000	0	10000	Everybody	Service
3-4-3-20	Motor Speed Unit *Motor speed unit*	rpm	rpm, Hz	-	-	Everybody	Service
3-4-3-21	Digital I/P 33 func. *Selecting the digital input*	No function	No function, coasting stop inv.	-	-	Everybody	Service
3-4-3-22	Digital I/P 29 func. *Selecting the digital input*	No function	No function, jog function, jog function	-	-	Everybody	Service
3-4-3-23	Jog frequency *Speed in manual mode*	50	30.. 50	30	50	Everybody	Service
3-4-3-24	Jog ramp time *Ramp time*	5	0,04.. 3600	0,04	3600	Everybody	Service
3-4-3-25	Coasting select *Selecting the manual mode*	Digital and bus	Digital input, bus, digital and bus, digital or bus	-	-	Everybody	Service
3-4-3-26	Start select *Selecting the start signal*	Digital and bus	Digital input, bus, digital and bus, digital or bus	-	-	Everybody	Service
3-4-3-27	Slip Compensation *Slip compensation*	0	-400.. 399	-400	399	Everybody	Service
3-4-3-5	No flow detection *Accuracy with which a minimum flow is detected (procedure for stopping the pumps)*	-	-	-	-	Everybody	Service
3-4-3-5-1	No flow bandwith *Bandwidth of flow detection*	6	0.. 50	0	50	Service	Service
3-4-3-5-2	No flow time *Flow detection time in seconds*	16	0.. 60	0	600	Service	Service
3-4-3-5-3	No flow step *Step height of flow detection in percent*	1	1.. 50	1	50	Service	Service

Parameter	Description	Factory setting	Possible settings	Min. value	Max. value	Read access right	Write access right
3-4-3-5-4	No flow max. power *Flow detection is active below this pump load in percent*	100	0.. 100	0	100	Service	Service
3-4-4	WSD settings *Configuring water flow detection*	-	-	-	-	Everybody	Nobody
3-4-4-1	Nbr of refreshments *Number of water replacement cycles*	30	0.. 99	0	99	Everybody	Service
3-4-4-2	Refresh time span *Duration of water replacement procedure in hours*	24	0.. 999	0	999	Everybody	Service
3-4-4-3	Average room temp. *Measured average ambient temperature*	25	0.. 50	0	50	Everybody	Service
3-4-4-4	Room temp. time span *Duration of ambient temperature measurement in hours*	24	0.. 999	0	999	Everybody	Service
3-4-5	MPO settings *Configuring the multiple pump operation functions*	-	-	-	-	Everybody	Customer
3-4-5-1	High Load Profile *Characteristic of pump*	Cubic	Linear, cubic	-	-	Customer	Develop
3-4-5-2	Rated Freq *Rated frequency of pump*	50	45.. 50	45	50	Everybody	Service
3-4-5-3	Switch On Freq. *Start frequency of pump*	49	31.. 50	31	50	Everybody	Service
3-4-5-4	Switch Off Freq. *Stop frequency of pump*	31	30.. 49	30	49	Everybody	Service
3-4-5-5	Cubic setting *Cubic setting*	-	-	-	-	Everybody	Service
3-4-5-5-1	Power 1 *Power 1 of pump*	2	0.. 100	0	100	Everybody	Service
3-4-5-5-2	Power 2 *Power 2 of pump*	2	0.. 100	0	100	Everybody	Service
3-4-5-6	Linear setting *Linear setting of pump*	-	-	-	-	Everybody	Service
3-4-5-6-1	Power 1 *Power 1 of pump*	2	0.. 100	0	100	Everybody	Service
3-4-5-6-2	Power 2 *Power 2 of pump*	2	0.. 100	0	100	Everybody	Service
3-4-5-6-3	Power 3 *Power 3 of pump*	2	0.. 100	0	100	Everybody	Service
3-4-5-6-4	Power 4 *Power 4 of pump*	2	0.. 100	0	100	Everybody	Service
3-4-5-7	Motor settings *Motor settings*	-	-	-	-	Everybody	Nobody
3-4-5-7-1	Rated Motor Power *Rated power of motor as per name plate*	2	0.. 110	0	110	Everybody	Service
3-4-5-7-2	Rated Motor Speed *Rated speed of motor as per name plate*	1450	300.. 3600	300	3600	Everybody	Service
3-4-5-7-3	Rated Freq *Rated frequency of motor as per name plate*	50	45.. 50	45	50	Everybody	Service
3-4-5-7-4	Rated Current *Rated current of motor as per name plate*	10	0,1.. 999	0,1	999	Everybody	Service

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Parameter	Description	Factory setting	Possible settings	Min. value	Max. value	Read access right	Write access right
3-4-5-7-5	Rated Cosphi *Rated cos phi of motor as per name plate*	1	0,1.. 0,99	0,1	0,99	Everybody	Service
3-4-5-8	Pump parameters *Pump settings*	-	-	-	-	Everybody	Nobody
3-4-5-8-1	Rated Pump Speed *Rated speed of pump for rated H/Q characteristic curve*	2900	300.. 3600	300	3600	Everybody	Service
3-5	Pressure *Configuring the system pressure*	-	-	-	-	Everybody	Nobody
3-5-1	Set point *Entering the pressure setpoint (system pressure)*	400	0.. 1000	0	1000	Everybody	Customer
3-5-3	Bandwidth *Bandwidth within which the frequency inverters remain at the same, constant speed independent of pressure.*	5	0.. 999	0	999	Everybody	Customer
3-5-4	Accumulation press. *Procedure for increasing pressure in the accumulator before the system stops*	30	0.. 999	0	999	Everybody	Customer
3-5-5	Max.set point *Limit value for maximum setpoint*	1000	400.. 1000	400	1000	Everybody	Service
3-5-9	Adapt. setpoint *Date/time-based alternative setpoint*	400	0.. 1000	0	1000	Everybody	Customer
3-5-10	Delta p Dynamic pressure compensation *Quadratic function for correcting the setpoint*	0	-999.. 999	-999	999	Everybody	Customer
3-5-11	High pressure alarm *Upper limit value for maximum system pressure*	1000	400.. 1000	400	1000	Everybody	Customer
3-5-12	High pressure action *Parameter for selecting action in case of excessively high system pressure (stop pumps or output message only)*	Stop pumps	Stop pumps, message only	-	-	Everybody	Customer
3-5-13	Low pressure alarm *Lower limit value for minimum system pressure*	0	0.. 400	0	400	Everybody	Customer
3-5-14	Low pressure action *Parameter for selecting action in case of excessively low system pressure (stop pumps or output message only)*	Stop pumps	Stop pumps, message only	-	-	Everybody	Customer
3-5-15	Shut down RDP *Minimum suction-side pressure limit for dry running protection*	20	0.. 80	0	80	Everybody	Customer
3-5-16	Reset RDP *Suction-side pressure for re-start following dry running occurrence*	80	20.. 999	20	999	Everybody	Customer
3-5-17	Press. Flow Control *Lack-of-water fault is set if setpoint minus pressure defined is undershot.*	100	0.. 1000	0	1000	Everybody	Service

Parameter	Description	Factory setting	Possible settings	Min. value	Max. value	Read access right	Write access right
3-6	Timer settings *Configuring the time parameters*	-	-	-	-	Everybody	Nobody
3-6-1	Opt. pump starts /h *Entering the optimal pump starts per hour.* *The pump runtime is adjusted automatically.*	10	0.. 99	0	99	Everybody	Service
3-6-2	Min. run time *Limit for minimum runtime of pump*	180	0.. 999	0	999	Everybody	Customer
3-6-3	Min. run time corr. *Correction value for minimum runtime of pump*	10	0.. 99	0	99	Everybody	Service
3-6-4	Max. run time *After the time has lapsed, the system switches over to the next pump.*	86400	0.. 604800	0	604800	Everybody	Service
3-6-5	Start delay *Start delay of pumps if pressure remains below setpoint*t	1	0.. 999	0	999	Everybody	Service
3-6-6	Stop delay *Stop delay of pumps if pressure remains at setpoint*	1	0.. 999	0	999	Everybody	Service
3-6-8	RDP delay *Stop delay following detection of dry running occurrence*	10	0.. 999	0	999	Everybody	Service
3-6-9	High/low alarm delay *Time window for suppressing alerts when system pressure is exceeded/undershot*	60	10.. 999	10	999	Everybody	Service
3-6-10	WSD 1 pulse length *Water flow detection 1, length of pulse in seconds*	4	0.. 99	0	99	Everybody	Service
3-6-11	WSD 2 pulse length *Water flow detection 2, length of pulse in seconds*	4	0.. 99	0	99	Everybody	Service
3-6-12	WSD 3 pulse length *Water flow detection 3, length of pulse in seconds*	4	0.. 99	0	99	Everybody	Service
3-6-13	Sys. start up delay *Start delay following re-start*	10	0.. 32	0	32	Service	Service
3-7	Time/Date *Date and time*	-	-	-	-	Everybody	Nobody
3-7-1	Date *Setting the date*	-	-	-	-	Everybody	Customer
3-7-1.1.1	Year *Setting the year*	...	1970.. 2099	1970	2099	Everybody	Customer
3-7-1.1.2	Month *Setting the month*	1	1.. 12	1	12	Everybody	Customer
3-7-1.1.3	Day *Setting the day*	1	1.. 31	1	31	Everybody	Customer
3-7-2	Time *Setting the time*	-	-	-	-	Everybody	Customer
3-7-2.1.1	Time *Setting the time in the format HH:MM:SS*	0	0.. 86399	0	86399	Everybody	Customer

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Parameter	Description	Factory setting	Possible settings	Min. value	Max. value	Read access right	Write access right
3-7-3	Check run mode *Basic setting for forced start (check run)*	Interval	Off, digital input, interval, day-based, week-based	-	-	Everybody	Customer
3-7-4	Check run interval *Interval-controlled forced start (check run); the pumps are started at fixed, defined intervals.*	86400	0.. 1000000	0	1000000	Everybody	Service
3-7-5	Check run at *Day-controlled forced start (check run); the pumps are started at a defined time*	-	-	-	-	Everybody	Customer
3-7-5.1.1	Hours *Hours for daily forced start (check run)*	0	0.. 23	0	23	Everybody	Customer
3-7-5.1.2	Minutes *Minutes for daily forced start (check run)*	0	0.. 59	0	59	Everybody	Customer
3-7-6	Check run at *Weekly forced start (check run): at a defined time on specific days*	-	-	-	-	Everybody	Customer
3-7-6.1.1	Hours *Weekly forced start (check run): at a defined time (hours) on specific days*	_	0.. 23	0	23	Everybody	Customer
3-7-6.1.2	Minutes *Weekly forced start (check run): at a defined time (minutes) on specific days*	_	0.. 59	0	59	Everybody	Customer
3-7-6.1.3	Day *Weekly forced start (check run): at a defined time on a specific day*	Sunday	Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday	-	-	Everybody	Customer
3-7-7	Check run duration *Specifying the duration of the forced start (check run)*	30	0.. 30	0	30	Everybody	Service
3-7-9	Date adapt level On *The alternative fill level is activated in accordance with day(s)/month(s).*	-	-	-	-	Everybody	Customer
3-7-9.1.1	Month adapt level On *Entering the month in which the alternative fill level is activated.*	Off	Off, January, February, March, April, May, June, July, August, September, October, November, December	-	-	Everybody	Customer
3-7-9.1.2	Day adapt level On *Entering the day on which the alternative fill level is activated*	1	1.. 31	1	31	Everybody	Customer

Parameter	Description	Factory setting	Possible settings	Min. value	Max. value	Read access right	Write access right
3-7-10	Date adapt level Off *Entering the date on which the alternative fill level is deactivated*	-	-	-	-	Everybody	Customer
3-7-10.1.1	Month adapt lev Off *Entering the month in which the alternative fill level is deactivated*	Off	Off, January, February, March, April, May, June, July, August, September, October, November, December	-	-	Everybody	Customer
3-7-10.1.2	Day adapt level Off *Entering the day on which the alternative fill level is deactivated*	1	1.. 31	1	31	Everybody	Customer
3-7-11	Maintenance interval *Configuring the maintenance interval for the system in days*	0	0.. 3000	0	3000	Service	Service
3-7-8	Clock adapt setp. *Alternative setpoint to take effect based on time*	-	-	-	-	Everybody	Nobody
3-7-8-1	Adaptation mode *Configuring the alternative setpoint to take effect on a daily or weekly basis*	Off	Off, weekly, daily	-	-	Everybody	Customer
3-7-8-2	Change on/off times *The alternative pressure setpoint is activated/ deactivated.*	-	-	-	-	Everybody	Customer
3-7-8-2.1.1	Hours adapt setp.ON *Entering the hours when the alternative pressure setpoint is activated*	0	0.. 23	0	23	Everybody	Customer
3-7-8-2.1.2	Min adapt setp.ON *Entering the minutes when the alternative pressure setpoint is activated*	0	0.. 59	0	59	Everybody	Customer
3-7-8-2.1.3	Hours adapt setp.OFF *Entering the hours when the alternative pressure setpoint is deactivated*	0	0.. 23	0	23	Everybody	Customer
3-7-8-2.1.4	Min adapt setp.OFF *Entering the minutes when the alternative pressure setpoint is deactivated*	0	0.. 59	0	59	Everybody	Customer
3-7-8-3	Select day of week *Entering the weekday on which the alternative pressure setpoint is activated*	Sunday	Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday	-	-	Everybody	Customer
3-7-8-4	Change on/off times *Entering the weekday on which the alternative pressure setpoint is deactivated*	-	-	-	-	Everybody	Customer

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Parameter	Description	Factory setting	Possible settings	Min. value	Max. value	Read access right	Write access right
3-7-8-4.1.1	Hours adapt setp.ON *Entering the hours when the alternative pressure setpoint is activated*	0	0.. 23	0	23	Everybody	Customer
3-7-8-4.1.2	Min adapt setp.ON *Entering the minutes when the alternative pressure setpoint is activated*	0	0.. 59	0	59	Everybody	Customer
3-7-8-4.1.3	Hours adapt setp.OFF *Entering the hours when the alternative pressure setpoint is deactivated*	0	0.. 23	0	23	Everybody	Customer
3-7-8-4.1.4	Min adapt setp.OFF *Entering the minutes when the alternative pressure setpoint is deactivated*	0	0.. 59	0	59	Everybody	Customer
3-8	Definable I/O *Programming inputs/outputs*	-	-	-	-	Service	Service
3-8-1	Inputs *Inputs*	-	-	-	-	Service	Nobody
3-8-1-1	Input 1 *Configuration of input 1*	None	None, forced start (check run), alt. setpoint, leakage, remote acknowledgement, bypass valve, emergency power	-	-	Service	Service
3-8-1-2	Input 2 *Configuration of input 2*	None	None, forced start (check run), alt. setpoint, leakage, remote acknowledgement, bypass valve, emergency power	-	-	Service	Service
3-8-1-3	Input 3 *Configuration of input 3*	None	None, forced start (check run), alt. setpoint, leakage, remote acknowledgement, bypass valve, emergency power	-	-	Service	Service
3-8-2	Outputs *Outputs*	-	-	-	-	Service	Nobody
3-8-2-1	Output 1 (P4) *Configuration of output 1*	None	None, threshold 1, threshold 2, supply valve, bypass valve, lack of water	-	-	Service	Service
3-8-2-2	Output 2 (P5) *Configuration of output 2*	None	None, threshold 1, threshold 2, supply valve, bypass valve, lack of water	-	-	Service	Service

Parameter	Description	Factory setting	Possible settings	Min. value	Max. value	Read access right	Write access right
3-8-2-3	Output 3 (P6) *Configuration of output 3*	None	None, threshold 1, threshold 2, supply valve, bypass valve, lack of water	-	-	Service	Service
3-8-2-4	Output 4 (FR4) *Configuration of output 4*	None	None, threshold 1, threshold 2, supply valve, bypass valve, lack of water	-	-	Service	Service
3-8-2-5	Output 5 (FR5) *Configuration of output 5*	None	None, threshold 1, threshold 2, supply valve, bypass valve, lack of water	-	-	Service	Service
3-8-2-6	Output 6 (FR6) *Configuration of output 6*	None	None, threshold 1, threshold 2, supply valve, bypass valve, lack of water	-	-	Service	Service
3-8-2-7	Opert./Fail. Relay *System operational / fault message relay*	Off	Off/on	-	-	Service	Service
3-9	Messages *Messages*	-	-	-	-	Service	Nobody
3-9-1	Message Settings *List of all alerts*	-	-	-	-	Service	Service
3-9-1.1.1	failure id *Fault ID*	-		-	-	Service	Service
3-9-1.2.1	Traffic Light *Assignment of fault as warning or alert*	Red	Green, amber, red	-	-	Service	Service
3-9-1.2.2	Fault on Hold *Without/with automatic reset (re-start)*	Off	Off, on	-	-	Service	Service
3-10	Root menu *Configuring the main menu*	-	-	-	-	Customer	Nobody
3-10-1.1	Root Menu Settings *List of all main menu elements*	-	-			Customer	Everybody
3-10-1.2	Root Menu Settings *List of all main menu elements*	-	-	-	-	Develop	Develop
3-10-1.2.1	rootmenu selection *Root menu selection*	1	1.. 65	1	65	Develop	Develop
3-10-1.2.1	Traffic Light *Assignment of fault as warning or alert*	Off	Off, on	-	-	Develop	Develop
3-11	Energy Saving Mode *Energy-saving mode*	-	-	-	-	Service	Nobody
3-11-1	Energy Saving Mode *Energy-saving mode*	Off	Off, on	-	-	Service	Service
3-11-2	direct off *Energy-saving mode is carried out without zero-flow detection function.*	Off	Off, on	-	-	Service	Service

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Parameter	Description	Factory setting	Possible settings	Min. value	Max. value	Read access right	Write access right
3-11-3	Power down speed % *Calculated stop speed if zero-flow detection is activated in energy-saving mode (in %)*	30	1.. 99	1	99	Service	Service
3-11-4	time direct off *Time after which the energy-saving mode is carried out without the zero-flow detection function*	5	0.. 9999	0	9999	Service	Service
3-14	By Pass Valve *Bypass valve*	-	-	-	-	Everybody	Service
3-14-1	Valve Function *Activating/deactivating the valve function*	Off	Off, forced start (check run), Pt1000, digital input	-	-	Everybody	Service
3-14-2	Open delay *Delay time that lapses before valve is opened*	2	0.. 20	0	20	Everybody	Service
3-14-3	Close delay *Delay time that lapses before valve is closed*	2	0.. 20	0	20	Everybody	Service
3-14-4	Temperature *Temperature above which the valve is opened*	20	0.. 40	0	40	Everybody	Service
3-14-5	Flush Time *Time window in which the valve is opened*	120	10.. 600	10	600	Everybody	Service
3-14-6	Attemps in 24Hrs *Valve opening frequency before an alert is displayed*	2	1.. 5	1	5	Everybody	Service
3-14-7	Min. open time *Minimum opening time of valve*	2	0.. 20	0	20	Everybody	Service
3-15	Fieldbus *Field bus settings*	-	-	-	-	Customer	Nobody
3-15-1	Profibus *Profibus settings*	-	-	-	-	Customer	Nobody
3-15-1-1	PB Slave Address *Profibus slave address*	126	1.. 255	1	255	Customer	Customer
3-15-2	Modbus *Modbus settings*	-	-	-	-	Customer	Nobody
3-15-2-1	MB Slave Address *Modbus slave address*	247	1.. 247	1	247	Customer	Customer
3-15-2-2	Baudrate *Baud rate*	192	9600,192	-	-	Customer	Customer
4	Info *Information*	-	-	-	-	Everybody	Nobody
4-1	Device *Control module (CM)*	-	-	-	-	Everybody	Nobody
4-1-1	Serial Number *Serial number of control module*	-	-	-	-	Everybody	Nobody
4-1-2	Parameter Set *Version of the control panel parameter set*	0	-	-	-	Everybody	Everybody
4-2	IO Info *IO information on internal communications unit*	-	-	-	-	Everybody	Nobody

Parameter	Description	Factory setting	Possible settings	Min. value	Max. value	Read access right	Write access right
4-2-1	IO Serial Number *IO information on serial number of internal communications unit*	-	-	-	-	Everybody	Nobody
4-2-2	IO FW-Version *IO information on firmware of internal communications unit*	-	-	-	-	Everybody	Nobody
4-2-3	IO FW-Revision *IO information on revision of internal communications unit*	-	-	-	-	Everybody	Nobody
4-2-4	IO HW-Revision *IO information on hardware of internal communications unit*	-	-	-	-	Everybody	Nobody
4-3	HMI Info *IO information on HMI*	-	-	-	-	Everybody	Everybody
4-3-1	HMI Serial Number *IO information on serial number of HMI*	-	-	-	-	Everybody	Nobody
4-3-2	HMI FW-Version *IO information on firmware of HMI*	-	-	-	-	Everybody	Nobody
4-3-3	HMI FW-Revision *IO information on revision of HMI*	-	-	-	-	Everybody	Nobody
4-3-4	HMI HW-Revision *IO information on hardware of HMI*	-	-	-	-	Everybody	Nobody
4-4	Profibus Info *Information on Profibus used*	-	-	-	-	Everybody	Everybody
4-4-1	PB FW-Version *Information on firmware of Profibus*	-	-	-	-	Everybody	Nobody
4-4-2	PB FW-Revision *Information on firmware of Profibus*	-	-	-	-	Everybody	Nobody
4-4-3	PB HW-Revision *Information on hardware of Profibus*	-	-	-	-	Everybody	Nobody
4-5	Modbus Info *Information on Modbus used*	-	-	-	-	Everybody	Everybody
4-5-1	MB FW-Version *Information on firmware of Modbus*	-	-	-	-	Everybody	Nobody
4-5-2	MB FW-Revision *Information on revision of Modbus*	-	-	-	-	Everybody	Nobody
4-5-3	MB HW-Revision *Information on hardware of Modbus*	-	-	-	-	Everybody	Nobody
5	Quickmenu *Information on quick menu*	-	-	-	-	Everybody	Nobody

10.3 Fault messages

Table 27: Overview of fault messages

Fault message	Description	Type of message	
		Warning	Alert
Failure PT. Dis.	Fault, discharge-side pressure sensor	-	✗
Sys. press.to low	System pressure below minimum pressure	-	✗

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Fault message	Description	Type of message	
		Warning	Alert
Sys press.to high	System pressure above maximum pressure	-	✗
No water	Insufficient fluid or insufficient inlet pressure on suction side	-	✗
Maintenance req.	Service interval exceeded	✗	-
More pumps fail	Multiple pump faults	-	✗
No refresh tank 1	Insufficient water replacement, tank 1	-	✗
No refresh tank 2	Insufficient water replacement, tank 2	-	✗
No refresh tank 3	Insufficient water replacement, tank 3	-	✗
Aver temp to high	Average temperature of water flow detection too high	-	✗
Curr temp to high	Current temperature of water flow detection too high	✗	-
Temp. Fail. Pump 1	Fault (temperature, motor protection switch, etc.), pump 1	✗	-
Temp. Fail. Pump 2	Fault (temperature, motor protection switch, etc.), pump 2	✗	-
Temp. Fail. Pump 3	Fault (temperature, motor protection switch, etc.), pump 3	✗	-
Temp. Fail. Pump 4	Fault (temperature, motor protection switch, etc.), pump 4	✗	-
Temp. Fail. Pump 5	Fault (temperature, motor protection switch, etc.), pump 5	✗	-
Temp. Fail. Pump 6	Fault (temperature, motor protection switch, etc.), pump 6	✗	-
Failure valve	Fault, suction-side valve	✗	-
Inlet sensor fail	Fault, suction-side pressure sensor or level sensor	✗	-
High water level	Water level in inlet tank too high	-	✗
Crit. water level	Water level in inlet tank too low	✗	-
Low water level	Water level in inlet tank low (lack of water)	-	✗
Comm. Error FC 1	Communication not possible, frequency inverter 1	✗	-
Comm. Error FC 2	Communication not possible, frequency inverter 2	✗	-
Comm. Error FC 3	Communication not possible, frequency inverter 3	✗	-
Comm. Error FC 4	Communication not possible, frequency inverter 4	✗	-
Comm. Error FC 5	Communication not possible, frequency inverter 5	✗	-
Comm. Error FC 6	Communication not possible, frequency inverter 6	✗	-
incor. check sum F1	Communication fault, frequency inverter 1	✗	-
incor. check sum F2	Communication fault, frequency inverter 2	✗	-
incor. check sum F3	Communication fault, frequency inverter 3	✗	-
incor. check sum F4	Communication fault, frequency inverter 4	✗	-
incor. check sum F5	Communication fault, frequency inverter 5	✗	-
incor. check sum F6	Communication fault, frequency inverter 6	✗	-
Temp. sensor fail	Fault, temperature sensor of water flow detection	✗	-
24V out of range	Internal 24 V voltage outside permissible range	✗	-
5V out of range	Internal 5 V voltage outside permissible range	✗	-
3V out of range	Internal 3 V voltage outside permissible range	✗	-
External off	External command for pressure booster system stop active	✗	-
Fire alarm	External fire alert command for starting all pumps active	-	✗
Br. Wire Sens.dis	Fault, discharge-side pressure sensor	-	✗
Br. Wire Sens.Inl	Fault, suction-side pressure sensor	-	✗
Fail. several FCs	Fault, several frequency inverters	-	✗
Leakage	Leak detected	-	✗

Fault message	Description	Type of message	
		Warning	Alert
Eeprom HW Error	EEPROM data not saved due to hardware problems	-	✗
Manual off Pump 1	Pump 1 switched off (independent of automatic mode)	✗	-
Manual off Pump 2	Pump 2 switched off (independent of automatic mode)	✗	-
Manual off Pump 3	Pump 3 switched off (independent of automatic mode)	✗	-
Manual off Pump 4	Pump 4 switched off (independent of automatic mode)	✗	-
Manual off Pump 5	Pump 5 switched off (independent of automatic mode)	✗	-
Manual off Pump 6	Pump 6 switched off (independent of automatic mode)	✗	-
Manual On Pump 1	Pump 1 in manual mode (independent of automatic mode)	✗	-
Manual On Pump 2	Pump 2 in manual mode (independent of automatic mode)	✗	-
Manual On Pump 3	Pump 3 in manual mode (independent of automatic mode)	✗	-
Manual On Pump 4	Pump 4 in manual mode (independent of automatic mode)	✗	-
Manual On Pump 5	Pump 5 in manual mode (independent of automatic mode)	✗	-
Manual On Pump 6	Pump 6 in manual mode (independent of automatic mode)	✗	-
More Pumps off	Several pumps switched off (independent of automatic mode)	✗	-
Internal Failure P1	Internal fault, frequency inverter 1	✗	-
Internal Failure P2	Internal fault, frequency inverter 2	✗	-
Internal Failure P3	Internal fault, frequency inverter 3	✗	-
Internal Failure P4	Internal fault, frequency inverter 4	✗	-
Internal Failure P5	Internal fault, frequency inverter 5	✗	-
Internal Failure P6	Internal fault, frequency inverter 6	✗	-
Mains Failure P1	Power supply fault, frequency inverter 1	✗	-
Mains Failure P2	Power supply fault, frequency inverter 2	✗	-
Mains Failure P3	Power supply fault, frequency inverter 3	✗	-
Mains Failure P4	Power supply fault, frequency inverter 4	✗	-
Mains Failure P5	Power supply fault, frequency inverter 5	✗	-
Mains Failure P6	Power supply fault, frequency inverter 6	✗	-
Over voltage P1	DC link voltage too high, frequency inverter 1	✗	-
Over voltage P2	DC link voltage too high, frequency inverter 2	✗	-
Over voltage P3	DC link voltage too high, frequency inverter 3	✗	-
Over voltage P4	DC link voltage too high, frequency inverter 4	✗	-
Over voltage P5	DC link voltage too high, frequency inverter 5	✗	-
Over voltage P6	DC link voltage too high, frequency inverter 6	✗	-
Under voltage P1	DC link voltage too low, frequency inverter 1	✗	-
Under voltage P2	DC link voltage too low, frequency inverter 2	✗	-
Under voltage P3	DC link voltage too low, frequency inverter 3	✗	-
Under voltage P4	DC link voltage too low, frequency inverter 4	✗	-
Over voltage P5	DC link voltage too low, frequency inverter 5	✗	-
Over voltage P6	DC link voltage too low, frequency inverter 6	✗	-

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Fault message	Description	Type of message	
		Warning	Alert
Overload Failure P1	Overload, frequency inverter 1	✗	-
Overload Failure P2	Overload, frequency inverter 2	✗	-
Overload Failure P3	Overload, frequency inverter 3	✗	-
Overload Failure P4	Overload, frequency inverter 4	✗	-
Overload Failure P5	Overload, frequency inverter 5	✗	-
Overload Failure P6	Overload, frequency inverter 6	✗	-
Brake resistor P1	Braking resistor fault, frequency inverter 1	✗	-
Brake resistor P4	Braking resistor fault, frequency inverter 2	✗	-
Brake resistor P3	Braking resistor fault, frequency inverter 3	✗	-
Brake resistor P4	Braking resistor fault, frequency inverter 4	✗	-
Brake resistor P5	Braking resistor fault, frequency inverter 5	✗	-
Brake resistor P6	Braking resistor fault, frequency inverter 6	✗	-
Temp. Failure P1	Temperature too high, frequency inverter 1	✗	-
Temp. Failure P2	Temperature too high, frequency inverter 2	✗	-
Temp. Failure P3	Temperature too high, frequency inverter 3	✗	-
Temp. Failure P4	Temperature too high, frequency inverter 4	✗	-
Temp. Failure P5	Temperature too high, frequency inverter 5	✗	-
Temp. Failure P6	Temperature too high, frequency inverter 6	✗	-
ATM Failure P1	Automatic motor adaptation fault, frequency inverter 1	✗	-
ATM Failure P2	Automatic motor adaptation fault, frequency inverter 2	✗	-
ATM Failure P3	Automatic motor adaptation fault, frequency inverter 3	✗	-
ATM Failure P4	Automatic motor adaptation fault, frequency inverter 4	✗	-
ATM Failure P5	Automatic motor adaptation fault, frequency inverter 5	✗	-
ATM Failure P6	Automatic motor adaptation fault, frequency inverter 6	✗	-
Flushing	Flushing procedure active	✗	-
Valve opened often	Several flushing procedures carried out	✗	-
Circuit Fail. FC1	Short circuit fault/earth fault, frequency inverter 1	✗	-
Circuit Fail. FC2	Short circuit fault/earth fault, frequency inverter 2	✗	-
Circuit Fail. FC3	Short circuit fault/earth fault, frequency inverter 3	✗	-
Circuit Fail. FC4	Short circuit fault/earth fault, frequency inverter 4	✗	-
Circuit Fail. FC5	Short circuit fault/earth fault, frequency inverter 5	✗	-
Circuit Fail. FC6	Short circuit fault/earth fault, frequency inverter 6	✗	-
Ext. Power Operation	Emergency power mode active; maximum system load limited	✗	-
Setpoint Reduction	Setpoint reduced due to drop in inlet pressure	✗	-
Factory Test	No test carried out in factory	-	✗
MPO Failure	Fault in VP mode, synchronous operation	✗	-
ASR Shutdown	Cancellation of automatic setpoint reduction	-	✗

11 EU Declaration of Conformity

Manufacturer: **KSB B.V.**
Kalkovenweg 13
2401 LJ Alphen aan den Rijn (The Netherlands)

The manufacturer herewith declares that **the product**:

KSB Delta Macro (F, VC, SVP)

Serial number: 38/2019 0000000-0001 - 52/2021 9999999-9999

- is in conformity with the provisions of the following Directives as amended from time to time:
  - Pump set: 2006/42/EC Machinery Directive
  - Electrical components[5)]: 2011/65/EU Restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)
  - 2014/30/EU: Electromagnetic Compatibility (EMC)

The manufacturer also declares that

- the following harmonised international standards have been applied:
  - ISO 12100
  - EN 809
  - EN 60204-1
  - EN 806-2

Person authorised to compile the technical file:

Menno Schaap
Manager Competence Centre Products
KSB B.V.
(Subsidiary D.P. Industries B.V.)
Kalkovenweg 13
2401 LJ Alphen aan den Rijn (The Netherlands)

The EU Declaration of Conformity was issued in/on:

Alphen aan den Rijn, 27.08.2019

Menno Schaap
Manager Competence Centre Products
KSB B.V.
Kalkovenweg 13
2401 LJ Alphen aan den Rijn

5 Where applicable

12 Certificate of Decontamination

Type: .....

Order number/

Order item number[6]: .....

Delivery date: .....

Applications: .....

Fluid handled[6]: .....

Please tick where applicable[6]:

☐ Corrosive

☐ Oxidising

☐ Flammable

☐ Explosive

☐ Hazardous to health

☐ Seriously hazardous to health

☐ Toxic

☐ Radioactive

☐ Bio-hazardous

☐ Safe

Reason for return[6]: .....

Comments: .....

.....

The product/accessories have been carefully drained, cleaned and decontaminated inside and outside prior to dispatch/ placing at your disposal.

We herewith declare that this product is free from hazardous chemicals, biological and radioactive substances.

For mag-drive pumps, the inner rotor unit (impeller, casing cover, bearing ring carrier, plain bearing, inner rotor) has been removed from the pump and cleaned. In cases of containment shroud leakage, the outer rotor, bearing bracket lantern, leakage barrier and bearing bracket or intermediate piece have also been cleaned.

For canned motor pumps, the rotor and plain bearing have been removed from the pump for cleaning. In cases of leakage at the stator can, the stator space has been examined for fluid leakage; if fluid handled has penetrated the stator space, it has been removed.

☐ No special safety precautions are required for further handling.

☐ The following safety precautions are required for flushing fluids, fluid residues and disposal:

.....

.....

We confirm that the above data and information are correct and complete and that dispatch is effected in accordance with the relevant legal provisions.

.....	.....	.....
Place, date and signature	Address	Company stamp

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6 Required fields

13 Commissioning Report

The pressure booster system specified below has been commissioned today by the undersigned, authorised KSB Service who created this report.

Pressure booster system details

Type series .....

Size .....

Serial number .....

Order No. .....

Purchaser/place of installation

Purchaser		**Place of installation**
Name	.....	.....
Address	.....	.....
	.....	.....

Operating data For further data refer to the wiring diagram.

Start-up pressure	p_E bar	.....
Inlet pressure monitoring (setting of inlet pressure switch)	p_{inl} - x	.....
Stop pressure	p_A bar	.....
Inlet pressure	p_{inl} [bar]	.....
Pre-charge pressure of accumulator	$p_{pre\text{-}charge}$ [bar]	.....

The operator or operator's representative herewith confirms to have received instructions on how to operate and service the pressure booster system. The relevant circuit diagrams and operating instructions have been handed over.

Non-conformities found during commissioning	**Deadline for remedial action**
Non-conformity 1	.....
.....	.....
.....	.....
.....	.....

Name of KSB representative	Name of purchaser or representative
.....	.....
Place	Date
.....	.....

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KSB B.V.
Kalkovenweg 13
2401 LJ Alphen aan den Rijn (Netherlands)