

Break Tank Package Booster Set for Fire
Fighting

Hya-Duo D FL Compact

From Series 2014w33

Installation/Operating Manual



Legal information/Copyright

Installation/Operating Manual Hya-Duo D FL Compact

Original operating manual

All rights reserved. The contents provided herein must neither be distributed, copied, reproduced, edited or processed for any other purpose, nor otherwise transmitted, published or made available to a third party without the manufacturer's express written consent.

Subject to technical modification without prior notice.

© KSB SE & Co. KGaA, Frankenthal 03/06/2019

Contents

	Glossary	5
1	General.....	6
1.1	Principles	6
1.2	Installation of partly completed machinery.....	6
1.3	Target group.....	6
1.4	Other applicable documents.....	6
1.5	Symbols	6
1.6	Key to safety symbols/markings.....	6
2	Safety	8
2.1	General.....	8
2.2	Intended use	8
2.3	Personnel qualification and personnel training.....	9
2.4	Consequences and risks caused by non-compliance with this manual	9
2.5	Safety awareness	9
2.6	Safety instructions for the operator/user.....	9
2.7	Safety information for maintenance, inspection and installation	10
2.8	Unauthorised modes of operation	10
3	Transport/Temporary Storage/Disposal.....	11
3.1	Checking the condition upon delivery	11
3.2	Transport.....	11
3.3	Storage/preservation	12
3.4	Return to supplier.....	13
3.5	Disposal	13
4	Description.....	15
4.1	General description	15
4.2	Product information as per Regulation No. 1907/2006 (REACH).....	15
4.3	Designation.....	15
4.4	Name plate.....	15
4.5	Design details.....	15
4.6	Configuration and function.....	17
4.7	Noise characteristics	18
4.8	Scope of supply.....	18
4.9	Dimensions and weights	18
5	Installation at Site	19
5.1	Checks to be carried out prior to installation.....	19
5.2	Installing the break tank package booster set for fire fighting.....	20
5.3	Mounting the accumulator.....	20
5.4	Connecting the piping	21
5.4.1	Connecting the overflow line	21
5.4.2	Fitting an expansion joint (optional).....	22
5.5	Installing operator-supplied valves	22
5.6	Setting up the float valve	23
5.7	Electrical connection	23
5.7.1	Sizing the power cable	24
5.7.2	On-site protective measures.....	24
5.7.3	Connecting the break tank package booster set for fire fighting	24
5.7.4	Connecting the limit switches (remote ON/OFF).....	25
5.7.5	Connecting the dry running protection device.....	25
5.7.6	Connecting the volt-free contacts	25
5.7.7	Connecting electrical accessories	25

6	Commissioning/Start-up/Shutdown	26
6.1	Commissioning/Start-up	26
6.1.1	Prerequisites for commissioning/start-up	26
6.1.2	Priming and venting the break tank package booster set for fire fighting	27
6.1.3	Setting the dry running protection device	28
6.1.4	Start-up	29
6.1.5	Checklist for commissioning/start-up	29
6.2	Operating limits	30
6.2.1	Application limits	30
6.2.2	Frequency of starts	31
6.2.3	Ambient conditions	31
6.2.4	Maximum operating pressure	31
6.2.5	Fluid handled	31
6.2.6	Drainage capacity	31
6.2.7	Minimum flow rate	32
6.3	Shutdown	32
6.3.1	Shutdown	32
6.3.2	Measures to be taken for shutdown	32
7	Operation	33
7.1	LED display	33
7.2	Operating modes	33
7.2.1	Manual mode	33
7.2.2	Functional check run	33
7.3	Functions	34
7.3.1	Automatic switchover (duty system and back-up system)	34
7.3.2	Dry running protection	35
7.3.3	Temperature monitoring	35
7.3.4	Mains water supply	35
7.3.5	Drinking water stop	35
7.3.6	Flushing	36
8	Servicing/Maintenance	37
8.1	General information/safety regulations	37
8.2	Inspection contract	38
8.3	Servicing/Inspection	38
8.3.1	Supervision of operation	38
8.3.2	Maintenance schedule	38
8.4	Setting the pre-charge pressure	39
9	Trouble-shooting	40
10	Related Documents	42
10.1	General assembly drawing with list of components	42
10.2	Wiring diagram (limit switches)	43
11	EU Declaration of Conformity	44
12	Certificate of Decontamination	45
13	Commissioning Report	46
	Index	47

Glossary

Accumulator

Pressure losses may occur in the piping system downstream of the break tank package booster set for fire fighting which may be caused by leakage of small quantities of water. The accumulator serves to compensate pressure losses and minimises the frequency of starts of the break tank package booster set for fire fighting.

Back-up system

The part of the fire-fighting system / break tank package booster set for fire-fighting which ensures the supply of fire-fighting water in the event of a fire if the duty system fails (see also duty 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.

DIN 1988

German Standard which stipulates technical rules for drinking water installations.

DIN 14462

The fire-fighting systems / break tank package booster sets for fire fighting must comply with the German standard for water conduits for fire extinguishing.

Duty system

The active part of the fire-fighting system / break tank package booster set for fire-fighting which ensures the supply of fire-fighting water in the event of a fire (see also back-up system).

Flushing

If the volume of the inlet line exceeds 1.5 l and/or the length of the inlet line $\geq 10 \times DN$, a flushing system must be provided. This will prevent stagnating fluid handled and microbial contamination of drinking water.

IE3

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

Manual mode

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

Pump activation

Pump activation means that a pump is started up by a starting signal from the pressure switch, from a wall hydrant (limit switch) via remote ON/OFF, or from the broken wire and short-circuit monitoring relay.

Rainwater storage tank

Tank for collecting rainwater, for buried installation or above-floor installation

Switchgear and controlgear assembly

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

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 Installation of partly completed machinery

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

1.3 Target group

This operating manual is aimed at the target group of trained and qualified specialist technical personnel. (⇒ Section 2.3, Page 9)

1.4 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

1.5 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

1.6 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.

Symbol	Description
	CAUTION This signal word indicates a hazard which, if not avoided, could result in damage to the machine and its functions.
	Explosion protection This symbol identifies information about avoiding explosions in potentially explosive atmospheres in accordance with EU Directive 2014/34/EU (ATEX).
	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.



2 Safety

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:
 - Flow direction arrow
 - 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 break tank package booster set for fire fighting must only be operated within the operating limits described in the other applicable documents.
- Only operate break tank package booster sets for fire fighting which are in perfect technical condition.
- Do not operate partially assembled break tank package booster sets for fire fighting.
- Only use the break tank package booster set for fire fighting to handle the fluids described in the product literature of the respective design variant.
- Never operate the break tank package booster set for fire fighting 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 break tank package booster set for fire fighting (to prevent cavitation damage).
- Consult the manufacturer about any other modes of operation not described in the product literature.

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 break tank package booster set for fire fighting 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 instructions 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.
- Provide the personnel with protective equipment and make sure it is used.
- Contain leakages (e.g. at the shaft seal) of hazardous fluids handled (e.g. explosive, toxic, hot) so as to avoid any danger to persons and the environment. Adhere to all relevant laws.
- Eliminate all electrical hazards. (In this respect refer to the applicable national safety regulations and/or regulations issued by the local energy supply companies.)

2.7 Safety information for maintenance, inspection and installation

- Modifications or alterations of the break tank package booster set for fire fighting require the manufacturer's prior consent.
- Use only original spare parts or parts/components authorised by the manufacturer. The use of other parts/components 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 break tank package booster set for fire fighting during standstill only.
- The pump (set) must have cooled down to ambient temperature.
- Pump pressure must have been released and the pump must have been drained.
- When taking the break tank package booster set for fire fighting out of service always adhere to the procedure described in the manual.
- Decontaminate break tank package booster sets for fire fighting which handle fluids posing a health hazard. (⇒ Section 8.1, Page 37)
- As soon as the work has been completed, re-install and re-activate any safety-relevant devices and protective devices. Before returning the product to service, observe all instructions on commissioning. (⇒ Section 6.1, Page 26)
- Make sure the break tank package booster set for fire fighting cannot be accessed by unauthorised persons (e.g. children).
- Prior to opening the break tank package booster set for fire fighting, 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 break tank package booster set for fire fighting supplied is only valid if the break tank package booster set for fire fighting is used in accordance with its intended use. (⇒ Section 2.2, Page 8)

3 Transport/Temporary 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 Tilting break tank package booster set for fire fighting Risk of injury from falling break tank package booster set for fire fighting! ▷ Never suspend the break tank package booster set for fire fighting by its 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. ▷ Attach the break tank package booster set for fire fighting to crane lifting tackle as shown, or use a forklift or pallet truck to move the pallet.
---	---

The break tank package booster set for fire fighting can be separated into three parts to facilitate transport.

- Control cabinet with hydraulic unit (pump sets with valves and piping)
- Tank
- Baseplate

Transporting the separated break tank package booster set for fire fighting

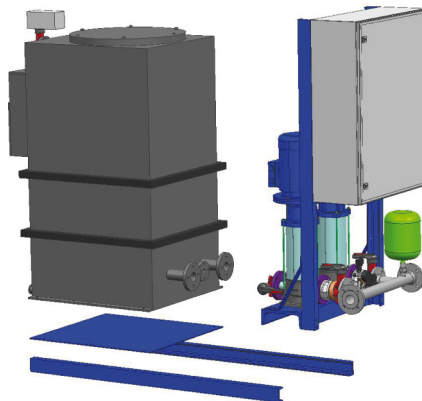


Fig. 1: Transporting the separated parts of the break tank package booster set for fire fighting

- ✓ Transport equipment / lifting equipment suitable for the corresponding weight has been selected and is on hand.
1. Remove the packaging. Remove the caps from the connection openings.
 2. Check for any in-transit damage.
 3. Disconnect the plug-type connection between the tank and the control cabinet.
 4. Undo the flanged connections between the hydraulic unit and the tank.
 5. Remove the hydraulic unit from the tank.
 6. Unbolt the tank from the baseplate.
 7. Transport the three modules to the place of installation.
 8. Suspend the tank, hydraulic unit and baseplate as illustrated.

9. Lift each of the three modules with suitable lifting equipment and carefully place the modules down at the place of installation.
10. Mount the tank and hydraulic unit on the baseplate. Flange the hydraulic unit to the tank.
11. Re-connect the plug-type connection between the tank and the control cabinet.

Transporting the complete break tank package booster set for fire fighting

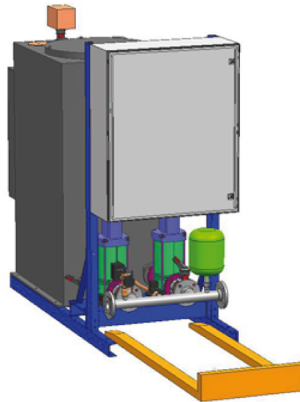


Fig. 2: Transporting the complete break tank package booster set for fire fighting

- ✓ Transport equipment / lifting equipment suitable for the corresponding weight has been selected and is on hand.
1. Remove the packaging. Remove the caps from the connection openings.
 2. Check for any in-transit damage.
 3. Transport the break tank package booster set for fire fighting to the place of installation.
 4. Attach the break tank package booster set for fire fighting to the lifting equipment as shown. Lift it off the wooden skids. Dispose of the wooden skids.
 5. Carefully place down the break tank package booster set for fire fighting at the site of installation.

3.3 Storage/preservation

	CAUTION Damage during storage due to frost, humidity, dirt, UV radiation or vermin Corrosion/contamination of the break tank package booster set for fire fighting! ▷ Store the break tank package booster set for fire fighting in a frost-proof, roofed area.
	CAUTION Wet, contaminated or damaged openings and connections Leaking or damaged break tank package booster set for fire fighting! ▷ Only remove caps/covers from the openings of the break tank package booster set for fire fighting at the time of installation.

If commissioning is to take place some time after delivery, we recommend that the following measures be taken for storing the break tank package booster set for fire fighting:

Store the break tank package booster set for fire fighting in a dry, protected room where the atmospheric humidity is as constant as possible.

Table 4: 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 break tank package booster set for fire fighting as per operating instructions.
2. Flush and clean the break tank package booster set for fire fighting, particularly if it has been used for handling noxious, explosive, hot or other hazardous fluids.
3. If the break tank package booster set for fire fighting has handled fluids whose residues could lead to corrosion damage in the presence of atmospheric humidity or could ignite upon contact with oxygen, the break tank package booster set for fire fighting must also be neutralised, and anhydrous inert gas must be blown through the break tank package booster set for fire fighting to ensure drying.
4. Always complete and enclose a certificate of decontamination when returning the break tank package booster set for fire fighting. (⇒ Section 12, Page 45)
Always indicate any safety measures 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



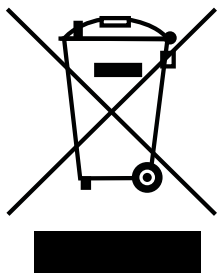
WARNING

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 break tank package booster set for fire fighting.
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.



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.

4 Description

4.1 General description

- Break tank package booster set for fire fighting

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: Hya-Duo D FL 2 / 1506 B Compact

Table 5: Designation key

Code	Description
Hya-Duo	Type series
D FL	Break tank package booster set for fire fighting with three-phase motor
2	Number of pump sets
15	Pump size
06	Number of stages
B	Design status
Compact	Compact design

4.4 Name plate

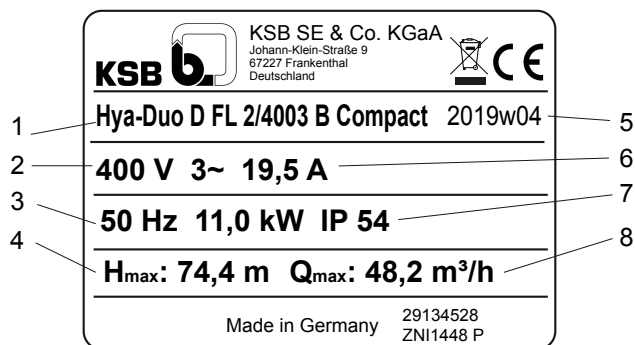


Fig. 3: Name plate (example)

1	Type series, size	5	Year, calendar week of construction
2	Rated voltage	6	Maximum current input
3	Frequency, power	7	Enclosure
4	Maximum head	8	Maximum permissible flow rate

4.5 Design details

Design

- Fully automatic break tank package booster set for fire fighting to EN 1717
- Baseplate-mounted
- Modular design (comprising 3 modules):
 - Control cabinet with hydraulic unit (two pump sets with redundant function, valves, piping, pressure switch¹⁾ and temperature sensor¹⁾)
 - Baseplate

1) Supplied fitted and electrically connected, with default settings

- Tank with inlet device and flushing device, overflow monitoring and dry running monitoring²⁾
- Vibration damping

Installation

- Stationary dry installation

Drive

- Three-phase asynchronous motor
- 380 / 420 V, 50 Hz
- 2 poles
- Enclosure IP55
- Efficiency class IE3 to IEC 60034-30
- Soft starter for each pump
- Pressure-controlled starting and flow-controlled stopping

Automation

- Electro-mechanical control system, IP54
- Timer
- Manual-automatic selector switch
- Phase monitoring relay
- In automatic mode, the motor protection circuit only outputs an alert.
- Terminal strip/terminals with identification for all connections
- Pressure switch or remote ON/OFF, monitored for broken wires and short circuit
- Circuit diagram to VDE and parts list for electric parts

Indication via indicator lamps:

- Colour LED indicating lack of water (red)
- Colour LED indicating a fault (amber)
- Colour LED indicating readiness for operation (green)
- Colour LED indicating operation started by pressure switch or remote ON/OFF (white)

Indication via volt-free isolating terminals:

- Lack of water
- Overflow
- Position of manual-automatic selector switch
- Pump control via pressure switch or remote ON/OFF
- General fault message
- Drinking water stop

Monitoring for broken wires and monitoring for short circuit:

- > 10.3 kΩ: broken wire
- 10 kΩ: good state
- 1 kΩ: pump start through actuation of limit switch
- < 300 Ω: short circuit

2) Supplied assembled and pre-set. The electrical components can be connected and disconnected at the control cabinet via plug-type connections.

4.6 Configuration and function

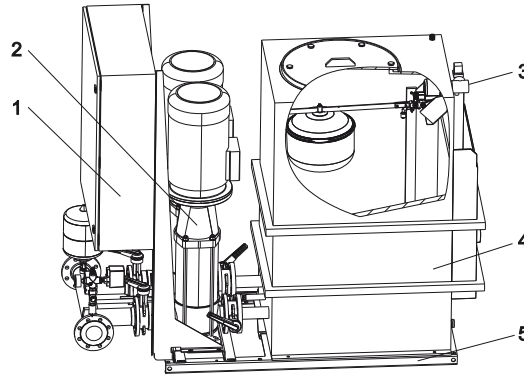


Fig. 4: Illustration of the break tank package booster set for fire fighting

1	Control cabinet	4	Tank
2	High-pressure centrifugal pump	5	Baseplate
3	Inlet		

Design Fully automatic, ready-to-connect break tank package booster set for fire fighting comprising two high-pressure centrifugal pumps (2) with redundant function, a control cabinet (1) and a tank (4) for the hygienic separation of drinking water and fire-fighting water. The modular design allows separating the break tank package booster set for fire fighting into three modules (control cabinet with hydraulic unit, tank and baseplate). Anti-vibration mounts are fitted at the pump feet and baseplate (5).

Function The pump sets are started and stopped as a function of pressure via the electro-mechanical control system. If the pressure drops below the set start-up pressure p_e , the pump sets are started up via the pressure switch. When consumption decreases again, the pump sets are stopped as a function of pressure after the set after-run period (up to 10 minutes). Independently of the pressure switch, the break tank package booster set for fire fighting can also be controlled via remote ON/OFF (e.g. a switch in the wall hydrant). The pressure switch and remote ON/OFF input are monitored for broken wires and short circuit. If a broken wire or short circuit are detected, the break tank package booster set for fire fighting is started up automatically and a fault is indicated.

In the event of a fire, pumping the fluid handled is of top priority. In automatic mode, the protective features (dry running protection, motor protection) cannot be enabled. If the motor protection switch trips, the motor will keep running on the power supply network without further monitoring. A fault message is output.

The required quantity of the fluid handled is supplied via the float valve. The float valve at the drinking water inlet is opened and closed fully automatically as a function of the fill level in the tank. A float switch monitors for lack-of-water and overflow, and signals such events to the control system. Power supply of the flushing system and water level monitoring equipment is effected via terminals in the control cabinet.

4.7 Noise characteristics

For the noise characteristics refer to the operating manual of the pump (set).

4.8 Scope of supply

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

- Break tank package booster set for fire fighting
 - Two vertical Movitec high-pressure centrifugal pumps
 - Discharge-side piping
 - Check valve
 - Shut-off valves
 - Discharge-side, direct-flow membrane-type accumulator
 - Two pressure switches on the discharge side
 - Pressure gauge
 - Base frame
 - Drain connection with integrated odour trap
 - Temperature sensor
 - Automatic flushing
 - Tank with type AB air gap to EN 1717
 - Float valve for mains water supply to DVGW
- Control unit
 - Two power supply connections
 - Two motor protection switches
 - Two master switches
 - Two relays for broken wire monitoring / short-circuit monitoring
 - Two manual-automatic selector switches
 - Two timers
 - Two phase monitoring relays
 - Two soft starters
 - Two control transformers
 - Terminal strip with markings for all connections
 - Plug-type connection for the control cabinet and tank

4.9 Dimensions and weights

For dimensions and weights refer to the outline drawing.

5 Installation at Site

5.1 Checks to be carried out prior to 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 The anti-vibration mounts provide adequate insulation against solid-borne noise.
	NOTE Do not operate the break tank package booster set for fire fighting near living quarters and/or sleeping quarters.
	NOTE Observe the installation requirements to DIN 14462.

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 break tank package booster set for fire fighting can be operated on the power supply network according to the data on the name plate.
(⇒ Section 4.4, Page 15)
- The place of installation is frost-free.
- The place of installation can be locked.
- The place of installation is well-ventilated.
- A suitably dimensioned drain connection (e.g. leading to a sewer) is available.
- If the system is installed below the flood level, the country-specific drainage regulations must be complied with.
- If expansion joints are used, take note of their creep resistance. Expansion joints must be easily replaceable.

5.2 Installing the break tank package booster set for fire fighting

	! DANGER Microbial contamination of drinking water Danger to life! ▷ If the volume of the inlet line exceeds 1.5 l and/or the length of the inlet line $\geq 10 \times \text{DN}$, flush the inlet line at least 1 x per week. (⇒ Section 7.3.6, Page 36)
	CAUTION Dirt in the break tank package booster set for fire fighting Damage to the pump set! ▷ Clean the tank before filling it. ▷ Clean the tank and the integrated odour trap at least once a year.
	NOTE DIN 1988 permits the installation of an unpressurised tank. The tank made of polyethylene meets the requirements of EN 1717 and EN 13077, (overflow type AB air gap).

- ✓ The packaging of the break tank package booster set for fire fighting has been removed.
 - ✓ Sufficient clearance in all directions is provided for servicing work.
 - ✓ All structural work required has been checked.
 - ✓ The dimensions of the foundation are correct, and the concrete has set firmly.
 - ✓ The foundation is level.
1. Align the break tank package booster set for fire fighting horizontally.
 - ⇒ Standard design: If necessary, insert shims, wedges or other supports under baseplate sections designed to contact the floor.
 - ⇒ Version with feet (optional): Adjust the feet height.
 2. Connect the mains water supply line and discharge line to the corresponding distribution lines on the inlet side and discharge side. See DIN 1988.
 3. Mark the fastening hole positions on the foundation in accordance with the outline drawing (other applicable documents).
 4. Drill the holes (maximum diameter: 12 mm).
 5. Insert plug fixings of appropriate size.
 6. Place the break tank package booster set for fire fighting in its correct installation position.
 7. Use suitable bolts to firmly anchor the break tank package booster set for fire fighting.
 8. Clean the tank.

5.3 Mounting the accumulator

	CAUTION Dirt in the break tank package booster set for fire fighting Damage to the pump set! ▷ Clean the accumulator before filling it.
---	--

- ✓ The original operating manual of the accumulator is on hand.
1. Mechanically and electrically connect the accumulator in accordance with the original operating manual supplied.

5.4 Connecting the piping

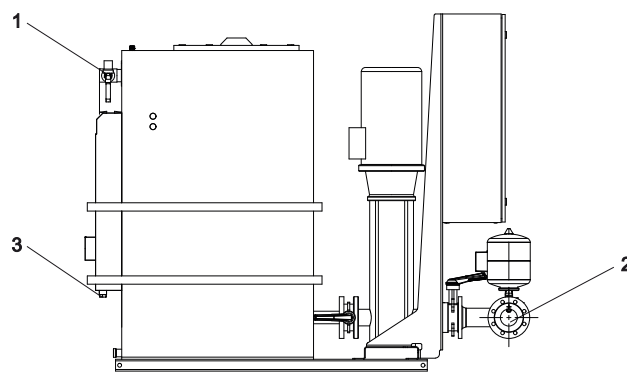


Fig. 5: Connecting the piping

1	Inlet line connection	3	Overflow line connection
2	Discharge line connection		

1. Install the piping without transmitting any stresses and strains.
2. Connect the piping to the distribution lines on the inlet side and discharge side. Connect the inlet line in a rigid horizontal position.
3. Connect the overflow. (⇒ Section 5.4.1, Page 21)

5.4.1 Connecting the overflow line

	CAUTION
	Overflow not connected Flooding of installation room! ▶ Lay the overflow line to a sewer of sufficient drainage capacity.
	NOTE
	The overflow with type AB air gap separates the drinking water from the fire-fighting water (service water) in compliance with the standard, also if the siphon is clogged or closed.

- ✓ The break tank package booster set for fire fighting has been properly installed.
 - ✓ The sewer has sufficient drainage capacity.
 - ✓ The drainage capacity required for the break tank package booster set for fire fighting is met. (⇒ Section 6.2.6, Page 31)
1. Design the overflow line as short as possible.
 2. Connect the overflow line to the overflow (connection DN 150).
 3. Lay the overflow line with a continuously falling slope to the sewer.

5.4.2 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. Sufficient clearance in all directions is provided for checking the expansion joint.
 2. Only fit an expansion joint upstream of the float valve if a rigid, supported pipe section is fitted between the float valve and the expansion joint.
 3. 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.
 4. Evenly tighten the bolts crosswise. The ends of the bolts must not protrude from the flange.

5.5 Installing operator-supplied valves

1. Any additional valves used (e.g. gate valve, water meter and lift check valve) must comply with the local water supplier's requirements.

5.6 Setting up the float valve

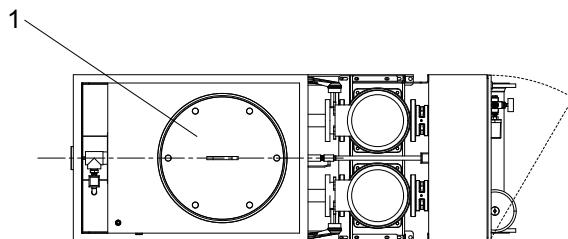


Fig. 6: Access to the float valve

1	Cover
---	-------

- ✓ The original operating manual of the float valve is on hand.
- ✓ The inlet line has been installed properly. (⇒ Section 5.4, Page 21)
- 1. Undo the six bolts of the cover at the top of the tank with a suitable tool. Store the bolts.
- 2. Remove the retaining tabs of the float valve.
- 3. Loosen the fastening screw of the floating ball with a suitable tool.
- 4. Move the floating ball along the lever arm as required.
 - ⇒ Floating ball close to the valve = maximum fill level.
 - ⇒ Floating ball at the end of the lever arm = maximum tightness and reliable closing at high inlet pressure.
- 5. Fasten the fastening screw of the floating ball with a suitable tool. The floating ball must be able to move freely.
- 6. Fit the cover on the top of the tank. Fasten it with the six bolts.

5.7 Electrical connection

	⚠ DANGER
	Electrical connection work by unqualified personnel Risk of fatal injury due to electric shock! ▷ Always have the electrical connections installed by a trained and qualified electrician. ▷ Observe regulations IEC 60364 and, for explosion-proof models, EN 60079.
	⚠ WARNING
	Incorrect connection to the mains Damage to the mains network, short circuit! ▷ Observe the technical specifications of the local energy supply companies.
	NOTE
	For the electrical connection comply with the requirements to DIN 14462.

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.

5.7.1 Sizing the power cable

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

5.7.2 On-site protective measures

For protective measures on site observe DIN 14462 for the electrical connection.

5.7.3 Connecting the break tank package booster set for fire fighting

	NOTE If the connection for emergency back-up power supply is connected to the second terminal, the power supply must be switched between the two power supply options at the site. The terminals for the power supply options are wired in the control cabinet. The control cabinet must only be supplied by one of the power supply options at a time.
---	---

- ✓ Prior to connecting the system to the power supply network, the operator has made sure that the applicable VDE and country-specific regulations are complied with.
- ✓ The power cable has been connected by an approved company.
 1. Connect the limit switches (remote ON/OFF). (⇒ Section 5.7.4, Page 25)
 2. Connect the dry running protection device. (⇒ Section 5.7.5, Page 25)
 3. Connect the volt-free contacts. (⇒ Section 5.7.6, Page 25)
 4. Connect the electrical accessories. (⇒ Section 5.7.7, Page 25)

5.7.4 Connecting the limit switches (remote ON/OFF)

1. Connect one or several limit switches in accordance with the wiring diagram (limit switches). When connecting several limit switches, connect the terminating resistor behind the last limit switch. (⇒ Section 10.2, Page 43)

The terminals for connecting limit switches (remote ON/OFF) are marked in the switchgear and controlgear assembly. A terminating resistor of 10 kΩ is connected at the terminals. The relay for broken wire monitoring and the relay for short-circuit monitoring analyse the following resistance values:

- 10 kΩ: no fault
- > 10.3 kΩ: broken wire
- < 300 Ω: short circuit
- 1 kΩ: pump start through actuation of limit switch

5.7.5 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.

5.7.6 Connecting the volt-free contacts

1. Establish the connection in accordance with the wiring diagram. The terminals are marked in the switchgear and controlgear assembly.
2. If fault information of volt-free individual fault message is to be transmitted as a volt-free general fault message, loop through the volt-free individual fault messages.

Volt-free contacts are provided for the following messages:

- General fault message
 - Motor protection warning
 - No control voltage
 - Short circuit / broken wire
 - Mains fault
 - Excessive pump temperature
- General fault message
 - Tank overflow
 - Pump activated
 - Lack of water / dry running
 - Switch position of manual-automatic selector switch
 - Drinking water stop

5.7.7 Connecting electrical accessories

1. Connect the electrical accessories in accordance with the wiring diagram.

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 / break tank package booster set for fire fighting! ▸ Use a dry running protection device. 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 break tank package booster set for fire fighting 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 owner or the owner's representative must have had the system's readiness for operation and connection conditions checked by the responsible authorities (e.g. local water provider or the office for industrial safety and product safety).
- The dry running protection device has been installed. (⇒ Section 5.7.5, Page 25)

6.1.2 Priming and venting the break tank package booster set for fire fighting

	CAUTION Foreign matter in the piping Damage to the pump set / break tank package booster set for fire fighting! ▷ Before commissioning/starting up or test running the break tank package booster set for fire fighting, make sure that there is no foreign matter in the break tank package booster set for fire fighting or piping.
	CAUTION Operation without the fluid to be handled Damage to the pump set! ▷ Prime the break tank package booster set for fire fighting with the fluid to be handled.
	NOTE Prior to delivery, the break tank package booster set for fire fighting is hydraulically tested 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 break tank package booster set for fire fighting 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. Start-up the duty system prior to starting up the stand-by system.

- ✓ The original operating manual of the pump set is on hand.
- ✓ The original operating manual of the pressure switch is on hand.
- ✓ The original operating manual of the timer is on hand.
- ✓ The pipe unions between the pump set and the piping have been re-tightened.
- ✓ The flange bolting has been checked for firm seating.
- ✓ The cooling air inlet openings and outlet openings at the motor are unobstructed.
- ✓ All shut-off valves are open.
- ✓ The pre-charge pressure of the accumulator has been checked.
(⇒ Section 8.4, Page 39)
- ✓ The minimum flow rate has been observed. (⇒ Section 6.2.7, Page 32)
 1. Set the master switch to 0 and the manual-automatic selector switch to automatic.
 2. Provide connection to power supply.
 3. Connect the water mains for the mains water supply.
 4. Open the vent plugs at the pump set in accordance with the supplied original operating manual of the pump set.
 5. Slowly open the inlet-side valve and slowly prime the break tank package booster set for fire fighting until the fluid to be handled escapes through the vent holes.
⇒ The tank starts to fill up.

6. Check that the float valve functions properly. (⇒ Section 5.6, Page 23)
7. Close and slightly tighten the pump vent plugs.
8. Switch on the master switch.
9. Set the manual-automatic selector switch to manual. Check the direction of rotation of the pump sets. Compare the direction of rotation to the arrow indicating the direction of rotation on the motor. If the direction of rotation does not match, interchange the phases at the terminal board of the motor.
10. Set the manual-automatic selector switch to automatic.
11. Slowly open the discharge-side valve. Check the set start-up pressure with a pressure gauge. If necessary, adjust the start-up pressure in accordance with the supplied original operating manual of the pressure switch.
12. Slowly close the discharge-side valve. Check the set stop pressure with a pressure gauge. If necessary, adjust the stop pressure in accordance with the supplied original operating manual of the pressure switch.
13. Slowly open the discharge-side valve.
14. Set the after-run time of the pump set to a value between 3 and 10 minutes using the timer in accordance with the supplied original operating manual. Observe the maximum permissible frequency of starts. (⇒ Section 6.2.2, Page 31)
15. When all pump sets are running, loosen the vent plugs again to let any remaining air escape.
16. Close the vent plugs.
17. Check that the pump sets are running smoothly.
18. Close the discharge-side valve in order to verify whether the pump sets reach the maximum shut-off head.
19. Open the discharge-side valve.
20. Set the time and duration of the test run in the switchgear and controlgear assembly (first channel of the timer) in accordance with the supplied original operating manual.
21. Set the flushing system. (⇒ Section 7.3.6, Page 36)
22. Check the minimum inlet pressure with a pressure gauge. If the inlet pressure is too low, contact the public utility company. (⇒ Section 6.2.1, Page 30)
23. Set the dry running protection device. (⇒ Section 6.1.3, Page 28)
24. Set the mains water supply. (⇒ Section 7.3.4, Page 35)

6.1.3 Setting the dry running protection device



NOTE

Dry running protection is only enabled in manual mode and test run mode. In automatic mode an alarm message is indicated by the (red) indicator lamp; the pump sets continue to run.

In the switchgear and controlgear assembly the digital input for dry running protection is directly connected to the float switch in the tank. If the connection opens, the control system stops the break tank package booster set for fire fighting after approximately 10 seconds (factory setting). The stop delay of 5 to 100 seconds can be set at the timer.

- ✓ The dry running protection device has been properly connected. (⇒ Section 5.7.5, Page 25)
 - ✓ The original operating manual of the timer is on hand.
1. Set the timer in accordance with the supplied original operating manual.

6.1.4 Start-up



NOTE

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

✓ The break tank package booster set for fire fighting has been primed and vented.

1. Switch on the master switch.

⇒ The green LED lights up and signals the system's readiness for operation.

6.1.5 Checklist for commissioning/start-up

Table 6: Checklist

Steps to be carried out	Action	Completed
1	Read the operating manual.	
2	Compare the power supply data against the name plate data.	
3	Check/measure the earthing system.	
4	Check the mechanical connection to the water supply system. Re-tighten the flanges and pipe unions.	
5	Prime and vent the break tank package booster set for fire fighting from the inlet side.	
6	Check the mains water supply.	
7	Check that all cables are firmly connected to the terminals inside the control unit.	
8	Check the direction of rotation.	
9	Check the start pressure and 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 set has been running for 5 to 10 minutes, vent it again.	
12	Check the pre-charge pressure.	
13	Enter any deviations from the name plate or order documentation in the commissioning report.	
14	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 Application limits

	NOTE On-site conditions deviating from the test conditions may have a negative impact on the operating reliability. Regardless of the effective volume of the tank, the operating reliability of the system must be checked in an on-site acceptance inspection in accordance with DIN 14462.
--	---

The effective volume of the tank is selected to DIN 1988-500 as standard. Mains water is refilled via a float valve.

To ensure a sufficient supply of fire-fighting water and when using a tank with reduced effective volume observe the following application limits:

Table 7: Application limits

Flow rate	Float switch connection	Minimum inlet pressure ³⁾	Maximum static pressure
[m³/h]		[bar]	[bar]
≤ 18	G 1 1/4	1,5	8
≤ 36	G 2	1,5	8
≤ 48	G 2	3	8

3) Minimum flow pressure at the float switch depending on the nominal flow rate

6.2.2 Frequency of starts

To prevent high temperature increases in the motor and excessive loads on the pump, motor, seals and bearings, the frequency of starts shall not exceed the following number of starts per hour.

Table 8: Frequency of starts

Motor rating [kW]	Maximum frequency of starts [Starts/hour]
≤ 7,5	20
11 - 22	10
≥ 30	6

6.2.3 Ambient conditions

Observe the following parameters and values during operation:

Table 9: Permissible ambient conditions

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

6.2.4 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.

6.2.5 Fluid handled

6.2.5.1 Permissible fluids to be handled

- Fire-fighting water
- Liquids not containing aggressive, abrasive or solid substances

6.2.5.2 Fluid temperature

Table 10: Temperature limits of the fluid handled

Permissible fluid temperature	Value
Maximum	+70 °C
Minimum	0 °C

6.2.6 Drainage capacity

Table 11: Drainage capacity depending on the effective volume of the tank

Effective volume of the tank [l]	Drainage capacity [m³/h]
540	25
1080	50

6.2.7 Minimum flow rate

Table 12: Minimum flow rate per pump in manual mode

Size	Minimum flow rate per pump
	[l/h]
Movitec 15B	1600
Movitec 25B	2800
Movitec 40B	4600

6.3 Shutdown

6.3.1 Shutdown

1. Close the valves in the inlet line.
2. Set the master switch to 0.

6.3.2 Measures to be taken for shutdown

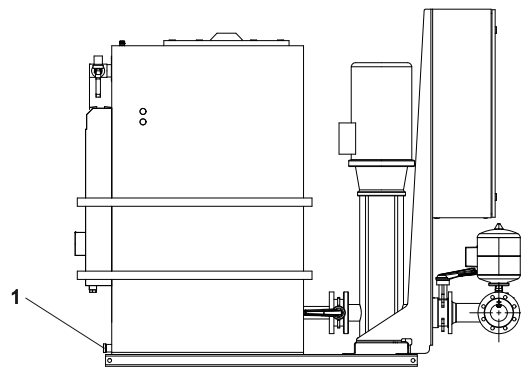


Fig. 7: Draining the break tank package booster set for fire fighting

1	Drain plug
---	------------

- ✓ The break tank package booster set for fire fighting has been shut down.
(⇒ Section 6.3.1, Page 32)
- 1. Open the drain plug at the tank with a suitable tool.
⇒ The break tank package booster set for fire fighting is drained.
- 2. Close the drain plug at the tank with a suitable tool.

7 Operation

	CAUTION
	Incorrect operation Damage to the pump system! ▷ Make sure to comply with all local regulations, particularly the EC Machinery Directive and the EC Directive on Low-Voltage Equipment. ▷ Check all electric cables prior to commissioning/start-up.

7.1 LED display

The LED display provides information about the operating status.

Table 13: LED description

LED	Description
Green	Trouble-free operation
Yellow	One or more warnings are active.
Red	Fire-fighting operation active, one or more alarm messages active.

7.2 Operating modes

7.2.1 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 sets to overheat. A manual-automatic selector switch for each pump set is provided at the switchgear and controlgear assembly. When the switch is set to **manual** the pump sets are operated on the power supply network, independently of the automatic system (pressure switch, remote ON/OFF).

7.2.2 Functional check run

The switchgear and controlgear assembly is fitted with a timer per pump set. During the functional check run the pump sets are operated directly on the power supply network, independently of the automatic system (pressure switch, remote ON/OFF). The functional check run parameters can be set via the timer (see supplied original operating manual).

7.3 Functions

7.3.1 Automatic switchover (duty system and back-up system)

If the duty system fails (motor protection switch or phase monitoring tripped, 24 V supply interrupted or control transformer failed), operation automatically switches from the duty system to the back-up system.

Table 14: Response in the event of a failure

Duty system fault	Back-up system fault	Response of pressure booster system
Motor protection switch tripped	Motor protection switch tripped	Back-up system ready for operation
	24 V supply interrupted	Back-up system starts up
	Control voltage interrupted	Switchover back to duty system Duty system ready for operation
	Failure phase monitoring	Switchover back to duty system Duty system ready for operation
24 V supply interrupted	Motor protection switch tripped	Back-up system ready for operation
	24 V supply interrupted	Back-up system starts up
	Control voltage interrupted	Switchover back to duty system Duty system starts up
	Failure phase monitoring	Switchover back to duty system Duty system starts up
Control voltage interrupted	Motor protection switch tripped	Back-up system ready for operation
	24 V supply interrupted	Back-up system starts up
	Control voltage interrupted	Switchover back to duty system Pressure booster system no longer ready for operation
	Failure phase monitoring	Switchover back to duty system Pressure booster system no longer ready for operation
Failure phase monitoring	Motor protection switch tripped	Back-up system ready for operation
	24 V supply interrupted	Back-up system starts up
	Control voltage interrupted	Switchover back to duty system Pressure booster system no longer ready for operation
	Failure phase monitoring	Switchover back to duty system Pressure booster system no longer ready for operation

7.3.2 Dry running protection

In the following cases, dry running protection is active in manual mode and during a test run:

- The discharge-side pressure is not below the start-up pressure p_E .
- The break tank package booster set for fire fighting is started up via the remote ON/OFF contact.

Both cases are interpreted as an event of fire. In the event of fire, the system's protective features must be disabled.

A digital input is provided for connecting the dry running protection device. When the input is open, the control unit detects dry running and stops the break tank package booster set for fire fighting after approx. 10 seconds (factory setting).

7.3.3 Temperature monitoring

To protect the pump sets against overheating during operation without minimum flow rate a temperature sensor is fitted on the pump shroud. The temperature sensor opens the solenoid valve in the by-pass line when a specific fluid temperature (factory-set to 65 °C) is exceeded. Temperature monitoring is enabled in automatic mode and manual mode.

7.3.4 Mains water supply

The tank is automatically re-filled with mains water via the float valve. During operation the fill level is maintained by the water supply balancing out the water consumed. The float switch monitors for lack-of-water and dry running, and signals such events to the switchgear and controlgear assembly as faults.

- ✓ The application limits of the float switch and tank are observed.
(⇒ Section 6.2.1, Page 30)
- ✓ The sewer has sufficient drainage capacity.
 1. Set the flow rate by means of throttle valves or pressure reducers so that the tank, when the valve closes automatically, fills up until just under the float valve.
The peak flow rate in an inlet line must not exceed the flow velocity of 5 m/s (DIN 1988-600).

7.3.5 Drinking water stop

If a drinking water supply branch is provided at the site, this branch can be closed off by the volt-free message **drinking water stop**. A time delay applies to this message (factory setting 30 seconds) when activated via pressure switch or limit switch (remote ON/OFF).

7.3.6 Flushing



NOTE

According to DIN 1988-600 automatic flushing must be effected once a week, if the supply line exceeds a length of $10 \times \text{DN}$ and a volume of 1.5 l. The flushing system must be set to replace three times the water volume in the supply line. During the flushing process the minimum flow velocity for DN 50 is 0.2 m/s; for larger nominal diameters the minimum flow velocity is 0.1 m/s.

The break tank package booster set for fire fighting is fitted with a discharge-side flushing system (solenoid valve $\frac{1}{2}$ inch).
For flushing the inlet line provide a flushing system (e.g. solenoid valve) at the site. The flushing duration of the inlet line must be determined and set using the timer in the switchgear and controlgear assembly.

Determining the flushing duration

1. Determine the flow rate (Q) of the solenoid valve at minimum available inlet pressure (p_{inl}).

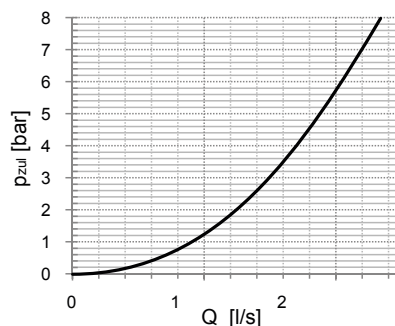


Fig. 8: Flow diagram, solenoid valve: flow rate (Q) as a function of inlet pressure (p_{inl})

2. Determine the flow velocity (V) at minimum available inlet pressure (p_{inl}). Multiply the result with three times the volume of the inlet line.

⇒ Nominal size $\leq$ DN 50: minimum flow velocity (V) = 0.2 m/s

⇒ Nominal size $>$ DN 50: minimum flow velocity (V) = 0.1 m/s

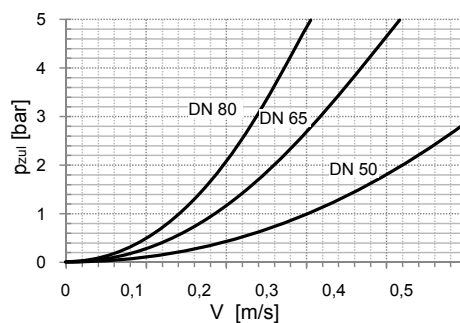


Fig. 9: Flushing process in the inlet line: flow velocity (V) as a function of inlet pressure (p_{inl})

3. Calculate the flushing duration.

Setting the discharge-side flushing system

- ✓ The overflow has been properly connected.
 - ✓ The required flushing duration has been determined.
1. Set the timers in the duty system and in the stand-by system. Set the time and duration for flushing in the switchgear and controlgear assembly (second channel of the timer) in accordance with the supplied original operating manual.
 - ⇒ The flushing water is discharged via the overflow.

8 Servicing/Maintenance

8.1 General information/safety regulations

	 DANGER Unintentional starting of the break tank package booster set for fire fighting Danger to life! ▷ De-energise the break tank package booster set for fire fighting for any repair work or servicing work. ▷ Ensure that the break tank package booster set for fire fighting 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 Work on the break tank package booster set for fire fighting by unqualified personnel Risk of injury! ▷ Always have repair work and maintenance work performed by specially trained, qualified personnel.
	CAUTION Use after event of fire / failure Malfunction; functions not working! ▷ Completely check the break tank package booster set for fire fighting after it has been operated in an event of fire.
	CAUTION Incorrectly serviced break tank package booster set for fire fighting Function of break tank package booster set for fire fighting not guaranteed! ▷ Regularly service the break tank package booster set for fire fighting. ▷ Create a maintenance schedule. Observe the information on lubricant, shaft seal and coupling of the pump sets.

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.

8.2 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.

8.3 Servicing/Inspection

8.3.1 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 8.4, Page 39)
- 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.

8.3.2 Maintenance schedule

Table 15: Overview of maintenance work

Maintenance interval	Servicing/maintenance work
At least once a year	Check the pump set for smooth running. Check the mechanical seal for integrity.
	If applicable, check the feet for any wear.
	Check the shut-off valves, drain valves and check valves for proper functioning and tightness.
	If applicable, clean the strainer in the pressure reducer.
	If applicable, check the expansion joints for any wear.
	Verify the pre-charge pressure. Check the accumulator for integrity.
	Check the automatic switching functionality.
	Check if the functional check run is running.
	Check the cut-in levels and cut-out levels.
	Check the inlet, inlet pressure, dry running protection and, if applicable, the pressure reducer.
	Check the tank, float switch and float valve. Check the overflow for integrity and cleanliness.

8.4 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 pre-charge pressure of the accumulator (p) must be below the set start-up pressure (p_E) of the break tank package booster set for fire fighting.

The best storage volumes are achieved at the following settings (average value):

- Factor 0.9 at pre-charge pressure > 3 bar
- Factor 0.8 at pre-charge pressure < 3 bar

Example 1 p_E = 5 bar

$$5 \text{ bar} \times 0.9 = 4.5 \text{ bar}$$

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

Example 2 p_E = 2 bar

$$2 \text{ bar} \times 0.8 = 1.6 \text{ bar}$$

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

Checking the pre-charge pressure

1. Close the valve under the accumulator.
2. Drain the accumulator via the drain valve.
3. Remove and store the protective cap of the accumulator valve.
4. Check the pre-charge pressure with a suitable pressure gauge (e.g. tyre pressure gauge).
5. Fit the protective cap of the accumulator valve.

Filling the accumulator

1. Remove and store the protective cap of the accumulator valve.
2. Re-fill nitrogen through the valve.
3. Fit the protective cap of the accumulator valve.

9 Trouble-shooting

	 WARNING Improper work to remedy faults Risk of injury! ► For any work performed to remedy faults, observe the relevant information given in this instruction manual and/or in the product literature provided by the accessories manufacturer.
	NOTE Prior to commissioning and maintenance work during the warranty period, consultation with KSB Service is required. Non-compliance with this instruction 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** Pump cuts out shortly after start-up in manual mode. Red indicator lamp signals lack of water.
- B** The break tank package booster set for fire fighting does not start.
- C** Pump running but not delivering water
- D** Insufficient flow rate of the break tank package booster set for fire fighting
- E** Discharge-side pressure too low.
- F** Discharge-side pressure too high.
- G** Leakage at mechanical seal.
- H** Motor/pump overheated.
- I** Motor protection switch triggered. Yellow indicator lamp is on.
- J** Pump does not stop.
- K** Pump starts too often (more than 30 starts per hour).
- L** Broken wire and short-circuit monitoring relay indicates a broken wire.
- M** Broken wire and short-circuit monitoring relay indicates a short circuit.
- N** Green lamp and yellow lamp light up simultaneously and pump is running.
- O** Yellow lamp and red lamp are lit.
- P** Drain connection overflows.

Table 16: Trouble-shooting

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Possible cause	Remedy ⁴⁾
-	-	X	X	-	-	-	X	-	X	-	-	-	-	-	-	Pump / piping not vented and/or primed	Vent and/or prime.
X	X	X	X	X	-	-	X	-	-	-	-	-	-	-	-	Shut-off valves fully or partially closed	Check, open as necessary.
X	-	-	X	X	-	-	-	-	X	-	-	-	-	-	-	Strainer / dirt trap clogged	Clean.
-	-	X	X	X	X	-	-	-	-	-	-	-	-	-	-	Inlet-side shut-off valve closed	Check, open as necessary.
-	-	-	-	-	-	-	X	-	X	-	-	-	-	-	-	Discharge-side shut-off valve closed or defective	Check, open as necessary.
X	X	-	X	X	X	-	X	-	X	-	-	-	-	-	-	Pressure switch set incorrectly	Check setting.
-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	Start-up pressure set too high	Check setting.
-	-	-	-	-	-	-	X	-	-	X	-	-	-	-	-	Pre-charge pressure of the accumulator too low	Restore nitrogen cushion.
-	-	-	-	-	-	-	X	-	-	X	-	-	-	-	-	Accumulator defective	Check integrity. Replace if necessary.

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	N	O	P	Possible cause	Remedy ⁴⁾
-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	Defective mechanical seal	Replace.
X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Tank / accumulator not filled	Check the water level in the tank / accumulator.
-	-	X	X	X	-	-	X	X	X	-	-	-	-	-	-	Check valve defective	Check. Replace sealing element if necessary.
X	-	-	-	X	-	-	-	X	X	X	-	-	-	-	-	Water consumption higher than stated in the purchase order	Contact the manufacturer.
-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	Motor protection switch triggered or set incorrectly / pump seized	Compare setting with the motor's rating plate data.
-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	Delay setting too short	Check the setting.
-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Mains supply interrupted	Check. Remedy defect. Check fuse.
-	X	-	-	-	-	-	-	X	-	-	-	-	-	-	-	Main fuse on (owner-supplied) distribution board loose or blown; fuses possibly too small or too fast	Check fuses and replace as necessary. Measure the motor current.
-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Phase failure	Check individual phases; replace fuse if necessary.
-	-	-	-	-	-	-	-	-	X	-	X	-	X	-	-	Broken wire in the input line of the pressure switch	Check. Remedy defect if applicable.
-	-	-	-	-	-	-	-	-	X	-	X	-	X	-	-	Broken wire in the input line of the remote ON/OFF system	Check. Remedy defect if applicable.
-	-	-	-	-	-	-	-	-	X	-	-	X	X	-	-	Short circuit in the input line of the pressure switch	Check. Remedy defect if applicable.
-	-	-	-	-	-	-	-	-	X	-	-	X	X	-	-	Short circuit in the input line of the remote ON/OFF system	Check. Remedy defect if applicable.
-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	Solenoid valve for minimum flow not actuated	Check. Remedy defect if applicable.
-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	Leakage on the discharge side	Check.
-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	Power supply disconnected	Check. Re-connect if required.
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	Excessive mains water supply. Siphon clogged.	Check mains water supply. Check siphon for free passage and clean it if required.

10 Related Documents

10.1 General assembly drawing with list of components

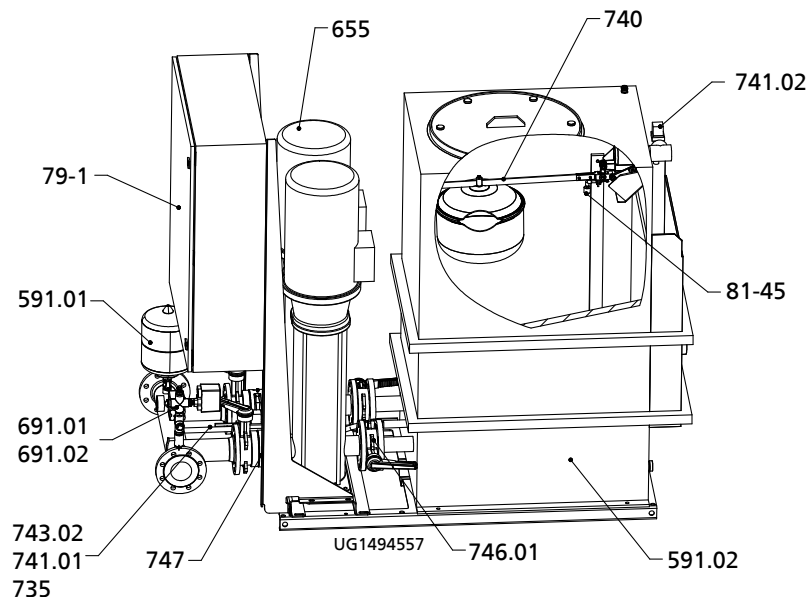


Fig. 10: General assembly drawing

Table 17: List of components

Part No.	Description	Ident. No.
591.01	Accumulator	01079764
591.02	Break tank	On request
655	Pump set	On request
691.01	Pressure gauge	00401413
691.02	Pressure switch MCS 22	01049356
735	Expansion joint (Movitec 15)	01349542
735	Expansion joint (Movitec 25, 40)	01349543
740	Float valve 1 1/4	01511210
740	Float valve 2	01511211
741.01	Solenoid valve 1/2	01357811
741.02	Solenoid valve 1/2	01228626
743.01	Ball valve 3/4	01079765
743.02	Ball valve 1/2	01349946
746.01	Butterfly valve DN 50 (Movitec 15)	42087765
746.01	Butterfly valve DN 65 (Movitec 25)	40982350
746.01	Butterfly valve DN 80 (Movitec 40)	40982351
747	Swing check valve DN 50 (Movitec 15)	01056738
747	Swing check valve DN 65 (Movitec 25)	01086243
747	Swing check valve DN 80 (Movitec 40)	01056931
79-1	Control unit	On request
81-45	Float switch	01048585

10.2 Wiring diagram (limit switches)

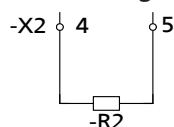


Fig. 11: Wiring without limit switch

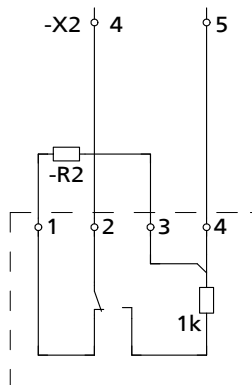


Fig. 12: Wiring with one limit switch

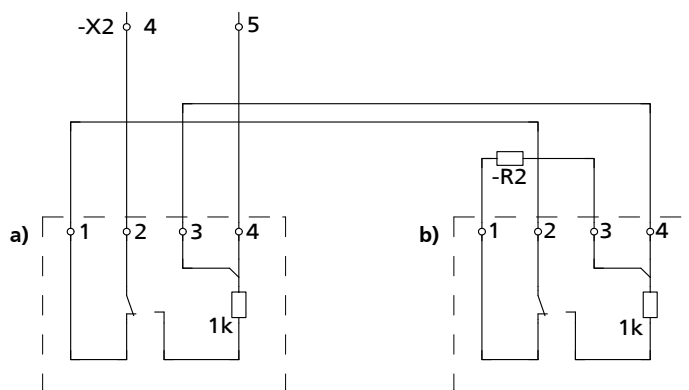


Fig. 13: Wiring with two limit switches

a) First limit switch	b) Last limit switch
-----------------------	----------------------

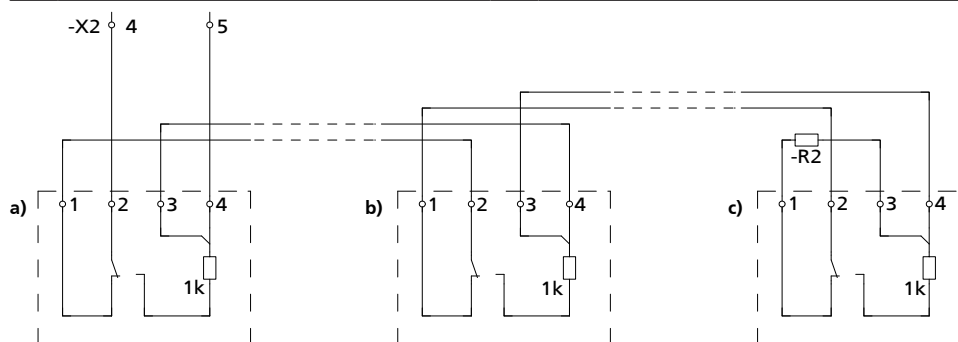


Fig. 14: Wiring with more than two limit switches

a) First limit switch	c) Last limit switch
b) Following limit switches	

11 EU Declaration of Conformity

Manufacturer:

KSB SE & Co. KGaA
Johann-Klein-Straße 9
67227 Frankenthal (Germany)

The manufacturer herewith declares that the product:

Hya-Duo D FL Compact, Hya-Solo D FL Compact

KSB order number:

- is in conformity with the provisions of the following Directives as amended from time to time:
 - Pump set: EC Machinery Directive 2006/42/EC
 - Pump set: Electromagnetic Compatibility Directive 2014/30/EU

The manufacturer also declares that

- the following harmonised international standards have been applied:
 - ISO 12100
 - EN 809
 - EN 60204-1
- Applied national technical standards and specifications, in particular:
 - DIN 14462
 - EN 1717
 - EN 13077

Person authorised to compile the technical file:

Name
Function
Address (company)
Address (street, No.)
Address (post or ZIP code, city) (country)

The EU Declaration of Conformity was issued in/on:

Place, date

.....⁵⁾.....

Name
Function
Company
Address

5) A signed, legally binding EU Declaration of Conformity is supplied with the product.

12 Certificate of Decontamination

Type:
Order number/
Order item number⁶⁾:
Delivery date:
Applications:
Fluid handled⁶⁾:

Please tick where applicable⁶⁾:



Corrosive



Oxidising



Flammable



Explosive



Hazardous to health



Seriously hazardous to health



Toxic



Radioactive



Bio-hazardous



Safe

Reason for return⁶⁾:
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

6) Required fields

13 Commissioning Report

The break tank package booster set for fire fighting specified below was today commissioned by the undersigned, authorised KSB customer service engineer who created this report.

Information on the break tank package booster set for fire fighting

Type series
Size
Serial number
Order number

Purchaser/place of installation

Purchaser

Name
Address
.....

Place of installation

Operating data For further data refer to the wiring diagram.

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

Special information

If, in addition, the system is operated with accumulators of Groups III / IV to the Pressure Equipment Directive, the responsible technical inspection body must be informed about commissioning of the system.

The system operator/operator's representative herewith confirms to have received instructions on how to operate and service the break tank package booster set for fire fighting. The relevant circuit diagrams and the operating manual 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

Index

A

After-run time 28
Applications 8
Automation 16

C

Certificate of Decontamination 45
Commissioning/start-up 26

D

Design 15
Designation 15
Disposal 13
Drive 16
Dry running protection 35
 Connecting the dry running protection device 25
 Setting the dry running protection device 28

E

Event of damage 6

F

Faults
 Causes and remedies 40
Float valve 23
Flushing 36
Frequency of starts 31
Functions
 Automatic switchover (duty system and back-up system) 34

I

Installation 16
Installation at site 19
Intended use 8

K

Key to safety symbols/markings 6

L

LED display 33
List of components 42

M

Maintenance work 38

N

Name plate 15

O

Operating modes
 Functional check run 33
 Manual mode 33
Other applicable documents 6

P

Partly completed machinery 6
Personnel 9
Pump activated 25

Q

Qualification 9

R

Return to supplier 13

S

Safety 8
Safety awareness 9
Scope of supply 18
Setting the start-up pressure 28
Setting the stop pressure 28

W

Warnings 6
Warranty claims 6



KSB SE & Co. KGaA

Johann-Klein-Straße 9 • 67227 Frankenthal (Germany)

Tel. +49 6233 86-0

www.ksb.com