

Pressure Booster System

Hya-Solo DSV

From series 2015w13

Installation/Operating Manual



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Installation/Operating Manual Hya-Solo DSV

Original operating manual

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Glossary

Accumulator

The accumulator serves to compensate for pressure losses in the piping system downstream of the pressure booster system which may be caused by the consumption of small quantities of water. As a result, the frequency of starts of the pressure booster system is minimised.

Automatic mode

The pump is started as a function of pressure and stopped as a function of flow.

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.

Manual mode

In manual mode, the pressure booster system is operated directly on mains power, independently of the control unit.

1 General

1.1 Principles

This operating manual is supplied as an integral part of the type series and variants indicated on the front cover. The manual describes the proper and safe use of this equipment in all phases of operation.

The name plate indicates the type series/size, the main operating data and the order number. The series/serial number uniquely identifies the pressure booster system and serves as identification for all further business processes.

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

Noise characteristics see (⇒ Section 5.6, Page 13)

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.

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

2 Safety



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

2.1 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.

3 Software Changes

The software has been specially created for this product and thoroughly tested. It is not allowed to make any changes or additions to the software or parts of the software. Software updates supplied by KSB are excluded from this rule.

4 Transport/Temporary Storage/Disposal

4.1 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.

4.2 Transport

	NOTE
	<p>The pressure booster system is bolted to a pallet and wrapped in plastic foil for shipping and temporary storage. All connecting points are capped.</p>
	⚠ DANGER
	<p>Pressure booster system tipping over Risk of injury by falling pressure booster system!</p> <ul style="list-style-type: none"> ▷ Never suspend the pressure booster system by its power cable. ▷ Observe the applicable local accident prevention regulations. ▷ Pay attention to the weight data and the centre of gravity. ▷ Use suitable and permitted transporting equipment, e.g. crane, forklift or elevating platform truck. ▷ Attach the pressure booster system to crane lifting tackle as shown, or use a forklift or pallet truck to move the pallet.

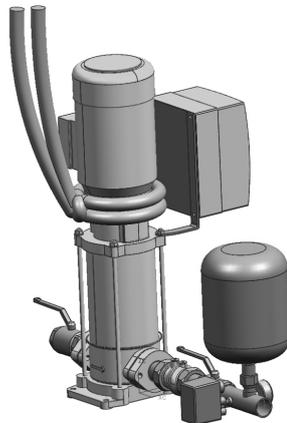


Fig. 1: Transporting the pressure booster system

- ✓ The pressure booster system has been checked for in-transit damage.
1. Make sure the transport equipment is suitable for safely carrying the indicated load.
 2. Transport the pressure booster system to the place of installation.
 3. Attach the pressure booster system to the lifting tackle as shown, lift it off the pallet and dispose of the pallet.
 4. Use suitable lifting equipment to lift the pressure booster system and carefully put it down at the place of installation.

4.3 Storage/preservation

If commissioning is to take place some time after delivery, we recommend that the following measures be taken when storing the pressure booster system:

	CAUTION
	<p>Damage during storage due to frost, moisture, dirt, UV radiation or vermin Corrosion/contamination of pressure booster system!</p> <p>▷ Store the pressure booster system in a frost-proof room. Do not store outdoors.</p>
	CAUTION
	<p>Wet, contaminated or damaged openings and connections Leakage or damage of the pressure booster system!</p> <p>▷ Only open the openings of the pressure booster system at the time of installation.</p>

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

4.4 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 13, Page 40)
Always indicate any safety and decontamination measures taken.

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

4.5 Disposal

	⚠ WARNING
	<p>Fluids, consumables and supplies which are hot and/or pose a health hazard Hazard to persons and the environment!</p> <p>▷ Collect and properly dispose of flushing fluid and any residues of the fluid handled.</p> <p>▷ Wear safety clothing and a protective mask if required.</p> <p>▷ Observe all legal regulations on the disposal of fluids posing a health hazard.</p>

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.

5 Description

5.1 General description

- Pressure booster system

5.2 Designation

Example: Hya-Solo DSV / 04 05 / 2 - 4

Table 4: Designation key

Code	Description
Hya-Solo	Pressure booster system with one pump
DSV	Model with three-phase motor, speed-controlled, pressure-dependent starting and flow-dependent stopping
04	Pump size
05	Number of stages per pump
2 - 4	Inlet pressure in bar

5.3 Name plate

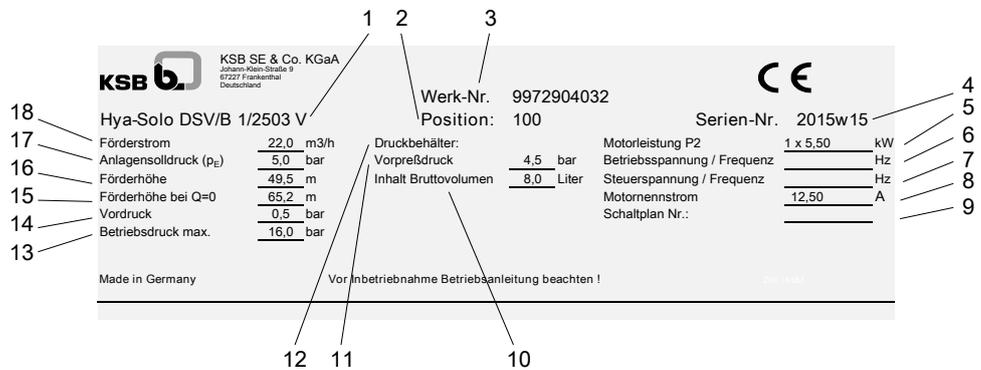


Fig. 2: Name plate (example) of a Hya-Solo DSV

1	Type series, size	2	Order item number
3	Order number	4	Series code
5	Motor power P2	6	Operating voltage/frequency
7	Control voltage/frequency	8	Nominal motor current
9	Circuit diagram	10	Gross vol. content
11	Pre-charge pressure	12	Accumulator
13	Maximum operating pressure	14	Inlet pressure
15	Head at Q = 0	16	Head
17	System setpoint pressure	18	Flow rate

5.4 Design details

Design

The pressure booster system consists of a non-self-priming multistage high-pressure centrifugal pump with suction and discharge side shut-off valves. The shut-off valves enable dismantling of the pump or check valve without draining the piping system. The check valve on the discharge side prevents backflow through the pump when the pump is not running and reduces the load on the mechanical seal.

An accumulator, a pressure transmitter and a pressure gauge are fitted on the discharge side of the pressure booster system.

The PumpDrive speed control system is mounted on and ready-wired to the pump set.

The system comes with separate rubber anti-vibration pads.

5.5 Configuration and function



Fig. 3: Illustration of a Hya-Solo DSV

1	Master switch	2	Accumulator
3	Pump	4	Pressure sensor
5	PumpDrive	6	Valves

Design The fully automatic pressure booster system is equipped with a non-self-priming vertical high-pressure pump (3) for pumping the fluid handled to the consumer installations at a constant pressure.

Function Automatic mode The pump is started as a function of pressure and stopped as a function of flow by a fully automatic control unit. If the pressure drops below the pre-set pressure, the pump starts up and the frequency inverter controls the pressure booster system to maintain the set pressure, so that the pressure is kept constant. If the demand decreases, the pump stops as soon as the flow rate has fallen below a set minimum value.

Function Manual mode A key for manual operation is provided on the control panel. In manual mode the pump operates at the pre-set minimum speed, independently of the automatic system (pressure transmitter) or an External ON/OFF signal.

	NOTE
	<p>Continuous manual mode is reserved exclusively for emergencies! Continuous operation of the pressure booster system in manual mode may result in waste of energy and water.</p>

In manual mode, a minimum flow (see table below) is essential to prevent the fluid handled and the pump from overheating when no water is consumed at the consumer installations.

Minimum flow for pump in manual mode

Table 5: Minimum flow per pump in manual mode

Pump	Minimum flow per pump in manual mode [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

Example An open 1/2-inch tap equals a water consumption of approx. 800 to 1,200 l/h.

Function The dry running protection function is active in automatic mode and manual mode.
Dry running protection 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 pressure booster system after approx. 10 seconds (factory setting).

5.6 Noise characteristics

For the noise level of the individual pumps please refer to the pump's operating instructions.

5.7 Scope of supply

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

- Pressure booster system
- One Movitec vertical high-pressure centrifugal pump
- Check valve
- Shut-off valves
- Membrane-type direct-flow accumulator on the discharge side
- Pressure transmitter on the discharge side
- Vibration damping
- Pressure gauge for pressure indication

PumpDrive

- Self-cooling motor-mounted frequency inverter (PumpDrive) for pressure-controlled starting and demand-based stopping
- Plain-text display (for voltage, current, power, speed, frequency)
- Control panel with operating keys (manual-0-automatic), navigation and function keys
- LEDs signalling operational availability (green), warning (yellow), alert (red)
- Two freely parameterisable relay outputs (operation/fault, alert, etc.)
- Two NO contacts 250 V AC/1 A
- Analog input for external setpoint adjustment
- Analog output for transmitting the actual value, motor speed, etc.
- Lockable master switch (repair switch)

5.8 Dimensions and weights

For dimensions and weights refer to the outline drawings of the pressure booster system.

6 Installation at Site

6.1 Installation to DIN 1988

Install pressure booster systems either in the technical equipment room or in a well-ventilated, frost-free, lockable room used for no other purpose. No harmful gases are allowed to enter the place of installation. An adequately sized floor drain (leading to a sewer or equivalent) must be provided.

The system is designed for a maximum ambient temperature of 0 °C to +40 °C at a relative humidity of 50 %.

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

If expansion joints (KSB accessory) are used for damping vibrations, their fatigue strength (endurance limit) must be given due consideration. Expansion joints must be installed to allow quick and easy replacement.

6.2 Checks to be carried out prior to installation

Place of installation

	! WARNING
	<p>Installation on mounting surfaces which are unsecured and cannot support the load</p> <p>Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▷ 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 of the pressure booster system provide adequate insulation against solid-borne noise.

1. Check the structural requirements.
All structural work required must have been prepared in accordance with the dimensions stated in the outline drawing.

6.3 Installing the pressure booster system

	! WARNING
	<p>Top-heavy pressure booster system</p> <p>Risk of personal injury by pressure booster system tilting!</p> <ul style="list-style-type: none"> ▷ Pressure booster systems awaiting final installation must be secured against tipping over. ▷ Firmly anchor the pressure booster system.

Remove all packaging before installing the pressure booster system. Connect the pressure booster system's inlet line and discharge line to the corresponding site distribution lines.

	NOTE
	<p>In order to avoid transmission of piping forces onto the pressure booster system and transmission of solid-borne noise, we recommend installing length-limited expansion joints.</p>

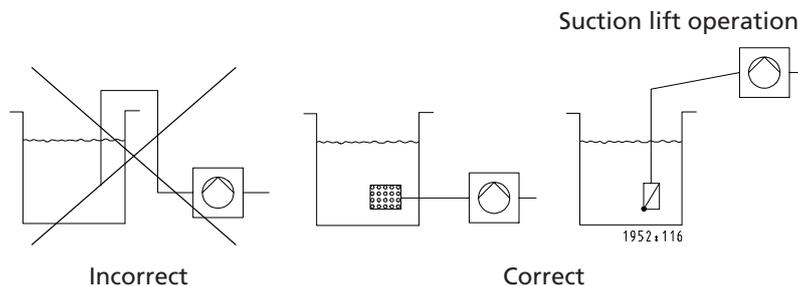
Allow sufficient space for maintenance and repair work.

- ✓ All structural work required has been checked.
 - ✓ The dimensions of the concrete foundation are correct, and the concrete has set firmly.
1. Mark out the anchoring holes on the floor as shown in the outline drawing.
 2. Drill the holes (max. diameter: 12 mm).
 3. Insert plug fixings of appropriate size.
 4. Set the pressure booster system down in its correct installation position.
 5. Use suitable bolts to firmly anchor the pressure booster system.

6.4 Installing the piping

Make sure that piping is installed without transmitting any stresses or strains. The use of length-limited expansion joints (see accessories) is recommended.

	CAUTION
	<p>Air pockets in suction line Pressure booster system cannot prime!</p> <p>▷ Lay piping with a continuously rising slope (as shown).</p>



	NOTE
	<p>For suction lift operation install suitable swing check valves at the suction line ends which are submerged in the fluid handled. Take into account the head losses caused by these swing check valves. Do not exceed the maximum suction lift of the pumps.</p>

6.4.1 Fitting an expansion joint

	⚠ DANGER
	<p>Sparks and radiant heat Fire hazard!</p> <p>▷ Take suitable precautions to protect the expansion joint if any welding work is carried out nearby.</p>

	CAUTION
	<p>Leaking expansion joint Flooding of installation room!</p> <ul style="list-style-type: none"> ▷ Regularly check for cracks or blisters, exposed fabric or other defects.

- ✓ The expansion joint has a length limiter with solid-borne sound insulation so as to be able to absorb reaction forces.
- 1. 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.
- 2. Tighten the bolts evenly and crosswise during assembly. The ends of the bolts must not protrude from the flange.
- 3. Do not apply paint to the expansion joint. Protect it from any contact with oil.
- 4. The position of the expansion joint within the pressure booster system must allow easy access and inspection and it must, therefore, not be insulated along with the piping.
- 5. Expansion joints are subject to wear.

6.4.2 Installing a pressure reducer

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

	NOTE
	<p>A pressure reducer must be installed</p> <ul style="list-style-type: none"> - if the inlet pressure fluctuation is too high for the pressure booster system to operate as intended or - if the total pressure (inlet pressure plus shut-off head) of the pressure booster system exceeds the design pressure. <p>The maximum pump discharge pressure at zero flow point is reached in manual mode.</p>

A minimum pressure gradient of 5 metres is required for the pressure reducer to fulfill its function. The pressure downstream of the pressure reducer (downstream pressure) is the basic parameter for determining the pump head.

For example:

The inlet pressure fluctuates between 4 and 8 bar. A pressure reducer is needed upstream of the pressure booster system on the inlet side.
 Min. inlet pressure (p_{in}) = 4 bar
 Min. pressure gradient = 0.5 bar
 Downstream pressure = 3.5 bar.

6.5 Installing unpressurised inlet tanks

Installation and location of an unpressurised inlet tank together with the pressure booster system are governed by the same rules applicable to the pressure booster system.

Install the closed PE inlet tank (under atmospheric pressure) available as a KSB accessory as described in the installation instructions supplied with the tank.

	CAUTION
	<p>Contamination in the pressure booster system Damage to the pumps!</p> <ul style="list-style-type: none"> ▷ Clean the tank before filling it.

The tank must be connected mechanically and electrically to the pressure booster system prior to commissioning of the system.

6.6 Fitting the dry running protection device

Install the dry running protection device supplied together with the pressure booster system as a separate, non-fitted accessory, or supplied at a later date for retrofitting, in accordance with its operating instructions and connect it to digital input 1 (terminals C1 and C2 on terminal strip C) of the PumpDrive.

This digital input is assigned exclusively to the Start/Stop function and is bridged if the system is supplied without a dry running protection device. Only dry running protection devices can be used which open a contact when dry running occurs. No cut-out delay can be set.

6.7 Connection to power supply

	<p style="background-color: #e67e22; color: white; padding: 5px;">⚠ DANGER</p> <p>Electrical connection work by unqualified personnel Danger of death from electric shock!</p> <ul style="list-style-type: none"> ▷ Always have the electrical connections installed by a trained and qualified electrician. ▷ Observe regulations IEC 60364.
	<p style="background-color: #f1c40f; color: white; padding: 5px;">⚠ WARNING</p> <p>Incorrect connection to the mains Damage to the mains network, short circuit!</p> <ul style="list-style-type: none"> ▷ Observe the technical specifications of the local energy supply companies.
	<p style="background-color: #2980b9; color: white; padding: 5px;">NOTE</p> <p>If a residual current device is installed, observe the operating manual for the frequency inverter.</p>

The circuit diagrams are included in the control cabinet of the pressure booster system, where they must remain when not in use.

The product literature of the switchgear and controlgear assembly supplied with the pressure booster system includes a list of the electrical components installed. When ordering spare parts for electrical components, please always indicate the circuit diagram number.

6.7.1 Sizing the power cable

The cross-section of the power cable must be sized for the total rated power requirement.

6.7.2 Connecting the pressure booster system

Connect the pressure booster system to the power supply via terminals L1, L2, L3 and PE of the terminal strip or the master switch in the connection space of the frequency inverter. To do so, proceed as described in the operating manual of the PumpDrive. Observe the data on the name plate.

6.7.3 Digital inputs

Terminal strip C, terminals C1 to C10

PumpDrive is equipped with six digital inputs.

Digital inputs 1 and 6 are factory-defaulted.

Digital input DI-EN is the digital enable input. In as-delivered condition it is linked with terminal C9. If the pressure booster system is equipped with a dry running

protection device, this device is connected to digital input 1 (C1 and C2). The functions of digital inputs 2 to 5 can be parameterised by the user at the control panel. To connect the inputs use terminal C1 (+24 V DC). For setting the parameters see the PumpDrive 2 operating manual.

6.7.4 Relay outputs

Terminal strip A, terminals A1 to A10

In as-delivered condition the relay outputs are parameterised as volt-free contacts for "Alarm" (relay 1) and "RUN operating status" (relay 2). Different messages can be assigned to these relay outputs via the control panel. For setting the parameters see the PumpDrive 2 operating manual.

6.7.5 Analog inputs

Terminal strip B, terminals B1 to B8

Analog input 1 can be connected to an external setpoint adjustment. Analog input 2 is assigned to the pressure transmitter (feedback value transmitter) as standard and connected to the mains-motor-PTC terminal strip. For setting the parameters see the PumpDrive 2 operating manual.

6.7.6 Analog output

Terminal strip B, terminals B9 and B10

PumpDrive features an analog output whose output value can be parameterised via the control panel depending on the digital inputs. For setting the parameters see the PumpDrive 2 operating manual.

7 Commissioning/Start-up/Shutdown

7.1 Commissioning/Start-up

7.1.1 Prerequisites for commissioning/start-up

Before commissioning/start-up of the pressure booster system make sure that the following requirements are met:

- 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.

	CAUTION
	<p>Dry running of pump Damage to the pump/pressure booster system!</p> <p>▷ If no dry running protection device is connected when commissioning takes place, the pressure booster system will start neither in manual nor in test run mode. 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.</p>

	NOTE
	<p>The competent authorities must be informed in due time prior to commissioning/ test running the system.</p>

7.1.2 Dry running protection

Pressure booster systems can be factory-equipped with pressure switches as dry running protection devices. Such dry running protection devices will be factory-set to the inlet pressure values specified in the purchase order.

If the factory settings should not match the site data, set the start and stop pressure as described in the operating manual of the pressure switch.

Table 6: Recommended settings

	Stop pressure	Start-up pressure
Pressure switch	0.5 bar below p_{inl}	0.2 bar below p_{inl}

7.1.3 Commissioning/start-up of pressure booster system

	NOTE
	<p>The pressure booster systems undergo hydraulic testing with water at the factory and are drained carefully before shipment. However, for technical reasons the presence of some residual water is unavoidable. The hydraulic connections are closed in as-supplied condition. They must only be opened immediately before installation. Refer to EN 806 before commissioning/starting up the pressure booster system. After an extended pre-installation period, in particular, flushing or even professional disinfection is recommended. For extensive or branched piping systems the pressure booster system should preferably be flushed either before installation, or flushing should be restricted to a limited area.</p>

Commissioning should be carried out by specialist KSB staff.

	CAUTION
	<p>Foreign matter in the piping Damage to the pump/pressure booster system!</p> <p>▷ Before commissioning/starting (or even test running) the pressure booster system, make sure that there is no foreign matter in the pressure booster system or piping.</p>

	NOTE
	<p>Commissioning of the pressure booster system - even test running - shall only be carried out in full compliance with all pertinent VDE (German Association of Electrical Engineers) regulations.</p>

- ✓ The pipe unions between the pump and the piping have been re-tightened.
- ✓ The flange bolting has been checked for firm seating.
- ✓ The cooling air inlet and outlet openings on the motor are unobstructed.
- ✓ All shut-off valves of the pressure booster system are open.
- ✓ The pre-charge pressure of the membrane-type accumulator has been checked. (⇒ Section 9.2.3, Page 33)
 1. Set the master switch to "0".
 2. Provide connection to power supply.
 3. Open/loosen the vent plugs on the pump (refer to the pump's installation and operating instructions).
 4. Slowly open the inlet-side shut-off element and prime the pressure booster system until the fluid to be handled escapes through all vent holes.
 5. Close and slightly tighten the pump vent plugs.
 6. Switch on the master switch.
 7. Open the discharge-side shut-off element.
 8. Loosen the vent plug again to let any remaining air escape.
 9. Then re-tighten the vent plugs firmly.
 10. Verify that the pump is running smoothly.
 11. Close the discharge-side shut-off element for a short period in order to verify that the pump reaches the shut-off head.
 12. Close the discharge-side shut-off element, causing the pump to stop.

	NOTE
	<p>Minor leakage of the mechanical seals during commissioning is normal and will cease after a short period of operation.</p>

7.2 Switching on the pressure booster system

Switch on the master switch to energise the pressure booster system. The green LED on the control panel lights up, indicating the system's readiness for operation.

	NOTE
	<p>The pressure booster system is factory-set to the operating data indicated on the name plate.</p>

7.3 Checklist for commissioning/start-up

Table 7: Checklist

Operations		Done
1	Read the operating instructions.	
2	Check power supply and compare against the name plate data.	
3	Check the earthing system (by measuring).	
4	Check the mechanical connection to the water mains. Re-tighten the flange bolting and pipe unions.	
5	Prime and vent the pressure booster system from the inlet side.	
6	Check inlet pressure.	
7	Check whether all cables are still firmly connected to the terminals inside the control unit.	
8	Check the setpoint, re-adjust if necessary.	
9	Test the proper function of the lack-of-water and dry running protection equipment. If not fitted, make a relevant note in the commissioning report.	
10	Vent the pump for a second time after it has been running for 5 to 10 minutes.	
11	Check the pre-charge pressure.	
12	Record all system conditions that do not correspond to our specifications or to the purchase order in the commissioning report (i.e. no dry running protection or inlet pressure + max. pressure of pressure booster system higher than 16 bar).	
13	Complete the commissioning report together with the operator/user and instruct the operator/user as to the function of the system.	

7.4 Shutdown


NOTE

As long as the pressure booster system is out of operation, water is supplied directly at p_{inl} through the pressure booster system.

Set the master switch to "0".


NOTE

Drain the pressure booster system for prolonged shutdown.

8 Operating the Pressure Booster System

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

The pressure booster system is factory-set to the operating data indicated on the name plate.
The settings can be modified via the control panel, if necessary.

8.1 Graphical control panel

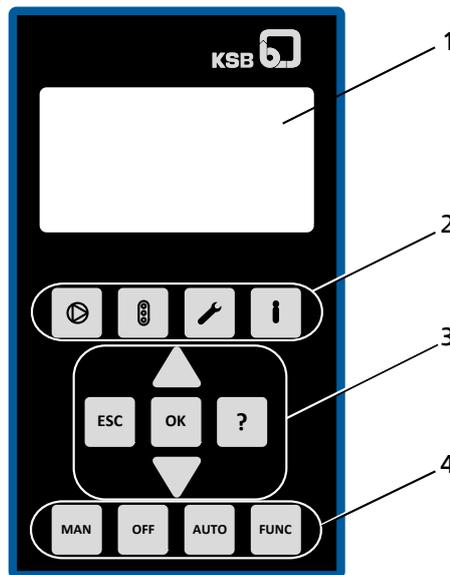


Fig. 4: Graphical control panel

Table 8: Description of graphical control panel

Position	Description	Function
1	Graphical display	Displays information on frequency inverter operation
2	Menu keys	Accessing the elements of the first menu level (Operation, Diagnosis, Settings and Information)
3	Navigation keys	Navigation and parameter setting
4	Operating keys	Toggleing operating modes

8.1.1 Graphical display

The main screen breaks down into 6 areas.

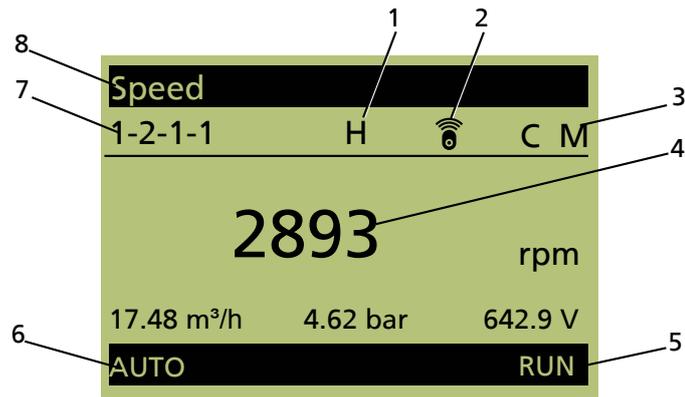


Fig. 5: Main screen (example)

1	Motor standstill heater is switched on
2	The wireless icon illuminates when the Bluetooth module is inserted. The wireless icon flashes when communication takes place.
3	Display of the master and login level
4	Display of up to four (4) operating values: One operating value is displayed in large format. Three (3) operating values are displayed in small format. The operating values scroll through cyclically.
5	Display of operating status
6	Display of the current operating mode
7	Parameter number of the operating value displayed in the centre
8	Name of the operating value displayed in the centre

Table 9: Assignment of keys

Key	Function
	Operation menu key
	Diagnosis menu key
	Settings menu key
	Information menu key
	Arrow keys: <ul style="list-style-type: none"> Move up/down in the menu options. Increase/decrease the value displayed when you are entering numerals. (When an arrow key is pressed and held down, the response repeats in ever shorter intervals.)
	Escape key: <ul style="list-style-type: none"> Delete/reset entry (the entry is not saved). Move up one menu level.
	OK key: <ul style="list-style-type: none"> Confirm settings. Confirm menu selection. Move to the next digit when entering numerals. Message display: Acknowledge alert. Measured value display: Go to Favourites menu.

Key	Function
	Help key: <ul style="list-style-type: none"> Displays a help text for each selected menu option.
	MAN operating key: <ul style="list-style-type: none"> Starts the frequency inverter in manual operating mode.
	OFF operating key: <ul style="list-style-type: none"> Stops the frequency inverter.
	AUTO operating key: <ul style="list-style-type: none"> Switches to automatic operating mode.
	FUNC operating key: <ul style="list-style-type: none"> Parameterisable function key

Manual mode via control panel

	NOTE
	<p>After a power failure, the frequency inverter reverts to the OFF operating mode. Manual mode must be restarted.</p>

Table 10: Assignment of keys for manual mode

Key	Function
	MAN operating key: <ul style="list-style-type: none"> When switching the operating mode from AUTO to MAN, the current operating speed is used as control value (Manual) 1-3-4 and is displayed accordingly. The control point 3-6-2 must be set to Local. When switching the operating mode from OFF to MAN, the frequency inverter operates at minimum speed. The control point 3-6-2 must be set to Local. If the control value (Manual) 1-3-4 is defined via an analog input, the analog input speed is accepted.
	Arrow keys: <ul style="list-style-type: none"> Pressing the arrow keys changes and immediately accepts the control value (Manual) 1-3-4. Making a change using the arrow key has a direct effect even when not confirmed with OK. The speed can only be changed between the set minimum speed and the maximum speed.
 	ESC/OK key: <ul style="list-style-type: none"> Press the OK or ESC key to go from digit to digit. Press the ESC key to go back. Changes are rejected. Pressing the OK key for the right-hand digit takes you back to the main screen.

8.1.2 Menu keys

The menu keys allow you to directly access the first menu level (Operation 1-x-x-x, Diagnosis 2-x-x-x, Settings 3-x-x-x, and Information 4-x-x-x).

The parameter numbers contain the navigation path, which helps you find a particular parameter quickly and easily. The first digit of the parameter number indicates the first menu level, which is called up directly via the four menu keys.

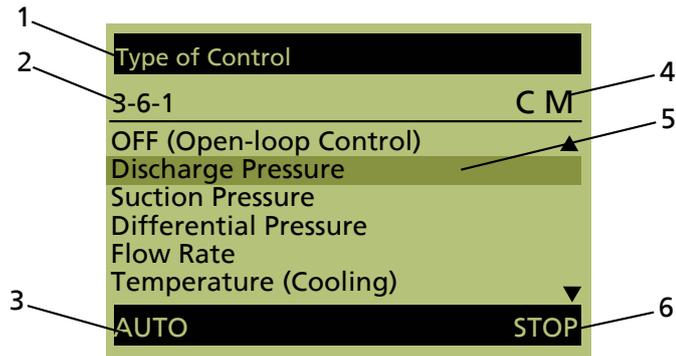


Fig. 6: Menu display

1	Name of current menu/parameter
2	Parameter number of parameter selected in selection list
3	Display of the current operating mode
4	Display of the master and login level
5	Parameter/submenu selection list
6	Display of operating status

8.1.2.1 Menu: Operation

The Operation section contains all information required for operating the machine and the process. This includes:

- Login to device with password
- Operating and measured values for motor, frequency inverter, pump and system
- Setpoints and control values
- Energy meter and operating hours

8.1.2.1.1 Access levels

Three access levels have been defined to prevent accidental or unauthorised access to frequency inverter parameters:

Table 11: Access levels

Access level	Description
Standard (No Login)	Access without password entry.
Customer	Access level for the expert user with access to all parameters required for commissioning
Customer service	Access level for service personnel.

If a parameter's access level is not explicitly specified, the parameter is always assigned the customer access level.

Table 12: Access level parameters

Parameter	Description	Possible settings	Factory setting
1-1-1	Customer Login <i>Log in as customer</i>	0000...9999	0000
1-1-2	Service Login <i>Log in for access to special parameters for KSB Service</i>	0000...9999	-
1-1-4	Logout <i>Log out of all access levels</i>	Run	-

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

The password can be changed after entering the factory default password.

Table 13: Parameters for changing passwords

Parameter	Description	Possible settings	Factory setting
1-1-5	Customer Access ID <i>Changing the customer access ID</i>	0000...9999	-
1-1-6	Service Access ID <i>Changing the service access ID</i>	0000...9999	-

8.1.2.1.2 Operating values for input and output signals

The status of the digital inputs/relay outputs is displayed via the Digital Inputs (1-2-4-6) and Digital Outputs (1-2-4-7) parameters.

Table 14: Example of status of digital inputs (1-2-4-6). 24 V is applied to digital input 1: System Start

	Optional IO card			Standard				
Digital input	DI8	DI7	DI6	DI5	DI4	DI3	DI2	DI1
Bit pattern on display	0	0	0	0	0	0	0	1

Table 15: Example of status of digital outputs (1-2-4-7). The following is reported via relay output 1: General fault message (configurable)

	Optional IO card								Standard	
Digital output	R8	R7	R6	R5	R4	R3	DO2	DO1	R2	R1
Bit pattern on display	0	0	0	0	0	0	0	0	0	1

8.1.2.2 Menu: Diagnosis

In the Diagnosis section, the user is provided with information about faults and warning messages that pertain to the pump set or process. The frequency inverter can be in fault (standstill) or warning (operational) status. The user can also find previous messages in the history.

Messages

All monitoring and protective functions trigger warnings or alerts. These are signalled via the amber or red LED of the LED traffic light function.

A corresponding message is output on the control panel display. If more than one message is output, the last one is displayed. Alerts have priority over warnings.

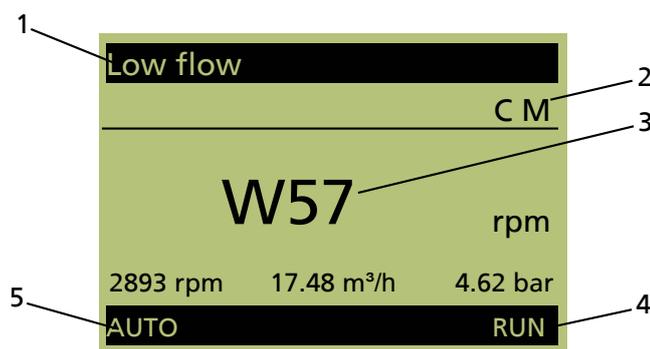


Fig. 7: Message display

1	Name of the message displayed in the centre
2	Display of the master and login level
3	Display of the message: The most recently received message is displayed in large format on the main screen. Three operating values are displayed in small format.
4	Display of operating status
5	Displays the current operating mode

Pending messages If a message has occurred and been acknowledged but has not gone, this message will be listed in the Pending Messages menu. All current messages can be displayed in the Diagnosis menu under Pending Messages (2-1). Active warnings and alerts can also be connected to the relay outputs.

Message history Only messages that have come, been acknowledged, and gone are listed in the message history. The message history can be viewed by selecting the Message History parameter 2-2. The last 100 messages are listed here. You can use the arrow keys and the OK key to select an entry from the list.

Acknowledging and resetting messages

	NOTE
	Depending on the combination of settings, the frequency inverter could conceivably restart automatically after acknowledgement/reset or when the cause of the malfunction or fault has been eliminated.

Acknowledgement You can acknowledge the message once the cause has been rectified. Messages can be acknowledged separately in the Diagnosis menu. A message can also be acknowledged via a digital input. Digital input 2 is defaulted for this purpose.

Overview of warnings and alerts

Messages can be acknowledged as follows:

Table 16: Acknowledgement types for messages

Property of message	Type of acknowledgement
Self-acknowledging	Message self-acknowledges if condition for message has gone.
Self-acknowledging (configurable)	Users can choose between self-acknowledging and acknowledging manually.
Partially self-acknowledging	Alerts that are partially self-acknowledging carry out self-acknowledgement in increasingly large intervals after the alarm condition has gone. If the alert occurs repeatedly within a specific time window, no additional self-acknowledgement is carried out. As soon as the alarm condition of a pending alert no longer exists, the time interval is started. When this interval expires, automatic acknowledgement takes place. If the alert occurs again within 30 seconds after the time interval has started, the interval is extended by one increment. Should this not be the case, the previous (shorter) time interval is reverted to and corresponding action is taken again in 30 seconds. The time intervals are 1 second, 5 seconds, 20 seconds, and endless (i.e. manual acknowledgement is required). When the 20-second interval is extended, self-acknowledgement no longer takes place.
Non-self-acknowledging	Must be acknowledged manually.

Time stamp If a message is not acknowledged and its condition comes and goes several times in this time window, the first occurrence of the message is always used for the Message Come time stamp. The Message Condition Gone time stamp, however, always shows the last time the message condition was no longer active.

8.1.2.3 Menu: Settings

General settings can be made or the settings for the process optimised in the Settings section.

8.1.2.3.1 Setting the display language

The display ships from the factory with support for 4 languages (language package). A language package can be changed using the KSB Service Tool:

Table 17: Parameters for display language

Parameter	Description	Possible settings	Factory setting
3-1-1	Language <i>Configurable display language</i>	Depending on the language package: <ul style="list-style-type: none"> ▪ English, German, French, Italian ▪ English, French, Dutch, Danish ▪ English, Spanish, Portuguese, Turkish ▪ English, Norwegian, Swedish, Finnish ▪ English, Estonian, Latvian, Lithuanian ▪ English, Polish, Hungarian, Czech ▪ English, Slovenian, Slovakian, Croatian ▪ English, Russian, Romanian, Serbian 	English, German, French, Italian

8.1.2.3.2 Setting the control panel

Table 18: Parameters for setting the control panel

Parameter	Description	Possible settings	Factory setting
3-1-2-1	Operating Values on Main Screen <i>Display of current operating values on the main screen</i>	Main screen selection list	-
3-1-2-2	Control Keys Require Login <i>Direct access to the MAN, OFF, AUTO and FUNC operating keys can be disabled via this parameter.</i>	<ul style="list-style-type: none"> ▪ OFF ▪ ON 	OFF
3-1-2-3	Function Key Assignment <i>Assigning a freely selectable function to the FUNC key</i>	<ul style="list-style-type: none"> ▪ No Function ▪ System Start / Stop ▪ Setpoint (Closed-loop Control) ▪ Control Value (Open-loop Control) ▪ Alternative Setpoint (Closed-loop Control) ▪ Alternative Control Value (Open-loop Control) ▪ Immediate Pump Changeover ▪ Immediate Functional Check Run ▪ Language ▪ Fixed Speed 1 ▪ PumpMeter Upload ▪ Remote/Local Control Point 	Language
3-1-2-4	Display Contrast <i>Configurable contrast for the display</i>	0...100	50
3-1-2-5	Display Backlight <i>Configuring the display backlight</i>	<ul style="list-style-type: none"> ▪ OFF ▪ ON ▪ Automatic 	Automatic
3-1-2-6	Display Backlight Duration <i>Duration of display backlight on period in automatic mode</i>	0...600	30

Operating Values on Main Screen Up to 4 operating values are simultaneously displayed on the main screen. An operating value is displayed in large format with the associated parameter name, parameter number and unit. Three (3) operating values are displayed in smaller format with the associated unit. The arrow keys can be used to cycle through the operating values. Each operating value passes through all display areas. Up to

10 operating values can be selected from the predefined list for the display. The sequence of the selection list determines the sequence of the operating values on the main screen. If more than 4 parameters are selected, the hidden parameters are also cycled through in the background.

Selecting operating values for the main screen

1. Open parameter 3-1-2-1 in the Settings menu.
2. Using the arrow keys, select the operating value to be displayed from the list.
3. Press OK key.
4. Select additional, required operating values from the list and confirm by pressing the OK key.

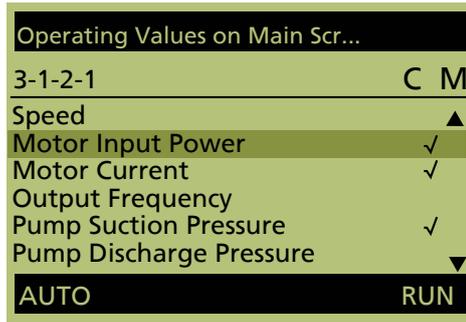


Fig. 8: Selecting multiple parameters from the selection list

Locking operating keys The operating keys of the control panel can be locked via the 3-1-2-2 parameter to prevent unauthorised operation or unauthorised acknowledgement of alerts.

Function key assignment The FUNC operating key can be preassigned a function from a selection list.

	NOTE
When the FUNC operating key is used in the System Start / Stop role, the system must be restarted via the FUNC operating key every time the voltage is reset.	

Favourites menu Press the OK key on the main screen to call up the favourites menu, where you can select various parameters and quickly adapt their configuration settings.

8.1.2.4 Menu: Information

All direct information about the frequency inverter is provided in the Information section. Important details regarding the firmware version are listed here.

8.2 Service interface and LED traffic light function

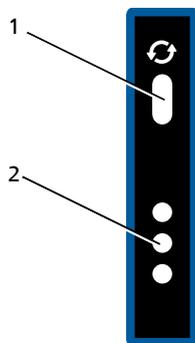


Fig. 9: Service interface and traffic light LEDs

Item	Description	Function
1	Service interface	Optical interface
2	LED traffic light function	The traffic light function provides information about the system's operating status.

Service interface The service interface allows a PC/notebook to be connected via a special cable (USB – optical).

The following action can be taken:

- Configuring and parameterising the frequency inverter with the service software
- Software update
- Saving and documenting set parameters

LED traffic light function The LED traffic light function provides information about the current PumpDrive operating status.

Table 19: LED description

LED	Description
● Red	One or more than one alert is active
● Amber	One or more than one warning is active
● Green	Steady light: Trouble-free operation

8.3 Adjusting the settings

8.3.1 Setting the setpoint

The pressure booster system is factory-set to the setpoint indicated on the rating plate.

If the setpoint needs to be adjusted to site conditions, parameter 1-3-2 has to be changed as required.

First, enter the customer password.

Then change the setpoint.

8.3.2 Changing the controller settings

The PI controller of the frequency inverter is optimised when leaving the factory, therefore no changes are required.

Should a process-related adjustment of the PI controller be necessary, check/change the factory settings in accordance with the PumpDrive operating manual.

9 Servicing/Maintenance

9.1 General information/Safety regulations

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

	<p>⚠ DANGER</p> <p>Unintentional start-up of pressure booster system Danger to life!</p> <ul style="list-style-type: none"> ▸ The pressure booster system must be de-energised before repair or maintenance work is carried out. Switching off the motor protection switch will not de-energise the motor power cables reliably.
	<p>⚠ WARNING</p> <p>Improper lifting/moving of heavy assemblies or components Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▸ Use suitable transport devices, lifting equipment and lifting tackle to move heavy assemblies or components.
	<p>⚠ WARNING</p> <p>Unintentional start-up of pressure booster system Risk of injury by moving parts!</p> <ul style="list-style-type: none"> ▸ Make sure the pressure booster system has been de-energised before commencing work on the pressure booster system. ▸ Make sure that the pressure booster system cannot be started up unintentionally.
	<p>⚠ WARNING</p> <p>Unqualified personnel performing work on the pressure booster system Risk of personal injury!</p> <ul style="list-style-type: none"> ▸ Always have repair and maintenance work performed by specially trained, qualified personnel.
	<p>CAUTION</p> <p>Incorrectly serviced pressure booster system Function of pressure booster system not guaranteed!</p> <ul style="list-style-type: none"> ▸ 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.

Observe the general safety instructions and information.

Observe the operating manual of the pump when performing work on the pumps.

In the event of damage you can always contact our service staff.

A regular maintenance schedule will help avoid expensive repairs and contribute to trouble-free, reliable operation of the pressure booster system with a minimum of maintenance expenditure and work.

Never use force when dismantling and re-assembling the pressure booster system.

9.1.1 Inspection contract

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

9.2 Servicing/inspection

9.2.1 Supervision of operation

	<p style="background-color: #FFD700; padding: 5px;">CAUTION</p> <p>Increased wear due to dry running Damage to the pump set!</p> <ul style="list-style-type: none"> ▷ 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.
	<p style="background-color: #FFD700; padding: 5px;">CAUTION</p> <p>Impermissibly high temperature of fluid handled Damage to the pump!</p> <ul style="list-style-type: none"> ▷ 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 system is in operation, observe and check the following:

- Check the test run (if activated).
- Compare the start and stop pressures of the pumps with the data on the name plate (using the pressure gauge).
- Compare the pre-charge pressure of the accumulator with the recommended data. (⇒ Section 9.2.3, Page 33)
Close the shut-off elements under the accumulator and drain the accumulator via the drain valve.
Remove the protective cap of the accumulator valve and check the pre-charge pressure with the aid of a tyre pressure gauge.
Add nitrogen as necessary.

	<p style="background-color: #FFA500; padding: 5px;">⚠ WARNING</p> <p>Wrong gas Danger of poisoning!</p> <ul style="list-style-type: none"> ▷ Use only nitrogen to charge the accumulator.
---	--

- 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 correct functioning of any auxiliary connections.

9.2.2 Checklist for inspection

In the event that you decide to conduct your own inspections, proceed according to the following checklist at least once a year:

1. Check the pump and drive for smooth running and the mechanical seal for integrity.
2. Check the shut-off, drain and check valves for proper functioning and tightness.
3. Clean the strainer in the pressure reducer (if applicable).

4. Check expansion joints for wear (if applicable).
5. Verify the pre-charge pressure level and check the accumulator for integrity if required. (⇒ Section 9.2.3, Page 33)
6. Check the automatic switching functionality.
7. Check the start and stop points of the pressure booster system.
8. Check the water inflow, inlet pressure, lack-of-water monitoring, flow monitoring and pressure reducer.
9. Check the inlet tank and the float valve (if applicable). Check the overflow for integrity and cleanliness.

9.2.3 Setting the pre-charge pressure

	 WARNING
	<p>Wrong gas Danger of poisoning!</p> <p>▷ Use only nitrogen to charge the accumulator.</p>

The pre-charge pressure in the accumulator should be set to a value below the set start-up pressure.
 The setting can be effected via a valve located under the cover at the top of the accumulator.

Example: Pre-charge pressure 10 % lower than start-up pressure

Pre-charge pressure of accumulator $p = 0.9 \times p_{start}$
 p_{start} = start-up pressure of pressure booster system

Recommendation

The stated values are average values. Tests on accumulators have shown that the best storage volumes are achieved with the following factors:
 pressures >3 bar: factor 0.9 and
 pressures <3 bar: factor 0.8

Example:

$p_{start} = 5$ bar: pre-charge pressure $5 \times 0.9 = 4.5$ bar
 $p_{start} = 2$ bar: pre-charge pressure $2 \times 0.8 = 1.6$ bar

	CAUTION
	<p>Pre-charge pressure too high Damage to accumulator!</p> <p>▷ Observe data provided by accumulator manufacturer (see name plate or operating manual of accumulator).</p>

10 Trouble-shooting

10.1 Trouble-shooting: pressure booster system

	WARNING
	<p>Improper work to remedy faults Risk of injury!</p> <p>▸ 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.</p>
	NOTE
	<p>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.</p>

If problems occur that are not described in the following table, consultation with the KSB customer 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 20: Trouble-shooting

A	B	C	D	E	F	G	H	I	J	K	L	M	Possible cause	Remedy ¹⁾
X	-	X	-	-	-	-	-	-	-	-	-	-	Dry-running protection device not connected.	Connect or bridge.
X	-	X	-	-	-	-	-	-	-	-	-	-	Mains supply interrupted	Check and remedy defect.
X	-	X	-	-	-	-	-	-	X	-	-	X	Phase failure	Check individual phases/fuse.
X	-	X	-	-	-	-	-	-	X	-	-	X	Motor protection switch triggered or set incorrectly, or pump seized	Compare setting with the motor's rating plate data and set accordingly. Press reset/fault acknowledgement key.
X	-	X	-	-	-	-	-	-	-	-	-	-	Control current fuse tripped.	Check fuse and replace as necessary.
-	-	X	-	-	-	-	-	-	-	-	-	-	Lack of water	Check inlet pressure.
-	-	X	-	-	-	X	-	-	-	-	-	-	Inlet pressure higher than stated in the purchase order	Fit pressure reducer; contact KSB.

1) The pump pressure must be released before attempting to remedy faults on parts which are subjected to pressure. Disconnect the pump from the power supply!

A	B	C	D	E	F	G	H	I	J	K	L	M	Possible cause	Remedy ¹⁾
-	-	-	-	X	X	X	-	X	X	X	-	-	Incorrect power supply; wrong speed.	Check power supply.
-	X	X	X	X	X	-	-	X	-	-	X	X	Shut-off valves (partially) closed	Check, open as necessary.
-	-	-	X	X	-	-	-	X	-	X	-	X	Pump and/or piping are not completely vented or primed.	Vent and/or prime.
-	-	-	X	X	X	-	-	X	X	X	-	X	Check valve in bypass line defective	Replace.
-	-	-	-	-	X	-	-	-	-	-	-	-	Insufficient inflow	Restore required inflow; connect inlet tank.
-	-	-	-	-	X	-	-	X	X	-	-	X	Pump runs sluggishly.	Have pump repaired by a specialist.
-	-	-	-	-	-	-	X	-	-	-	-	-	Defective mechanical seal	Replace.
-	-	X	-	-	-	-	-	X	-	-	-	X	Incorrect pre-charge pressure of accumulator	Set correct pre-charge pressure; replace membrane.
X	-	X	X	-	-	-	-	-	X	X	-	-	Inlet-side pressure switch defective or set incorrectly.	Check/correct the value set at the pressure switch.
-	-	-	-	-	-	-	-	X	-	X	X	X	Defective time-lag relay or time set incorrectly.	Check time-lag relay/correct minimum operating time.
-	-	-	-	-	-	-	-	-	-	-	X	-	System leaking.	Restore system integrity.
-	-	X	-	-	X	X	-	-	-	X	X	-	Discharge-side pressure switch defective or set incorrectly.	Check/correct the value set at the pressure switch.
X	-	-	-	-	-	-	-	-	X	-	-	-	Intermittent voltage fluctuations	Press reset/fault acknowledgement key.
-	-	-	X	-	-	-	-	X	X	-	-	X	Defective check valve in the pressure booster system	Check; fit new valve if required.
-	-	-	X	X	X	-	-	X	-	X	-	-	Pump running in the wrong direction of rotation.	Interchange two phases of the power cable.
-	-	-	X	-	X	-	-	-	-	X	X	-	Inlet pressure lower than stated in the purchase order	Connect inlet tank, contact KSB.
-	X	-	-	-	X	-	-	-	X	X	-	-	Water extraction higher than stated in the purchase order	Contact KSB.

10.2 Trouble-shooting: frequency inverter

	WARNING
	<p>Improper work to remedy faults Risk of injury!</p> <p>▷ 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.</p>

If problems occur that are not described in the following table, consultation with the KSB customer 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 21: Trouble-shooting

A	B	C	D	E	F	G	H	I	Possible cause	Remedy
-	X	-	-	-	-	X	-	-	No voltage	Check the mains voltage; check the mains fuses.
-	X	-	-	-	-	-	-	-	No enable	Check enable via DIGIN-EN and system start.
X	-	-	-	-	-	-	-	-	Mains fuse rating too small for frequency inverter input current	Check design configuration of mains fuse.
-	-	-	X	-	-	-	-	-	No setpoint signal or setpoint set too low / drive overloaded and in i ² t control mode	Check setpoint signal and operating point.
-	-	-	-	X	-	-	-	-	Process-related persistent control deviation (actual value smaller than setpoint) / no actual value (e.g. due to broken wire)	Check setpoint/actual value signal; check operating point; check controller setting.
-	X	-	-	-	-	-	-	X	Permissible voltage range undershot/exceeded	Check mains voltage; supply frequency inverter with required voltage.
-	-	-	-	-	-	-	X	-	Wrong direction of rotation setting	Change the direction of rotation.
-	-	X	X	-	-	-	-	X	Frequency inverter overloaded	Reduce the power input by lowering the speed; check the motor/pump for blockages.
-	X	-	-	-	-	-	-	X	Short circuit in control cable/pump blocked	Check/replace control cable connections. Remove the blockage manually.
-	-	X	X	-	-	-	-	X	Temperature of power electronics or motor winding too high	Reduce the ambient temperature by improving ventilation. Improve cooling by cleaning the cooling fins. Ensure the intake opening for the motor fans is not blocked. Ensure that the motor 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.
-	-	-	-	-	-	X	-	X	24 V supply overloaded	Disconnect PumpDrive from the power supply and eliminate the cause of the overload.
-	-	-	-	-	-	-	-	X	Dry running of pump	Check the hydraulic system and rectify the fault on PumpDrive.
-	-	-	X	-	X	-	-	X	Sensor signal error (e.g. broken wire)	Check sensor and sensor cable.
-	X	X	-	-	-	-	-	X	Phase failure, drive side	Check motor connection and motor winding.

11 Related Documents

11.1 List of components

11.1.1 Hya-Solo DSV with Movitec 2, 4, 6, 10, 15

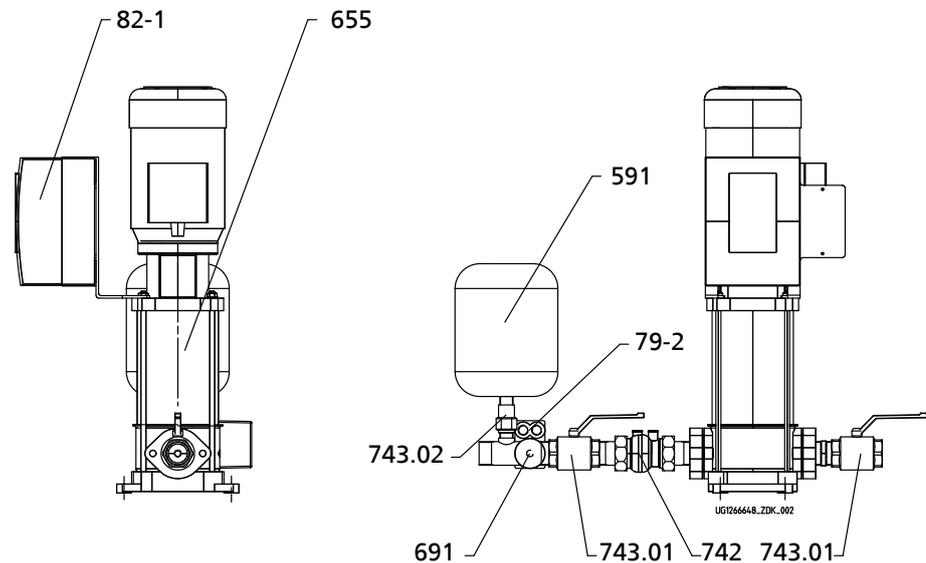


Fig. 10: General assembly drawing of Hya-Solo DSV with Movitec 2, 4, 6, 10, 15

Table 22: Spare parts for Hya-Solo DSV with Movitec 2, 4, 6, 10, 15

Part No.	Description	Ident. No.
591	Accumulator	01 079 764
655	Pump	
691	Pressure gauge, discharge side	00 401 413
742	Lift check valve 1 (Movitec 2, 4)	01 149 253
742	Lift check valve 1 1/4 (Movitec 6)	01 149 254
742	Lift check valve 1 1/2 (Movitec 10)	01 149 255
742	Lift check valve 2 (Movitec 15)	01 149 256
743.01	Ball valve 1 (Movitec 2, 4)	01 057 427
743.01	Ball valve 1 1/4 (Movitec 6)	01 057 428
743.01	Ball valve 1 1/2 (Movitec 10)	01 057 429
743.01	Ball valve 2 (Movitec 15)	01 057 430
743.02	Ball valve (make Reflex)	01 079 765
79-2	Measuring transducer 0 - 16 bar	01 112 649
82-1	PumpDrive	On request

For electric parts refer to the circuit diagram in the Annex.



NOTE

Pump spare parts correspond to Movitec in standard design (with oval flange).

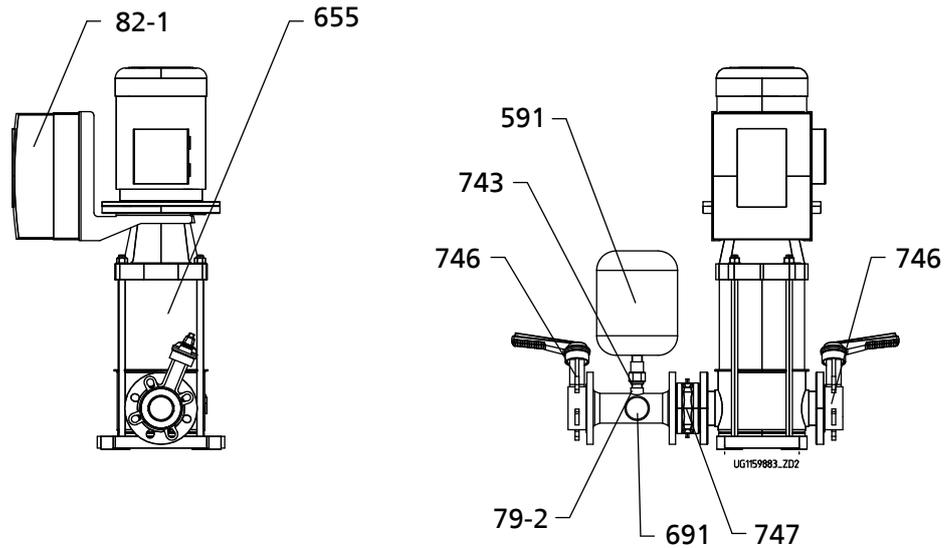
11.1.2 Hya-Solo DSV with Movitec 25, 40, 60, 90

Fig. 11: General assembly drawing of Hya-Solo DSV with Movitec 25, 40, 60, 90

Table 23: Spare parts for Hya-Solo DSV with Movitec 25, 40, 60, 90

Part No.	Description	Ident. No.
591	Accumulator	01 079 764
655	Pump	
691	Pressure gauge, discharge side	00 401 413
743	Ball valve (make Reflex)	01 079 765
746	Butterfly valve DN 65 (Movitec 25)	40 982 350
746	Butterfly valve DN 80 (Movitec 40)	40 982 351
746	Butterfly valve DN 100 (Movitec 60, 90)	40 982 352
747	Swing check valve DN 65 (Movitec 25)	01 086 243
747	Swing check valve DN 80 (Movitec 40)	01 056 931
747	Swing check valve DN 100 (Movitec 60, 90)	01 087 142
79-2	Measuring transducer 0 - 16 bar	01 112 649
82-1	PumpDrive	On request

For electric parts refer to the circuit diagram in the Annex.

Non-documented parts on request (please indicate serial No. or order No.)


NOTE

Pump spare parts correspond to Movitec in standard design (with round flange).

12 EU Declaration of Conformity

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

The manufacturer herewith declares that the product:

Hya-Solo DV, Hya-Solo DSV

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 1988-500

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

.....²⁾.....

Name
Function
Company
Address

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

14 Commissioning Report

The KSB pressure booster system specified below was today commissioned by the undersigned authorised KSB customer service engineer 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 details please refer to the circuit diagram.

Start-up pressure p_{start} bar

Inlet pressure monitoring $p_{inl} - x$
 (setting of inlet pressure switch)

Stop pressure p_{stop} bar

Inlet pressure p_{inl} bar

Pre-charge pressure of accumulator $p_{pre-charge}$ bar

The system operator/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-conformities 1
.....
.....
.....

Name of KSB representative	Name of purchaser or representative
Place	Date

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