

Pressure Booster System

# Hya-Solo DV

From series 2014w33

## Installation/Operating Manual



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Installation/Operating Manual Hya-Solo DV

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
 <b>DANGER</b>	<b>DANGER</b> This signal word indicates a high-risk hazard which, if not avoided, will result in death or serious injury.
 <b>WARNING</b>	<b>WARNING</b> This signal word indicates a medium-risk hazard which, if not avoided, could result in death or serious injury.
 <b>CAUTION</b>	<b>CAUTION</b> This signal word indicates a hazard which, if not avoided, could result in damage to the machine and its functions.
	<b>General hazard</b> In conjunction with one of the signal words this symbol indicates a hazard which will or could result in death or serious injury.
	<b>Electrical hazard</b> In conjunction with one of the signal words this symbol indicates a hazard involving electrical voltage and identifies information about protection against electrical voltage.
	<b>Machine damage</b> 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 impermissible to make any changes or additions to the software or parts of the software. Software updates supplied by KSB are excluded from this rule.

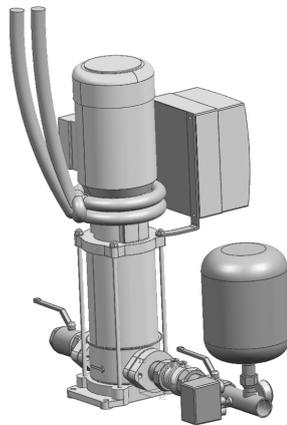
## 4 Transport/Temporary Storage/Disposal

### 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 (as applicable) and the insurer about the damage in writing immediately.

### 4.2 Transport

	<b>NOTE</b>
	<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>
	<b>⚠ DANGER</b>
	<p><b>Pressure booster system tipping over</b> Risk of injury by falling pressure booster system!</p> <ul style="list-style-type: none"> <li>▶ Never suspend the pressure booster system by its power cable.</li> <li>▶ Observe the applicable local accident prevention regulations.</li> <li>▶ Pay attention to the weight data and the centre of gravity.</li> <li>▶ Use suitable and permitted transporting equipment, e.g. crane, forklift or elevating platform truck.</li> <li>▶ Attach the pressure booster system to crane lifting tackle as shown, or use a forklift or pallet truck to move the pallet.</li> </ul>



**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:

	<b>CAUTION</b>
	<p><b>Damage during storage by frost, moisture, dirt, UV radiation or vermin</b> Corrosion/contamination of pressure booster system!</p> <ul style="list-style-type: none"> <li>▸ Store the pressure booster system in a frost-proof room. Do not store outdoors.</li> </ul>

	<b>CAUTION</b>
	<p><b>Wet, contaminated or damaged openings and connections</b> Leakage or damage of the pressure booster system!</p> <ul style="list-style-type: none"> <li>▸ Only open the openings of the pressure booster system at the time of installation.</li> </ul>

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 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 50)  
Always indicate any safety and decontamination measures taken.

	<b>NOTE</b>
	<p>If required, a blank certificate of decontamination can be downloaded from the KSB web site at: <a href="http://www.ksb.com/certificate_of_decontamination">www.ksb.com/certificate_of_decontamination</a></p>

#### 4.5 Disposal

	<b>⚠ WARNING</b>
	<p><b>Fluids, consumables and supplies which are hot and/or pose a health hazard</b> Hazard to persons and the environment!</p> <ul style="list-style-type: none"> <li>▸ Collect and properly dispose of flushing fluid and any residues of the fluid handled.</li> <li>▸ Wear safety clothing and a protective mask, if required.</li> <li>▸ Observe all legal regulations on the disposal of fluids posing a health hazard.</li> </ul>

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 DV / 04 05 / 2 - 4

Table 4: Key to the designation

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

### 5.3 Name plate

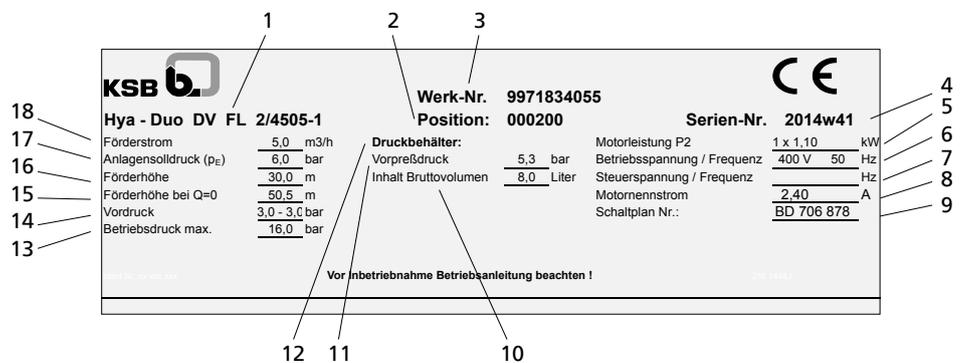


Fig. 2: Name plate (example) of a Hya-Solo DV

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

#### Key to the series code

Calendar year	Week
2014	w33

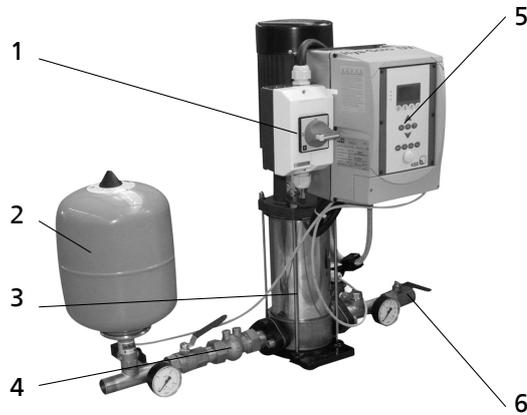
### 5.4 Design details

#### 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:** Hya-Solo DV

1	Master switch	2	Accumulator
3	Pump	4	Pressure transmitter
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 unit to maintain the set pressure, so that the pressure is kept constant.  
As the consumption decreases, the speed is reduced. At zero flow, the pressure booster system stops after a set after-run period (45 to 360 seconds).

**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.

	<b>NOTE</b>
	<p><b>Continuous manual mode is reserved exclusively for emergencies!</b> 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 dry running protection equipment. 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.

**5.9 Terminal wiring diagram**

**5.9.1 Power terminals**

	<b>NOTE</b>
<p>The PumpDrive is wired to the master switch, the motor and the pressure sensor at the factory. Work at the power terminals is only required if the PumpDrive needs to be removed.</p>	

The power terminals are located underneath the V-shaped cover.

	<p><b>⚠ DANGER</b></p>
	<p><b>Electrical connection work by unqualified personnel</b>            Danger of death from electric shock!</p> <ul style="list-style-type: none"> <li>▷ Always have the electrical connections installed by a trained and qualified electrician.</li> <li>▷ Observe regulations IEC 60364 and, for explosion-proof models, EN 60079.</li> </ul>

	<p><b>NOTE</b></p>
	<p>The housing cover must not be opened.            Non-compliance will result in forfeiture of any and all warranty claims.</p>



Remove the cross-head screws on the L-shaped cable cover for the control cables and remove the cover.

Removing the L-shaped cover.



Remove the cross-head screws on the V-shaped cover for the mains and motor connection and remove the cover.

Removing the V-shaped cover.

Route the mains cable and motor cable through the cable glands and connect them to the specified terminals.  
 When closing the covers, make sure that the sealing elements are properly seated.

	<p><b>NOTE</b></p>
	<p>The screws fastening the cover of the mains and motor terminal box must be tightened to a torque of 1.2 Nm to ensure that the device has IP55 enclosure protection.</p>

	<p><b>⚠ DANGER</b></p>
	<p><b>Open terminals and connectors of brake resistor.</b>            Danger to life!</p> <ul style="list-style-type: none"> <li>▷ Do not open the terminals and connectors of the brake resistor.</li> </ul>

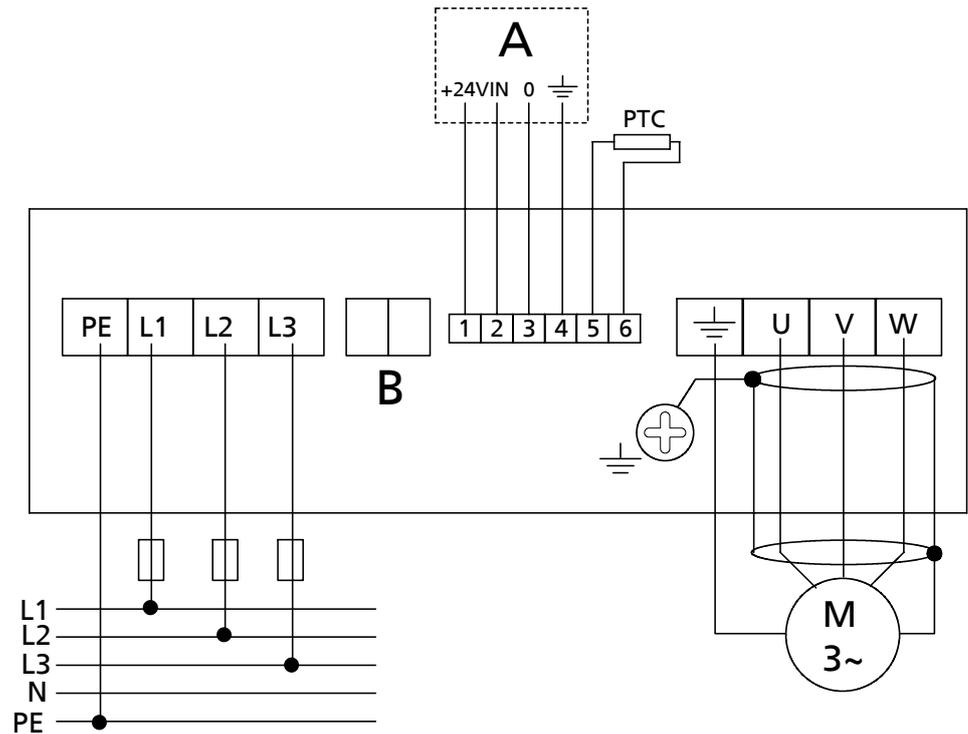


Fig. 4: Power supply and motor wiring up to 7.5 kW

A	Analog input 2	B	Brake resistor
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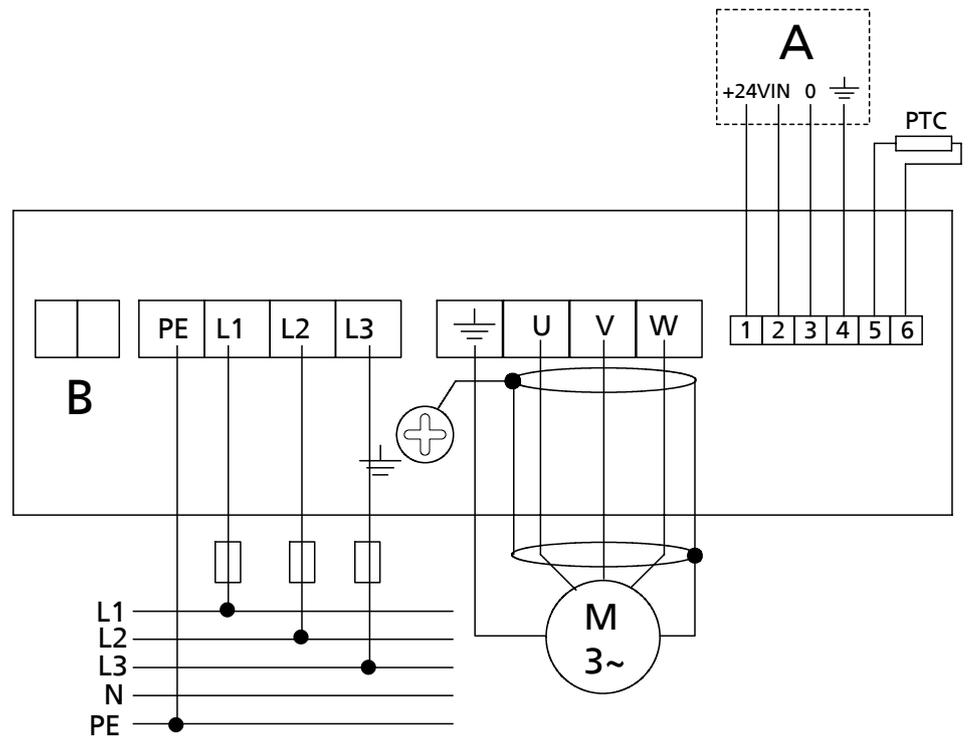


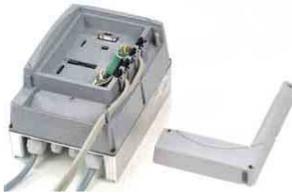
Fig. 5: Power supply and motor wiring from 11 kW

A	Analog input 2	B	Brake resistor
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5.9.2 Connecting the control terminals

	<b>⚠ DANGER</b>
	<p><b>Power supply not disconnected</b> Danger to life!</p> <ul style="list-style-type: none"> <li>▸ Pull the mains plug or disconnect all electrical connections and secure against unintentional start-up.</li> </ul>

	<b>NOTE</b>
	<p>The housing cover must not be opened. Non-compliance will result in forfeiture of any and all warranty claims.</p>



**Fig. 6:** Removing the cover for the control cable

The control terminals are located underneath the control panel.  
This must be removed as follows.

1. Remove the cross-head screws on the L-shaped cover for the control cable and remove the cover.
2. Remove the cross-head screws on the control panel and remove the control panel.

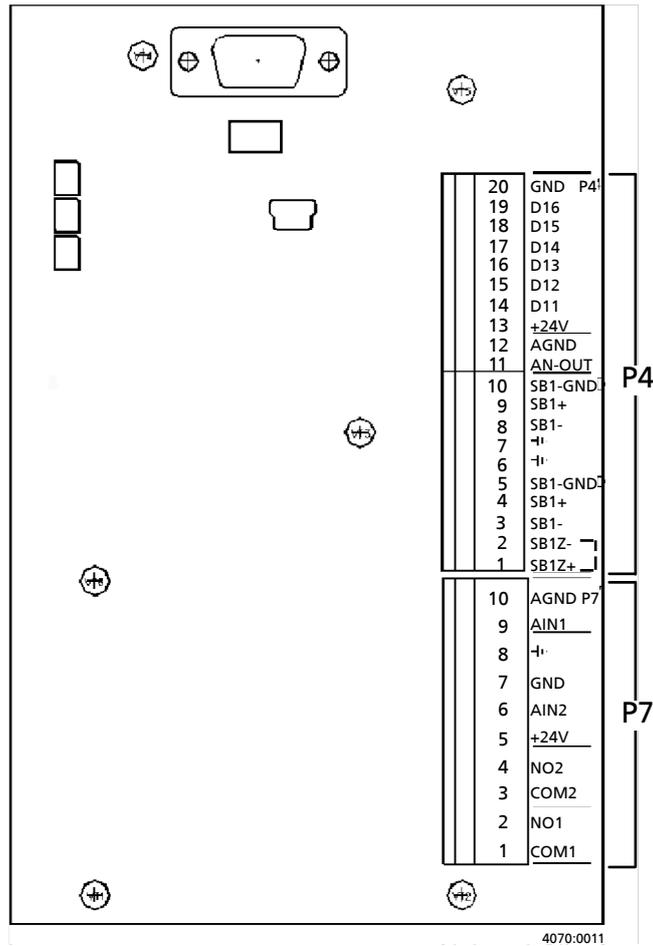
	<b>NOTE</b>
	<p>The screws fastening the cover of the mains and motor terminal box must be tightened to a torque of 1.2 Nm to ensure that the device has IP55 enclosure protection.</p>

The control terminal assignment is shown below.

The maximum cable cross-sections (wire size) which can be connected to the control terminals of terminal strip P4 and terminal strip P7 are:

**Table 6:** Max. cable cross-sections to be connected to control terminals

Control terminals	Rigid and flexible cables	Flexible cable with wire end sleeve
Terminal strip P4	0.2 - 1.5 mm <sup>2</sup>	0.75 mm <sup>2</sup>
Terminal strip P7	0.2 - 2.5 mm <sup>2</sup>	0.25 - 1.5 mm <sup>2</sup>



**Fig. 7:** Inputs/output control terminals

**Table 7:** Terminal strip P4

Terminal	Signal	Description
20	0V	Ground for +24 V
19	DIG IN6	Digital input (15/28 V DC)
18	DIG-IN5	Digital input (15/28 V DC)
17	DIG-IN4	Digital input (15/28 V DC)
16	DIG-IN3	Digital input (15/28 V DC)
15	DIG-IN2	Digital input (15/28 V DC)
14	DIG-IN1	Digital input (15/28 V DC)
13	+24 V	+24 V DC voltage source Max. load 200 mA
12	0V-AN	Ground for AN-OUT
11	AN OUT	Analog output 0-10 V. Max. load 5 mA
10	SB1-GND	Ground for CAN
9	SB1 +	CAN signal
8	SB1 -	CAN signal
7	PE (GROUND)	Ground
6	PE (GROUND)	Ground
5	SB1-GND	Ground for CAN
4	SB1 +	CAN signal
3	SB1 -	CAN signal
2	SB1Z-	Bus terminator for CAN
1	SB1Z+	Bus terminator for CAN

**Table 8:** Terminal strip P7

Terminal No.	Signal	Description
10	0V-AN	Ground for AIN1/2
9	AN1-IN	Programmable analog input 1 0-10 V or 0-20 mA
8	PE (GROUND)	Ground
7	0V	Ground for +24 V
6	AN2-IN	Programmable analog input 2 0-10 V or 0-20 mA
5	+24 V	+24 V DC voltage source Max. load 200 mA
4	NO2	NO contact "NO" No. 2 (250 V AC, 1 A)
3	COM2	NO contact "COM" No. 2 (250 V AC, 1 A)
2	NO1	NO contact "NO" No. 1 (250 V AC, 1 A)
1	COM1	NO contact "COM" No. 1 (250 V AC, 1 A)

## 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 %.

	<b>NOTE</b>
	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

	<b>⚠ WARNING</b>
	<p><b>Installation on mounting surfaces which are unsecured and cannot support the load</b> Personal injury and damage to property!</p> <ul style="list-style-type: none"> <li>▶ Use a concrete of compressive strength class C12/15 which meets the requirements of exposure class X0 to EN 206-1.</li> <li>▶ The mounting surface must have set and must be completely horizontal and even.</li> <li>▶ Observe the weights indicated.</li> </ul>

	<b>NOTE</b>
	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

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

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.

	<b>NOTE</b>
<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>	

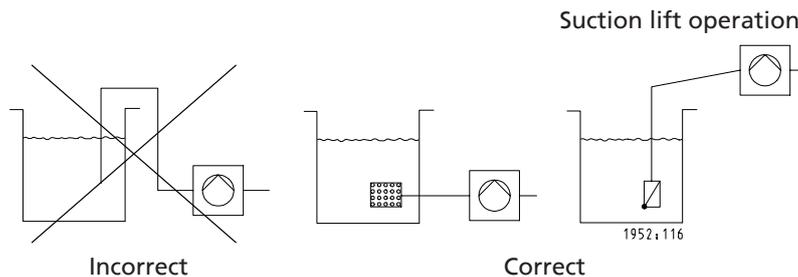
Allow sufficient space for maintenance and repair work.

- ✓ 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.

	<b>CAUTION</b>
<p><b>Air pockets in suction line</b> Pressure booster system cannot prime!</p> <ul style="list-style-type: none"> <li>▸ Lay piping with a continuously rising slope (as shown).</li> </ul>	



	<b>NOTE</b>
<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

	<b>⚠ DANGER</b>
<p><b>Sparks and radiant heat</b> Fire hazard!</p> <ul style="list-style-type: none"> <li>▸ Take suitable precautions to protect the expansion joint if any welding work is carried out nearby.</li> </ul>	

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

- ✓ 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

	<b>NOTE</b>
	A pipe length of approximately 600 mm must be provided on the inlet side to accommodate a pressure reducer, if necessary.
	<b>NOTE</b>
	<p>A pressure reducer must be installed</p> <ul style="list-style-type: none"> <li>- if the inlet pressure fluctuation is too high for the pressure booster system to operate as intended or</li> <li>- if the total pressure (inlet pressure plus shut-off head) of the pressure booster system exceeds the design pressure.</li> </ul> <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.

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

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 the digital input 1 (terminals 13 and 14 on terminal strip P4) of the PumpDrive. (⇒ Section 5.9 Page 13)  
 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

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

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, PE and N as shown in the enclosed circuit diagram.  
 Observe the data given on the name plate.

#### 6.7.3 Digital inputs

##### Terminal strip P4, terminals 13 to 20. (⇒ Section 5.9 Page 13)

PumpDrive is equipped with six digital inputs.  
 Digital inputs 1 and 6 are factory-defaulted.  
 Digital input 1 is the External ON/OFF input, which is connected to terminal P4-13 in as-delivered condition. If the pressure booster system is equipped with dry-running protection, this is connected in series with the External ON/OFF input.  
 The functions of digital inputs 2 to 5 can be parameterised by the user at the control panel. To connect the inputs use terminal P4-13 (+24 V DC). If an external 24 V DC

source is to be used, the neutral conductor from this source must be connected to terminal P4-20.

Parameterisation (⇒ Section 8.7.4 Page 37)

#### **6.7.4 Relay outputs**

##### **Terminal strip P7, terminals 1 to 4. (⇒ Section 5.9 Page 13)**

In as-delivered condition the relay outputs are parameterised as volt-free contacts for "No alarm" (relay 1) and "Operation" (relay 2). Different messages can be assigned to these relay outputs via the control panel.

Parameterisation (⇒ Section 8.7.5 Page 38)

#### **6.7.5 Analog inputs**

##### **Terminal strip P7, terminals 5 to 10. (⇒ Section 5.9 Page 13)**

Analog input 1 can be used for external setpoint adjustment.

Analog input 2 is assigned to the pressure transmitter (feedback value transmitter) as a standard, which, however, is connected to the mains-motor-PTC terminal strip.

(⇒ Section 5.9.1 Page 13)

Parameterisation (⇒ Section 8.7.6 Page 38)

#### **6.7.6 Analog output**

##### **Terminal strip P4, terminals 11 and 12 (⇒ Section 5.9 Page 13)**

PumpDrive is equipped with an analog output, whose output value can be parameterised via the control panel depending on the digital inputs.

Parameterisation (⇒ Section 8.7.7 Page 39)

#### **6.7.7 LON module**

The plug-on LON interface module is connected to an available on-site LON network.

The LON interface is equipped with a FTT-10A transceiver (Free Topology Transceiver).

The following settings parameters can be set:

- Start
- Stop
- Setpoint for settings

The following monitoring parameters can be set:

- Actual value
- Speed
- Pressure (if connected to sensor)
- Pump status
- Pump fault or malfunction
- Operating hours
- Energy input
- Pump input power

Further details and parameters can be found in the LON literature for PumpDrive; refer to the Product Catalogue on the KSB web site.

The LON literature is based on the LONMARK Functional Profile Pump Controller V 1.0 - SFPTpumpController standard.

The LON interface is put into service on site.

## 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.

	<p><b>CAUTION</b></p>
	<p><b>Dry running of pump</b> Damage to the pump/pressure booster system!</p> <ul style="list-style-type: none"> <li>▸ 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.</li> </ul>
	<p><b>NOTE</b></p>
	<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 9:** 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

	<p><b>NOTE</b></p>
	<p>The hydraulic connections are closed in as-supplied condition. They must only be opened immediately before installation. In accordance with DIN EN 806, prior to commissioning, the pressure booster system must be flushed by the operator and disinfected, if necessary.</p>

Commissioning should be carried out by specialist KSB staff.

	<p><b>CAUTION</b></p>
	<p><b>Foreign matter in the piping</b> Damage to the pump/pressure booster system!</p> <ul style="list-style-type: none"> <li>▸ 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.</li> </ul>

	<b>NOTE</b>
	<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 43)
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.

	<b>NOTE</b>
	<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.

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

### 7.3 Check list for commissioning/start-up

Table 10: Check list

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.	

Operations		Done
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

	<b>NOTE</b>
	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".

	<b>NOTE</b>
	Drain the pressure booster system for prolonged shutdown.

## 8 Operating the Pressure Booster System

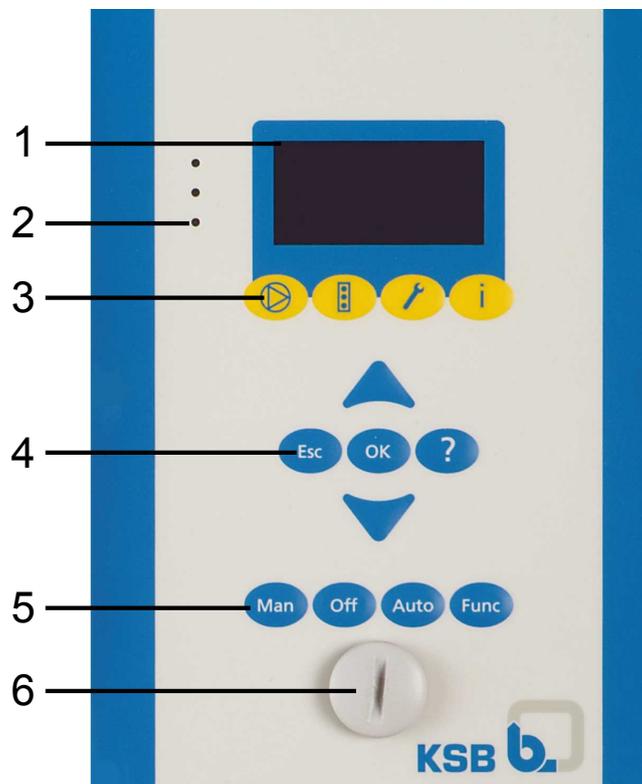
	<b>CAUTION</b>
	<p><b>Incorrect operation</b> Water supply is not assured!</p> <ul style="list-style-type: none"> <li>Make sure to comply with all local regulations, particularly the EC Machinery Directive and the EC Directive on Low-Voltage Equipment.</li> </ul>

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 Control panel functions

The control panel comprises a back-lit display, LEDs, function and navigation keys, and an access point for the service interface.

The display shows important information for operating the pressure booster system. Plain-text data can be accessed and parameters can be set.



4070:0007

Fig. 8: PumpDrive control panel

1	Display	2	"Traffic light" LEDs
3	Function keys	4	Navigation keys
5	Operating keys	6	Service interface

### 8.1.1 Display

The six-row display contains the following information:

Parameter No.	Model/Selected pump
Main menu selection	
Parameter selection list	
Operating mode	Operating status

Fig. 9: Display for the selected menu option

Display element	Description
Parameter No.	Displays the selected parameter No.
Model or	A - HMI - C A = Advanced or B = Basic HMI With control panel C Customer access level
Selected pump	Pump 1, Pump 2 ... Pump 6
Main menu selection	Operation Diagnosis Settings Information
Parameter selection list	List of selectable parameters
Operating mode	Man, Off, Auto
Operating status	Run, Stop, Sleep

The number of the current menu or parameter is always displayed at the top left of the screen. This four-digit number indicates the path through the menu levels and thus enables the user to quickly locate parameters. (⇒ Section 8.4 Page 31)

The PumpDrive model or selected pump is displayed at the top right of the screen.

The current operating mode of the PumpDrive currently selected is displayed at the bottom left of the screen: Man/Auto/Off.

The current operating status of the PumpDrive selected is displayed at the bottom right of the screen.

If a fault or malfunction occurs, this is displayed in the bottom line instead of the operating mode and status.

### 8.1.2 LEDs

The "traffic light" LEDs provide information about the pump system's operating status.

Table 11: LED description

LED	Description
	<b>Red:</b> One or more than one alert is active
	<b>Amber:</b> One or more than one warning is active
	<b>Green:</b> Trouble-free operation

### 8.1.3 Function keys

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

**Table 12:** Assignment of menu keys

Key	Menu
	Operation
	Diagnosis
	Settings
	Information

### 8.1.4 Navigation keys

For navigating through the menus and confirming settings:

**Table 13:** Control unit: Navigation keys

Key	Description
	<b>Direction keys:</b> <ul style="list-style-type: none"> <li>Move up/down in the menu options</li> <li>Increase/decrease a numerical value</li> <li>Scroll up or down</li> </ul>
	<b>Escape key:</b> <ul style="list-style-type: none"> <li>Cancel an entry without saving it.</li> <li>Move up one menu level.</li> </ul>
	<b>OK key:</b> <ul style="list-style-type: none"> <li>Confirm settings.</li> <li>Confirm a menu selection.</li> <li>When entering numbers: Go to the next digit.</li> </ul>
	<b>Help key:</b> <ul style="list-style-type: none"> <li>Displays a help text for each selected menu option.</li> </ul>

### 8.1.5 Operating keys

You can use the operating keys to select the Manual, Off or Automatic operating modes.

The operating keys for selecting the manual (Man) and "Off" (Off) operating modes can be disabled, see parameters 3-1-4-1 and 3-1-4-2.

This prevents improper or unauthorised intervention in the operating mode of the pressure booster system.

**Table 14:** Control unit: operating keys

Key	Description
	<b>Manual mode</b> Starts the pressure booster system independently of the control unit. The pressure booster system will continue to run until switched off with the "OFF" key or switched to automatic mode with the "Auto" key. In manual mode, the pump speed can be freely selected between $n_{min}$ and $n_{max}$ by using the direction keys.
	<b>OFF</b> Switches off the pressure booster system.
	<b>Automatic operation</b> Switches the pressure booster system to automatic mode.
	<b>Parameterisable function key</b> Without function on Hya-Solo DV pressure booster systems.

**8.1.6 Service interface**

The service interface allows a PC/Notebook to be connected via a special cable (USB - RS232).

The pressure booster system can be parameterised by using the Service-Tool software.

The control unit can also be updated via this interface.

**8.2 Menu structure**

**Table 15:** Structure of main menu: KSB logo/actual value display

Main menu key	Sub-menu	Information displayed
1 Operation	1-1 Operation	1-1-1 Operation
	1-2 Motor	1-2-1 Motor
	1-3 Signals	1-3-1 Process
		1-3-2 Inputs & Outputs
	1-4 PumpDrive	1-4-1 Status
		1-4-2 Local Bus
		1-4-3 Diagnosis Bus
	1-5 Pump	1-5-1 Flow Rate Meas
		1-5-2 Power Measurmnt
		1-5-3 Pump Status
	1-6 LON Module	1-6-1 LON Input Netw
		1-6-2 LON Output Netw
		1-6-3 LON Config
2 Diagnosis	2-1 Alert History	2-1-1 Alert History
	2-2 Warnings	2-2-1 Warnings
	2-3 Alerts	2-3-1 Alerts
	2-4 Op Logger	2-4-1 PumpDrive
2-4-2 Process Timer		
3 Settings	3-1 Panel	3-1-1 Basic Settings
		3-1-2 Set-up
		3-1-3 Display Config.
		3-1-4 Keypad
		3-1-5 Panel Commands
		3-1-6 Password
		3-1-7 Network Config
	3-2 PumpDrive	3-2-1 Basic Settings
		3-2-2 Units
		3-2-3 Set-up
	3-3 Load and Motor	3-3-1 V/f Settings
		3-3-2 Motor Data
		3-3-4 Start Adjust
		3-3-5 Motor Temp
		3-3-6 Ramps
	3-4 Spec Pump Sett	3-3-7 Res Freq Bypass
		3-4-1 Q/p Measurement
		3-4-2 Setpoint Comp
	3-5 Setpoint	3-4-3 Sleep Mode
		3-5-1 General Settngs
		3-5-2 Preset Setpoint
		3-5-3 Prset Out Freq1
	3-6 Limits&Warns	3-5-4 Setpoint source
		3-6-1 Motor Limits
		3-6-2 Motor Warnings
3-6-3 Analog IN Wrn		
3-6-4 Load Warnings		
3-6-5 Setpoint Warns		
3-7 Digital IN/OUT	3-6-6 Feedback Warn	
	3-7-1 Digital IN 2-5	
	3-7-2 Digital OUT 1	

Main menu key	Sub-menu	Information displayed
		3-7-3 Digital OUT 2
	3-8 Analog IN/OUT	3-8-1 Analog IO Mode 3-8-2 Analog IN 1 3-8-3 Analog IN 2 3-8-4 Analog OUT 1
	3-9 PI Controller	3-9-1 Process PI Ctrl 3-9-2 Feedback Source
	3-10 Kommunikation	3-10-1 General Settings
	3-11 Add Settings	3-11-1 Inverter Switch 3-11-2 Trip 3-11-3 Crrnt Lim Ctrl 3-11-4 Max Output 3-11-5 PDrive Settings
	3-12 Adv Pump Ctrl	3-12-1 Flow Rate Meas 3-12-2 Low Q Limit 3-12-3 H/P/Q Curves 3-12-4 Pump Protection 3-12-5 MultipumpConfig 3-12-6 dp sensorless
4-Information	4-1 PDrive Info	4-1-1 PDrive ID/LON Identificat
	4-2 Panel	4-2-1 Panel Ident

### 8.3 Access levels

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

- "Standard" level** Unless users log on to one of the other access levels, they will only have limited access to parameters.
- "Customer" level** Access level for suitably trained users. This level enables access to all the parameters required for commissioning. A password has to be entered under 3-1-6-1, Login. The password can be changed under 3-1-6-4, Customer Passwd, after entering "0000" (factory password). If password protection is deactivated via parameter 3-1-6-5, this access level becomes the "Standard" access level. This applies to the factory settings.
- "Service" level** Access level for service personnel.
- "Factory" level** Access level for the manufacturer only.

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

### 8.4 Displaying and changing parameters

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 function keys.

**Table 16:** Function keys

	Operation
	Diagnosis
	Settings
	Information

Subsequent steps are carried out via the navigation keys.

**Example: Parameter 3-5-2-1 Setpoint**

First, enter the customer password.  
Then change the setpoint as follows:

**First digit of parameter number: 3-5-2-1**

	Press the third function key for Settings. 3-1 appears at the top left of the screen.
---	--

**Second digit of parameter number: 3-5-2-1**

	Change the display 3-1 on the screen (top left) to 3-5 by pressing the navigation keys.
	To confirm the selection, press OK. 3-5-1 appears at the top left of the screen.

**Third digit of parameter number: 3-5-2-1**

	Change the display 3-5-1 on the screen (top left) to 3-5-2 by pressing the navigation keys.
	To confirm the selection, press OK. 3-5-2-1 appears at the top left of the screen. You have called up the required parameter.
	To change this parameter, press OK again.

Numerical values can then be entered digit by digit from left to right.

	Increase value
	Reduce value.

The bar above the entry displays the value currently being entered in relation to the value range.

	To confirm the selected value press OK. The cursor moves to the next position (second position from the left).
---	--

Make the settings for the subsequent positions as described above.

	Press OK to save the new parameter value.
	Press ESC several times to return to the main display.

**8.5 Monitoring**

**8.5.1 Messages**

All monitoring and protective functions trigger warnings or alerts. These are signalled via the amber or red LED. A flashing message is output in the last line of the control panel display.

If more than one message is output, the last one is displayed.

Alerts have priority over warnings.

**Table 17:** Function keys

	To display current messages, choose the <b>Diagnosis</b> menu and then <b>2-2-1 (warnings)</b> or <b>2-3-1 (alerts)</b> .
---	---

Active warnings and alerts can also be connected to the relay outputs. (⇒ Section 8.7.5 Page 38)

### 8.5.2 Resetting and acknowledging alerts

You can acknowledge alerts once the cause has been rectified. Alerts can be acknowledged individually in the alert list in the **Diagnosis** menu under **2-1**. When the system is reset, this causes all the alerts to be reset too. Resetting is initiated via the control panel by pressing the OK key and is only possible in the main menu. You may therefore need to press the ESC key several times to return to the main menu. The reset can also be carried out via a digital input. Digital input 5 is defaulted for this purpose.

	<b>NOTE</b>
	Resetting alerts may cause the system to re-start.

By making the appropriate settings at parameter 3-11-2-1, Trip Reset Mode, alerts can also be reset automatically. This parameter is defaulted to automatic reset.

	<b>NOTE</b>
	The motor will restart after an automatic fault reset.

### 8.5.3 Alert history

	You can display the alert history in the <b>Diagnosis</b> menu under <b>2-1-1</b> . The last few alerts are listed here.
	You can use the navigation keys and the OK key to select an entry from the list. Information about when the alert has come and gone is then displayed.

Display	Description
C:	HHHH:MM Hours (H) and minutes (M) since alert has come
G:	HHHH:MM Hours (H) and minutes (M) since alert has gone

## 8.6 Description of parameters

The main parameters required for operating Hya-Solo DV are described below. For an overview and detailed information on all PumpDrive parameters please refer to the enclosed PumpDrive operating manual.

### 8.6.1 Parameter group 1 "Operation"

#### Access via "Operation" key

Parameters starting with the digit "1" indicate current operating conditions. Exception: parameters 1-1-1-5 and 1-1-1-6, which can be used to reset the kWh and operating hours counters.



Fig. 10: Operation key

Parameter	Description
1-1-1-2	Operating hours counter [h]
1-3-1-1	Feedback/actual value [bar]
1-3-1-3	Setpoint [bar]

**8.6.2 Parameter group 2 "Diagnosis"**

**Access via "Diagnosis" key**

Parameters starting with the digit "2" are used for fault diagnosis. (⇒ Section 8.5 Page 32)



**Fig. 11:** Diagnosis key

Parameter	Description
2-1-1	Alert history, list of alerts which can be acknowledged individually by pressing OK
2-2-1	Display of warnings
2-3-1	Display of alerts

**8.6.3 Parameter group 3 "Settings"**

**Access via "Settings" key**

This key is used to change parameters which are required to adjust the pressure booster system to site conditions if the data specified in the purchase order no longer applies or if accessories or supplementary equipment have been retrofitted.



**Fig. 12:** Settings key

Parameter	Description
3-1-4-1	[Man] key: Disable or enable key for manual operation.
3-1-4-2	[Off] key: Disable or enable key for switching off the system.
3-1-6	Password: Log on with the required access level.
3-4-3	Sleep mode: Settings for stopping the pump at Q = 0 (⇒ Section 8.7.3 Page 36)
3-5-2-1	Preset setpoint: Setting the setpoint
3-9-1-2	PI Prop Gain: Changing the proportional gain of the PI controller
3-9-1-3	PI Integral TM: Changing the integral term of the PI controller

**8.6.4 Parameter group 4 "Information"**

**Access via "Information" key**

Parameters starting with the digit "4" provide information on:



**Fig. 13:** Information key

Parameter	Description
4-1	PumpDrive
4-2	Panel

**8.7 Adjusting the settings**

**8.7.1 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 3-5-2-1 has to be changed as required.

First, enter the customer password. (⇒ Section 8.3 Page 31)

Then change the setpoint. (⇒ Section 8.4 Page 31)

**8.7.2 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 following table:

**Table 18:** Main parameters of the PI controller:

Parameter	Description	Factory Set 1 / Factory Set 2	Setting range / options	Access	Reference to
3-9-1-1	Disable/enable PI controller	1 / 1	See selection list	Customer	
3-9-1-2	PI proportional gain - kp	1 / 1		Customer	
3-9-1-3	PI controller integral term	1 / 1	0..60 [s]	Customer	
3-9-1-4	Process PI sense	1 / 1	See selection list	Customer	
3-9-1-5	Process type of PI controller	1 / 1	See selection list	Customer	
3-9-1-6	PI Auto Detect	2 / 2	See selection list	Customer	
3-6-1-2	Lower limit for motor frequency	0 / 0	0..100 [%]	Customer	3-11-4-1
3-6-1-3	Upper limit for motor frequency	100 / 100	0..100 [%]	Customer	3-11-4-1
3-11-4-1	Maximum output frequency	60 / 60	1..600 [Hz]	Factory	

**Table 19:** Selection list for parameters

Selection list for parameters			
3-9-1-1	3-9-1-4	3-9-1-5	3-9-1-6
1 - Disabled	1 - Negative	1 - Const Pressure	1 - Disabled
2 - Enabled	2 - Positive	2 - Variable Press	2 - Enabled
		3 - Constant Flow	
		4 - Other Setpts	

**Table 20:** Additional information on parameters

		Process setting
3-9-1-2	Adjusting the proportional gain	
	e.g. open hydraulic circuit - pressure control	kp _____
	e.g. closed hydraulic circuit - differential pressure control	kp _____
3-9-1-3	Adjusting the integral component	
	e.g. open hydraulic circuit - pressure control	Tn _____
	e.g. closed hydraulic circuit - differential pressure control	Tn _____
3-9-1-4	Negative direction of action: actual value decreasing – speed is to increase	
	Positive direction of action: actual value decreasing – speed is to decrease	
3-9-1-5	1 – Constant pressure/differential pressure at the sensor measuring location	
	2 – Variable pressure/differential pressure activates the dynamic pressure compensation function	
3-9-1-6	Automatic controller recognition when a signal is connected to the actual value source	

### 8.7.3 Changing the stop criteria

Hya-Solo DV with PumpDrive recognises whether the flow rate supplied is actually used.

When the system has reached its steady state (the actual value has reached the setpoint within the programmed hysteresis for pressure fluctuations 5), PumpDrive increases the setpoint by a value 3 (test pulse) for a period of time 2.

If the flow rate is zero, this pressure compensation will continue to be applied. PumpDrive reduces the speed to the set minimum output frequency (3-6-1-2). If the pressure increase continues to be applied for the period of time 7 measured from the moment at which the speed drops below the minimum speed before stopping 6, the PumpDrive will stop the pump subsequently. The drive remains in stand-by mode.

If the flow rate consumed rises again, the pressure in the system drops and PumpDrive starts the pump again after the time delay 8 when the cut-in hysteresis 4 has been reached.

If the motor speed drops below the value of parameter 3-4-3-4 6, PumpDrive switches the pump to stand-by mode after the time delay 7 without carrying out a test pulse cycle through setpoint compensation (2, 3).

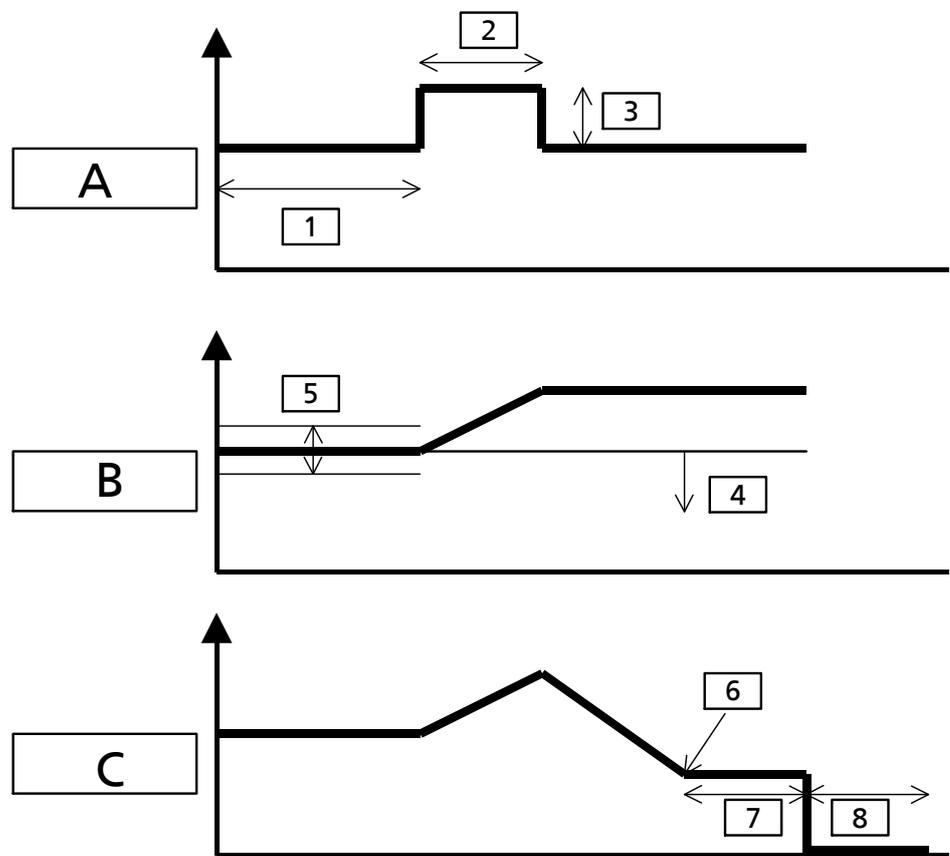


Fig. 14: Changing the stop criteria

A	Setpoint	
B	Pressure	
C	Speed	
1	Waiting time until activation	Parameter: 3-4-3-6
2	Duration of test pulse	Parameter: 3-4-3-9
3	Setpoint increase/pulse	Parameter: 3-4-3-8
4	Hysteresis for closed-loop control mode	Parameter: 3-4-3-2
5	Hysteresis for pressure variations	Parameter: 3-4-3-7
6	Minimum speed before stopping	Parameter: 3-4-3-4
7	Waiting time before stopping	Parameter: 3-4-3-5
8	Waiting time before system start-up	Parameter: 3-4-3-3

**Table 21:** Parameters required for settings

Parameter	Description	Factory Set 1/ Factory Set 2	Setting range / options	Access	Reference to
3-4-3-1	Enable/disable sleep mode	1 / 1	See selection list	Customer	
3-4-3-2	Difference between feedback and setpoint to start	0 / 0	0..6500 [3-2-2-1]	Customer	
3-4-3-3	Start delay, sleep mode	1 / 1	0.1..60 [s]	Customer	
3-4-3-4	Frequency limit to enter sleep mode	50 / 50	3-6-1-2..3-6-1-3 [%]	Customer	3-11-4-1
3-4-3-5	Time delay to stop the PumpDrive	10 / 10	0.1..30 [s]	Customer	
3-4-3-6	Time delay after detection of minimum flow level	60 / 60	45..360 [s]	Service	
3-4-3-7	Difference between feedback and setpoint to start test pulses	2 / 2	0..9999 [3-2-2-1]	Service	
3-4-3-8	Test pulse amplitude	2 / 2	0..9999 [3-2-2-1]	Service	
3-4-3-9	Pulse time	10 / 10	3..30 [s]	Service	
3-2-2-1	Physical unit of setpoint	1 / 1	See selection list	Service	
3-6-1-2	Lower limit for motor frequency	0 / 0	0..100 [%]	Customer	3-11-4-1
3-6-1-3	Upper limit for motor frequency	100 / 100	0..100 [%]	Customer	3-11-4-1
3-11-4-1	Maximum output frequency	60 / 60	1..600 [Hz]	Factory	

**Table 22:** Selection list for parameters

Selection list for parameters			
3-4-3-1	3-2-2-1		
1 - Disabled	1 - %	18 - W/m <sup>2</sup>	35 - lb/min
2 - Enabled	2 -	19 - m/s	36 - lb/h
	3 - Hz	20 - ft/s	37 - CFM
	4 - kW	21 - l/s	38 - ft <sup>3</sup> /s
	5 - kWh	22 - l/min	39 - ft <sup>3</sup> /min
	6 - hex	23 - l/h	40 - ft <sup>3</sup> /h
	7 - mA	24 - kg/s	41 - mbar
	8 - A	25 - kg/min	42 - bar
	9 - V	26 - kg/h	43 - Pa
	10 - s	27 - m <sup>3</sup> /s	44 - kPa
	11 - h	28 - m <sup>3</sup> /min	45 - m lc
	12 - °C	29 - m <sup>3</sup> /h	46 - m Hg
	13 - K	30 - GPM	47 - in Hg
	14 - rpm	31 - gal/s	48 - ft Hg
	15 - m	32 - gal/min	49 - psi
	16 - ft	33 - gal/h	50 - lb/in
	17 - HP	34 - lb/s	

### 8.7.4 Digital inputs

PumpDrive is equipped with six digital inputs (24 V process level). Inputs 1 and 6 are assigned a fixed function:

- **Digital input 1:** Start/Stop command for single-pump drive, enable command in multiple pump configuration
- **Digital input 6:** Changeover to multi-pump operation (not required for Hya-Solo DV)

**Table 23:** The functions of inputs 2 to 5 are user-definable:

Parameter	Description	Factory settings	Setting range / options	Access
3-7-1-2	Function of digital input 2	7	See selection list	Customer
3-7-1-3	Function of digital input 3	10	See selection list	Customer

Parameter	Description	Factory settings	Setting range / options	Access
3-7-1-4	Function of digital input 4	9	See selection list	Customer
3-7-1-5	Function of digital input 5	2	See selection list	Customer

**Table 24:** Selection list for parameters

Selection list for parameters 3-7-1-2 to 3-7-1-5	Description
1 - None	No Function
2 - Reset	Reset after alert; CAUTION: possible restart
3 - System Start	System start for multiple pump system
4 - Start	Pump start in automatic mode
5 - Ramp Select	Selection of ramp 1 or 2
6 - None	No Function
7 - Pset OutF Bit 0	Bit 0 for digital selection of fixed speed
8 - Pset OutF Bit 1	Bit 1 for digital selection of fixed speed
9 - Preset Setpt +	Setpoint increase via digital pulses
10 - Preset Setpt -	Setpoint decrease via digital pulses
11 - None	No Function
12 - Pset AOUT Bit 0	Bit 0 for selecting the output variable on the analog output
13 - Pset AOUT Bit 1	Bit 1 for selecting the output variable on the analog output

### 8.7.5 Relay output

Operating status information can be queried on the two volt-free contacts (NO relay) of the PumpDrive:

Parameter	Description	Factory settings	Setting range / options	Access
3-7-2-1	Function of digital OUT 1	29	See selection list	Customer
3-7-2-2	Time delay between event and response (on time delay)	1	0..360 [s]	Customer
3-7-2-3	Time delay between event and response (off time delay)	1	0..360 [s]	Customer
3-7-3-1	Function of digital OUT 2	4	See selection list	Customer
3-7-3-2	Time delay between event and response (on time delay)	1	0..360 [s]	Customer
3-7-3-3	Time delay between event and response (off time delay)	1	0..360 [s]	Customer

Selection list for parameters 3-7-2-1 and 3-7-3-1		
1 - None	12 - Low current	24 - Low An IN2
2 - PDrive Ready	13 - Frequency Range	25 - Thermal Warn
3 - Ready/No Warn	14 - High Frequency	26 - Rdy/No Temp Wrn
4 - Running	15 - Low Frequency	27 - Rdy/No Line Wrn
5 - Running/No Warn	16 - Power Range	28 - Rdy/V Range OK
6 - Setpt/No Warn	17 - High Power	29 - No Alert
7 - Alert	18 - Low Power	30 - Drive MAN Mode
8 - Alert or Warn	19 - An IN1 Range	31 - Drive AUTO Mode
9 - At Current Lim (i <sup>2</sup> t)	20 - High An IN1	32 - Setpoint OK
10 - Current Range	21 - Low An IN1	33 - Feedback OK
11 - High Current	22 - An IN2 Range	34 - Sleep, Stand-By
	23 - High An IN2	35 - ON>maxP,OFF<min

### 8.7.6 Analog inputs

**Table 25:** Parameters for analog input 1

Parameter	Description	Factory setting	Setting range / options	Access
3-8-2-1	Setting of analog input 1	2	See selection list	Customer
3-8-2-2	Analog IN 1 Low voltage	0	0..3-8-2-3 [V]	Customer
3-8-2-3	Analog IN 1 High voltage	10	3-8-2-2..10 [V]	Customer

Parameter	Description	Factory setting	Setting range / options	Access
3-8-2-4	Analog IN 1 Low current	4	0..3-8-2-5 [mA]	Customer
3-8-2-5	Analog IN 1 High current	20	3-8-2-4..20 [mA]	Customer
3-8-2-6	Unit of Analog IN 1	1	See selection list	Customer
3-8-2-7	Low value for Analog IN 1	0	0..3-8-2-8 [3-8-2-6]	Customer
3-8-2-8	High value for Analog IN 1	100	3-8-2-7..9999 [3-8-2-6]	Customer
3-8-2-9	Analog IN 1 Filter time constant	0,1	0.1..10 [s]	Customer
3-8-2-10	Analog IN 1 Scaling factor	1	0,5..2	Customer
3-8-2-11	Description of Analog IN 1	1	See selection list	Customer

Table 26: Selection list for parameters

Selection list for parameters				
3-8-2-1	3-8-2-6			3-8-2-11
1 - Current	1 - %	19 - m/s	37 - CFM	1 - Process
2 - Voltage	2 -	20 - ft/s	38 - ft <sup>3</sup> /s	2 - Pressure P1
	3 - Hz	21 - l/s	39 - ft <sup>3</sup> /min	3 - Pressure P2
	4 - kW	22 - l/min	40 - ft <sup>3</sup> /h	4 - Q
	5 - kWh	23 - l/h	41 - mbar	5 - Temperature
	6 - hex	24 - kg/s	42 - bar	
	7 - mA	25 - kg/min	43 - Pa	
	8 - A	26 - kg/h	44 - kPa	
	9 - V	27 - m <sup>3</sup> /s	45 - m lc	
	10 - s	28 - m <sup>3</sup> /min	46 - m Hg	
	11 - h	29 - m <sup>3</sup> /h	47 - in Hg	
	12 - °C	30 - GPM	48 - ft Hg	
	13 - K	31 - gal/s	49 - psi	
	14 - rpm	32 - gal/min	50 - lb/in	
	15 - m	33 - gal/h	51 - kg/m <sup>3</sup>	
	16 - ft	34 - lb/s	52 - W	
	17 - HP	35 - lb/min		
	18 - W/m <sup>2</sup>	36 - lb/h		

Table 27: Additional information on parameters

3-8-2-9	If signal smoothing is required, the signal can be filtered by lengthening the time constants. This has the same effect as a low-pass filter.
3-8-2-10	By changing the scaling, you can alter the setting range for the input signal by the required factor.

### 8.7.7 Analog outputs

On the PumpDrive analog output, up to four different operating parameters (sources) can be output as voltage signals.

If two digital inputs are assigned the function of a multiplexer, the source is output as a function of the logical wiring of the digital inputs (see table below). To do so, the functions of the two digital inputs must be set to Pset AOUT bit 0 and Pset AOUT bit 1 (see table below). The sources and the value range of the output voltage must be parameterised as shown in the tables. The value range of the source is mapped linearly to the value range of the output voltage (parameters 3-8-4-5 and 3-8-4-6). If the digital inputs are not wired, the operating parameter in accordance with source1 is output.

The maximum switch-over speed between the individual sources for the analog output is 100 ms (10 Hz).

Bit 0	Bit 1	Analog output source
0V	0V	Source 1
0V	24V	Source 2
24V	0V	Source 3
24V	24V	Source 4

Parameter	Description	Factory settings	Setting range / options	Access
3-8-4-1	Source 1 for Analog OUT	1	See selection list	Customer
3-8-4-2	Source 2 for Analog OUT	1	See selection list	Customer

Parameter	Description	Factory settings	Setting range / options	Access
3-8-4-3	Source 3 for Analog OUT	1	See selection list	Customer
3-8-4-4	Source 4 for Analog OUT	1	See selection list	Customer
3-8-4-5	Analog OUT Minimum output voltage	0	0..10 [V]	Customer
3-8-4-6	Analog OUT Maximum output voltage	10	0.01..10 [V]	Customer
3-8-4-7	Analog OUT Low-pass filter time constant	0,5	0.01..1 [s]	Customer

**Table 28:** Selection list for parameters

Selection list for parameters 3-8-4-1 to 3-8-4-4
1 - None
2 - Setpoint
3 - Feedback
4 - Rated Power
5 - Motor Voltage
6 - None
7 - Motor Current
8 - Output Freq
9 - DC Link Voltage

### 8.7.8 Restoring the factory settings

All the factory parameter settings can be restored via the 3-1-5-5 parameter command. Before doing so, make sure that there is no start signal on digital input 1. Once you have restored the settings, the rated motor data (parameters 3-3-2-1 to 3-3-2-6) may have to be re-entered.

	<b>NOTE</b>
	<p>When the factory settings are restored, automatic sensor recognition is activated (parameter 3-9-1-6). This can result in automatic activation of the PI controller if a signal is present on analog input 2. If you do not want this, you have to deactivate the sensor recognition function and the PI controller via parameters 3-9-1-6 and 3-9-1-1.</p>

	<b>NOTE</b>
	<p>If the system has been commissioned/started up before, restoring the factory settings will cause all parameter settings made so far to be deleted if they have not been backed up using the Service software.</p>

## 9 Servicing/Maintenance

### 9.1 General information/Safety regulations

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

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

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.

Checklist for commissioning/inspection and maintenance

**9.2 Servicing/inspection**

**9.2.1 Supervision of operation**

	<p style="background-color: #FFD700; margin: 0;"><b>CAUTION</b></p> <p><b>Increased wear due to dry running</b> Damage to the pump set!</p> <ul style="list-style-type: none"> <li>▷ Never operate the pump set without liquid fill.</li> <li>▷ Never close the shut-off element in the suction line and/or supply line during pump operation.</li> </ul>
	<p style="background-color: #FFD700; margin: 0;"><b>CAUTION</b></p> <p><b>Impermissibly high temperature of fluid handled</b> Damage to the pump!</p> <ul style="list-style-type: none"> <li>▷ Prolonged operation against a closed shut-off element is not permitted (heating up of the fluid).</li> <li>▷ Observe the temperature limits in the data sheet and in the section on operating limits.</li> </ul>

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 43)  
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; margin: 0;"><b>⚠ WARNING</b></p> <p><b>Wrong gas</b> Danger of poisoning!</p> <ul style="list-style-type: none"> <li>▷ Use only nitrogen to charge the accumulator.</li> </ul>
---	---

- 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 43)
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**

	<p><b>⚠ WARNING</b></p>
	<p><b>Wrong gas</b>            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

	<p><b>CAUTION</b></p>
	<p><b>Pre-charge pressure too high</b>            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 Hya-Solo DV

	<p><b>⚠ WARNING</b></p>
	<p><b>Improper work to remedy faults</b> Risk of injury!</p> <p>▸ For any work to remedy faults observe the relevant information in this manual or in the relevant accessory manufacturer's product literature.</p>
	<p><b>NOTE</b></p>
	<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 KSB's 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 29:** Trouble-shooting

A	B	C	D	E	F	G	H	I	J	K	L	M	Possible cause	Remedy <sup>1)</sup>
X	-	X	-	-	-	-	-	-	-	-	-	-	Dry-running protection equipment not connected.	Connect/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.
-	-	-	-	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.

<sup>1)</sup> 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 <sup>1)</sup>
-	-	-	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 PumpDrive

	<p><b>⚠ WARNING</b></p>
	<p><b>Improper work to remedy faults</b> Risk of injury!</p> <ul style="list-style-type: none"> <li>▸ For any work to remedy faults observe the relevant information in this manual or in the relevant accessory manufacturer's product literature.</li> </ul>

	<p><b>NOTE</b></p>
	<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 KSB's customer service is required.

- A** Mains fuse rating too small for the nominal mains current
- B** Drive does not start.
- C** Drive running unevenly.
- D** Max. speed not reached.
- E** Drive running at minimum speed only.
- F** Drive running at maximum speed only.
- G** No/faulty 24 V supply
- H** Fault message/protective tripping.

<sup>1)</sup> 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!

Table 30: Trouble-shooting

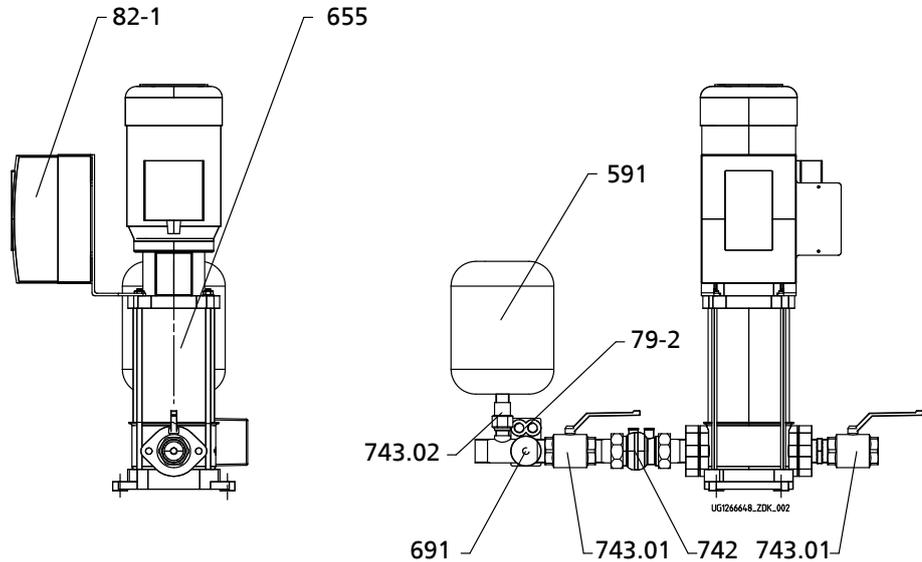
A	B	C	D	E	F	G	H	Possible cause	Remedy <sup>2)</sup>
-	X	-	-	-	-	X	-	No voltage	Check the mains voltage; check the mains fuses.
-	X	-	-	-	-	-	-	No enable	Insert jumper / enable via field bus.
X	X	-	-	-	-	-	-	Mains cables connected incorrectly/Fault in power cable.	Check the wiring
X	-	-	-	-	-	-	-	Mains fuse rating too small for PumpDrive input current	The instructions given in section 10 must be observed!
-	-	-	X	X	-	-	-	No setpoint signal (internal/external)	Check the setpoint signal (internal/external)
X	X	-	-	-	-	-	X	Permissible voltage range undershot/exceeded.	Check the mains voltage; supply the drive with the specified voltage (via transformer, if necessary).
-	-	X	X	-	-	-	X	Motor overload	Reduce the power input by lowering the speed; check the motor/pump for blockages.
-	X	-	X	-	-	-	X	Short circuit on control cables	Check/replace the control cables/connections.
-	-	-	-	-	-	-	X	Pump blocked	Remove the blockage manually.
-	-	X	X	-	-	-	X	Temperature of power electronics or motor winding too high (particularly at high torque and low speed)	Reduce the ambient temperature by improving ventilation. Improve cooling by cleaning the cooling fins. Make sure the intake opening for the motor fan is not blocked. Make sure that the motor fan is 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 the voltage from the drive and eliminate the cause of overload.
-	-	-	-	-	-	-	X	Dry running of pump	Check the hydraulic system. Rectify the fault on the drive.
-	X	-	-	-	X	-	X	Sensor (signal) fault	Check the sensor and sensor cable.

<sup>2)</sup> 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!

## 11 Related Documents

### 11.1 List of components

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



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

**Table 31:** Spare parts for Hya-Solo DV 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.

	<b>NOTE</b>
	Pump spare parts correspond to Movitec in standard design (with oval flange).

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

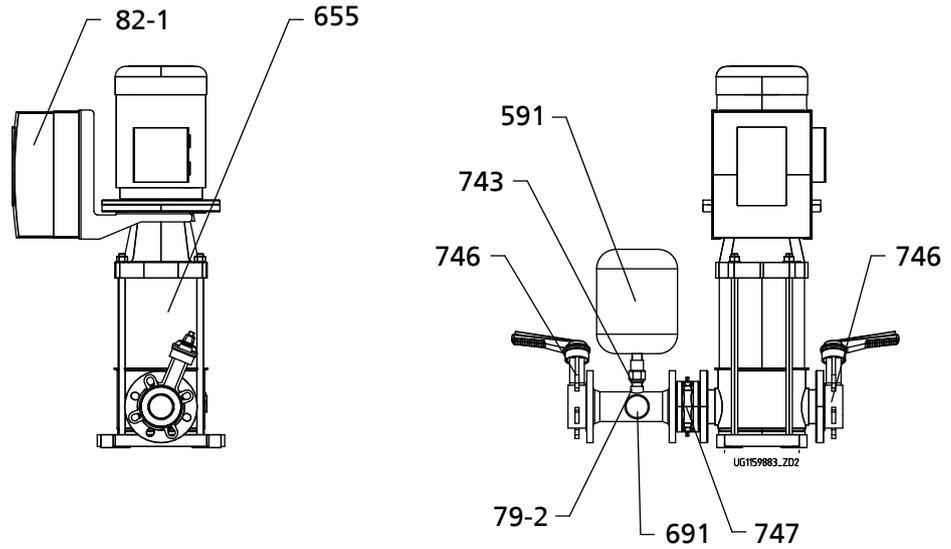


Fig. 16: General assembly drawing of Hya-Solo DV with Movitec 25, 40, 60, 90

Table 32: Spare parts for Hya-Solo DV 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.)

	<b>NOTE</b>
	Pump spare parts correspond to Movitec in standard design (with round flange).

## 12 EC Declaration of Conformity

Manufacturer: **KSB Aktiengesellschaft  
Johann-Klein-Straße 9  
67227 Frankenthal (Germany)**

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

### Hya-Solo DV

KSB order number: .....

- is in conformity with the provisions of the following Directives as amended from time to time:
  - Pump set: Machinery Directive 2006/42/EC
  - Pump set: Electromagnetic Compatibility Directive 2004/108/EC

The manufacturer also declares that

- the following harmonised international standards have been applied:
  - ISO 12100,
  - EN 809/A1,
  - EN 60204-1
- Applied national technical standards and specifications, in particular:
  - DIN 1988-500

Person authorised to compile the technical file:

Dr Frank Obermair  
Technical Project Manager  
Product Development, Business Unit Automation and Drives  
KSB Aktiengesellschaft  
Johann-Klein-Straße 9  
67227 Frankenthal (Germany)

The EC Declaration of Conformity was issued in/on:

Place, date

.....<sup>3)</sup>.....

Name  
Function  
Company  
Address

---

<sup>3)</sup> A signed, legally binding declaration of conformity is supplied with the product.

### 13 Certificate of Decontamination

Type: .....  
 Order number/ .....  
 Order item number<sup>4)</sup>: .....

Delivery date: .....

Field of application: .....

Fluid handled<sup>4)</sup>: .....

Please tick where applicable<sup>4)</sup>:



Radioactive



Explosive



Corrosive



Toxic



Harmful



Bio-hazardous



Highly flammable



Safe

Reason for return<sup>4)</sup>: .....

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

<sup>4)</sup> Required fields

## 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. ....

### 2 Purchaser/place of installation

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

### 3 Operating data For further details 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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