

**Fully electronic pressure boosting systems
with 2 - 6 vertical high-pressure pumps**

from series S-R



These operating instructions contain fundamental information which must be complied with during installation, operation and maintenance. For this reason, they must be read and understood by the installing personnel and the responsible technical staff / operators before the machine / unit is installed and commissioned. They must always be kept available at the place of installation for future reference.

Works No.: _____

Type series: **Hyamat K** _____

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1 General

Configuration and function of the Hyamat pressure boosting units are in accordance with DIN 1988 stipulations.

These operating instructions are intended to facilitate familiarization with the unit and its designated use.

The manual contains important information for reliable, proper and efficient operation. Compliance with the operating instructions is of vital importance to ensure reliability and a long service life of the unit and to avoid any risks.

These operating instructions do not take into account local regulations; the operator must ensure that such regulations are strictly observed by all, including the personnel called in for installation.

This pump / unit must not be operated beyond the limit values for the fluid handled, capacity, speed, density, pressure, temperature and motor rating specified in the technical documentation. Make sure that operation is in accordance with the instructions laid down in this manual or in the contract documentation.

The name plate indicates the type series / size, main operating data and works / serial number; please quote this information in all queries, repeat orders and particularly when ordering spare parts.

If you need additional information or instructions or if the device is damaged, contact your nearest KSB customer service centre.

2 Safety

These operating instructions contain important information which must be observed when installing, operating and maintaining the unit. Therefore this operating manual must be read and understood both by the installing personnel and the responsible trained personnel / operators prior to installation and commissioning, and it must always be kept close to the location of operation of the machine / unit for easy access.

Not only must the general safety instructions laid down in this chapter on "Safety" be complied with, but also the safety instructions outlined under specific headings.

2.1 Marking of instructions in the manual

The safety instructions contained in this manual whose non-observance might cause hazards to persons are specially marked with the general hazard sign, namely



safety sign to ISO 7000 - 0434.
The electrical danger warning sign is



safety sign to IEC 417 - 5036

The word

Caution

is used to introduce safety instructions whose non-observance may lead to damage to the equipment and its functions.

Instructions attached directly to the machine, e.g.

- arrow indicating the direction of rotation
- markings for fluid connections

must always be complied with and be kept in a perfectly legible condition at all times.

2.2 Personnel qualification and training

All personnel involved in the operation, maintenance, inspection and installation of the unit must be fully qualified to carry out the work involved. Personnel responsibilities, competence and supervision must be clearly defined by the operator. If the personnel in question does not already possess the requisite know-how, appropriate training and instruction must be provided. If required, the operator may commission the manufacturer / supplier to take care of such training. In addition, the operator is responsible for ensuring that the contents of the operating instructions are fully understood by the responsible personnel.

2.3 Non-compliance with safety instructions

Non-compliance with safety instructions can jeopardize the safety of personnel, the environment and the machine / unit itself. Non-compliance with these safety instructions will also lead to forfeiture of any and all rights to claims for damages.




In particular, non-compliance can, for example, result in:

- failure of important machine/system functions,
- failure of prescribed maintenance and servicing practices,
- hazard to persons by electrical, mechanical and chemical effects,
- hazard to the environment due to leakage of hazardous substances.

2.4 Safety awareness

It is imperative to comply with the safety instructions contained in this manual, the relevant national health and safety regulations and the operator's own internal work, operation and safety regulations.

2.5 Safety instructions for the operator / user

- Any hot or cold components that could pose a hazard must be equipped with a guard by the operator. 
- Guards which are fitted to prevent accidental contact with moving parts (e.g. coupling) must not be removed whilst the unit is operating.
- Leakages (e.g. at the shaft seal) of hazardous fluids handled (e.g. explosive, toxic, hot) must be contained so as to avoid any danger to persons and the environment. All relevant laws must be heeded. 
- Electrical hazards must be eliminated. (In this respect refer to the relevant safety regulations applicable to different countries and / or the local energy supply companies.) 

2.6 Safety instructions for maintenance, inspection and installation work

The operator is responsible for ensuring that all maintenance, inspection and installation work be performed by authorized, qualified specialist personnel who are thoroughly familiar with the manual.

Work on the machine / unit must be carried out only during standstill. The shutdown procedure described in the manual for taking the unit out of service must be adhered to without fail. Pumps or pump units handling fluids injurious to health must be decontaminated.

Immediately following completion of the work, all safety-relevant and protective devices must be re-installed and / or re-activated.

Please observe all instructions set out in the chapter on "Commissioning / start-up" before returning the unit to service.

2.7 Unauthorized modification and manufacture of spare parts

Modifications or alterations of the equipment supplied are only permitted after consultation with the manufacturer. Original spare parts and accessories authorized by the manufacturer ensure safety. The use of other parts can invalidate any liability of the manufacturer for resulting damage.

2.8 Unauthorized modes of operation

The warranty relating to the operating reliability and safety of the unit supplied is only valid if the equipment is used in accordance with its designated use (see section 4). The limits stated in the data sheet must not be exceeded under any circumstances.

3 Transport and interim storage

The package unit is packaged on pallets or in wooden crates and wrapped in plastic foil for shipping and interim storage. All connecting points are capped. It is imperative that the shipping / handling instructions shown on the package be followed.

Caution

The unit must be protected against frost.

If upon unpacking the unit you should discover that the package has been damaged by dropping or some other form of mechanical impact, please carefully inspect the unit itself for possible damage and inform the freight forwarder / KSB's customer service, even if you have not been able to detect any such damage.

Once the unit has been removed from the package, it must be stored in accordance with the location and installation instructions (see Installation and location).

4 Description

4.1 General description

The fully electronic pressure boosting package units are supplied ready for connection.

The equipment circuitry allows both direct and indirect connection to the water supply system.

For combined use as drinking water supply and fire protection system, **Hyamat K** can be installed as an interconnected system in accordance with DIN 1988, Part 5.

The equipment must be operated and maintained in accordance with DIN 1988 (DVGW) so as to ensure uninterrupted reliability of water supply, without causing disturbances in the public water supply or other consumer supply systems.

The **instructions put forth in DIN 1988** must be adhered to for connection to the public water supply system; any applicable **water utility or fire protection regulations** must also be complied with.

Furthermore, local conditions must be taken into account (for example excessive or very unsteady supply pressure requiring the installation of a pressure reducer).

4.2 Configuration and function

4.2.1 Configuration

Between 2 and 6 vertical high-pressure pumps (for description and function, please refer to the pump's Operating Instructions) are arranged on a baseplate.

Each pump is installed on its own anti-vibration mounts.

Pumps connected in series are coupled by stainless steel pipes.

On the system side, a combined non-return and shut-off valve (KFR) or a swing check valve and a shut-off butterfly valve are fitted downstream of each pump.

On the suction side, a ball valve or a shut-off butterfly valve are fitted upstream of each pump as a service valve.

The shut-off elements permit dismantling of individual pumps without having to drain the pipework. The discharge side non-return valve ensures that the system remains filled with water and prevents backflow through the pumps.

Both distributor pipes feature additional connections for draining, venting and installation of various dry running protection devices.

The surge vessel (accumulator) is fitted with an isolating valve. It compensates discharge-side peak pressures and, together with the minimum operating period, limits the pumps' switching frequency.

Hyamat K units are switched on as a function of pressure. To this effect, a pressure transmitter is fitted in the discharge-side piping.

Depending on the number and performance of the pumps, the completely wired control cabinet is either supplied mounted on the baseplate or as a free-standing cabinet.

Only additional and special equipment is already fitted on the system.

Accessories such as expansion joints, tanks, accumulators, pressure reducers etc. are supplied with the unit but are not mounted.

The unit is driven by surface-cooled three-phase squirrel-cage motors, 50 Hz, air-cooled, 2-pole, KSB standardized motor with main dimensions to IEC. Other motor makes after consultation with KSB,

up to 2.2 kW 220–240 V/380–420 V,

from 3 kW 380–420 V/660–725 V

enclosure IP 55, thermal class F, up to 4 kW design V18,

from 5.5 kW design V1, all motors >3 kW with PTC thermistor.

4.2.2 Function

The Hyamat unit is switched on and off as a function of the pressure. The start-up pressure p_E and the switch-off pressure p_A are derived from the adjustable set value p_{soll} and the adjustable hysteresis.

$p_E = p_{soll} - \text{hysteresis}$, $p_A = p_{soll} + \text{hysteresis}$.

Automatic mode

The unit consisting of 2 to 6 pumps starts the first pump when the pressure falls below the start-up pressure p_E .

When the start-up pressure is reached, a minimum operating period of 3 minutes is activated.

If this pump meets the current demand and if a pressure $> p_E$ and $< p_A$ is maintained, the pump operates until the demand drops and the switch-off pressure p_A is reached.

If the first pump cannot meet the demand, the pressure will fall below p_E again, and the next pump available is started after a cut-in delay period of 2 seconds.

This routine is repeated until all pumps are running.

If the unit has been correctly selected in accordance with DIN 1988, the demand will be covered without using the stand-by pump.

As demand decreases, the pumps are automatically sequenced out after their minimum operating period and a cut-out delay of 2 seconds. The pump that was started up first will be switched off first.

In order to ensure equal distribution of pump operating hours, the pumps will be changed for the next start-up cycle.

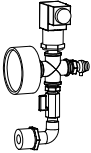
The operating status is displayed via LEDs.

4.3 Dry running protection (supplementary equipment)

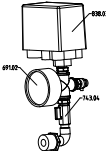
A pressure transmitter or manometric switch with pressure gauge may be fitted in the suction-side distributor pipe.

Pressure transmitter:

Set with parameter 3-4-1-1 and 3-4-1-2



Manometric switch:



- The inlet pressure is set by means of a manometric switch.

If the pressure drops below the set inlet pressure, the unit is switched off after 7 seconds due to lack of water. The unit is automatically switched on again as soon as the lack-of-water condition has been remedied or sufficient inlet pressure is available again.

For indirect connection to an inlet tank and an inlet pressure below 0.5 bar, the inlet must be monitored by level monitoring (for example with a dry running protection set, see Accessories).

Caution

If other dry running protection devices are retrofitted (see Accessories), the instructions in the circuit diagram must be observed.

Inadequate connection may damage the unit.

Caution

On pressure boosting units ordered without dry running protection the terminal intended for the dry running device is open.

If no dry running protection device is connected when commissioning takes place, the unit will be shut down after 7 seconds. If the dry running protection terminal is deactivated by means of a bridge, the operator shall assume responsibility for any dry running that might occur.

4.4 Manual mode

Each pump can be started up in manual mode for 10 seconds via the control unit (parameter 1-2-1). If fitted with manual-0-automatic switches (supplementary equipment), the pumps can also be started up in manual mode by means of the manual-0-automatic switches. The pumps are then connected **directly** to the mains, independently of the control unit.

For this mode of operation no pressure control and no lack-of-water monitoring will be effected.

Furthermore, in manual mode a minimum flow rate is required for each pump in order to ensure sufficient cooling of the pumps.

Example:

An open tap means a water consumption of approx. 800 to 1200 l/h.

Minimum flow rate per pump:

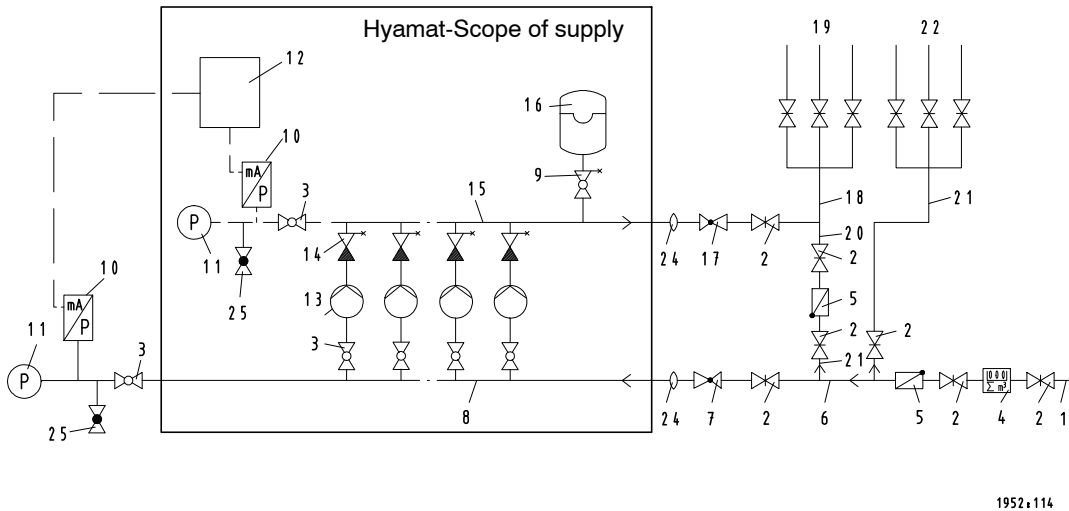
Movitec V 2	300 l/h
Movitec V 4	600 l/h
Movitec V 10	1200 l/h
Movitec VF 18	2400 l/h
Movitec VF 32	4000 l/h
Movitec VF 45	4600 l/h
Movitec VF 65	6100 l/h

4.5 Control cabinet

The control cabinet is completely wired and connected to the package unit. It is equipped with:

- a BoosterControl Advanced control unit with multi-line display, function and navigation keys and 3 LEDs signalling the operating conditions
- 1 motor protection switch per pump
- 1 protective switch for mains and transformer
- 1 master switch (accessible from the outside)
- 1 printed circuit board
- 1 mains and control transformer
- 1 contactor/pump
- 2 volt-free changeover contacts for warning and alert (capacity 230 V~, 2 A)
- 1 connection for lack-of-water monitoring

4.6 Flow diagram
Movitec 2 / 4 / 10 / 18



Movitec 32 / 45 / 65

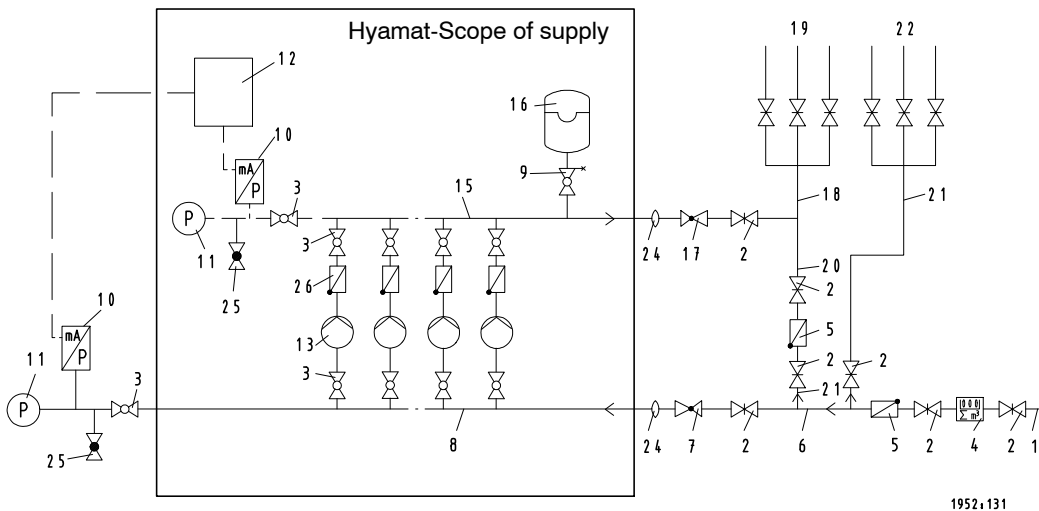


Fig. 4 Flow diagram for direct connection

- 1 Power supply cable
- 2 Shut-off element
- 3 Ball valve
- 4 Water meter
- 5 Check valve
- 6 Distribution line, inlet pressure side
- 7 Pressure reducer, inlet pressure side
- 8 Inlet line
- 9 Shut-off elements
- 10 Pressure transmitter
- 11 Pressure reading indicator
- 12 Control system
- 13 Pump with drain and vent valve
- 14 Combined non return / shut-off valve (= KFR valve)
- 15 Discharge pipe
- 16 Accumulator, discharge pressure side
- 17 Pressure reducer, discharge pressure side
- 18 Distribution line, downstream of Hyamat
- 19 Consumer line, downstream of Hyamat
- 20 By-pass line (for direct connection only)
- 21 Consumer line, upstream of Hyamat
- 22 Distribution line, upstream of Hyamat
- 23 Inlet tank with float valve and level monitor
- 24 Expansion joint
- 25 Drain valve
- 26 Swing check valve

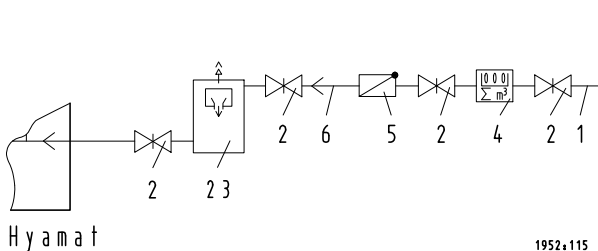


Fig. 5 Flow diagram for indirect connection

5 Installation at site

5.1 Readiness for operation

The owner or the owner's representative must report the package system's readiness for operation to the responsible authorities (normally either the water company or the Trade Inspection Office). Prior to commissioning, the operator must demonstrate conclusively that the installation requirements have been complied with.

Prior to connecting the package unit to the mains, the user must have familiarized himself with the relevant VDE standards.

The power supply line must be installed / connected by a duly authorized company.

5.2 Installation and location as per DIN 1988

The Hyamat must be located either in the control 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 drain connection (leading to a sewer or equivalent) must be provided.

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

Hyamat units should not be installed next to sleeping or living quarters.

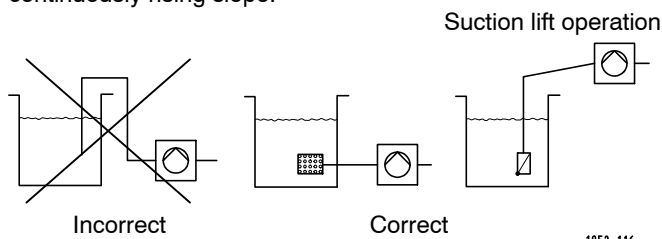
Thanks to the anti-vibration mounting buffers, the Hyamat unit is adequately insulated to prevent transmission of solid-borne noise.

To reduce the motor sound emission, we offer acoustic cladding as an accessory. If expansion joints (see Accessories) are used for damping vibrations, their fatigue strength (endurance limit) must be given due consideration. They must be installed for quick and easy replacement.

5.3 Piping

All piping must be installed without transmitting any stresses or strains. The use of length-limited expansion joints is advisable (see Accessories).

The formation of air pockets must be avoided. For suction lift operation, the suction side piping must be laid with a continuously rising slope.



5.4 Foundation

The package system is designed for installation on a level concrete floor. Its anti-vibration pads provide adequate insulation against solid-borne noise.

Thanks to level-adjustable mounting feet (see Accessories) the system can also be installed in horizontal position on uneven floors.

Units with Movitec 32, 45 or 65 pump are supplied with level-adjustable feet. 2 of these feet can be fixed to the floor.

5.5 Installation

Prior to installing the system, remove the packaging.

Connect the system's inlet and discharge pressure lines with the corresponding distribution lines (DIN 1988).

In order to avoid transmission of piping forces onto the system and transmission of solid-borne noise, we recommend installing length-limited expansion joints.

The unit must be accessible to allow maintenance and repair work.

Units with Movitec 32, 45 or 65 pumps are supplied with additional, adjustable anti-vibration expansion joints. Two of these expansion joints can be fixed to the floor to compensate the axial thrust.

Adjustable anti-vibration expansion joints are available on option for units equipped with Movitec 2, 4, 10 or 18.

5.6 Acoustic cladding (supplementary equipment)

Acoustic cladding reduces the air-borne sound caused by motors. The cooling air inlets must remain unobstructed.

Sufficient circulation must be ensured.

5.7 Installing an expansion joint

The expansion joint must have a length limiter with solid-borne sound insulation so as to be able to absorb reaction forces. The expansion joint must be installed in the piping free of twist. It must not be used to compensate for misalignment or mismatch of the piping. During assembly, the bolts must be evenly tightened crosswise. The ends of the bolts must not protrude from the flange. If any welding work is carried out nearby, the expansion joint must be covered for protection (spark, radiant heat). The expansion joint must remain unpainted and shall not be allowed to come into contact with oil. Its position within the system must allow easy access and inspection and, therefore, it must not be insulated along with the piping.



Expansion joints are subject to wear. Consequently, the expansion joint must be checked at regular intervals for early detection of cracking or bubbling, exposed fabric or other defects (see recommendations laid down in DIN 1988).

5.8 Installing a pressure reducer

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



A pressure reducer must be installed if the inlet pressure fluctuation is so high that the system must be shut down or if the total system pressure (inlet pressure plus shutoff head) exceeds the design pressure.

The maximum pump discharge pressure at shutoff head is reached in manual mode.

For the pressure reducer to function properly, there must be a minimum pressure gradient of 5 m. The pressure downstream of the pressure reducer (downstream pressure) is the basic parameter for determining the pump head.

Example:

The inlet pressure fluctuates between 4 and 8 bar. A pressure reducer is needed upstream of the unit on the inlet pressure side.
 Min. inlet pressure (H_{vor}) = 4 bar
 Minimum pressure gradient = 0.5 bar
 Downstream pressure = 3.5 bar

5.9 Location and installation of unpressurized inlet tanks

5.9.1 Location

As per DIN 1988 inlet tanks may be installed in the same location as the pressure boosting system. Installation and location are governed by the rules applicable to the pressure boosting system (see 5.2).

5.9.2 Installation

The closed PE inlet tank (under atmospheric pressure) available on option must be installed as described in the installation instructions supplied with the tank. Mechanical and electrical installation of the tank must be completed prior to commissioning of the plant.

Caution

Clean the tank before filling it.

5.10 Valves and fittings

All other valves and fittings in the service pipes, e.g. gate valves, water meters and non-return valves must be sized in accordance with the data provided by the responsible water company.

5.11 Noise characteristics

Hyamat systems are available with different pump models in variable numbers.

Therefore, the total sound pressure level in dB(A) needs to be calculated.

For the noise level of the individual pumps refer to the pumps' Operating Instructions or to the Type Series Booklet Hyamat K.

Calculation:

Single pump	=	dB(A)
2 pumps, total		+3	dB(A)
3 pumps, total		+4.5	dB(A)
4 pumps, total		+6	dB(A)
5 pumps, total		+7	dB(A)
6 pumps, total		+7.5	dB(A)

Example

Single pump		48	dB(A)
4 pumps, total		+6	dB(A)
	=	<u>54</u>	<u>dB(A)</u>


The max. sound pressure level of 54 dB(A) for this configuration may develop when all four pumps are running under full load conditions.

For noise characteristics of the pumps refer to the pumps' Operating Instructions.


On units with acoustic cladding the noise emission of the unit is reduced by 7 dB(A).

6 Connection to power supply

6.1 Electric wiring

All work marked with the symbol  must be performed by a qualified electrician or a duly trained, experienced person as described in DIN EN 50110-1:2004.

6.2 Selecting a power supply cable

 A 3+PE wire power supply cable is required for the control cabinet.
 All connections shall be effected in accordance with the technical specifications issued by the local energy supply company.

6.2.1 Sizing the power supply cable

The cross-section of the power supply cable must be sized for the total rated power requirement.
 External fusing as per DIN VDE 0100 part 430/11.91 and DIN VDE 0100 part 520/2003-06 (see circuit diagram).

6.3 Protective measures

- Neutralization (4-wire system) PE and N connected
- Earthing (5-wire system) PE and N separate
- Earth leakage circuit breaker

6.4 Temperature requirements

- Operation 0 °C to 40 °C
 For temperatures exceeding 40 °C the power must be reduced by 1.5 % per additional degree. A maximum cooling air temperature of 45 °C must not be exceeded.
- Storage up to 55 °C

6.5 Humidity requirements

- Maximum relative humidity 50 % at 40 °C
- Condensation must be effectively precluded.

6.6 Installation altitude

Max. 1000 m above sea level. For any higher altitude, the power must be reduced accordingly. Please contact your nearest KSB customer service centre.

6.7 Pollution exposure

The room air may contain dry dust comparable to that normally encountered in work environments with no extraordinary machinery-induced dust accumulation. Exposure to unusually high dust levels, acids, corrosive gases, salts, etc. must be avoided.

6.8 Checking the voltage

Compare the mains voltage with the name plate data and the control unit's circuit diagram.

6.9 Logic / circuit diagrams

for each unit are included in the control cabinet, where they must remain when not in use. This documentation includes a parts list for electric components.

When ordering spare parts for electric components, please always indicate the circuit diagram No.

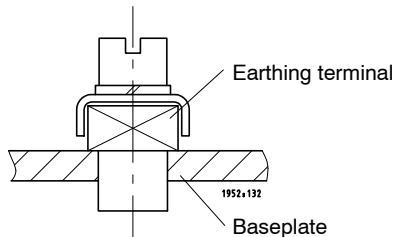
6.10 Motor protection switch

For d.o.l. starting the adjusting screw on the motor protection switch must be set to the rated motor current.

For the setting range, refer to electrical performance data. Compare these data with the motor rating plate. If there are any discrepancies, the data stated on the rating plate must be observed.

6.11 Potential equalization

A terminal is provided on the baseplate to connect a potential equalization line.



7 Commissioning / start-up

7.1 Preparations for commissioning / start-up Safety instructions

The water company and the fire department must be informed in due time prior to commissioning / test run. All health and safety regulations relevant to commissioning shall be observed.

If the pressure boosting system includes pressure vessels (accumulators) with a total capacity exceeding 20 l, the responsible TÜV (German Association for Technical Supervision) must also be informed prior to commissioning.

7.2 Test run

Commissioning should be carried out by specialist KSB staff. Commissioning of the pressure boosting unit - including test run - shall only be executed in full compliance with all pertinent VDE (German Association of Electrical Engineers) specifications.

Caution

The unit must not be put in operation without having been filled with water first; this also applies to test runs, even for checking the direction of rotation.

Unions between the pump and the pipeline must always be retightened. Flanged connections must also be checked for tight fit.

Set the master switch to "0"; unlock all motor protection switches (if applicable). Provide connection to power supply. Ensure that the motor's cooling-air inlet and outlet openings remain unobstructed.

Open / loosen the vent plugs on the pumps (for vent plugs refer to the annexed pump operating instructions).

Slowly open the inlet-side shut-off element and prime the system until the fluid escapes through all vent holes. Close and slightly tighten the pump vent plugs.

Switch on the master switch and start up one pump after the other via the corresponding motor protection switch, making

sure that the motor runs in the correct direction of rotation as indicated by the arrow on the motor.

Prior to starting up individual pumps, open the pump's discharge-side shut-off element.

When the pumps are running, loosen the vent plugs again to let any remaining air escape. Then retighten the vent plugs carefully.

Check the pump for smooth running and close the discharge-side shut-off element for a short period in order to verify whether the pump reaches the shutoff head.

Having checked each pump as described above, all motor protection switches may be actuated and the system set to automatic mode.

On units with manual-0-automatic switch (optional) set all pumps to automatic mode.

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

Caution

If the master switch was turned off at any time during the above procedure, the system will not begin operation until after the pre-set delay period.

7.3 Checking the direction of rotation

For test operation each pump must be started up individually to check the direction of rotation. If a pump is found to be running in the wrong direction, switch two phases on the motor terminal board.

7.4 Functional description / Automatic mode

After start-up, pressure boosting units in standard design will run in automatic mode. For units with manual-0-automatic switch, set all pumps to automatic mode.

Each pressure boosting unit has been factory-checked and adjusted to the required operating data.

Caution

The factory settings may only be altered by authorized, duly qualified staff.

The PBU comprises 2 to 6 pump units (including stand-by pump). Cascade connection allows operation in line with current consumption; i.e. the individual pumps operate only as required by actual demand.

The stand-by pump ensures uninterrupted operation of the system, if one pump does not function properly or breaks down. In the case of a pump failure, the next free pump is started up at once and the fault is reported.

The switch-on and switch-off signals for the pumps are transmitted by the discharge-side pressure transmitter to the system's control element, analyzed and transmitted as an output signal via the contactors to the individual pumps.

7.5 Starting the unit

Switch on the master switch to supply the unit with power. The green LED on the control panel indicates the unit's readiness for operation.

7.5.1 Function of the control panel

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

The display shows important information for operating Hyamat. Data can be displayed in plain text and parameters can be set.

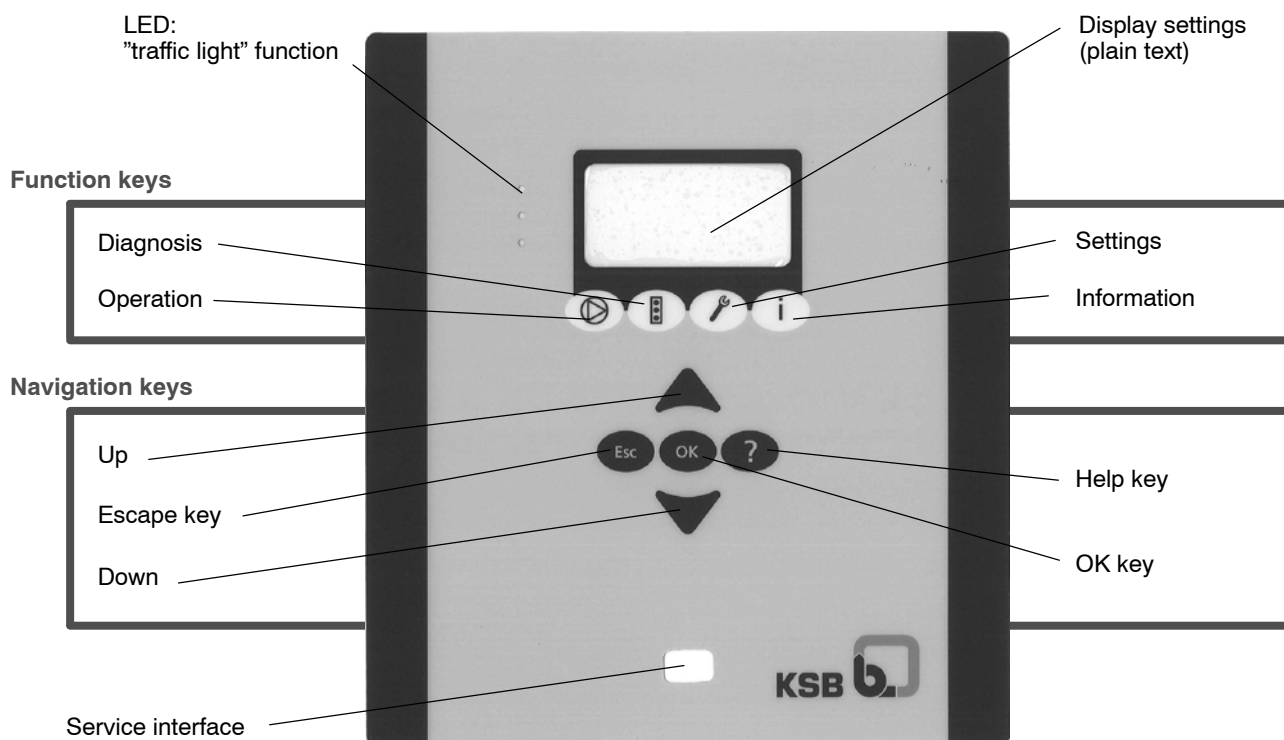


Illustration: Control unit BoosterControl Advanced

7.5.1.1 LEDs

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

LED:

Red: alarm (system stopped)

Yellow: warning (system still operating)

Green: signals trouble-free operation or readiness for operation

7.5.1.2 Function keys

You can use the function keys to access the elements at the first menu level directly: Operation, Diagnosis, Settings and Information.



7.5.1.3 Navigation keys

The navigation keys are used for navigating in the menu and for confirming settings.



Up or Down

- Move up / down through the menu options or
- increase / decrease a value when you are entering numerals



Escape key

- Delete / reset entry (the entry is not saved)
- Return to the previous menu level



OK key

- Confirm a setting
- Confirm a menu selection
- Move to the next digit when you are entering numbers.



Help key

- Displays a help text for each selected menu option

7.5.1.4 Display

The six-line display contains the following information:

Parameter No.	Level
Selected parameter	
Selection list for this parameter	v
Date	Time

Display	Description
Parameter No.	Displays the selected parameter No.
Level	Displays the access level: Standard (no display) Operator (display "C") Service (display "S") Manufacturer (display "F")
Selected parameter	Plain text of selected parameter
Selection list for this parameter	List of available sub-parameters in plain text
Date	TT-MM
Time	HH:MM

Example: Changing the set value at "operator" level:

3-5	C
Pressure config.	
Set value	v
Hysteresis	
Range	
22-02	12:49

The number of the current menu or parameter is displayed in the top left of the screen. This number indicates the path through the menu levels and thus allows you to quickly locate parameters (see section 7.5.2.2 Displaying and changing parameters).

7.5.1.5 Service interface

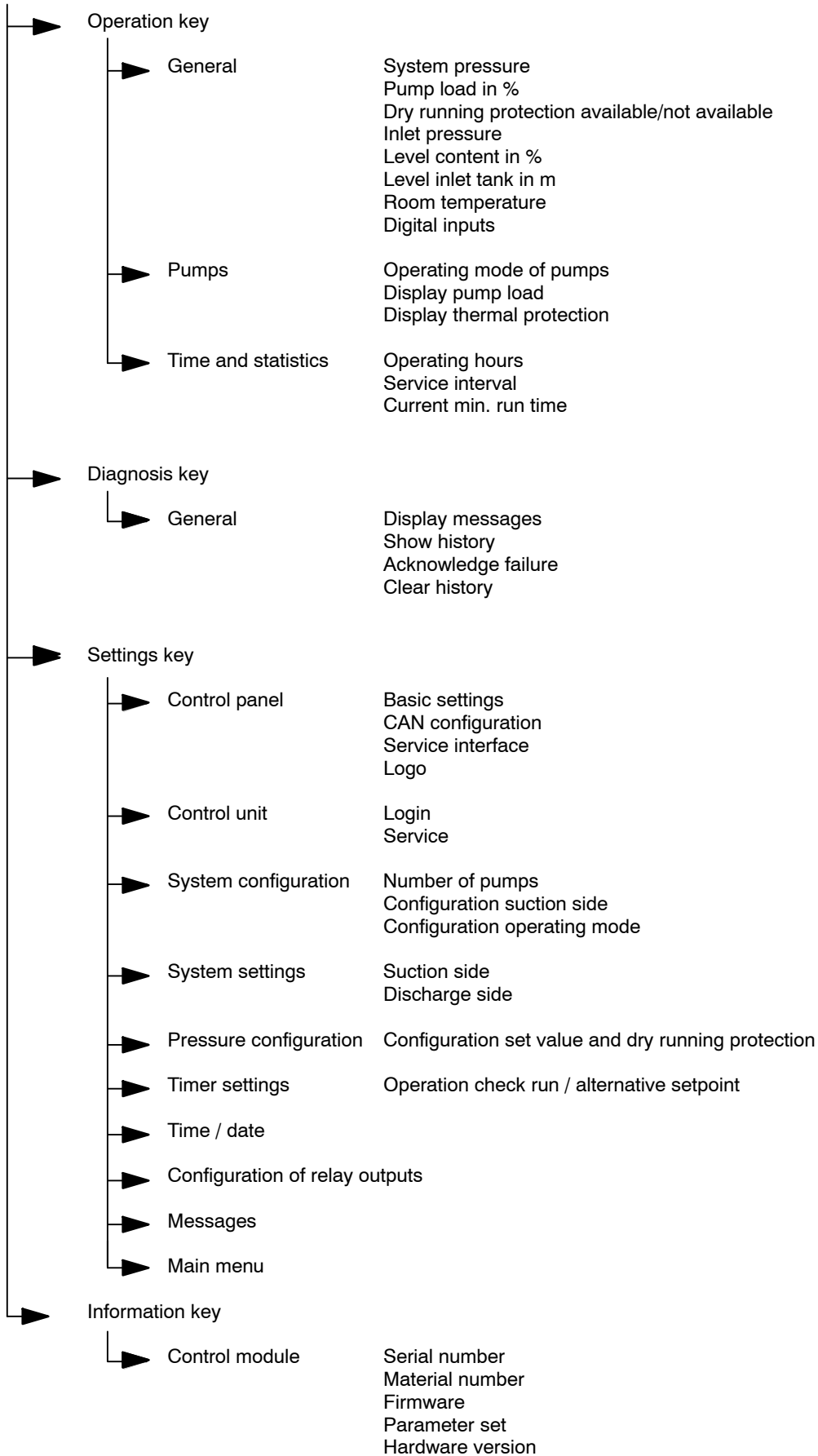
The service interface allows a PC / Notebook to be connected via a special cable (USB - RS232).

The unit can be parameterized by using the Service-Tool Software.

The control unit can also be updated via this interface.

7.5.2 Menu structure

Main menu: KSB logo / actual value display



7.5.2.1 Access levels

Various access levels have been defined to prevent accidental or unauthorized access to Hyamat parameters.

Access levels:

Standard

Unless users log on to one of these access levels, they will only have limited access to parameters.

Customer

Access level for expert users. This level enables access to all the parameters required for commissioning.

You have to enter a password under 3-2-1-1 Login. You can change your password under 3-2-6-4 customer password after you have entered 7353 (factory password). If you deactivate password protection via parameter 3-2-6-5, this access level becomes the default access level. This is the case with factory settings.

Service

Access level for service technicians.

You have to enter a password under 3-2-6-2 Login.

Factory

Access level for the manufacturer only.

Note: If no keys are pressed for ten minutes, the system automatically returns to the default access level.

7.5.2.2 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.



1-Operation



2-Diagnosis



3-Settings



4-Information

Subsequent steps are carried out via the navigation keys.

Example: Parameter 3-5-1 set value

First, enter the customer password as described under 7.5.2.1 Access levels - customer. Then change the set value as follows:

First digit of parameter number: 3-5-1



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

Second digit of parameter number: 3-5-1



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 on the top left of the screen. You have reached the required parameter.



To change this parameter, press OK again.

Numbers 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 as described above for the subsequent positions and then



save the new parameter value by pressing OK.



Press ESC repeatedly to return to the main display.

The new set value is now active.

7.6 Monitoring

All monitoring and protective functions trigger warnings or alarms. These are signalled by the yellow or red LED and connected to the relay outputs.



Display all current messages in the **Diagnosis** menu under **2-1-1** and acknowledge them individually if the cause of failure has been remedied.

Access the history of messages in the menu **Diagnosis** under **2-1-2**. This indicates the start and end of a failure.

You can acknowledge the list of failure messages in the menu **Diagnosis** under **2-1-3** and clear the history in the menu **Diagnosis** under **2-1-4**. For this step, you will have to login at the "Service" level.

When the system is reset (switching the system on and off with the master switch), all alarms are reset too.

When resetting alarms, you may have to restart the system.

7.7 Parameter list

Parameters	Display or selection option	Factory setting	Authorisation Read only	Authorisation Edit/submit
1 Operation				
1 - 1 General				
1-1-1 Pressure	0...16 bar		All	
1-1-2 System load in %	0...100 %		All	
1-1-3 RDP switch	available not available		All	
1-1-4 Inlet pressure	0...10 bar		All	
1-1-5 Level content in %	0...100 %		All	
1-1-6 Level height	m		All	
1-1-7 Ambient temp. (WSD)	°C		All	
1-1-8 Digital inputs			Service	
1-1-9 Position supply valve	1 = Open, 2 = Closed or 0...100 %		All	
1-2 Pumps				
1-2-1 Operating mode	Automatic Manual ON Manual OFF		All	
1-2-2 Pump load	0...100 %		All	
1-2-3 Thermal fail. flags	0 = not active 1 = active		Service	
1-2-4 Running hours pump	Pump number: Days Hours:Minutes		All	
1-2-5 Number of pumpstarts	Pump number: Number of starts/faults		Service	
1-3 Time and statistics				
1-3-1 Act.Runtime Op hours	hhhhhh:minmin		All	
1-3-2 Time to service	h		All	
1-3-3 Act Minimum Runtime	s		All	
2 Diagnosis				
2-1 General				
2-1-1 Active Messages			All	Customer
2-1-2 History			All	
2-1-3 Acknowledge All			Service	Service
2-1-4 Clear History			Service	Service
3 Settings				
3-1 HMI				
3-1-1 Basic settings				
3-1-1-1 Language	English Deutsch Nederlands Francais	Deutsch	All	Customer
3-1-1-2 Backlight				
3-1-1-2-1 Mode	Always ON Timed OFF	Timed OFF	All	Customer
3-1-1-2-2 Backlight time	0...30	30	All	Customer
3-1-1-3 Displayed units				
3-1-1-3-1 Pressure	kPa bar PSI feet metre	bar	All	Service
3-1-1-3-2 Fill level	m cm	cm	All	Service
3-1-1-3-3 Temperature	degrees C degrees F	degrees C	All	Service

Parameters	Display or selection option	Factory setting	Authorisation Read-only	Authorisation Edit/submit
3-1-2 CAN Config				
3-1-2-1 User ID		3	Service	Service
3-1-2-2 NMT master	ON OFF	OFF	Service	Service
3-1-2-3 Baud rate in kBit/s	10 20 50 125 250 500 800 1000	1000	Manufacturer	Manufacturer
3-1-3 Service Port				
3-1-3-1 Baud rate in kBit/s	9600 19200 38400	38400	Manufacturer	Manufacturer
3-1-4 Logo		KSB	Manufacturer	Manufacturer
3-2 Device				
3-2-1 Login				
3-2-1-1 PIN				All
3-2-1-2 Login required	No Yes	No	All	Customer
3-2-2 Service				
3-2-2-1 Reset default param.			Service	Service
3-2-2-2 Reset Srv Interval			Service	Service
3-2-2-3 Factory Reset			Customer	Customer
3-2-2-4 Save parameters			Manufacturer	Manufacturer
3-3 Configuration				
3-3-1 Number of pumps	2...6	depends on the system	All	Service
3-3-2 Inlet	Manometric switch Pressure Level / valve on-off Level / valve prop.	Manometric switch	All	Service
3-3-3 Discharge	Fixed speed One jockey Two jockey VFD changeover VFD fixed one VFD fixed all	Fixed speed	All	Service
3-3-4 WSD	OFF ON	OFF	All	Service
3-4 System settings				
3-4-1 Inlet				
3-4-1-1 Sensor press. 4mA		0	All	Service
3-4-1-2 Sensor press. 20mA		10	All	Service
3-4-1-3 Automatic RDP reset	Automatic Manual	Automatic	All	Service

Parameters	Display or selection option	Factory setting	Authorisation Read-only	Authorisation Edit/submit
3-4-1-4 Level config				
3-4-1-4-1 0 % level		0	All	Service
3-4-1-4-2 100 % level		200	All	Service
3-4-1-4-3 Sensor level		0	All	Service
3-4-1-4-4 Switch-off level		10	All	Service
3-4-1-4-5 Low level reset		15	All	Service
3-4-1-4-6 Critical water level		30	All	Service
3-4-1-4-7 High water level		105	All	Service
3-4-1-4-8 Threshold				
3-4-1-4-8-1 Threshold 1: ON		50	All	Service
3-4-1-4-8-2 Threshold 1: OFF		50	All	Service
3-4-1-4-8-3 Threshold 2: ON		40	All	Service
3-4-1-4-8-4 Threshold 2: OFF		40	All	Service
3-4-1-4-9 Supply valve ON/OFF				
3-4-1-4-9-1 Level 1 open		70	All	Service
3-4-1-4-9-2 Level 1 closed		90	All	Service
3-4-1-4-9-3 Level 1A open		40	All	Service
3-4-1-4-9-4 Level 1A closed		60	All	Service
3-4-1-4-10 Supply valve prop.				
3-4-1-4-10-1 Level setpoint 1		80	All	Service
3-4-1-4-10-2 Level setpoint 1 A		40	All	Service
3-4-1-4-10-3 Hysteresis		15	All	Service
3-4-1-4-10-4 Sample time		10	All	Service
3-4-2 Discharge				
3-4-2-1 Sensor press. 4mA	0...99	0	All	Service
3-4-2-2 Sensor press. 20mA	0...99	16	All	Service
3-4-2-3 Pumps ON sensor fail	0...6 0 = all pumps stop 1 = one pump running 6 = all 6 pumps running	0	All	Service
3-4-2-4 Max power		Number of pumps x 100 %	All	Service
3-4-3 Variable frequ. drive 1)				
3-4-3-1 Communication	Analog 4-20 mA RS485 Danfoss RS485 Lenze PumpDrive	depends on the system	All	Service
3-4-3-2 Proportional const.	0...999	depends on the system	All	Service
3-4-3-3 Integral const.	0...999	depends on the system	All	Service
3-4-3-4 Differential const.	0...999	depends on the system	All	Service
3-4-3-5 No-flow detection	0...9	depends on the system	All	Service
3-4-3-6 Relative pump load [%]	0...100	depends on the system	All	Service
3-4-3-7 VFD Write slave nr.	1...6	depends on the system	All	Service
3-4-3-8 Serial com.	Active Inactive	depends on the system	All	Service
3-4-3-9 VFD Ramp-up [s]	0,1...999	depends on the system	All	Service
3-4-3-10 VFD Ramp-down [s]	0,1...999	depends on the system	All	Service
3-4-3-11 VFD min. frequency	0...60	depends on the system	All	Service
3-4-3-12 VFD max. frequency	0...60	depends on the system	All	Service
3-4-3-13 P nominal of VFD [W]	0...100000	depends on the system	All	Service
3-4-3-14 U nominal of VFD [V]	0...500	depends on the system	All	Service
3-4-3-15 F nominal of VFD [Hz]	50...60	depends on the system	All	Service
3-4-3-16 I nominal of VFD [A]	0...450	depends on the system	All	Service
3-4-3-17 RPM nominal of VFD [rpm]	0...10000	depends on the system	All	Service

1) Configuration not possible for Hyamat K

Parameters	Display or selection option	Factory setting	Authorisation Read-only	Authorisation Edit/submit
3-4-4 WSD settings				
3-4-4-1 Nbr of refreshments	0...99	30	All	Service
3-4-4-2 Refresh time span	0...999	24 h	All	Service
3-4-4-3 Average room temp.	0...99	25 °C	All	Service
3-4-4-4 Room temp. time span	0...999	24 h	All	Service
3-5 Pressure				
3-5-1 Setpoint	0...99	-	All	Customer
3-5-2 Hysteresis	0...9	0,3	All	Customer
3-5-3 Bandwidth	0...9	0,05	All	Customer
3-5-4 Accumulation press.	0...9	0,3	All	Customer
3-5-5 Max. setpoint	0...99	16	All	Service
3-5-6 Max. pump pressure	0...99	-	All	Service
3-5-7 Refer. inlet press.	0...9	0	All	Service
3-5-8 Average inlet press.	0...9	2,5	All	Service
3-5-9 Adapt. setpoint	0...99	4	All	Customer
3-5-10 Delta p	0...9	0	All	Customer
3-5-11 High pressure alarm	0...99	16	All	Customer
3-5-12 High pressure action	shutdown pumps only message	shutdown pumps	All	Customer
3-5-13 Low pressure alarm	0...9	0	All	Customer
3-5-14 Low pressure action	shutdown pumps only message	shutdown pumps	All	Service
3-5-15 Shut down RDP	0...9	0,2	All	Service
3-5-16 Reset RDP	0...9	0,8	All	Service
3-6 Timer settings				
3-6-1 Opt. pump starts /h	0...99	10	All	Service
3-6-2 Min. run time	0...999	10	All	Service
3-6-3 Min. run time corr.	0...99	10	All	Service
3-6-4 Max. run time	0...356400	21600	All	Service
3-6-5 Start delay	0...999	2	All	Service
3-6-6 Stop delay	0...999	2	All	Service
3-6-8 RDP delay	0...999	10	All	Service
3-6-9 High/Low alarm delay	0...999	60	All	Service
3-6-10 WSD 1 pulse length	0...99	0	All	Service
3-6-11 WSD 2 pulse length	0...99	0	All	Service
3-6-12 WSD 3 pulse length	0...99	0	All	Service
3-6-13 PDrive start delay	0...32	25	Manufacturer	Manufacturer

Parameters	Display or selection option	Factory setting	Authorisation Read-only	Authorisation Edit/submit
3-7 Time/date				
3-7-1 Date	Year	2006	All	Customer
	Month	1	All	Customer
	Day	1	All	Customer
3-7-2 Time	Time	0	All	Customer
3-7-3 Check run mode	OFF Interval based Time of day based Time of week based	Interval based	All	Customer
3-7-4 Check run interval		604800	All	Customer
3-7-5 Check run at	Hours	12	All	Customer
	Minutes	0	All	Customer
3-7-6 Check run at	Hours	12	All	Customer
	Minutes	0	All	Customer
	Monday Tuesday Wednesday Thursday Friday Saturday Sunday	Monday	All	Customer
3-7-7 Check run duration		30	All	Service
3-7-8 Clock adapt. setp.				
3-7-8-1 Adaption mode	OFF Adapt. ON/OFF ev. day Adapt. ON/OFF per day	OFF	All	Customer
3-7-8-2 Change on/off times	Hours adapt. setp. ON	0	All	Customer
	Min. adapt setp. ON	0	All	Customer
	Hours adapt setp. OFF	0	All	Customer
	Min. adapt setp. OFF	0	All	Customer
3-7-8-3 Select day of week	Monday Tuesday Wednesday Thursday Friday Saturday Sunday Always	Monday	All	Customer
3-7-8-4 Change on/off times	Hours adapt. setp. ON	0	All	Customer
	Min. adapt setp. ON	0	All	Customer
	Hours adapt setp. OFF	0	All	Customer
	Min. adapt setp. OFF	0	All	Customer
3-7-9 Date adapt. level On	OFF January February March April May June July August September October November December	OFF	All	Customer

Parameters	Display or selection option	Factory setting	Authorisation Read-only	Authorisation Edit/submit
3-7-10 Date adapt. level Off				
	OFF January February March April May June July August September October November December	OFF	All	Customer
3-7-11 Maintenance interval				
			All	Service
3-8 Definable I/O				
3-8-1 Threshold function				
	No threshold relay 1 threshold relays 2 threshold relays	No threshold relay	All	Service
3-9 Messages				
3-9-1 Message settings				
	0... 65535			
	green amber red			
	disabled enabled		All	
3-10 Root menu				
4 Info				
4-1 Device (CM)				
			All	
4-1-1 Serial number (CM)				
			All	
4-1-2 Product Id (CM)				
			All	
4-1-3 FW version (CM)				
			All	
4-1-4 Parameter Set (CM)				
			All	
4-1-5 HW version (CM)				
			All	

7.8 Alerts and warnings – overview

Alert	Description
Sens. fail. discharge	Failure pressure transmitter discharge side (value under 4 mA). Replace PT and reset system.
System pressure too low	System pressure too long under minimum value (3–5–13).
System pressure too high	System pressure too long above maximum value (3–5–11).
No water available	Insufficient water or pressure at suction side.
Thermal failure	Thermal failure urgent.
Therm. supply valve	Thermal failure supply (current too high).
Level sensor fail.	Failure level sensor in receiver tank (value under 4 mA). Replace l.s. and reset system.
Fire alarm	Alert when opening the "external ON" contactor

Warning	Description
Maintenance required	Customer service required.
Therm. fail Pump 1	Thermal failure pump 1 (motor current too high).
Therm. fail Pump 2	Thermal failure pump 2 (motor current too high).
Therm. fail Pump 3	Thermal failure pump 3 (motor current too high).
Therm. fail Pump 4	Thermal failure pump 4 (motor current too high).
Therm. fail Pump 5	Thermal failure pump 5 (motor current too high).
Therm. fail Pump 6	Thermal failure pump 6 (motor current too high).
Pump 1 out of service	1. Pump set to manual OFF. Deactivate by selecting automatic mode.
Pump 2 out of service	2. Pump set to manual OFF. Deactivate by selecting automatic mode.
Pump 3 out of service	3. Pump set to manual OFF. Deactivate by selecting automatic mode.
Pump 4 out of service	4. Pump set to manual OFF. Deactivate by selecting automatic mode.
Pump 5 out of service	5. Pump set to manual OFF. Deactivate by selecting automatic mode.
Pump 6 out of service	6. Pump set to manual OFF. Deactivate by selecting automatic mode.
High water level	Water level in receiver tank too high.
Critical water level	Water level in receiver tank critical (almost empty).
Water level too low	Water level in receiver tank too low (system shut down for dry running protection).
24 V out of range	Internal 24 V outside of the valid range.
Anal. 5 V out of range	Internal 5 V outside of the valid range.
3 V out of range	Internal 3 V outside of the valid range.
External OFF	Warning when opening the "external OFF" contactor

7.9 Adjusting the settings

7.9.1 Setting the set pressure

The unit's default setting equals the set pressure indicated on the rating plate.

If the set value needs to be adjusted to the plant conditions, parameter **3-5-1** has to be changed.

First, enter the customer password as described under 7.5.2.1 Access levels - customer. Then change the set value as described under 7.5.2.2.

7.9.2 Further settings

If any further settings have to be adjusted to the plant conditions, change their parameters as described in section 7.5.2.2. Refer to section 7.5.2 for the menu structure.

7.10 Connection remote-OFF

The remote-OFF connection is a NC contact. When this contact is open, all pumps which are in operation will cut out after the set delay, one after the other.

When this contact is closed, the pumps will start up again in line with the demand.

7.11 Connection fire alarm

The fire alarm connection is a NC contact. When this contact is opened, all pumps are started up one after the other after the set cut-in delay and an alarm signal (red LED) is shown. The dry running protection and remote-Off functions are ignored.

When this contact is closed, the pumps will stop again in line with the demand. The alarm is cleared.

7.12 Shutdown

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

- Set master switch to "0".
- For prolonged shutdown, drain the system.

8 Dismantling / reassembling the pumps

The pumps can be individually dismantled to facilitate maintenance.

Dismantling sequence:

1. Disconnect the pump from the power supply.



De-energize the pump via the motor protection switch.

2. Close the suction and discharge side valves.

Reassembly:

1. Insert pump (original spare part only), always use new gaskets for unions and tighten. Check tightness of screwed connection!
2. Fasten the pump foot to the baseplate using hexagon head bolts.
3. Connect to power supply, switch on motor protection switch.

9 Returning to service

Return the unit to service as described under Commissioning/ start-up.

10 Maintenance

10.1 Operation monitoring

All technical systems require a certain degree of monitoring. The same applies to our package systems for which the following checks and inspections are prescribed:

- The system's readiness for operation.
- Check the operation check run, if activated.
- With the aid of the pressure gauge, compare the start-up and switch-off pressures of the pumps with the data on the name plate.
- The pump's mechanical seal allows little or no visible leakage. It is maintenance-free.
- The motor requires practically no maintenance.
- Verify whether the pre-set accumulator pressure corresponds to the data in the pre-set pressure table (see section 14). Close the shut-off elements under the accumulator for this purpose and drain the accumulator via the drain valve. Remove the protective cap of the accumulator valve and check the pressure with the aid of a tyre pressure gauge. Add nitrogen as necessary.

Caution

Do not add any other gases.

11 Work on the control cabinet

Each pump can be switched off via the motor protection switch.

The motor protection switches are fitted with a padlock as a standard.



The pumps can be stopped by using the manual-0-automatic switch (supplementary equipment). However, this will **not disconnect the system from the power supply**, i.e. all electric devices are still live, even if the pumps are not in automatic operation mode.

Prior to working on the control cabinet or opening the motor terminal box, set the master switch to "0" and unscrew the back-up fuse.

Do not tamper with the control unit, which should only be serviced by KSB's customer service.

Prior to opening any electric equipment such as control cabinet and motor terminal box, de-energize the system.

Even when the mains lamp goes out, check whether all phases are actually dead prior to performing any work on the control cabinet.

Maintenance of the control cabinet

It is recommended to have the control cabinet serviced once a year. For this purpose you can take out a maintenance contract with one of KSB's Service Partners.

12 Inspection

KSB offers inspection services to relieve you as far as possible of the routine necessity of inspecting your Hyamat package system(s). Take advantage of this additional after-sales service by taking out a maintenance contract with KSB. Get in touch with your Service Partner for details.

13 Check list

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

1. Check the pumps and drives for quiet running and the mechanical seal for integrity.
2. Check the flexible transmission elements for wear.
3. Check the function and seal condition of the shut-off, drain and non-return valves.
4. Clean the strainer in the pressure reducer (if applicable).
5. Check the expansion joints for wear (if applicable).
6. Verify the pre-set pressure level and check the accumulator for integrity, if required (see section 14 pre-set pressure table).
7. Check the automatic control unit / switchgear.
8. Check the ON and OFF points of the system.
9. Check if the functional check run is working.
10. Check the function of the overall system and compare the actual data with the name plate data.
11. Check the water inlet, pre-set pressure, lack-of-water monitoring, flow monitoring and pressure reducer.
12. Check the inlet tank and float valve, if applicable. Check the overflow for integrity and cleanliness.

14 Pre-set pressure

The pre-set pressure in the accumulator should be set to a value which is 10 % lower than the set start-up pressure. The setting can be effected via a valve located under the cover at the top of the accumulator.

Pre-set pressure table

Pre-set pressure of accumulator

$$p = 0.9 \times p_E; \quad p_E = \text{system start-up pressure}$$

Recommendation

Fill the accumulator with nitrogen only (risk of corrosion).

The stated values are average values. Tests on accumulators have shown that pressures >3 bar for factor 0.9 and pressures <3 bar for factor 0.8 result in the best storage volumes.

Example:

$$p_E = 5 \text{ bar} \quad \text{pre-set pressure } 5 \times 0.9 = 4.5 \text{ bar}$$

$$p_E = 2 \text{ bar} \quad \text{pre-set pressure } 2 \times 0.8 = 1.6 \text{ bar}$$

15 Electrical performance data

Hyamat K with pumps Movitec	Rated power per motor (P ₂) kW	Rated current per motor at 3~400 V A	Total rated power requirement in kVA Hyamat K Number of pumps (motors)				
			2	3	4	5	6
0202	0.37	1.4	2.04	3.06	4.08	5.10	6.12
0203	0.37	1.4	2.04	3.06	4.08	5.10	6.12
0204	0.55	1.5	2.18	3.27	4.36	5.45	6.54
0205	0.55	1.5	2.18	3.27	4.36	5.45	6.54
0206	0.75	2.1	3.01	4.51	6.02	7.52	9.03
0207	0.75	2.1	3.01	4.51	6.02	7.52	9.03
0208	1.1	2.9	4.12	6.18	8.24	10.30	12.36
0209	1.1	2.9	4.12	6.18	8.24	10.30	12.36
0210	1.1	2.9	4.12	6.18	8.24	10.30	12.36
0211	1.1	2.9	4.12	6.18	8.24	10.30	12.36
0213	1.5	4.4	6.20	9.30	12.39	15.49	18.59
0215	1.5	4.4	6.20	9.30	12.39	15.49	18.59
0402	0.37	1.4	2.04	3.06	4.08	5.10	6.12
0403	0.55	1.5	2.18	3.27	4.36	5.45	6.54
0404	0.75	2.1	3.01	4.51	6.02	7.52	9.03
0405	0.75	2.1	3.01	4.51	6.02	7.52	9.03
0406	1.1	2.9	4.12	6.18	8.24	10.30	12.36
0407	1.1	2.9	4.12	6.18	8.24	10.30	12.36
0408	1.5	4.4	6.20	9.30	12.39	15.49	18.59
0409	1.5	4.4	6.20	9.30	12.39	15.49	18.59
0410	1.5	4.4	6.20	9.30	12.39	15.49	18.59
0411	2.2	6.0	8.41	12.62	16.83	21.03	25.24
0413	2.2	6.0	8.41	12.62	16.83	21.03	25.24
0415	2.2	6.0	8.41	12.62	16.83	21.03	25.24
1002	0.75	2.1	3.01	4.51	6.02	7.52	9.03
1003	1.1	2.9	4.12	6.18	8.24	10.30	12.36
1004	1.5	4.4	6.20	9.30	12.39	15.49	18.59
1005	2.2	6.0	8.41	12.62	16.83	21.03	25.24
1006	2.2	6.0	8.41	12.62	16.83	21.03	25.24
1007	3.0	7.0	9.80	14.70	19.60	24.50	29.40
1008	3.0	7.0	9.80	14.70	19.60	24.50	29.40
1009	4.0	9.0	12.57	18.86	25.14	31.43	37.71
1010	4.0	9.0	12.57	18.86	25.14	31.43	37.71
1012	5.5	11.8	16.45	24.68	32.90	41.13	49.35
1802	2.2	6.0	8.41	12.62	16.83	21.03	25.24
1803	3.0	7.0	9.80	14.70	19.60	24.50	29.40
1804	4.0	9.0	12.57	18.86	25.14	31.43	37.71
1805	5.5	11.8	16.45	24.68	32.90	41.13	49.35
1806	5.5	11.8	16.45	24.68	32.90	41.13	49.35
1807	7.5	14.3	19.91	29.87	39.83	49.79	59.74
1808	7.5	14.3	19.91	29.87	39.83	49.79	59.74
1810	11.0	26.6	36.96	55.44	73.92	92.40	110.87
3202	4.0	9.0	12.57	18.86	25.14	31.43	37.71
3203	5.5	11.8	16.45	24.68	32.90	41.13	49.35
3204	7.5	14.3	19.91	29.87	39.83	49.79	59.74
3205	11.0	26.6	36.96	55.44	73.92	92.40	110.87
3206	11.0	26.6	36.96	55.44	73.92	92.40	110.87
3207	15.0	31.7	44.02	66.04	88.05	110.06	132.07
3208	15.0	31.7	44.02	66.04	88.05	110.06	132.07
4502-1	5.5	11.8	16.45	24.68	32.90	41.13	49.35
4502	7.5	14.3	19.91	29.87	39.83	49.79	59.74
4503-1	11.0	26.6	36.96	55.44	73.92	92.40	110.87
4503	11.0	26.6	36.96	55.44	73.92	92.40	110.87
4504-1	11.0	26.6	36.96	55.44	73.92	92.40	110.87
4504	15.0	31.7	44.02	66.04	88.05	110.06	132.07
4505-1	15.0	31.7	44.02	66.04	88.05	110.06	132.07
4505	18.5	40.5	56.22	84.33	112.44	140.55	168.66
4506-1	18.5	40.5	56.22	84.33	112.44	140.55	168.66
4506	22.0	44.5	61.76	92.64	123.52	154.40	185.28
6502	5.5	11.8	16.45	24.68	32.90	41.13	49.35
6503	7.5	14.3	19.91	29.87	39.83	49.79	59.74
6504	11.0	26.6	36.96	55.44	73.92	92.40	110.87
6505	15.0	31.7	44.02	66.04	88.05	110.06	132.07
6506	15.0	31.7	44.02	66.04	88.05	110.06	132.07
6507	18.5	40.5	56.22	84.33	112.44	140.55	168.66
6508	22.0	44.5	61.76	92.64	123.52	154.40	185.28
6509	22.0	44.5	61.76	92.64	123.52	154.40	185.28

16 Shutoff head

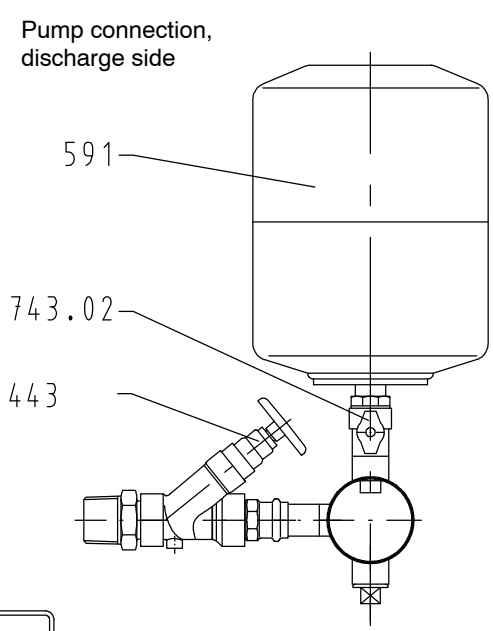
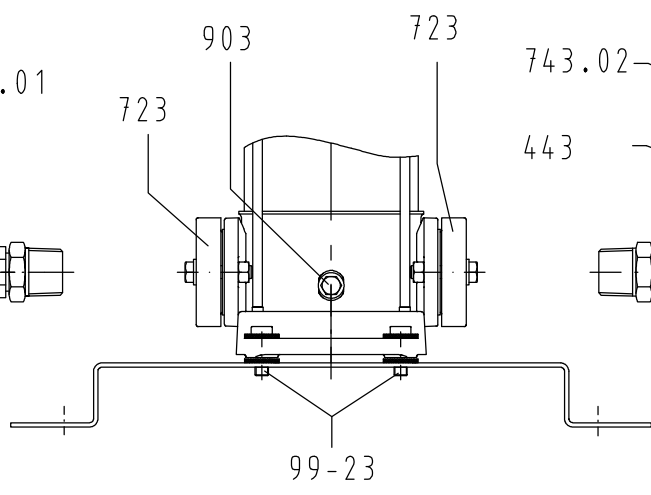
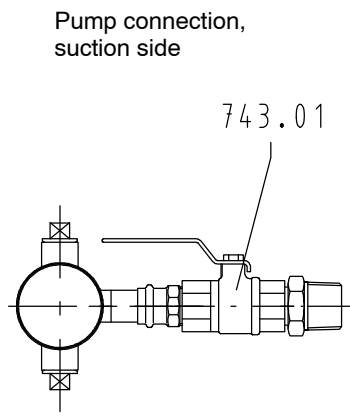
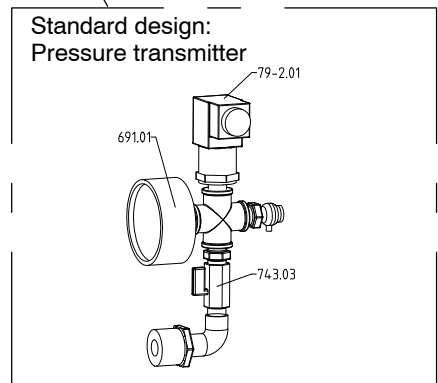
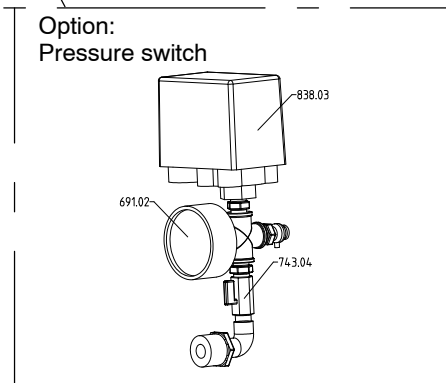
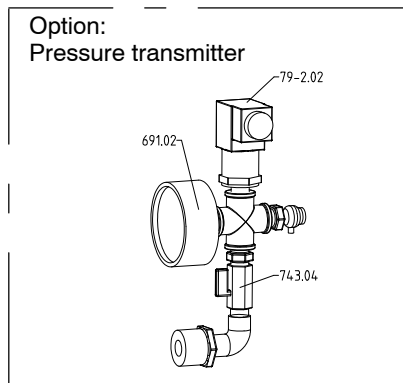
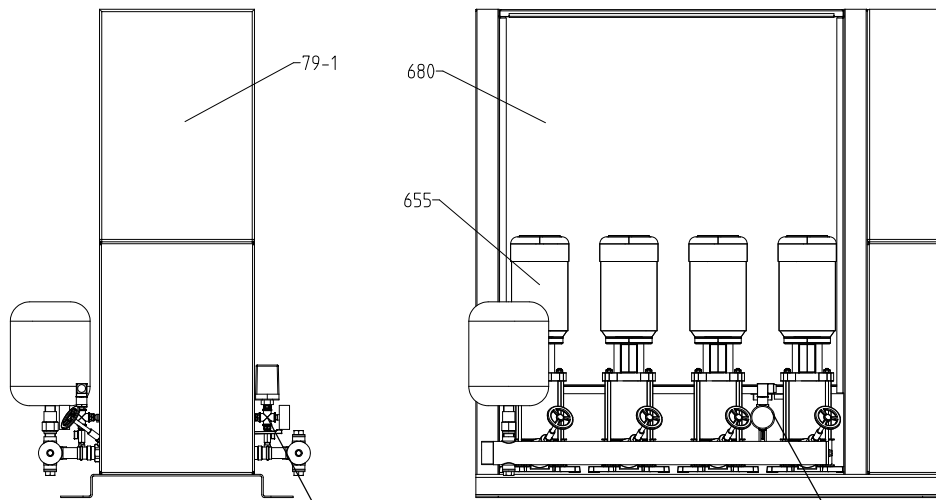
Hyamat K	Shutoff head in m at flow rate Q = 0
0202	19
0203	30
0204	40
0205	50
0206	60
0207	71
0208	82
0209	90
0210	100
0211	111
0213	127
0215	150
0402	19
0403	29
0404	39
0405	49
0406	59
0407	68
0408	78
0409	88
0410	98
0411	108
0413	127
0415	147
1002	23
1003	35
1004	46
1005	58
1006	70
1007	82
1008	93
1009	106
1010	117
1802	29
1803	43
1804	58
1805	72
1806	85
1807	100
1808	115
1810	143
3202	39
3203	59
3204	79
3205	99
3206	118
3207	138
3208	158
4502-1	45
4502	50
4503-1	70
4503	74
4504-1	94
4504	98
4505-1	118
4505	123
4506-1	143
4506	147
6502	34
6503	52
6504	69
6505	87
6506	104
6507	121
6508	139
6509	156

17 Troubleshooting

A	B	C	D	E	F	G	H	I	J	K	L	Code	Code	
Pumps fail to start in automatic mode or cut out shortly after start-up. Lack of water is indicated.	System does not start up	Pumps running but not delivering water.	Insufficient delivery.	System pressure too low.	System pressure too high.	Leakage at mechanical seal.	Pump(s) running hot.	Motor protection switch(es) triggered. Lack-of-water LED lit.	Pump(s) do(es) not stop.	Switching frequency too high (more than 30 start-ups per pump and hour).	Motor(s) running hot.	Cause	Remedy	Code
		●	●				●		●			Pumps / pipes are not properly vented / filled.	Vent and/or prime.	1
●	●	●	●	●			●			●		Shut-off elements (partially) closed.	Check, open as necessary.	2
●			●	●					●	●		Strainer clogged (inlet-side pressure reducer).	Clean.	3
●			●	●	●				●	●		Inlet-side pressure reducer set incorrectly.	Check, adjust as necessary.	4
		●	●	●			●	●	●	●		Defective by-pass line of check valve.	Replace.	5
●	●											Inlet-side shut-off valve closed.	Check, open as necessary.	6
	●						●		●			Discharge-side shut-off valve closed or defective.	Check, open as necessary.	7
●			●	●			●		●	●		Inlet pressure lower than stated in the purchase order.	Request particulars.	8
	●				●							Inlet pressure higher than stated in the purchase order.	Request particulars.	9
									●			Start-up pressure set too high.	Check setting.	10
	●			●	●		●		●		●	Pressure transmitter set incorrectly or defective	Check setting.	11
							●			●	●	Pre-set pressure of the accumulator too low.	Restore nitrogen cushion.	12
							●			●	●	Defective accumulator.	Check integrity / replace.	13
							●					Defective mechanical seal.	Replace.	14
●							●		●			Suction-side pressure transmitter / manometric switch set incorrectly or defective.	Check setting.	15
		●	●	●			●	●	●	●		System's check valve is defective.	Check, replace sealing element as necessary.	16
				●				●	●		●	Water extraction higher than stated in the purchase order.	Request particulars.	17
	●							●			●	Motor protection switch triggered or set incorrectly, or pump seizure.	Compare setting with the motor's rating plate data.	18
										●		Set delay period too short.	Check setting.	19
	●											Mains supply interrupted.	Check cable and remedy defect / check fuse.	20
	●											Control current fuse tripped (control cabinet).	Determine reason and reset.	21
	●							●				Main fuse on distribution board (owner-supplied) loose or blown; fuses possibly too small or too fast.	Check fuses and replace as necessary. Measure motor current.	22
								●				Intermittent voltage fluctuations.	Press reset and fault acknowledgement key.	23
	●											Phase failure.	Check individual phases / fuse.	24
●												Inlet tank empty or float switch defective / disconnected.	Check and remedy defect.	25

Check list for Commissioning / start-up, see page 33.

18 System schematic, List of components
 18.1 Hyamat K with acoustic cladding (accessory) Movitec 2 / 4 / 10 / 18



Spare parts for units with Movitec 2 / 4 / 10 / 18 pumps

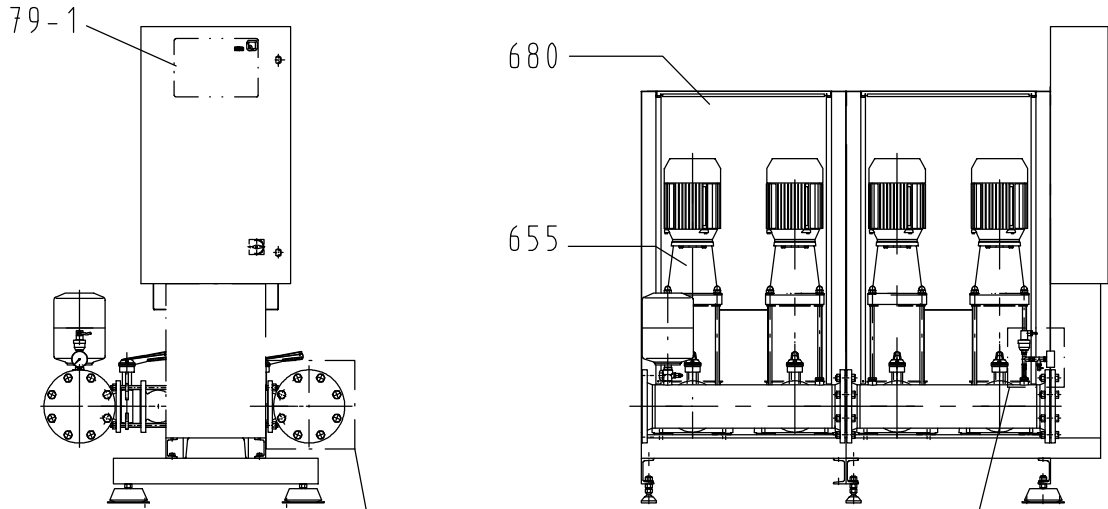
Part No.	Description	Ident-No.
443	Seal insert for isolating valve Rp 1	01 055 407
443	Seal insert for isolating valve Rp 1 1/2	01 095 753
443	Seal insert for isolating valve Rp 2	01 117 095
591	Accumulator	01 079 764
655	Pumps see Spare Parts Programme	
680	Acoustic cladding see accessories	
691.01	Pressure gauge indication 0 - 16 bar	00 401 413
691.02	Pressure gauge indication 0 - 10 bar	00 401 414
723	Flange set Movitec 2	47 113 000
	Movitec 4	47 113 001
	Movitec 10	47 113 002
	Movitec 18	47 113 003
743.01	Ball valve G 1	01 057 427
743.01	Ball valve G 1 1/2	01 057 429
743.01	Ball valve G 2	01 057 430
743.02	Ball valve for pressure vessel (accumulator)	01 079 765
743.03	Ball valve G 1/4	00 410 125
743.04	Ball valve G 1/4	00 410 125
79-2.01	Measuring transducer 0 - 16 bar	01 112 649
79-2.02	Measuring transducer 0 - 10 bar	01 115 087
79-1	Control unit 3 pumps	18 041 018
79-1	Control unit 6 pumps	18 041 019
838.03	Manometric switch 0 - 11 bar	01 034 231
903	Set of screwed plugs	47 113 080
99-23	Installation set per pump	18 040 627

For electric parts see circuit diagram in the Annex.

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

Please note! Pump spare parts correspond to Movitec in standard design.

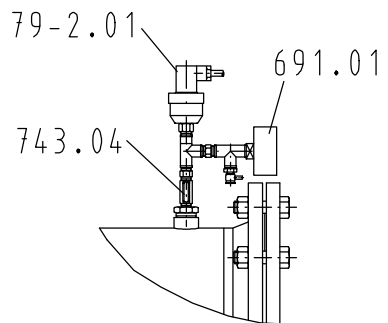
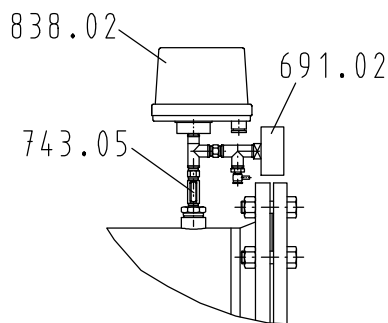
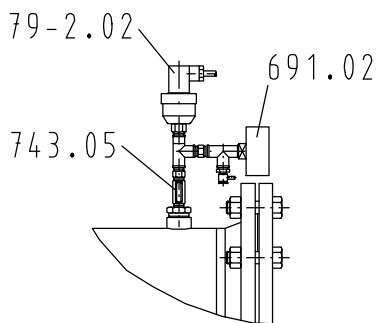
18.2 Hyamat K with acoustic cladding (accessory) Movitec 32 / 45 / 65



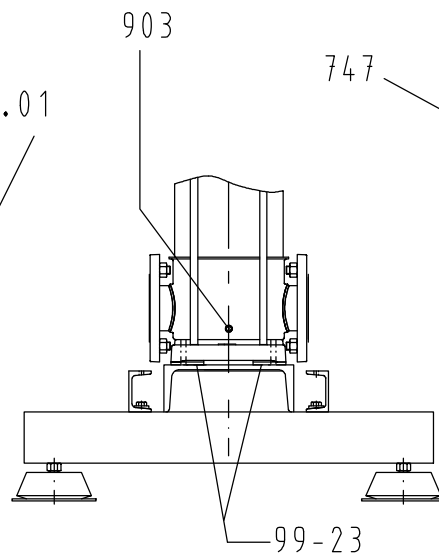
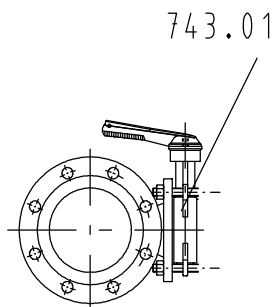
Option:
Pressure transmitter

Option:
Pressure switch

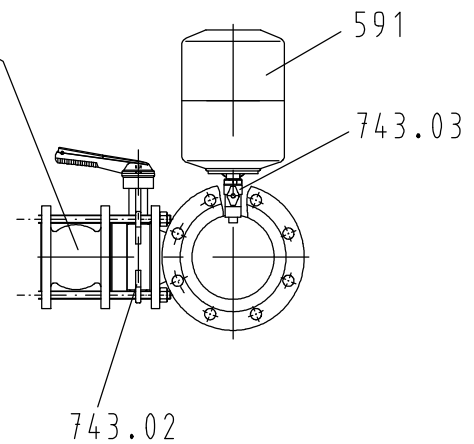
Standard design:
Pressure transmitter



Pump connection,
suction side



Pump connection,
discharge side



Spare parts for units with Movitec 32 / 45 / 65 pumps

Part No.	Description	Ident-No.
591	Accumulator	01 079 764
655	Pumps see Spare Parts Programme	
680	Acoustic cladding see accessories	
691.01	Pressure gauge indication 0 - 16 bar	00 401 413
691.02	Pressure gauge indication 0 - 10 bar	00 401 414
743.01	Shut-off butterfly valve DN 65	42 087 766
743.01	Shut-off butterfly valve DN 80	42 087 767
743.01	Shut-off butterfly valve DN 100	42 087 768
743.02	Shut-off butterfly valve DN 65	42 087 766
743.02	Shut-off butterfly valve DN 80	42 087 767
743.02	Shut-off butterfly valve DN 100	42 087 768
743.03	Ball valve for pressure vessel (accumulator)	01 079 765
743.04	Ball valve G 1/4	00 410 125
743.05	Ball valve G 1/4	00 410 125
747	Swing check valve DN 65	40 984 470
747	Swing check valve DN 80	40 984 471
747	Swing check valve DN 100	40 984 472
79-2.01	Measuring transducer 0 - 16 bar	01 112 649
79-2.02	Measuring transducer 0 - 10 bar	01 115 087
79-1	Control unit 3 pumps	18 041 018
79-1	Control unit 6 pumps	18 041 019
838.02	Manometric switch 0 - 11 bar	01 034 231
903	Set of screwed plugs	47 113 080
99-23	Installation set per pump	18 040 654

For electric parts see circuit diagram in the Annex.

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

Please note! Pump spare parts correspond to Movitec in standard design.

19 Annex

Acceptance report

The KSB pressure boosting unit specified below was today commissioned by the undersigned, authorized KSB customer service engineer who created this protocol.

1 Pressure Boosting Unit

Type series Hyamat _____
 Size _____
 Works number _____
 Order No. _____

2 Purchaser/Place of Installation

Purchaser	Place of Installation
Name _____	_____
Address _____	_____
_____	_____

3 Operating Data For further details please refer to the circuit diagram.

Start-up pressure p_E bar _____ Inlet pressure monitoring $p_{vor-x} =$ _____
 (set value inlet pressure switch)

Switch-off pressure p_A bar _____

Inlet pressure p_{vor} bar _____

Pre-set pressure of accumulator p_{vor} bar _____

4 Special information

According to DVGW worksheet W 314, the system operator must notify the responsible water company of commissioning.

If, in addition, the system is operated with pressure vessels of groups III/IV to the Pressure Vessel Directive, commissioning shall also be reported to the responsible TÜV (German Association for Technical Supervision).

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

Defects found during commissioning	Date of remedy
Defect 1	

Name of KSB representative	Name of contractor or representative
_____	_____
Place	Date
_____	_____

Check list for commissioning / start-up

1.	Read the operating instructions	
2.	Check the power supply data and compare them with data on the name plate.	
3.	Check the earthing system (by measuring).	
4.	Check the mechanical connection to the water supply system. Retighten the flanges and the unions.	
5.	Fill and vent the system from the inlet side.	
6.	Check the inlet pressure.	
7.	Retighten the terminal connections in the switch gear and check whether all cables are still firmly connected to the terminals.	
8.	Compare the set values of the motor protection switches with the name plate data; if required, readjust.	
9.	Set the pump to 0 via the manual-0-automatic selector switch. Briefly start up each pump manually and compare the fan impeller's direction of rotation with the arrow indicating the direction of rotation.	
10.	Check the direction of rotation in automatic mode.	
11.	Check the start-up and switch-off pressure; readjust, if required.	
12.	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.	
13.	Vent the pumps for a second time after they have been running for 5 to 10 minutes.	
14.	Set all switches to "automatic".	
15.	Check the pre-set pressure.	
16.	Include any non-conformances with our catalogue or order data in the commissioning report (e.g. no dry running protection, or inlet pressure + system pressure exceeding 16 bar).	
17.	Complete the commissioning report together with the operator / user and instruct the operator / user as to the function of the unit.	

EC Declaration of Conformity

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

The manufacturer herewith declares that the product:

Hyamat K

- is in conformity with the provisions of the following directives as applicable in their current version:
 - Machinery Directive 2006/42/EC
 - Electromagnetic Compatibility Directive 2004/108/EC

The manufacturer also declares that

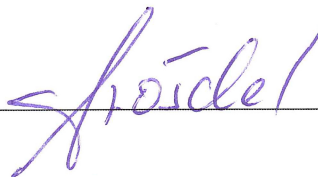
- the following harmonised international standards were applied:
 - ISO 12100-1/A1, ISO 12100-2/A1,
 - ISO 14121-1,
 - EN 809/A1,
 - EN 60204-1,
 - EN 61000-6-1, EN 61000-6-3
- Applied national technical standards and specifications, in particular:
 - DIN 1988-5

Responsible for compiling the technical documentation:

Name: Dr. Frank Obermair

Address: Johann-Klein-Straße 9
 67227 Frankenthal

Pegnitz, 29.12.2009



Jürgen Gröschel
 Head of Product Development Seal-less Pumps/Building Services
 KSB Aktiengesellschaft
 Bahnhofplatz 1
 91257 Pegnitz (Germany)

CE conformity marking

The product is CE-marked and fulfils the requirements specified in the European Electromagnetic Compatibility Directive 2004/108/EC dated 15 December 2004, Annex I. Compliance with the provisions of the directive is certified by a Declaration of Conformity. In accordance with the EN 61000-6-1 and EN 61000-6-3 standards, the product meets Class B requirements (limits to EN 55011).

Table 1: Classification by category

Category	C1	C2	C3	C4
Mode of sales distribution	Unrestricted distribution	Restricted distribution	Restricted distribution	Restricted distribution
Environment	1. environment	1. or 2. environment (operator's decision)	2. environment	2. environment
Voltage/ Current	< 1000 V			> 1000 V I _n > 400 A Connection to IT network

Category	C1	C2	C3	C4
EMC competence	No special requirement	Installation and commissioning by personnel suitable trained in EMC applications		EMC plan required
Limits to EN 55011	Class B	Class A1 (+ warning)	Class A2 (+ warning)	Values exceed class A2 limits

