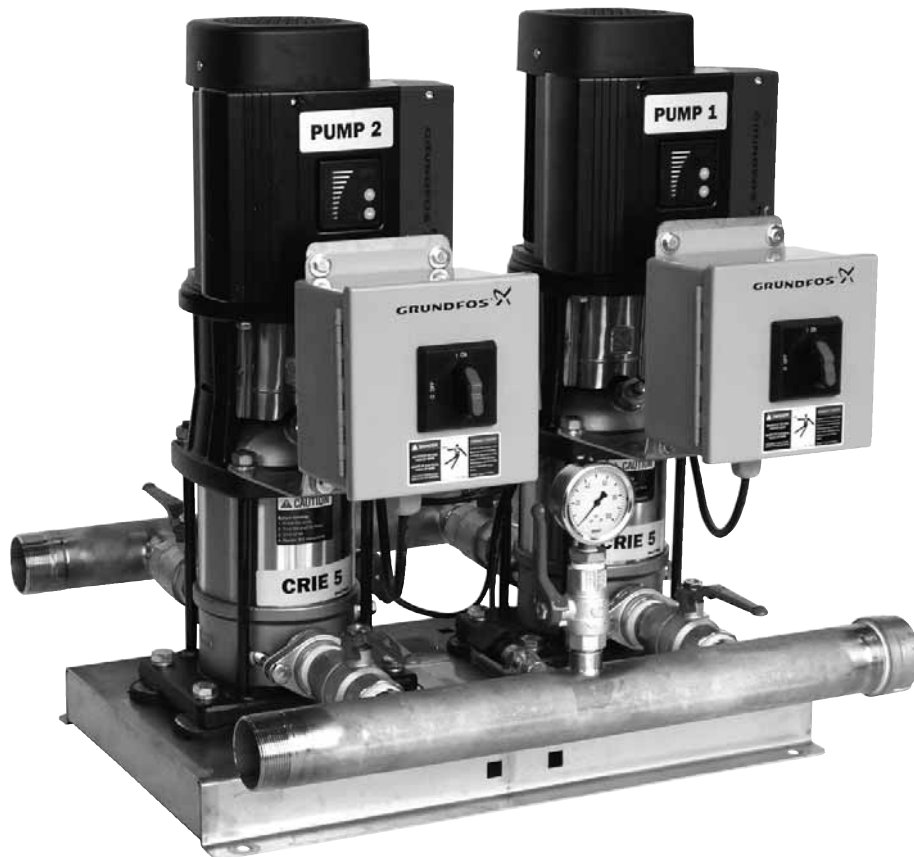


Hydro Multi-E

US Installation and operating instructions



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Warning

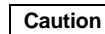
Prior to installation, read these installation and operating instructions. Installation and operation must comply with local regulations and accepted codes of good practice.

1. Symbols used in this document



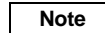
Warning

If these safety instructions are not observed, it may result in personal injury!



Caution

If these safety instructions are not observed, it may result in malfunction or damage to the equipment!



Note

Notes or instructions that make the job easier and ensure safe operation.

2. Product description

2.1 General description

Grundfos Hydro Multi-E booster sets are designed for the pressure boosting of clean water in apartment buildings, hotels, hospitals and schools.

The Hydro Multi-E incorporates Grundfos CRE pumps fitted with intergrated frequency-controlled single- or three-phase MLE motors.

The Hydro Multi-E

- maintains a constant pressure through continuously variable adjustment of the speed of the pumps connected.
- adjusts its performance to the demand through cutting in/out the required number of pumps and through parallel control of the pumps in operation.
- performs automatic pump changeover according to the principle "first in, first out" (FIFO).

2.2 Functions

The Hydro Multi-E offers the functions:

- Constant pressure.
- Stop at low flow.
- Cascade control of pumps.
- Manual operation, all pumps stopped or all pumps running at maximum performance.
- Digital input for dry-running protection via level switch or pressure switch.
- Emergency operation, if installed.
- System monitoring functions:
 - dry-running protection (via digital input),
 - motor protection,
 - bus communication,
 - sensor fault.
- Display and indication functions:
 - green indicator light for operating indications and
 - red indicator light for fault indications,
 - potential-free changeover contacts for fault, operating or ready signal.
 - yellow light fields indicating the setpoint set.
- Communication via the R100 remote control.
- Grundfos bus communication.
- Connection to a building management system via Grundfos G10-LON interface or G100 gateway.

2.3 Hydro Multi-E

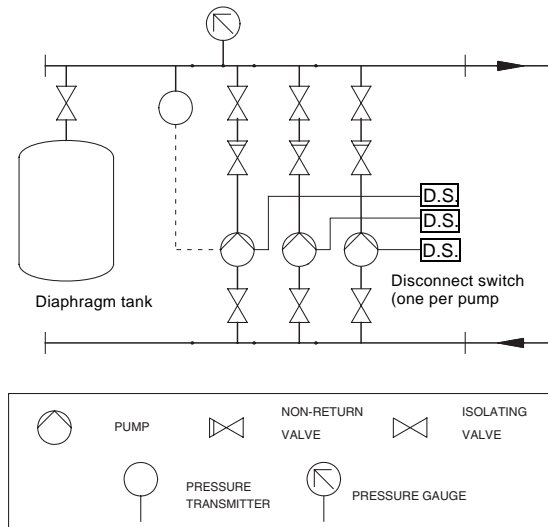


Fig. 1 Hydro Multi-E components

3. Operating conditions

3.1 Temperature ranges

Ambient temperature

At ambient temperatures ranging from 32°F to 104°F, the motors may be loaded 100%.

If the ambient temperature exceeds 104°F, or if the motors are located 3300 feet above sea level, the motor output (P2) must be reduced, see fig. 2.

This means that larger motors must be used.

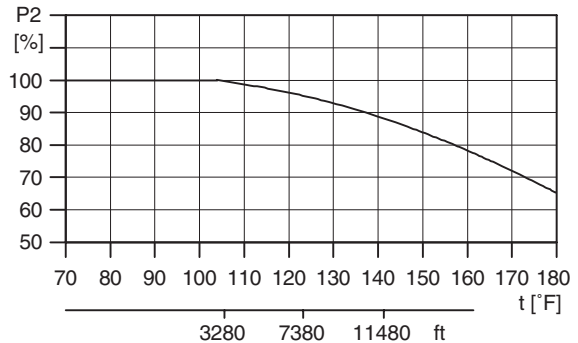


Fig. 2 Motor output reduction in relation to ambient temperature and altitude above sea level

Liquid temperature

32°F to +158°F.

Note

The liquid temperature applies to the pumps only.

Temperature during storage/transport

–40°F to 140°F.

3.2 Relative air humidity

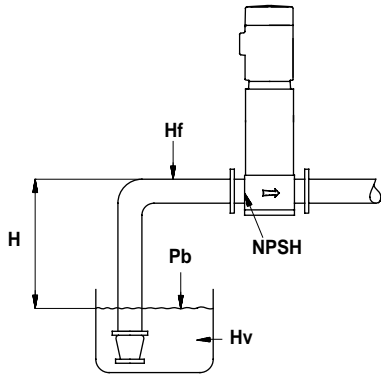
Maximum 95%.

3.3 Maximum operating pressure

As standard the maximum operating pressure is 230 psi [16 bar].

On request, Grundfos offers Hydro Multi-E booster sets with a maximum operating pressure higher than 230 psi [16 bar].

3.4 Minimum inlet pressure



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Fig. 3 Parameters for the calculation of minimum inlet pressure

To avoid cavitation, make sure that there is a minimum inlet pressure on the suction side of the booster set. The minimum inlet pressure in bar can be calculated as follows:

$$H = P_b - \text{NPSH} - H_f - H_v - H_s$$

P_b = Barometric pressure in feet (33.9 feet at sea level).
In closed systems, P_b indicates system pressure in feet.

H_f = Friction loss in suction piping in feet.
(At the highest flow the pump will be delivering).

H_v = Vapor pressure of water in feet.

NPSH= Net Positive Suction Head in feet.
NPSH can be read from the NPSH curve at the maximum capacity at which the pump will run.
(See installation and operating instructions for CR, CRI, CRN).

H_s = Safety margin = minimum 2 feet.

If "H" is calculated as positive, the pump can operate at a suction of maximum "H" feet. If "H" is calculated as negative, an inlet pressure (psia) if minimum "H" feet is required.

3.5 Maximum inlet pressure

Pump	Maximum inlet pressure [bar / psi]
50 Hz	
CR(E) 3-10	10 / 145
CR(E) 5-4 to CRI(E) 5-10	10 / 145
CR(E) 10-3 to CRI(E) 10-6	8 / 116
CR(E) 15-5	10 / 145
CR(E) 20-5	10 / 145
CR(E) 32-4	4 / 58
CR(E) 45-2	4 / 58
CR(E) 45-3 to CR(E) 45-4	10 / 145
CR(E) 64-4-2	10 / 145
CR(E) 90-3	15 / 218
60 Hz	
CR(E) 5-7	10 / 145
CR(E) 10-3	8 / 116
CR(E) 15-3	10 / 145
CR(E) 20-3	10 / 145
CR(E) 32-2	4 / 58
CR(E) 45-2-1	10 / 145
CR(E) 64-2-1	10 / 145
CR(E) 90-2-1	15 / 218

The maximum inlet pressure is determined by the construction of the pump, such as bearing pressure.

Note

For information about other CR pump sizes, see WebCAPS on www.grundfos.com.

3.6 Start/stop

The number of starts and stops via the mains voltage must not exceed 4 times per hour.
When the Hydro Multi-E is switched on via the mains, it will start after approx. 5 seconds.

3.7 Diaphragm tank

The recommended diaphragm tank precharge pressure should be set to 0.7 x setpoint.

If the setpoint is changed, the diaphragm tank precharge pressure should be changed accordingly to ensure optimum operation.

Calculate the precharge pressure as follows:

Precharge pressure = 0.7 x setpoint.

The precharge pressure must be measured in a pressure-less system.

It is recommended to use nitrogen gas for precharging.

4. Installation



The Hydro Multi-E should be installed in accordance with local regulations and accepted codes of good practice.

4.1 Location

To ensure adequate cooling of motor and electronics, the following must be observed:

- Place the Hydro Multi-E in such a way that adequate cooling is ensured.
- Motor cooling fins and fan blades must be kept clean.

The Hydro Multi-E is not suitable for outdoor installation.

The Hydro Multi-E should be placed with a 3 feet clearance in front and on the two sides.

4.2 Mechanical installation

Arrows on the pump base show the direction of flow of water through the pump.

The pipes connected to the Hydro Multi-E must be of adequate size. To avoid resonance, expansion joints should be fitted in the discharge and suction pipes, see fig. 4.

Connect the pipes to the manifolds of the booster set.

Either end can be used. Apply sealing compound to the unused end of the manifold and fit the screw cap. For manifolds with flanges, a blind flange with gasket must be fitted.

Check for any loose bolts on piping connections and mounting hardware prior to start-up.

If booster sets are installed where the first consumer on the line is close to the booster set, it is advisable to fit pipe hangers on the suction and discharge pipes to prevent vibration being transmitted through the pipework, see fig. 4.

Position the booster set on solid surface, e.g. a concrete floor or foundation. If the booster set is not fitted with vibration dampers, it must be bolted to the floor or foundation.

The pipes must be fastened to parts of the building to ensure that they cannot move or be twisted.

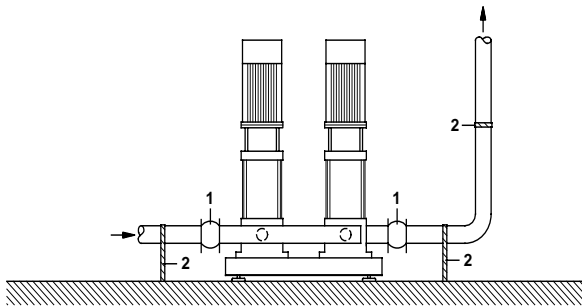


Fig. 4 Installation example with expansion joints and pipe hangers

1. Expansion joint.
2. Pipe hanger.

Expansion joints, pipe hangers and vibration dampers shown in fig. 4 are not included in the standard Hydro Multi-E.

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5. Electrical connection – Hydro Multi-E with single-phase pumps

Note

The user or the installer is responsible for the installation of the correct earthing and protection according to valid national and local standards. All operations must be carried out by a qualified electrician.



Never make any connections in the Hydro Multi-E terminal box or in the terminal box of each individual pump unless the electricity supply has been switched off for at least 5 minutes.

5.1 Mains switch

The Hydro Multi-E must be connected to an external all-pole mains switch with a contact separation of at least 3 mm in each pole according to IEC 364.

5.2 Protection against electric shock – indirect contact



The Hydro Multi-E must be earthed and protected against indirect contact in accordance with national regulations.

Protective earth conductors must always have a yellow /green or green (PE) color marking.

5.3 Additional protection

If the Hydro Multi-E is connected to an electric installation where an earth leakage circuit breaker is used as additional protection, this circuit breaker must be marked with the following symbol:



ELCB

Note

When an earth leakage circuit breaker is selected, the total leakage current of all the electrical equipment in the installation must be taken into account.

The leakage current of the Hydro Multi-E can be found in section 19.2 *Leakage current*.

5.4 Thermal motor protection

The Hydro Multi-E requires no external motor protection. The motors incorporate thermal protection against slow overloading and blocking (IEC 34-11: TP 211).

5.5 Protection against mains voltage transients

The Hydro Multi-E is protected against mains voltage transients in accordance with EN 61 800-3.

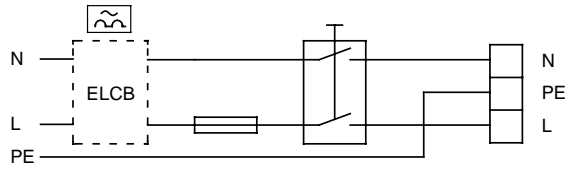
5.6 Supply voltage

1 x 200-240V ±10%, 50/60 Hz, PE.

The supply voltage and frequency are marked on the pump nameplate. Please make sure that the motor is suitable for the electricity supply on which it will be used.

The wires in the Mains Switch must be as short as possible. Excepted from this is the protective earth conductor which must be so long that it is the last one to be disconnected in case the cable is inadvertently pulled out of the cable entry.

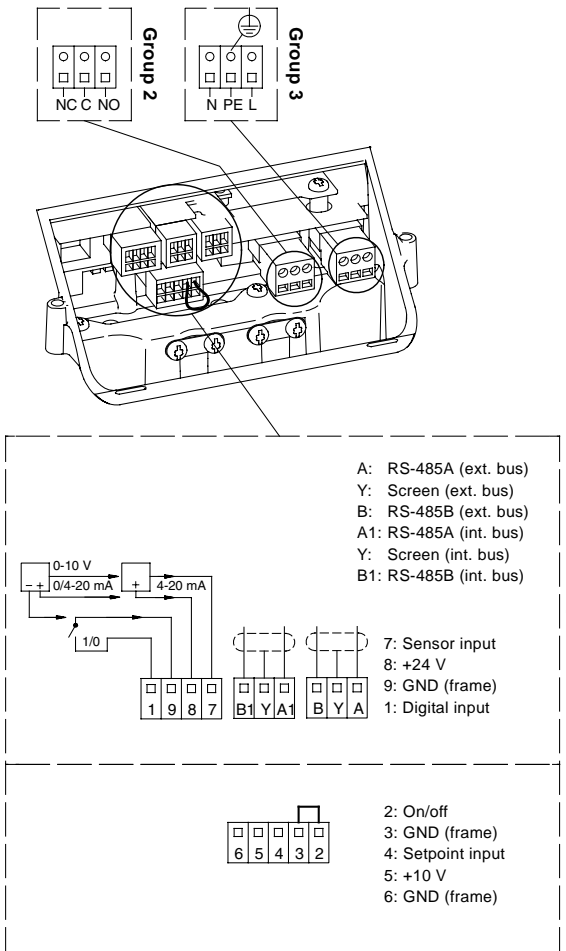
For maximum backup fuse, see section 19.1 Supply voltage.



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Fig. 5 Example of a mains-connected Hydro Multi-E with back-up fuses and additional protection

5.7 Other connections



Group 1

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Fig. 6 Connection terminals in pump 1

Note

As a precaution, the wires to be connected to the following connection groups must be separated from each other by reinforced insulation in their entire lengths:

1. **Inputs** external start/stop, digital function, setpoint and sensor signal, terminals 1-9, and bus connection, terminals B, Y, A and B1, Y, A1).

All inputs (group 1) are internally separated from the mains-conducting parts by reinforced insulation and galvanically separated from other circuits.

All control terminals are supplied by protective extra-low voltage (PELV), thus ensuring protection against electric shock.

2. **Output** (relay signal, terminals NC, C, NO).

The output (group 2) is galvanically separated from other circuits. Therefore, the supply voltage or protective extra-low voltage can be connected to the output as desired.

3. **Mains supply** (terminals N, PE, L).

A galvanically safe separation must fulfil the requirements for reinforced insulation including creepage distances and clearances specified in EN 60335.



If the mains supply cable is damaged between the breaker cabinet and the pump, it must be replaced by the manufacturer, the manufacturer's service partner or similarly qualified persons in order to avoid a hazard.

6. Electrical connection – Hydro Multi-E with three-phase pumps

The user or the installer is responsible for the installation of the correct earthing and protection according to valid national and local standards. All operations must be carried out by a qualified electrician.

Note



Never make any connections in the Hydro Multi-E terminal box or in the terminal box of each individual pump unless the electricity supply has been switched off for at least 5 minutes.

6.1 Mains switch

The Hydro Multi-E must be connected to an external all-pole mains switch with a contact separation of at least 3 mm in each pole according to IEC 364.

6.2 Protection against electric shock – indirect contact



The Hydro Multi-E must be earthed and protected against indirect contact in accordance with national regulations.

Protective earth conductors must always have a yellow/green or green (PE) color marking.

Note

As the leakage current of 5 HP to 10 HP motors is > 3.5 mA, these motors must be connected to especially reliable/sturdy earth connections.

The leakage current of the Hydro Multi-E can be found in section 20.2 Leakage current.

EN 50 178 and BS 7671 specify the following:

Leakage current > 3.5 mA:

The Hydro Multi-E must be stationary and installed permanently. Furthermore, it must be connected permanently to the electricity supply.

- The earth connection must be carried out as duplicate conductors.

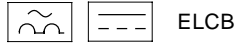
6.3 Additional protection

If the Hydro Multi-E is connected to an electric installation where an earth leakage circuit breaker is used as additional protection, this circuit breaker must be of the type:

- which is suitable for handling leakage currents and cutting-in with short pulse-shaped leakage.
- which trips out when alternating fault currents and fault currents with DC content, i.e. pulsating DC and smooth DC fault currents, occur.

For these booster sets an earth leakage circuit breaker **type B** must be used.

This circuit breaker must be marked with the following symbols:



When an earth leakage circuit breaker is selected, the total leakage current of all the electrical equipment in the installation must be taken into account.

Note

The leakage current of the Hydro Multi-E can be found in section 20.2 Leakage current.

6.4 Thermal motor protection

The Hydro Multi-E requires no external motor protection. The motors incorporate thermal protection against slow overloading and blocking (IEC 34-11: TP 211).

6.5 Protection against mains voltage transients

The Hydro Multi-E is protected against mains voltage transients in accordance with EN 61 800-3.

6.6 Supply voltage

3 x 380-480 V ±10%, 50/60 Hz, PE.

3 x 208-230 V ±10%, 50/60 Hz, PE.

The supply voltage and frequency are marked on the pump nameplate. Please make sure that the motor is suitable for the electricity supply on which it will be used.

The wires in the motor must be as short as possible. Excepted from this is the protective earth conductor which must be so long that it is the last one to be disconnected in case the cable is inadvertently pulled out of the cable entry.

For maximum backup fuse, see section 20.1 Supply voltage.

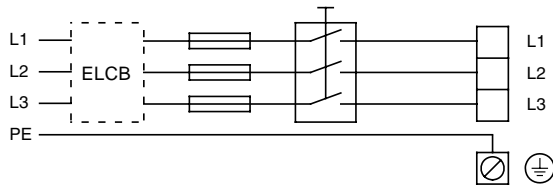


Fig. 7 Example of a mains-connected Hydro Multi-E with back-up fuses and additional protection

6.7 Other connections

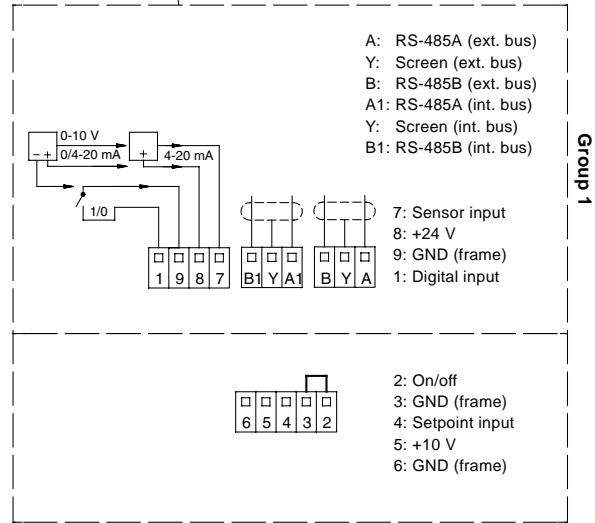
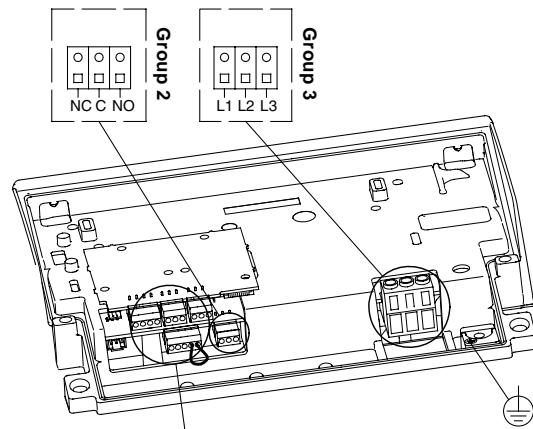


Fig. 8 Connection terminals in pump 1

As a precaution, the wires to be connected to the following connection groups must be separated from each other by shielded insulation in their entire lengths:

Note

1. **Inputs** external start/stop, digital function, setpoint and sensor signals, terminals 1-9; and bus connection, terminals B, Y, A and B1, Y, A1).

All inputs (group 1) are internally separated from the mains-conducting parts by reinforced insulation and galvanically separated from other circuits.

2. **Output** (relay signal, terminals NC, C, NO).

The output (group 2) is galvanically separated from other circuits. A maximum supply voltage of 250 V or protective extra-low voltage can be connected to the output as desired.

3. **Mains supply** (terminals L1, L2, L3, PE).

A galvanically safe separation must fulfil the requirements for reinforced insulation including creepage distances and clearances specified in EN 60335.



If the mains supply cable is damaged between the mains switch and the pump, it must be replaced by the manufacturer, the manufacturer's service partner or similarly qualified persons in order to avoid a hazard.

6.8 Signal cable

- Use a shielded cable having a cross-sectional area of min. 0.5 mm² and max. 1.5 mm² for the digital input.
- The shield of the cable must be connected to frame at both ends with good frame connection. It must be as close as possible to the terminals, fig. 9.

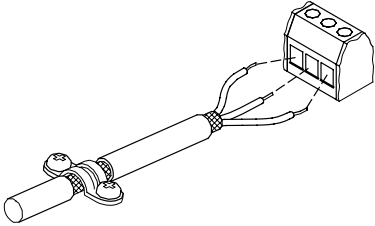


Fig. 9 Stripped cable with shield and wire connection

- Screws for frame connections must always be tightened whether a cable is fitted or not.
- The wires must be as short as possible.

6.9 Bus connection cable

For the bus connection a screened 3-core cable having a cross-sectional area of min. 0.5 mm² and max. 1.5 mm² must be used.

- If the Hydro Multi-E is connected to a unit with a cable clamp which is identical to the one on the Hydro Multi-E, the shield must be connected to this cable clamp.
- If the unit has no cable clamp as shown in fig. 10, the shield is left unconnected at this end.

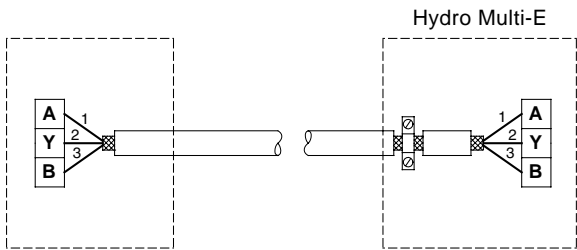


Fig. 10 Connection with shielded 3-core cable

6.10 Dry-running protection

Note

The Hydro Multi-E must be protected against dry running.

Type of dry-running protection:

- a pressure switch fitted in the suction manifold (3 psi pressure switch) or
- a level switch fitted in the supply water tank.

The dry-running protection has been connected to terminals 1 and 9 in pump 1.

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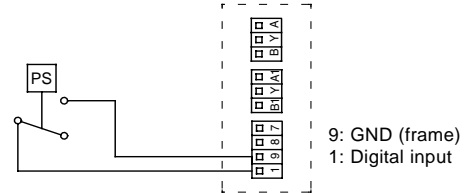
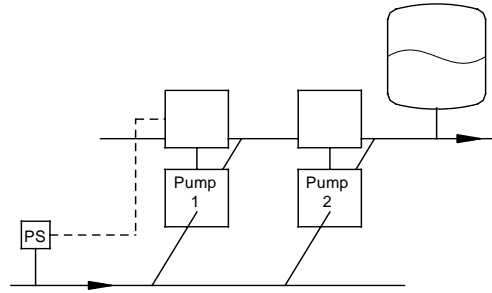


Fig. 11 Pressure switch connected to pump 1.
(Standard method for dry-running protection)

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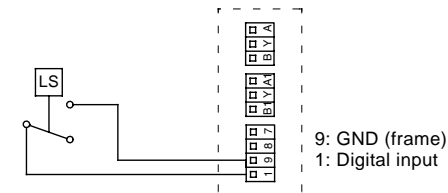
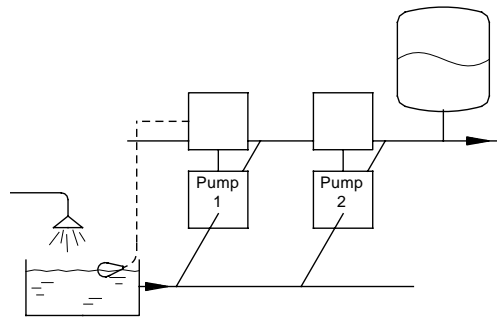


Fig. 12 Level switch connected to pump 1 (Optional method for dry-running protection)

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7. Start-up

7.1 Hydro Multi-E in system with inlet pressure

To start up a booster set with inlet pressure, proceed as follows:

Step	Action	Result
1.	Check that the Hydro Multi-E corresponds to order and that no single parts have been damaged.	
2.	Turn the disconnect switch for each pump to the off position.	The installation is now safe to work on.
3.	Connect water and electricity supplies.	
4.	Close the discharge valves of the pumps.	
5.	Check that the diaphragm tank precharge pressure is 0.7 times the desired discharge pressure (setpoint).	
6.	Open the suction valve of each pump and vent the pumps one by one by means of the vent screw and recirculation screw.	
7.	Switch on the electricity supply by means of the disconnect switches at each pump.	The Hydro Multi-E starts and increases the speed to maximum.
8.	Slowly open the discharge valve of each pump.	No impurities will be flushed into the system.
9.	Wait for a few minutes.	The Hydro Multi-E reduces the speed.
10.	Set the desired discharge pressure. Note: When changing the discharge pressure, change the diaphragm tank precharge pressure accordingly.	
11.	Check that the pumps are cutting in and out, adjusting performance to the demand.	The Hydro Multi-E is now ready for operation.

7.2 Hydro Multi-E in system without inlet pressure

To start up a booster set without inlet pressure, proceed as follows:

Step	Action	Result
1.	Check that the Hydro Multi-E corresponds to order and that no single parts have been damaged.	
2.	Turn the disconnect switch for each pump to the off position.	The installation is now safe to work on.
3.	Connect water and electricity supplies. Disconnect the factory installed pressure switch and connect float switch.	
4.	Check that the diaphragm tank precharge pressure is 0.7 times the desired discharge pressure (setpoint).	
5.	Open the suction isolation valve for all pumps.	
6.	Close the discharge isolation valve for all pumps.	
7.	Remove the vent screw in the pump head for all pumps and prime the suction pipe and the pumps from where the vent screw was removed.	
8.	Reinstall vent screws in pumps and suction piping.	
9.	Turn the disconnect switch for each pump to the on position.	The pumps starts and increases the speed to maximum.
10.	Vent all pumps by means of the vent screw and recirculation screw. Note: Do not allow pumps to dead head for more then 5 min.	All pumps should be operating while venting or air will draw in pump/s not operating.
11.	Slowly open the discharge isolation valve for each pump after pumps are completely vented.	
12.	Wait for a few minutes.	The pump reduces the speed.
13.	Ensure all discharge isolation valves are in the open position.	
14.	Set the desired discharge pressure. Note: When changing the discharge pressure, change the diaphragm tank precharge pressure accordingly.	
15.	Check that the pumps are cutting in and out, adjusting performance to the demand.	The Hydro Multi-E is now ready for operation.

8. Operating modes

The operating modes are the operating conditions that the booster set can be brought in by the user.

Possible operating modes:

- **Stop**
All pumps stopped.
- **Normal** (factory setting)
One or more pumps are operating to maintain the set pressure.
- **Max.**
All pumps running at maximum speed.

The operating modes can be selected on the control panel, via the R100 or via bus.

8.1 Normal operation

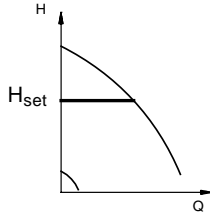


Fig. 13 Hydro Multi-E in normal operation, i.e. constant-pressure mode

In **constant-pressure mode**, the Hydro Multi-E adjusts its performance to the desired setpoint.

8.2 Stop or max. operation

In addition to normal operating mode, the **Stop** or **Max. operating mode can be selected**. See the example in fig. 14.

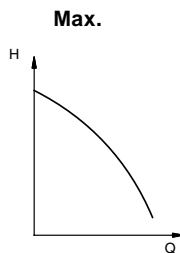


Fig. 14 Hydro Multi-E in max. operation mode

Max. operation can for instance be used in connection with the venting and start-up procedures.

8.3 Operating condition in case of disconnection of electricity supply

If the electricity supply to the Hydro Multi-E is disconnected, the settings will be stored. The Hydro Multi-E will restart in the same operating condition as it was in before the disconnection.

8.4 Other settings

Other Hydro Multi-E settings can be made by means of the R100, see section 10. *Setting by means of the R100.*

Factory settings are marked with **bold**-faced type under each individual display in sections 10.1 *Menu OPERATION* and 10.3 *Menu INSTALLATION*.

8.5 Priority of settings

No priority of settings - the last given command applies.

9. Setting by means of control panel

The control panel, fig. 15 or 16, incorporates:

- Buttons, ⤴ and ⤵, for setpoint setting.
- Light fields, yellow, for indication of setpoint.
- Indicator lights, green (operation) and red (fault).

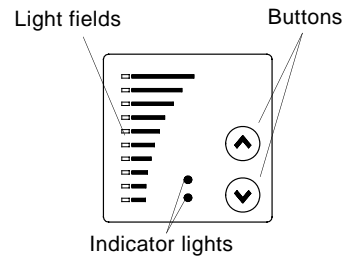


Fig. 15 Control panel for single-phase Hydro Multi-E

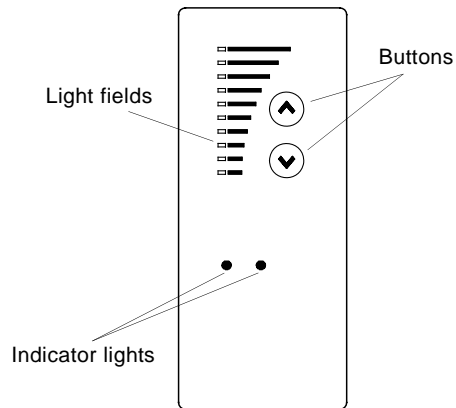


Fig. 16 Control panel for three-phase Hydro Multi-E

9.1 Setpoint setting

Set the desired setpoint by pressing the buttons ⤴ and ⤵. The light fields on the control panel indicate the setpoint set.

9.2 Hydro Multi-E in constant-pressure operation

Figure 17 shows that the light fields 5 and 6 are activated, indicating a desired setpoint of 5 bar with a sensor measuring range from 0 to 10 bar. The setting range is equal to the sensor measuring range (see sensor nameplate).

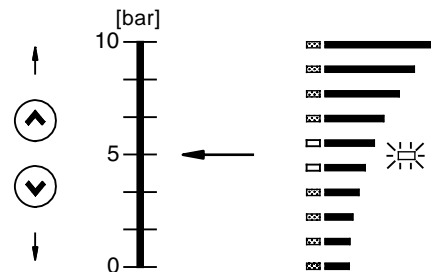


Fig. 17 Setpoint set to 5 bar

TM02 4328 0602

TM02 4318 0602

TM00 7600 0304

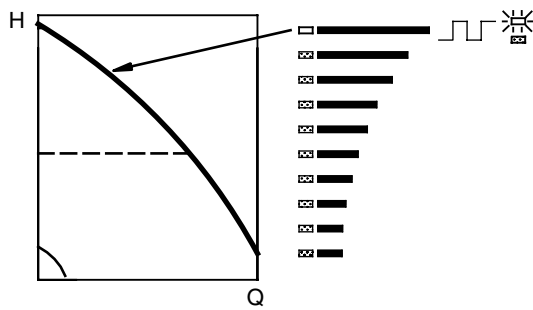
TM02 8513 0304

TM03 0236 4604

9.3 Setting to max. curve duty

Press \odot continuously to change over to the max. curve of the Hydro Multi-E (top light field flashes). When the top light field is on, \odot must be pressed for 3 seconds before the light field starts flashing.

To change back, press \ominus continuously until the desired setpoint is indicated.



TM00 7345 1304

Fig. 18 Max. curve duty

9.4 Start/stop

Stop the Hydro Multi-E by continuously pressing \ominus until none of the light fields are activated and the green indicator light flashes.

Start the Hydro Multi-E by continuously pressing \odot until the desired setpoint is indicated.

10. Setting by means of the R100

The Hydro Multi-E is designed for wireless communication with the Grundfos remote control R100. (Sold separately)

During communication, the R100 must be pointed at the control panel of the Hydro Multi-E pump. When the R100 communicates with the Hydro Multi-E, the red indicator light will flash rapidly.

The displays are divided into four parallel menus, fig. 19:

0. GENERAL (see operating instructions for the R100)

1. OPERATION

2. STATUS

3. INSTALLATION

The number stated at each individual display in fig. 20 refers to the section in which the display is described.

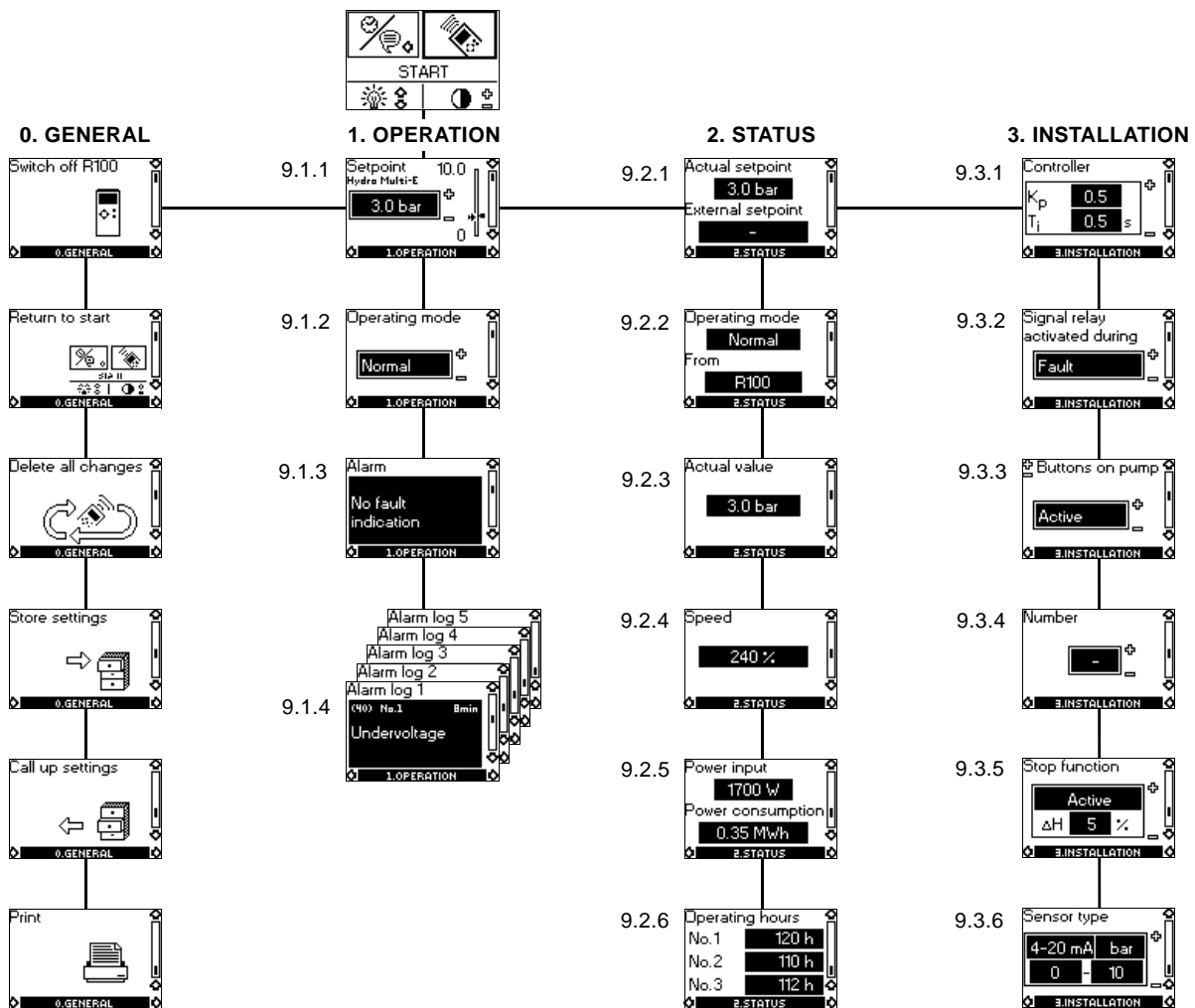


Fig. 19 Menu overview

10.1 Menu OPERATION

When communication between the R100 and the Hydro Multi-E has been established, the first display in this menu will appear.

10.1.1 Setpoint setting



- ▶ Setpoint set
- Actual value

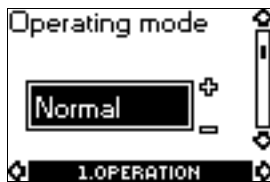
In this display, the setpoint is set.

In normal operating mode (factory setting), the setting range is equal to the sensor measuring range.

One of the following operating modes can be selected:

- *Stop*,
- *Max.* (max. curve).

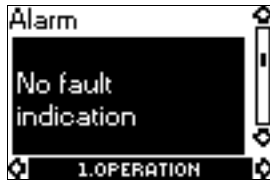
10.1.2 Select one of the following operating modes



- *Stop*,
- **Normal** (operation),
- *Max.*

The operating modes can be selected without changing the setpoint setting.

10.1.3 Fault indications



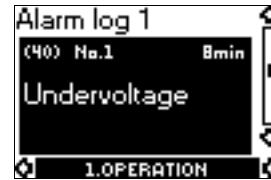
If the Hydro Multi-E is faulty, the cause will appear in this display.

Possible causes:

- *Too high motor temperature*,
- *Undervoltage*,
- *Overvoltage*,
- *Too many restarts* (after faults),
- *Overload*,
- *Sensor signal outside signal range* (only 4-20 mA),
- *External fault*,
- *Dry running* (emergency operation, only),
- *Other fault*.

A fault indication can be reset in this display if the cause of the fault has disappeared.

10.1.4 Alarm log



If faults have been indicated, the last five fault indications will appear in the alarm log. "Alarm log 1" shows the newest/latest fault.

The example shows the fault indication "Undervoltage" for pump No. 1, the fault code and the number of minutes the Hydro Multi-E has been connected to the electricity supply after the fault occurred.

10.2 Menu STATUS

The displays appearing in this menu are status displays only. It is not possible to change or set values.

The displayed values are the values that applied when the last communication between the Hydro Multi-E and the R100 took place. If a status value is to be updated, point the R100 at the control panel and press "OK".

If a parameter, e.g. speed, should be called up continuously, press "OK" constantly during the period in which the parameter in question should be monitored.

The tolerance of the displayed value is stated under each display. The tolerances are stated as a guide in % of the maximum values of the parameters.

10.2.1 Display of actual setpoint



Tolerance: $\pm 2\%$

This display shows the actual setpoint.

It is not possible to connect an external setpoint signal.

10.2.2 Display of operating mode



This display shows the actual operating mode (*Stop*, *Normal* (operation) or *Max.*). Furthermore, it shows where this operating mode was selected (*R100*, *Pump*, *BUS*, *External* or *Stop func.*). For further details about the stop function (*Stop func.*), see section 10.3.5 *Setting of stop function*.

10.2.3 Display of actual value



The actually measured value of a connected sensor will appear in this display.

If no sensor is connected to the Hydro Multi-E, "-" will appear in the display.

10.2.4 Display of total actual output in %



Tolerance: $\pm 5\%$

The actual output of all operating pumps can be read in this display.

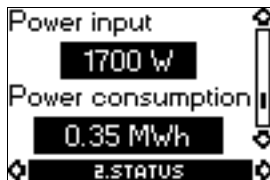
Example:

300% corresponding to 3 pumps running at 100% speed.

150% corresponding to 2 pumps running at 75% speed.

80% corresponding to 1 pump running at 80% speed.

10.2.5 Display of input power and power consumption



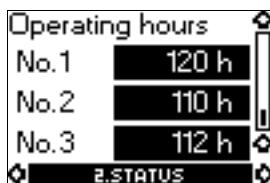
Tolerance: $\pm 10\%$

This display shows the actual Hydro Multi-E input power from the mains supply. The power is displayed in W.

The Hydro Multi-E power consumption can also be read from this display. The value of power consumption is an accumulated value calculated from the Hydro Multi-E's birth and it cannot be reset.

If a pump is replaced, the accumulated power consumption will be stored.

10.2.6 Display of operating hours



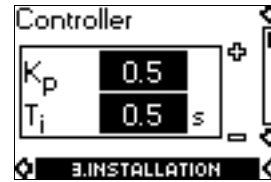
Tolerance: $\pm 2\%$

This display shows the operating hours for each individual pump of the booster set. The number of operating hours is an accumulated value and cannot be reset.

If a pump is replaced, the number of operating hours will be reset.

10.3 Menu INSTALLATION

10.3.1 Selection of controller



In this display, the gain (K_p) and the integral-action time (T_i) of the built-in PI controller can be set if the factory setting is not the optimum setting:

- The gain (K_p) is set within the range from 0.1 to 20.
- The integral-action time (T_i) is set within the range from 0.1 to 3600 s. If 3600 s is selected, the controller will function as a P controller.

10.3.2 Selection of fault, operating or ready signal relay



It can be selected in which situation the relay should be activated:

- **Fault** (fault indication),
- Operation (operating indication),
- *Ready* (ready indication).

See section 13. *Indicator lights and signal relay.*

10.3.3 Blocking of the buttons on the control panel



The buttons \odot and \ominus on the control panel can be set to:

- **Active,**
- *Not active.*

10.3.4 Allocation of number



A number between 1 and 64 can be allocated to the Hydro Multi-E. In the case of bus communication, a number must be allocated to each Hydro Multi-E.

10.3.5 Setting of stop function



The purpose of the stop function is to stop the Hydro Multi-E at a very low flow in order to avoid unnecessary power consumption.

The function is only active when one pump is operating.

The stop function can be set to:

- **Active**,
- *Not active*.

The low-flow detection is carried out by means of the built-in "low-flow detector".

The Hydro Multi-E will check the flow regularly by reducing the speed for a short time, thus checking the change in pressure. If there is no or a small change in pressure, the Hydro Multi-E will detect a low flow.

When the Hydro Multi-E detects a low flow, the speed will be increased until the stop pressure (actual setpoint + 0.5 x ΔH) is reached and the Hydro Multi-E stops. When the pressure has fallen to the start pressure (actual setpoint – 0.5 x ΔH), the Hydro Multi-E will restart.

ΔH indicates the difference between start and stop pressures, fig. 20.

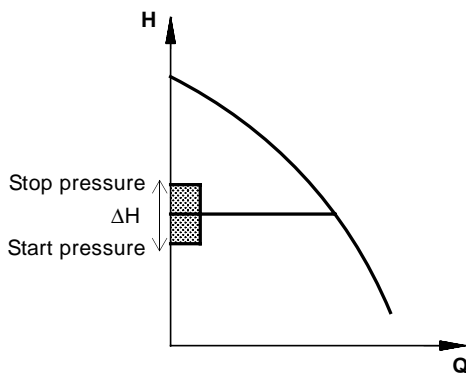


Fig. 20 Difference between start and stop pressures (ΔH)

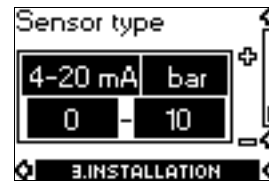
ΔH is factory-set to **10% of actual setpoint**.

ΔH can be set within the range from 5% to 30% of actual setpoint.

The stop function requires a tank precharge pressure of 0.7 x actual setpoint.

TM00 7744 1896

10.3.6 Setting of sensor



Note *The sensor setting is only relevant for normal operation.*

Select the following:

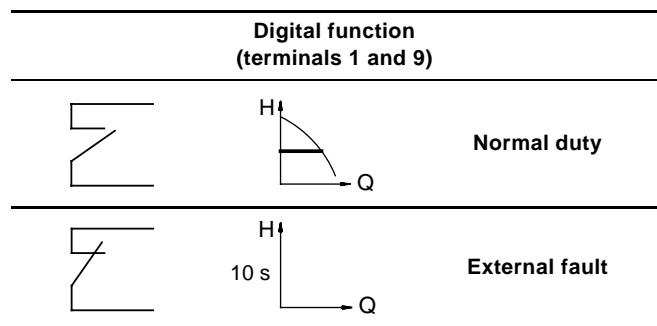
- Sensor output signal (0-10 V, 0-20 mA or 4-20 mA),
- sensor measuring unit (bar, mbar, m, kPa, psi, ft, m³/h, m³/s, l/s, gpm, °C, °F or %) and
- sensor measuring range.

11. Digital input, (Pump #1)

The Hydro Multi-E has a digital input for external fault.

The digital input has been factory-set to external fault and will be **active** in closed condition.

Functional diagram: Input for digital function:



If the digital input is activated for more than 10 seconds, the Hydro Multi-E will stop because of an "external fault".

The digital input is used for the dry-running protection.

12. Bus signal

The Hydro Multi-E enables external serial communication via an RS-485 input. The communication is carried out according to the Grundfos bus protocol, GENIbus, and enables connection to a building management system or another external control system.

Via the bus signal, it is possible to remote-set Hydro Multi-E operating parameters, like setpoint, operating mode, etc. At the same time, the Hydro Multi-E can provide status information about important parameters, like actual value of control parameter, input power, fault indications, etc.

Contact Grundfos for further details.

Note *If a bus signal is used, the number of settings available via the R100 will be reduced.*

If the Hydro Multi-E is to be connected to a building management system, it must communicate with the system via a Grundfos G10-LON interface or G100 gateway.

13. Indicator lights and signal relay

The operating condition of the Hydro Multi-E is indicated by the green and red indicator lights on the control panel, see fig. 21.

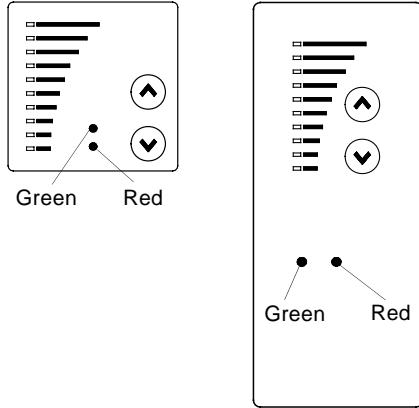


Fig. 21 Indicator lights on control panels of single- and three-phase Hydro Multi-E

The Hydro Multi-E incorporates an output for a potential-free signal via an internal relay.

The signal output can be set to fault, operating or ready indication by means of the R100, see section 10.3.2 *Selection of fault, operating or ready signal relay*.

The functions of the two indicator lights and the signal relay are as shown in the following table:

Indicator lights		Signal relay activated during:			Description
Fault (red)	Operation (green)	Fault	Operation	Ready	
Off	Off				The electricity supply has been switched off.
Off	Permanently on				The Hydro Multi-E is operating.
Off	Flashing				The Hydro Multi-E has been set to stop via the control panel, R100 or bus.
Permanently on	Off				The Hydro Multi-E has stopped because of a fault and will attempt to restart. If the cause is "sensor signal outside signal range", the Hydro Multi-E will stop and the fault indication cannot be reset until the signal is inside the signal range.
Permanently on	Permanently on				The Hydro Multi-E is still operating, but one or two pumps are faulty. The fault will be reset automatically when the fault has disappeared.
Permanently on	Flashing				The Hydro Multi-E has been set to stop via the control panel, R100 or bus but one or two pumps are faulty.

Resetting of fault indications

A fault indication (red indicator light) will be automatically reset by the Hydro Multi-E when the fault has disappeared.

14. Megging

Note

Megging of an installation incorporating CRE pumps is not allowed, as the built-in electronics may be damaged.

15. Maintenance



Before starting work on the Hydro Multi-E, make sure that the electricity supply has been switched off for at least 5 minutes and that it cannot be accidentally switched on.

15.1 Pumps

Pump bearings and shaft seals are maintenance-free.

If the pump is to be drained for a long period of inactivity, remove one of the coupling guards to inject a few drops of silicone oil on the shaft between the pump head and the coupling. This will prevent the shaft seal faces from sticking.

15.2 Motors

To ensure sufficient cooling of the motor and electronics, the motor cooling fins and fan blades must be cleaned regularly.

15.2.1 Motor bearings

Motors up to and including 7.5 kW are maintenance-free.

In the case of seasonal operation (motor is idle for more than 6 months of the year), it is recommended to grease the motor when the Hydro Multi-E is taken out of operation.

16. Taking out of operation

To take the Hydro Multi-E out of operation, switch off the mains switch in the breaker cabinet.



The leads in front of the mains switch are still energized.

Each individual pump is taken out of operation by switching off the corresponding circuit breaker or disconnect switch.

16.1 Frost protection

Pumps which are not being used during periods of frost should be drained to avoid damage.

Drain the pumps by loosening the vent screw in the pump head and by removing the drain plug from the base.

Do not tighten the vent screw and replace the drain plug until the Hydro Multi-E is to be used again.

16.2 Service kits

Service kits for Hydro Multi-E pumps, see www.grundfos.com (WebCAPS) or WinCAPS.

17. Fault finding chart



Before making any connections in pumps, terminal boxes or breaker cabinet, make sure that the electricity supply has been switched off for at least 5 minutes and that it cannot be accidentally switched on.

Fault	Cause	Remedy
1. The Hydro Multi-E does not run when started.	a) Actual pressure is higher than or equal to the setpoint set.	Wait until the pressure has dropped or lower the pressure on the discharge side of the Hydro Multi-E and check that the booster set starts.
	b) Electricity supply disconnected.	Connect the electricity supply.
	c) Circuit breakers cut out.	Correct the fault and cut in the-circuit breakers.
	d) Internal motor protection activated.	Contact Grundfos.
	e) Circuit breaker defective.	Replace the circuit breaker.
	f) Motor defective.	Repair or replace the motor.
	g) Pressure transmitter fault.	
	h) Pressure transmitter defective.	Replace the pressure transmitter. Transmitters with 0-20 mA or 4-20 mA output signals are monitored by the Hydro Multi-E.
	i) Cable broken or short-circuited.	Repair or replace the cable.
2. The Hydro Multi-E starts, but stops immediately afterwards. The operating pressure is not reached.	a) Dry running or no inlet pressure.	Check the supply of water to the Hydro Multi-E. When the inlet pressure has been reestablished, the pumps will restart after 15 secs.
3. The Hydro Multi-E is stopped and cannot restart.	a) Pressure transmitter fault.	
	b) Pressure transmitter defective.	Replace the pressure transmitter. Transmitters with 0-20 mA or 4-20 mA output signals are monitored by the Hydro Multi-E.
	c) Cable broken or short-circuited.	Repair or replace the cable.
	d) Control unit fault.	
	e) Electricity supply disconnected on pump 1.	Connect the electricity supply.
	f) Control unit defective.	Replace the terminal box on pump 1. Contact Grundfos.
4. Unstable water delivery from Hydro Multi-E (applies only to very low consumption).	a) Inlet pressure too low.	Check the suction pipe and possible suction strainer.
	b) Suction pipe or pumps partly blocked by impurities.	Clean the suction pipe or pumps.
	c) Pumps suck air.	Check the suction pipe for leakages.
	d) Pressure transmitter defective.	Replace the transmitter.
5. Pumps are running, but deliver no water.	a) Suction pipe or pumps blocked by impurities.	Clean the suction pipe or pumps.
	b) Non-return valve blocked in closed position.	Clean the non-return valve. The non-return valve must move freely.
	c) Suction pipe leaky.	Check the suction pipe for leakages.
	d) Air in suction pipe or pumps.	Vent the pumps. Check the suction pipe for leakages.
6. The Hydro Multi-E is unable to reach the setpoint.	a) Cable broken or short-circuited (GENIbus communication between pump 1 and pump 2/3).	Repair or replace the cable.
	b) Pump 2 or 3 out of operation.	Connect the electricity supply to the pump and check the pump condition.
7. Leakage from a shaft seal.	a) Shaft seal defective.	Replace the shaft seal.
	b) Height adjustment of pump shaft inaccurate.	Readjust the shaft height.
8. Noise.	a) The pumps are cavitating.	Clean the suction pipe or pumps and possible suction strainer.
	b) The pumps do not rotate freely (frictional resistance) due to inaccurate height adjustment of the pump shaft.	Readjust the shaft height. Follow the procedure in fig. D or E at the end of these instructions.
9. Very frequent starts and stops.	a) Wrong diaphragm tank precharge pressure.	Check the diaphragm tank precharge pressure.

18. Fault correction

18.1 Fault readings

Three-phase E-Pumps

Code (fault log)	Fault reading		Cause/explanation	Remedy
	R100	Grundfos PC Service Tool (GST)		
1	Too high leakage current.	Discharge current.	Leakage current too high.	<ul style="list-style-type: none"> • Check stator insulation. • Check terminal box insulation.
2	Phase failure (mains).	Phase failure.	–	Check that all three mains phases are OK.
3	External fault.	External fault.	The digital input which has been set to "external fault" has been activated.	No remedy - part of normal operation.
4	Too many restarts (after faults)	Too many restarts	The number of permissible restarts within 24 hours has been exceeded.	Reset by pressing "+" or "-".
7	Undervoltage.	Too many HSD.	<p>HSD = Hardware Shut Downs. There has been a fault and the permissible number of restarts for the fault type has been exceeded.</p> <ul style="list-style-type: none"> • Fault in mains supply. • Terminal box defective. 	<ul style="list-style-type: none"> • Restore mains supply. • Replace terminal box.
32	Overvoltage	Overvoltage	Mains supply voltage is too high in the starting moment.	Bring voltage back to prescribed level.
40	Undervoltage	Undervoltage	Mains supply voltage is too low in the starting moment.	Bring voltage back to prescribed level.
42	Undervoltage	Cut-in fault	Faulty mains supply voltage at the time of cutting in the terminal box.	Restore proper mains supply.
48	Overload	Overload	Heavy overload has caused software shutdown (SSD)	Check and possibly reduce the load.
49	Overload	Overcurrent	Heavy overload. Pump blocked.	Deblock the pump.
50	Overload	MPF general shutdown	MPF = Motor Protection Function. The built-in motor protection has detected a sustained overload (MPF 60 sec. limit).	Check and possibly reduce load/improve cooling.
51	Overload	Blocked motor	Heavy overload (I_{max} . very high). Pumped blocked in the starting moment.	Deblock the pump.
54	Overload	Short time overload limit	The built-in motor protection has detected a transitory overload (MPF 3 sec. limit).	Check and possibly reduce load/improve cooling.
56	Dry running	Underload	Pump has been operating with too low flow.	Restore prescribed flow.
65	Too high motor temperature	Motor temperature	PTC sensor in the motor has signalled overtemperature.	Check and possibly reduce load/improve cooling.
67	Too high motor temperature	Power converter temperature	Terminal box has indicated overtemperature.	Check and possibly reduce load/improve cooling. (Temperature during operation can be read via GST).
73	Undervoltage	Hardware shutdown	<ul style="list-style-type: none"> • Fall in mains supply. • Mains supply failure while motor is running. 	Restor proper mains supply.
76	Other fault	Internal communication error	Terminal box defective.	Replace the terminal box.
83	Other fault	Par. area verification error	Setting data not correct.	Replace the terminal box.

Code (fault log)	Fault reading		Cause/explanation	Remedy
	R100	Grundfos PC Service Tool (GST)		
88	Sensor signal outside signal range	Sensor fault	Sensor specified for 4-20 mA but signal received is below 4 mA: <ul style="list-style-type: none"> • Signal range wrongly set; • Sensor wrongly connected; • Sensor of the wrong type; • Sensor defective; • Electricity supply failure. 	<ul style="list-style-type: none"> • Correct signal range setting; • Connect sensor correctly; • Connect correct sensor; • Replace sensor; • Restore proper electricity supply.
96	Setpoint signal outside signal range	Reference input fault	External setpoint signal specified for 4-20 mA but signal received is below 4 mA: <ul style="list-style-type: none"> • Setpoint signal range wrongly set; • Setpoint signal wrongly connected; • Setpoint signal of the wrong type. 	<ul style="list-style-type: none"> • Correct signal range setting; • Connect setpoint signal correctly; • Provide correct setpoint signal.
255	–	Unknown	GST has received an undefined fault signal.	GST should be updated.

19. Technical data – Hydro Multi-E with single-phase pumps

19.1 Supply voltage

1 x 208 - 230 V $\pm 10\%$, 60 Hz, N, PE.

Cable: 0.5 - 1.5 mm².

See nameplate.

Recommended fuse size

Motor sizes from 0.5 HP to 1.5 HP: Max. 10 A.

Standard as well as quick-blow or slow-blow fuses may be used.

19.2 Leakage current

Motor size [HP]	Number of pumps in booster set	Leakage current [mA]
0.5 to 1.5	2	< 7
	3	< 10.5

The leakage currents are measured in accordance with EN 60 355-1.

19.3 Inputs/output

Digital

External potential-free switch.

Voltage: 5 VDC.

Current: < 5 mA.

Screened cable: 0.5 - 1.5 mm².

Sensor signals

- Voltage signal
0-10 VDC, $R_i > 50 \text{ k}\Omega$ (via internal voltage supply).
Tolerance: +0%/–3% at maximum voltage signal.
Screened cable: 0.5 - 1.5 mm².
Maximum cable length: 500 m, 1640 ft.
- Current signal
DC 0-20 mA/4-20 mA, $R_i = 175 \Omega$
Tolerance: +0%/–3% at maximum current signal.
Screened cable: 0.5 - 1.5 mm².
Maximum cable length: 500 m, 1640 ft.
- Electricity supply to sensor:
+24 VDC, max. 40 mA.

Signal output

Potential-free changeover contact.

Maximum contact load: 250 VAC, 2 A.

Minimum contact load: 5 VDC, 10 mA.

Screened cable: 0.5 - 2.5 mm².

Maximum cable length: 500 m, 1640 ft.

Bus input

Grundfos bus protocol, GENIbus protocol, RS-485.

Screened 3-core cable: 0.5 - 1.5 mm².

Maximum cable length: 500 m, 1640 ft.

20. Technical data – Hydro Multi-E with three-phase pumps, 0.75-7.5kW

20.1 Supply voltage

3 x 460 V $\pm 10\%$, 60 Hz, PE.

3 x 208-230 V $\pm 10\%$, 50/60 Hz, PE.

Cable: 2.5 - 4 mm² / 10 - 8 AWG

See nameplate.

Recommended fuse size

See 22. *Installation in the USA and Canada* page 24.

20.2 Leakage current

Motor size [HP]	Number of pumps in booster set	Leakage current [mA]
2 to 3 (supply voltage < 460 V)	2	< 7
	3	< 10.5
2 to 3 (supply voltage > 460 V)	2	< 10
	3	< 15
5 to 7.5	2	< 10
	3	< 15
7.5, 4-pole	2	< 20
	3	< 30
10	2	< 20
	3	< 30

The leakage currents are measured in accordance with EN 60 355-1.

20.3 Inputs/output

Digital

External potential-free switch.

Voltage: 5 VDC.

Current: < 5 mA.

Screened cable: 0.5 - 1.5 mm².

Sensor signals

- Voltage signal
0-10 VDC, $R_i > 50 \text{ k}\Omega$ (via internal voltage supply).
Tolerance: +0%/–3% at maximum voltage signal.
Screened cable: 0.5 - 1.5 mm².
Maximum cable length: 500 m, 1640 ft.
- Current signal
DC 0-20 mA/4-20 mA, $R_i = 175 \Omega$
Tolerance: +0%/–3% at maximum current signal.
Screened cable: 0.5 - 1.5 mm².
Maximum cable length: 500 m, 1640 ft.
- Electricity supply to sensor:
+24 VDC, max. 40 mA.

Signal output

Potential-free changeover contact.

Maximum contact load: 250 VAC, 2 A.

Minimum contact load: 5 VDC, 10 mA.

Screened cable: 0.5 - 2.5 mm².

Maximum cable length: 500 m, 1640 ft.

Bus input

Grundfos bus protocol, GENIbus protocol, RS-485.

Screened 3-core cable: 0.5 - 1.5 mm².

Maximum cable length: 500 m, 1640 ft.

21. Other technical data

EMC (electromagnetic compatibility)

EN 61 800-3.

Residential areas - unlimited distribution, corresponding to CISPR 11, class B, group 1.

Industrial areas - unlimited distribution, corresponding to CISPR 11, class A, group 1.

Contact Grundfos for further information.

Enclosure class

Standard: IP 55 (IEC 34-5).

Insulation class

F (IEC 85).

Ambient temperature

- During operation: 32° F to 104° F.
- During storage/transport: -40° F to 140° F.

Relative air humidity

Maximum 95%.

Sound pressure level

Hydro Multi-E with single-phase pumps:

Motor size [HP]	Number of pumps in booster set		Sound pressure level [dB(A)]
	2	3	
0.5 to 1.5	●		60
		●	63

Hydro Multi-E with three-phase pumps:

Motor size [HP]	Number of pumps in booster set		Sound pressure level [dB(A)]
	2	3	
2	●		66
		●	68
3	●		67
		●	69
5	●		71
		●	73
7.5	●		71
		●	73
10	●		77
		●	79

22. Installation in the USA and Canada

Note

Applies only to single-phase pumps and three-phase pumps up to and including 7.5 kW.

In order to maintain the UL/cUL approval, these additional installation procedures must be followed. The UL approval is according to UL508C.

22.1 Electrical installation

22.1.1 Conductors

Use 140/167° F (60/75° C) copper conductors only.

22.1.2 Torques

Power terminal, M4: 21 in-lb. (2.35Nm.)

Relay, M2.5: 4.4 in-lb. (0.5 Nm.)

Input control, M2: 1.8 in-lb. (0.2 Nm.)

22.1.3 Line reactors

Line reactors are normally not required for use with 3-phase Grundfos MLE and MGE motors.

If a line reactor is required, select the reactor per the inductance limits listed below.

- Inductance < 1.5 mH (10hp and 7.5hp)
- Inductance < 2.0 mH (5hp - 1hp)

22.1.4 Fuse size/circuit breaker

The pump is "suitable for use on a circuit capable of delivering not more than 5000 A RMS symmetrical amperes, 480V maximum"

- when protected by fuses rated in the table below and/or
- "when protected by a circuit breaker having less let-through energy (i2t) and

less let-through current (Ip) than the fuse in the table below"

USA - hp

		Circuit breaker type				Fuse Models
		Max. pre-fuse size		Inverse time		
2-pole	4-pole	3/60/460	3/60/208-230	3/60/460	3/60/208-230	
0.33	0.33	25 A		25 A		Bussmann NOS*
0.5	0.5	25 A		25 A		Bussmann NOS*
0.75	0.75	25 A		25 A		Bussmann NOS*
1	1	25 A		25 A		Bussmann NOS*
1.5	1.5	25 A	35 A	25 A	35 A	Bussmann NOS*
2	2	25 A	35 A	25 A	35 A	Bussmann NOS*
3	3	25 A	35 A	25 A	35 A	Bussmann NOS*
5	5	40 A	60 A	40 A	60 A	Bussmann NOS*
7.5	–	40 A	60 A	40 A	60 A	Bussmann NOS*
10	7.5	50 A		50 A		Bussmann NOS*

Europa - kW

2-pole	4-pole	Max. pre-fuse size	Circuit breaker type	Fuse Models
–	0.55	25 A	25 A / Inverse time	Bussmann NOS*
0.75	0.75	25 A	25 A / Inverse time	Bussmann NOS*
1.1	1.1	25 A	25 A / Inverse time	Bussmann NOS*
1.5	1.5	25 A	25 A / Inverse time	Bussmann NOS*
2.2	2.2	25 A	25 A / Inverse time	Bussmann NOS*
3	3	25 A	25 A / Inverse time	Bussmann NOS*
4	4	40 A	40 A / Inverse time	Bussmann NOS*
5.5	–	40 A	40 A / Inverse time	Bussmann NOS*
7.5	5.5	50 A	50 A / Inverse time	Bussmann NOS*

* To comply with UL approval, use fuses with UL Fuse classification UL 248. It is recommended to use fast-acting pre-fuses by Bussmann type NOS fuses. Ferraz-Shawmut type OTS and Littelfuse type NLS fuses can also be used.

A UL 489 listed inverse-time circuit breaker having less let-through energy (i2t) and less let-through current (Ip) than the max pre-fuses listed above can also be used.

The voltage rating of the fuse and the inverse-time circuit breaker must be at least the same voltage rating as the drive.

22.1.5 Overload protection

Degree of overload protection provided internally by the drive, in percent of full-load current: 102%.

22.2 Before starting the pump

- The pump must always be connected to the power supply at least one hour prior to start.
- From then on the pump must always be connected to the power supply.

This procedure will help to avoid condensation in the terminal box.

23. Disposal

This product or parts of it must be disposed of in an environmentally sound way:

1. Use the public or private waste collection service.
2. If this is not possible, contact the nearest Grundfos company or service workshop.

Subject to alterations.

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