Grundfos_Pump_CRE_CRIE_CRNE_CRKE_SKPE_MTRE_CHIE_instr_D102

CRE, CRIE, CRNE, CRKE, SPKE, MTRE, CHIE, 1~ and 3~

(GB) **Installation and operating instructions**
(D) **Montage- und Betriebsanleitung**
(F) **Notice d'installation et d'entretien**
(I) **Istruzioni di installazione e funzionamento**
(E) **Instrucciones de instalación y funcionamiento**
(P) **Instruções de instalação e funcionamento**
(GR) **Οδηγίες εγκατάστασης και λειτουργίας**
(NL) **Installatie- en bedieningsinstructies**
(S) **Monterings- och driftsinstruktion**
(SF) **Asennus- ja käyttöohjeet**
(DK) **Monterings- og driftsinstruktion**

Declaration of Conformity

We **GRUNDFOS** declare under our sole responsibility that the products **CRE, CRIE, CRNE, CRKE, SPKE, MTRE** and **CHIE**, to which this declaration relates, are in conformity with the Council Directives on the approximation of the laws of the EEC Member States relating to:

– Machinery (98/37/EEC).
  Standard used: EN 292.
– Electromagnetic compatibility (89/336/EEC).
  Standard used: EN 61 800-3.
– Electrical equipment designed for use within certain voltage limits (73/23/EEC).
  Standards used: EN 60 335-1 and EN 60 335-2-51.

Konformitätserklärung

Wir **GRUNDFOS** erklären in alleiniger Verantwortung, daß die Produkte **CRE, CRIE, CRNE, CRKE, SPKE, MTRE** und **CHIE**, auf die sich diese Erklärung bezieht, mit den folgenden Richtlinien des Rates zur Angleichung der Rechtsvorschriften der EG-Mitgliedstaaten übereinstimmen:

– Maschinen (98/37/EWG).
  Norm, die verwendet wurde: EN 292.
– Elektromagnetische Verträglichkeit (89/336/EWG).
  Norm, die verwendet wurde: EN 61 800-3.
– Elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen (73/23/EWG).
  Normen, die verwendet wurden: EN 60 335-1 und EN 60 335-2-51.

Déclaration de Conformité

Nous **GRUNDFOS** déclarons sous notre seule responsabilité que les produits **CRE, CRIE, CRNE, CRKE, SPKE, MTRE** et **CHIE** auxquels se réfère cette déclaration sont conformes aux Directives du Conseil concernant le rapprochement des législations des Etats membres CEE relatives à

– Machines (98/37/CEE).
  Standard utilisé: EN 292.
– Compatibilité électromagnétique (89/336/CEE).
  Standard utilisé: EN 61 800-3.
– Matériel électrique destiné à employer dans certaines limites de tension (73/23/CEE).
  Standards utilisés: EN 60 335-1 et EN 60 335-2-51.

Dichiarazione di Conformità

Noi **GRUNDFOS** dichiariamo sotto la nostra esclusiva responsabilità che i prodotti **CRE, CRIE, CRNE, CRKE, SPKE, MTRE** e **CHIE**, ai quali questa dichiarazione si riferisce, sono conformi alle direttive del Consiglio, concernenti il ravvicinamento delle legislazioni degli Stati membri CEE relativi a

– Macchine (98/37/CEE).
  Standard usato: EN 292.
– Compatibilità elettromagnetica (89/336/CEE).
  Standard usato: EN 61 800-3.
– Materiale elettrico destinato ad essere utilizzato entro certi limiti di tensione (73/23/CEE).
  Standard usati: EN 60 335-1 e EN 60 335-2-51.

Declaración de Conformidad

Nosotros **GRUNDFOS** declaramos bajo nuestra única responsabilidad que los productos **CRE, CRIE, CRNE, CRKE, SPKE, MTRE** y **CHIE** a los cuales se refiere esta declaración son conformes con las Directivas del Consejo relativas a la aproximación de las legislaciones de los Estados Miembros de la CEE sobre

– Máquinas (98/37/CEE).
  Norma aplicada: EN 292.
– Compatibilidad electromagnética (89/336/CEE).
  Norma aplicada: EN 61 800-3.
– Material eléctrico destinado a utilizarse con determinados límites de tensión (73/23/CEE).
  Normas aplicadas: EN 60 335-1 y EN 60 335-2-51.

Declaração de conformidade

Nós **GRUNDFOS** declaramos sob nossa responsabilidade que os produtos **CRE, CRIE, CRNE, CRKE, SPKE, MTRE** e **CHIE**, aos quais esta declaração se refere, estão em conformidade com as Directivas Comunitárias com aproximação das leis dos estados membros da CEE para:

– Máquinas (98/37/CEE).
  Norma usada: EN 292.
– Compatibilidades Electromagnéticas (89/336/CEE).
  Norma usada: EN 61 800-3.
– Equipamento Eléctrico desenhado para uso de certos limites de tensão (73/23/CEE).
  Norma usada: EN 60 335-1 e EN 60 335-2-51.

Δήλωση Συμμόρφωσης

Εμείς η **GRUNDFOS** δηλώνουμε με αποκλειστικά δική μας ευθύνη ότι τα προιόντα **CRE, CRIE, CRNE, CRKE, SPKE, MTRE** και **CHIE** συμμορφώνονται με την Οδηγία του Συμβουλίου επί της σύγκλισης των νόμων των Κρατών Μελών της Ευρωπαικής Ενωσης σε σχέση με τα:

– Μηχανήματα (98/37/EEC).
  Πρότυπο που χρησιμοποιήθηκε: EN 292.
– Ηλεκτρομαγνητική συμβατότητα (89/336/EEC).
  Πρότυπο που χρησιμοποιήθηκε: EN 61 800-3.
– Ηλεκτρικές συσκευές σχεδιασμένες γιά χρήση εντός ορισμένων ορίων ηλεκτρικής τάσης (73/23/EEC).
  Πρότυπα που χρησιμοποιήθηκαν: EN 60 335-1 και EN 60 335-2-51.

Overeenkomstigheidsverklaring

Wij **GRUNDFOS** verklaren geheel onder eigen verantwoordelijkheid dat de produkten **CRE, CRIE, CRNE, CRKE, SPKE, MTRE** en **CHIE** waarop deze verklaring betrekking heeft in overeenstemming zijn met de Richtlijnen van de Raad inzake de onderlinge aanpassing van de wetgevingen van de Lid-Staten betreffende

– Machines (98/37/EEG).
  Norm: EN 292.
– Elektromagnetische compatibiliteit (89/336/EEG).
  Norm: EN 61 800-3.
– Elektrisch materiaal bestemd voor gebruik binnen bepaalde spanningsgrenzen (73/23/EEG).
  Normen: EN 60 335-1 en EN 60 335-2-51.

Försäkran om överensstämmelse

Vi **GRUNDFOS** försäkrar under ansvar, att produkterna **CRE, CRIE, CRNE, CRKE, SPKE, MTRE** och **CHIE**, som omfattas av denna försäkran, är i överensstämmelse med Rådets Direktiv om inbördes närmande till EU-medlemsstaternas lagstiftning, avseende

– Maskinell utrustning (98/37/EC).
  Använd standard: EN 292.
– Elektromagnetisk kompatibilitet (89/336/EC).
  Använd standard: EN 61 800-3.
– Elektrisk material avsedd för användning inom vissa spänningsgränser (73/23/EC).
  Använda standarder: EN 60 335-1 och EN 60 335-2-51.

Vastaavuusvakuutus

Me **GRUNDFOS** vakuutamme yksin vastuullisesti, että tuotteet **CRE, CRIE, CRNE, CRKE, SPKE, MTRE** ja **CHIE**, jota tämä vakuutus koskee, noudattavat direktiivejä jotka käsittelevät EY:n jäsenvaltioiden koneellisia laitteita koskevien lakien yhdenmukaisuutta seur.:

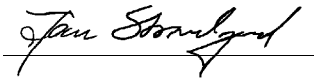
– Koneet (98/37/EY).
  Käytetty standardi: EN 292.
– Elektromagneettinen vastaavuus (89/336/EY).
  Käytetty standardi: EN 61 800-3.
– Määrättyjen jänniterajoitusten puitteissa käytettävät sähköiset laitteet (73/23/EY).
  Käytetyt standardit: EN 60 335-1 ja EN 60 335-2-51.

Overensstemmelseserklæring

Vi **GRUNDFOS** erklærer under ansvar, at produkterne **CRE, CRIE, CRNE, CRKE, SPKE, MTRE** og **CHIE**, som denne erklæring omhandler, er i overensstemmelse med Rådets direktiver om indbyrdes tilnærmelse til EF medlemsstaternes lovgivning om:

– Maskiner (98/37/EEC).
  Anvendt standard: EN 292.
– Elektromagnetisk kompatibilitet (89/336/EEC).
  Anvendt standard: EN 61 800-3.
– Elektrisk materiel bestemt til anvendelse inden for visse spændingsgrænser (73/23/EEC).
  Anvendte standarder: EN 60 335-1 og EN 60 335-2-51.

Bjerringbro, 1st January 2002



Jan Strandgaard
Technical Manager

CRE, CRIE, CRNE, CRKE, SPKE, MTRE, CHIE, 1~ and 3~

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CONTENTS

Before beginning installation procedures, these installation and operating instructions should be studied carefully. **Furthermore, the enclosed installation and operating instructions for the standard pump should be studied carefully.** The installation and operation should also be in accordance with local regulations and accepted codes of good practice.

1. General

GRUNDFOS E-pumps are pumps fitted with frequency-controlled standard motors for single-phase or three-phase mains connection.

The pumps have a built-in PI controller and can be connected to an external sensor enabling control of for instance pressure, differential pressure, temperature, differential temperature or flow in the system in which the pumps are installed. The pumps can be set to uncontrolled operation, i.e. the pump performance can be set according to the demand.

The pumps are typically used as pressure booster pumps in systems with variable demands.

The desired setpoint can be set directly on the pump control panel, via an input for external setpoint signal or by means of the GRUNDFOS wireless remote control R100.

All other settings are made by means of the R100.

Important parameters such as actual value of control parameter, power consumption, etc. can be read via the R100.

The pump incorporates inputs for external potential-free contacts for start/stop and digital function. The digital function enables external setting of max. curve, min. curve, external fault function or flow switch.

The pump incorporates an output for a potential-free fault, operating or ready signal.

Furthermore, the pump has an input for bus communication. Via the bus communication input, the pump can be controlled and monitored by a building management system or another external control system.

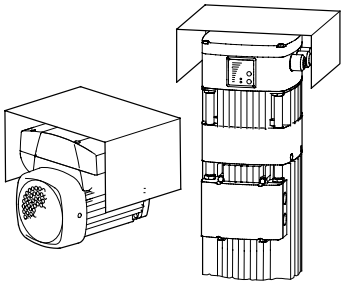
2. Installation

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

- Place the pump in such a way that sufficient cooling is ensured.
- The temperature of the cooling air must not exceed 40°C.
- Motor cooling fins and fan blades must be kept clean.

When installed outdoors, the motor must be provided with a suitable cover to avoid condensation on the electronic components, fig. 1.

Fig. 1



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For further installation, see installation and operating instructions for the standard pump.

2.1 Electrical connection – 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 pump terminal box unless the electricity supply has been switched off for at least 5 minutes.

2.1.1 Mains switch

The pump 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.

2.1.2 Protection against electric shock – indirect contact

The pump must be earthed and protected against indirect contact in accordance with national regulations.

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

2.1.3 Additional protection

If the pump 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 pump can be found in section *12.2 Leakage current*.

2.1.4 Motor protection

The pump requires no external motor protection. The motor incorporates thermal protection against slow overloading and blocking (IEC 34-11: TP 211).

2.1.5 Overvoltage protection

The pump is overvoltage-protected through built-in varistors between phase-neutral and phase-earth.

2.1.6 Supply voltage

1 x 200-240 V ±10%, 50/60 Hz, PE.

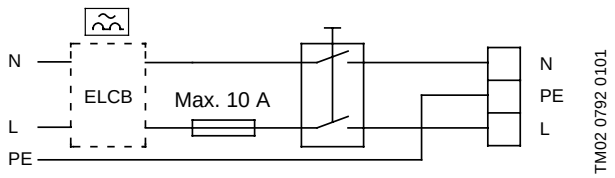
The supply voltage and frequency are marked on the pump nameplate. Please make sure that the motor is suitable for the electricity supply on which it will be used.

The wires in the pump terminal box 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.

Figure 2 shows an example of a mains-connected pump with mains switch, back-up fuses and additional protection.

Fig. 2

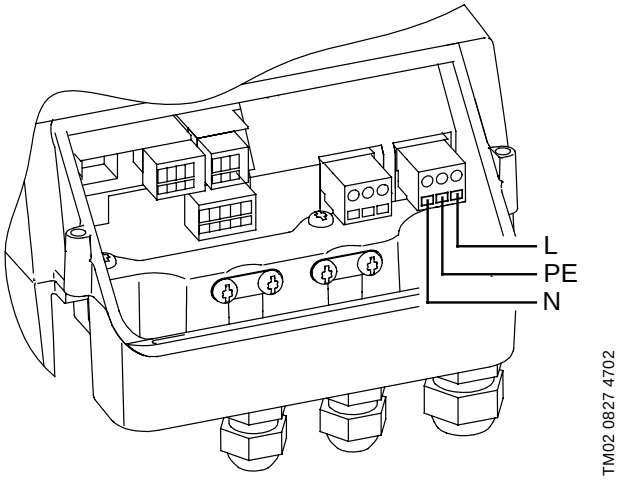
MGE 71 and MGE 80



Actual mains connection is shown in fig. 3.

Fig. 3

MGE 71 and MGE 80



2.1.7 Start/stop of pump

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

If a higher number of starts and stops is desired, the input for external start/stop must be used when starting/stopping the pump. When the pump is started/stopped via an external on/off switch, it will start immediately.

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2.2 Electrical connection – three-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 pump terminal box unless the electricity supply has been switched off for at least 5 minutes.

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2.2.1 Mains switch

The pump 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.

2.2.2 Protection against electric shock – indirect contact

The pump must be earthed and protected against indirect contact in accordance with national regulations.

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

Note: As the leakage current of 4 kW to 7.5 kW motors is > 3.5 mA, these motors must be connected to especially reliable/sturdy earth connections.

The leakage current of the individual motor size can be found in section *13.2 Leakage current*.

EN 50 178 and BS 7671 specify the following:

Leakage current > 3.5 mA:
The pump must be stationary and installed permanently. Furthermore, the pump must be connected permanently to the electricity supply or may be connected via an industrial type of plug (CEE). The plug must comply with EN 60 309 or IEC 309.

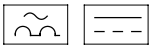
- The earth connection must be carried out as duplicate conductors.

2.2.3 Additional protection

If the pump 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 pumps an earth leakage circuit breaker **type B** must be used.
This circuit breaker must be marked with the following symbols:


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 pump can be found in section *13.2 Leakage current*.

2.2.4 Motor protection

The pump requires no external motor protection. The motor incorporates thermal protection against slow overloading and blocking (IEC 34-11: TP 211).

2.2.5 Overvoltage protection

The pump is overvoltage-protected through built-in varistors between the phases and between phases and earth.

2.2.6 Supply voltage

3 x 380-415 V ±10%, 50/60 Hz, PE.

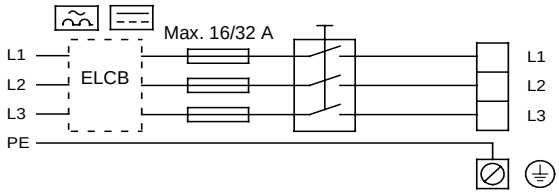
The supply voltage and frequency are marked on the pump nameplate. Please make sure that the motor is suitable for the electricity supply on which it will be used.

The wires in the pump terminal box 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.

Figure 4 shows an example of a mains-connected pump with mains switch, back-up fuses and additional protection.

Fig. 4

MGE 90 to MGE 132



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Actual mains connection is shown in figs. 5 and 6.

Fig. 5

MGE 90 and MGE 100

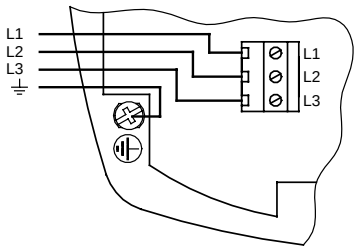

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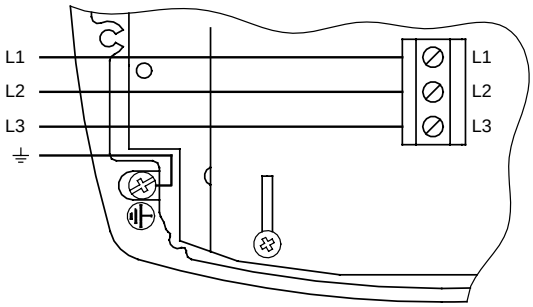
Fig. 6

MGE 112 and MGE 132



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2.2.7 Start/stop of pump

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

If a higher number of starts and stops is desired, the input for external start/stop must be used when starting/stopping the pump. When the pump is started/stopped via an external on/off switch, it will start immediately.

2.3 Other connections

The connection terminals of external potential-free contacts for start/stop and digital function, external setpoint signal, sensor signal, GENIbus and relay signal are shown in figs. 7, 8 and 9.

Note: If no external on/off switch is connected, short-circuit terminals 2 and 3 using a short wire.

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 signals, terminals 1-9, and bus connection, A, Y, B).

   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, NO, C).

   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. **Supply voltage** (terminals L and N or L1, L2, L3).

A galvanically safe separation must fulfil the requirements for reinforced insulation including creepage distances and clearances specified in EN 50 178.

Fig. 7

MGE 71 and MGE 80

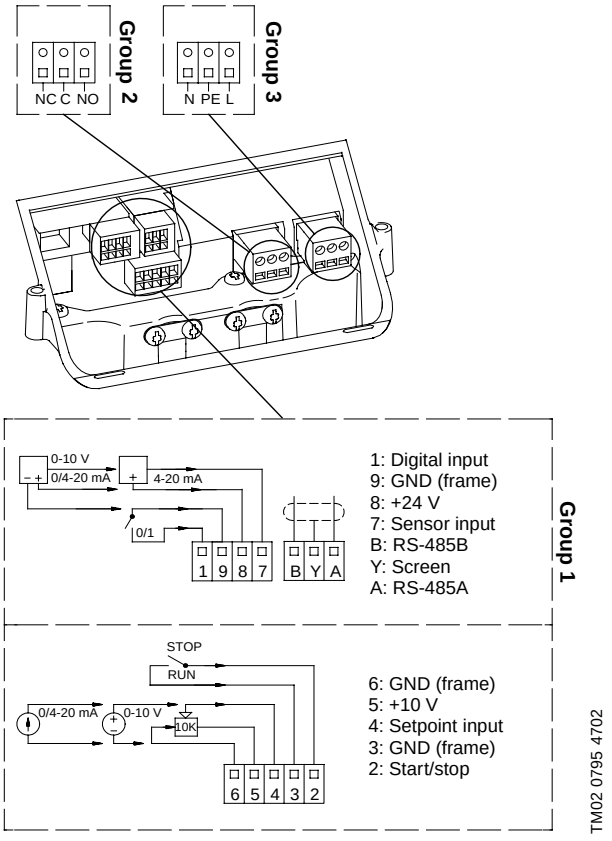

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Fig. 8

MGE 90 and MGE 100

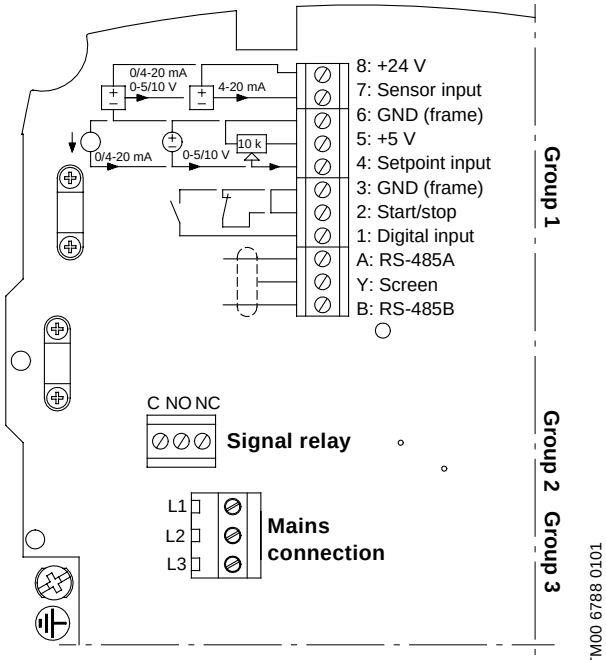

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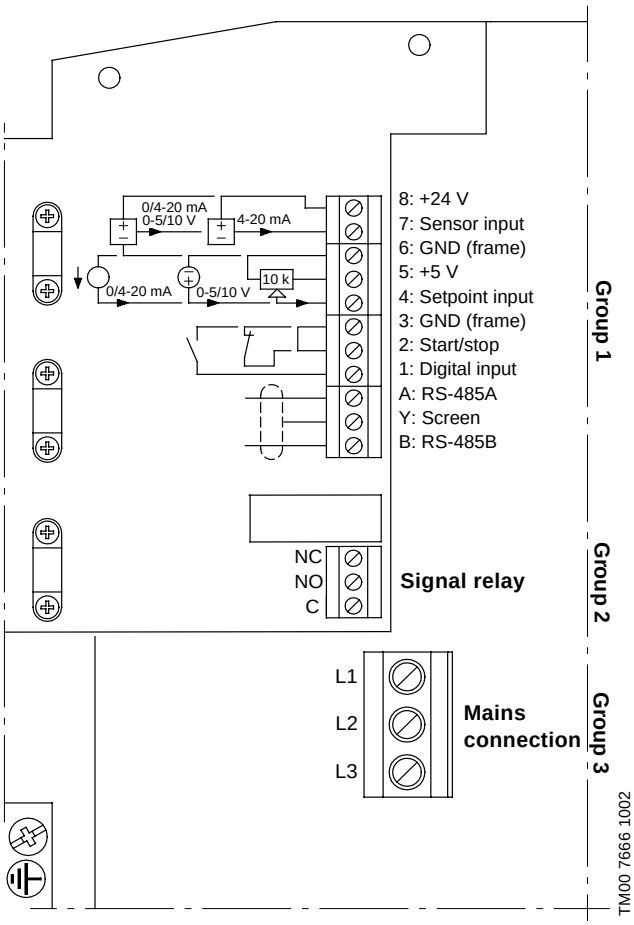
Fig. 9

MGE 112 and MGE 132



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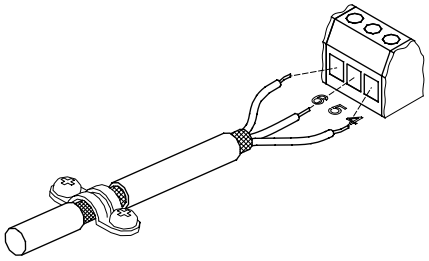
2.4 Signal cables

- Use screened cables having a cross-sectional area of min. 0.5 mm² and max. 1.5 mm² for external on/off switch, digital input, setpoint and sensor signals.
- The screens of the cables must be connected to frame at both ends with good frame connection. They must be as close as possible to the terminals, fig. 10.

Fig. 10



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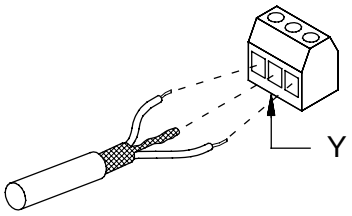
- Screws for frame connections must always be tightened whether a cable is fitted or not.
- The wires in the pump terminal box must be as short as possible.

For the bus connection a screened 2-core cable must be used. Connect the screen to terminal Y at both ends, fig. 11.

Fig. 11



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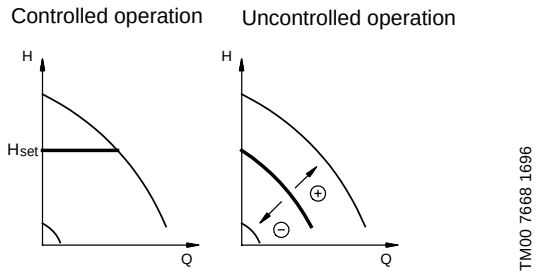
3. Setting the pump

E-pumps can be set to two control modes, i.e. controlled and uncontrolled operation, fig. 12.

In **controlled**-operation mode, the pump will adjust its performance to the desired setpoint for the control parameter (pressure, differential pressure, temperature, differential temperature or flow). Figure 12 shows a pressure-controlled pump as an example of controlled operation.

In **uncontrolled**-operation mode, the pump will operate according to the constant curve set.

Fig. 12



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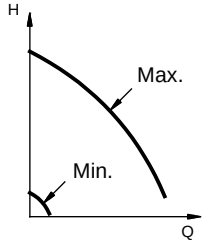
The pumps have been factory-set to uncontrolled operation, see section *3.1 Factory setting.*

In addition to normal operation (controlled or uncontrolled operation), the following operating modes can be selected, **Stop**, **Min**. or **Max**., fig. 13.

Fig. 13



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The max. curve can for instance be used in connection with the venting procedure during installation.
The min. curve can be used in periods in which a minimum flow is required.

The operating modes (Stop, Normal, Min., Max.) can all be set on the pump control panel.

If the electricity supply to the pump is disconnected, the pump setting will be stored.

The remote control R100 offers additional possibilities of setting and status displays, see section *5. Setting by means of R100.*

3.1 Factory setting

The pumps have been factory-set to uncontrolled operation. The setpoint value corresponds to 100% of the maximum pump performance (see data sheet for the pump).

Other pump settings are marked with ***bold***-faced type under each individual display in sections *5.1 Menu OPERATION* and *5.3 Menu INSTALLATION.*

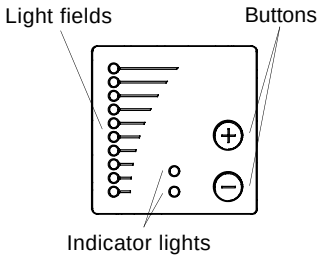
4. Setting by means of control panel

At high system temperatures, the pump may be so hot that only the buttons should be touched to avoid burns.

The pump control panel, fig. 14, incorporates the following:

- Buttons, “+” and “–”, for setpoint setting.
- Light fields, yellow, for indication of setpoint.
- Indicator lights, green (operation) and red (fault).

Fig. 14



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4.1 Setpoint setting

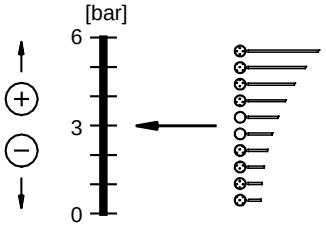
The desired setpoint is set by pressing the button “+” or “–”.

The light fields on the control panel will indicate the setpoint set. See the following examples, figs. 15 and 16.

Example: Pump in controlled-operation mode (pressure control):

Figure 15 shows that the light fields 5 and 6 are activated, indicating a desired setpoint of 3 bar with a sensor measuring range from 0 to 6 bar. The setting range is equal to the sensor measuring range (see sensor nameplate).

Fig. 15

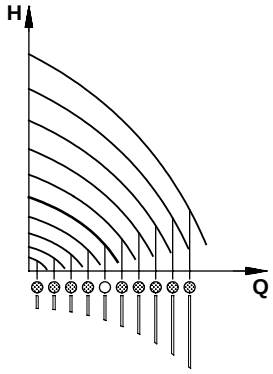


TM00 7743 1896

Example: Pump in uncontrolled-operation mode:

In uncontrolled-operation mode, the pump performance is set within the range from min. to max. curve, fig. 16.

Fig. 16



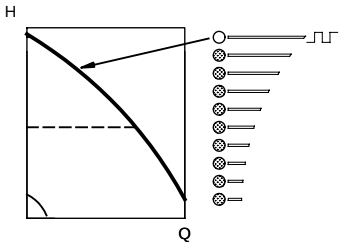
TM00 7746 1896

4.2 Setting to max. curve duty

Press “+” continuously to change over to the max. curve of the pump (top light field flashes). When the top light field is on, “+” must be pressed for 3 seconds before the light field starts flashing.

To change back, press “–” continuously until the desired setpoint is indicated.

Fig. 17



Max. curve

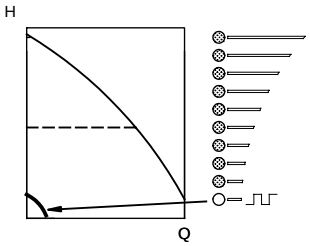
TM00 7345 1196

4.3 Setting to min. curve duty

Press “–” continuously to change over to the min. curve of the pump (bottom light field flashes). When the bottom light field is on, “–” must be pressed for 3 seconds before the light field starts flashing.

To change back, press “+” continuously until the desired setpoint is indicated.

Fig. 18



Min. curve

TM00 7346 1196

4.4 Start/stop of pump

Stop the pump by continuously pressing “–” until none of the light fields are activated and the green indicator light flashes.

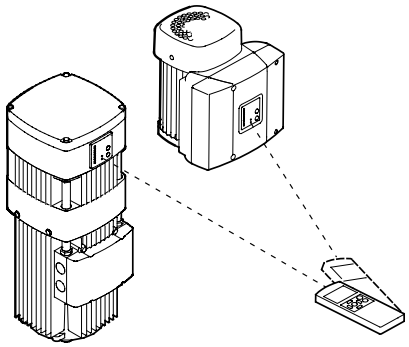
Start the pump by continuously pressing “+” until the desired setpoint is indicated.

5. Setting by means of R100

The pump is designed for wireless communication with the GRUNDFOS remote control R100.

The R100 communicates with the pump via infra-red light. The transmitter and the receiver are incorporated in the pump control panel, fig. 19.

Fig. 19



TM02 0791 0101

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

The R100 offers additional possibilities of setting and status displays for the pump.

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The displays are divided into four parallel menus, fig. 20:

0. GENERAL (see operating instructions for the R100)

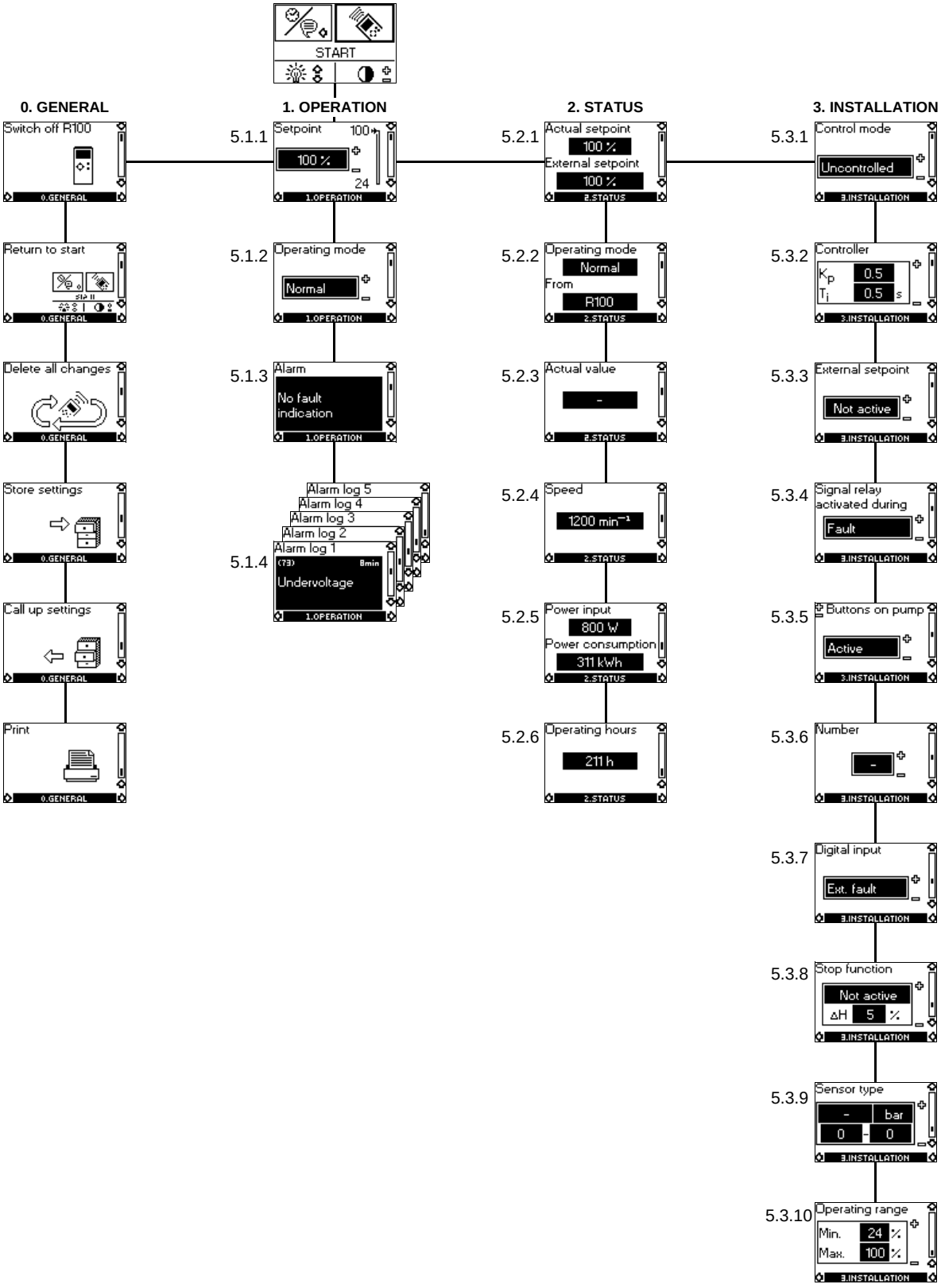
1. OPERATION

2. STATUS

3. INSTALLATION

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

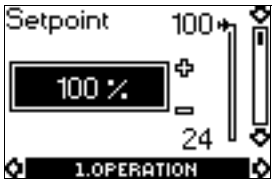
Fig. 20



5.1 Menu OPERATION

When communication between the R100 and the pump has been established, the first display in this menu will appear.

5.1.1 Setpoint setting



- Setpoint set
- Actual setpoint
- Actual value

In this display, the setpoint is set.

In **controlled**-operation mode, the setting range is equal to the sensor measuring range.

In **uncontrolled**-operation mode, the setpoint is set in % of the maximum performance. The setting range will lie between the min. and max. curves.

Select one of the following operating modes:

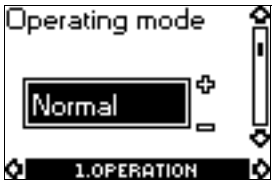
- *Stop*,
- *Min.* (min. curve),
- *Max.* (max. curve).

If the pump is connected to an external setpoint signal, the setpoint in this display will be the maximum value of the external setpoint signal, see section *7. External setpoint signal.*

If the pump is controlled via external signals (Stop, Min. curve or Max. curve) or a bus, this will be indicated in the display if setpoint setting is attempted.

In this case, the number of possible settings will be reduced, see section *9. Priority of settings.*

5.1.2 Setting of operating mode

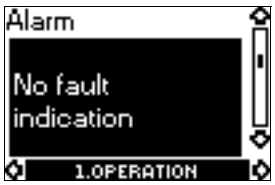


Select one of the following operating modes:

- *Stop*,
- *Min.*,
- ***Normal*** (duty),
- *Max*.

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

5.1.3 Fault indications



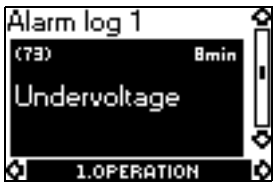
If the pump is faulty, the cause will appear in this display.

Possible causes:

- *Too high motor temperature*
- *Undervoltage*
- *Overvoltage*
- *Phase failure* (three-phase pumps only)
- *Mains supply failure* (three-phase pumps only)
- *Too many restarts* (after faults)
- *Overload*
- *Sensor signal outside signal range* (only 4-20 mA)
- *Setpoint signal outside signal range* (only 4-20 mA)
- *External fault*
- *Dry running*
- *Other fault*

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

5.1.4 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”, the fault code and the number of minutes the pump has been connected to the electricity supply after the fault occurred.

The time cannot be displayed for three-phase pumps as the software does not support this function.

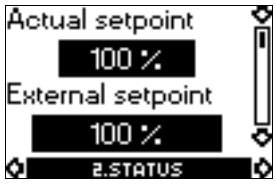
5.2 Menu STATUS

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 pump 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.

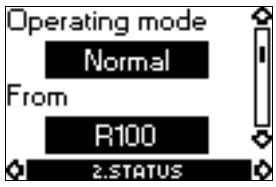
5.2.1 Display of actual setpoint



Tolerance: ±2%

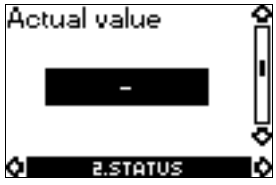
This display shows the actual setpoint and the external setpoint in % of the range from minimum value to the setpoint set, see section *7. External setpoint signal.*

5.2.2 Display of operating mode



This display shows the actual operating mode (*Stop, Min., Normal* (duty) 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 *5.3.8 Setting of stop function.*

5.2.3 Display of actual value



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

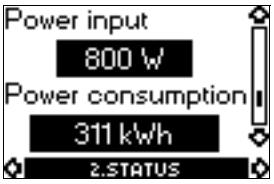
If no sensor is connected to the pump, "–" will appear in the display.

5.2.4 Display of actual speed

Tolerance: ±5%

The actual pump speed will appear in this display.

5.2.5 Display of input power and power consumption



Tolerance: ±10%

This display shows the actual pump input power from the mains supply. The power is displayed in W or kW.

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

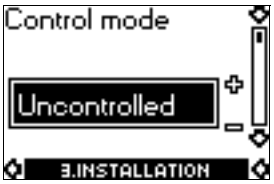
5.2.6 Display of operating hours

Tolerance: ±2%

The value of operating hours is an accumulated value and cannot be reset.

5.3 Menu INSTALLATION

5.3.1 Selection of control mode



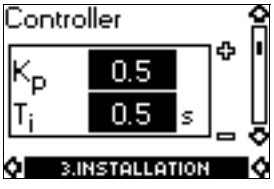
Select one of the following control modes (see fig. 12):

- *Controlled*,
- ***Uncontrolled***.

The desired performance is set in section *5.1.1 Setpoint setting.*

Note: If the pump is connected to a bus (see section *8. Bus signal*), it is not possible to select the control mode via the R100.

5.3.2 Setting 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.

Furthermore, it is possible to set the controller to inverse control (if the setpoint is increased, the speed will be reduced). In the case of inverse control, the gain (K_p) must be set within the range from *–0.1* to *–20*.

Setting the PI controller:

For most applications, the factory setting of the controller constants K_p and T_i will ensure optimum pump operation. In the following cases, a change of the setting can be useful or necessary.

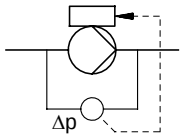
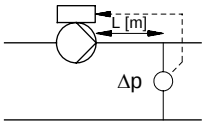
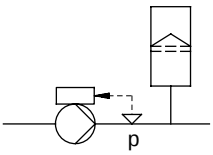
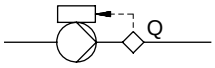
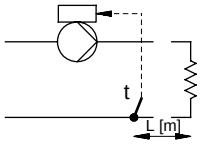
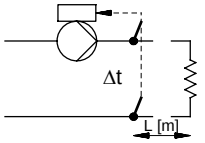
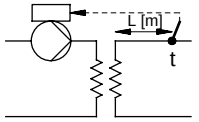
A change of the T_i setting can be useful:

- in a differential-pressure control system if the sensor is placed far away from the pump.

A change of the T_i setting, and in some cases the K_p setting, may be necessary:

- if the pump is controlled on the basis of temperature or differential temperature.

The table below shows the recommended controller settings:

System/ application	K_p		T_i
	Heating system[1]	Cooling system[2]	
	**0.5**		**0.5**
	**0.5**		L < 5 m: **0.5** L > 5 m: 3 L > 10 m: 5
	**0.5**		**0.5**
	**0.5**		**0.5**
	**0.5**	–0.5	10 + 5L
	**0.5**		10 + 5L
	**0.5**	–0.5	30 + 5L

1. Heating systems are systems in which an increase in pump performance will result in a **rise** in temperature at the sensor.
2. Cooling systems are systems in which an increase in pump performance will result in a **drop** in temperature at the sensor.

5.3.3 Selection of external setpoint signal

The input for external setpoint signal can be set to different signal types.

Select one of the following types:

- *0-5 V* (potentiometer) (three-phase pumps only),
- *0-10 V*,
- *0-20 mA*,
- *4-20 mA*,
- ***Not active***.

If *Not active* is selected, the setpoint set by means of the R100 or on the control panel will apply.

The setpoint set is the maximum value of the external setpoint signal, section *7. External setpoint signal.* The actual value of the external setpoint can be read from section *5.2.1 Display of actual setpoint.*

5.3.4 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 *10. Indicator lights and signal relay.*

5.3.5 Blocking of the buttons on the pump

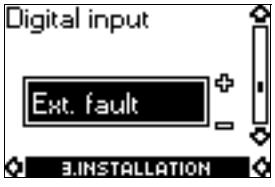
The buttons “+” and “–” on the pump can be set to:

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

5.3.6 Allocation of pump number

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

5.3.7 Selection of function for digital input



The digital input of the pump (terminal 1, fig. 7, 8 or 9) can be set to different functions.

Select one of the following functions:

- *Min.* (min. curve),
- *Max.* (max. curve),
- ***Ext. fault*** (external fault),
- *Flow switch*.

The selected function is activated by closing the contact between the following terminals:

- 1 and 9 of single-phase pumps (fig. 7) and
- 1 and 3 of three-phase pumps (fig. 8 or 9).

See also section *6.2 Digital input*.

Min.:
When the input is activated, the pump is operating according to the min. curve.

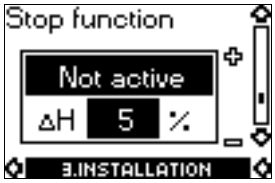
Max.:
When the input is activated, the pump is operating according to the max. curve.

Ext. fault:
When the input is activated, a timer is started. If the input is activated for more than 5 seconds, the pump is stopped and a fault is indicated. If the connection is disconnected for more than 5 seconds, the fault condition will cease and the pump can be restarted manually by resetting the fault indication.
The typical application will be detection of missing inlet pressure or water shortage by means of a pressure switch installed on the suction side of a pump.

Flow switch:
When this function is active, the pump will be stopped when a connected flow switch detects a low flow.
It is only possible to use this function if the pump is connected to a pressure sensor.

When the input is activated for more than 5 seconds, the stop function incorporated in the pump will take over, see section *5.3.8 Setting of stop function*.

5.3.8 Setting of stop function



When the stop function is active, the pump will be stopped at very low flows to avoid unnecessary power consumption.
It is only possible to use this function if the pump is connected to a pressure sensor.

The stop function can be set to:

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

There are two possibilities of low-flow detection:

1. By means of the built-in “low-flow detector” which automatically starts functioning if no flow switch is chosen/connected to the digital input. The pump 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 pump will detect a low flow.
2. By means of a flow switch connected to the digital input. When the input is activated for more than 5 seconds, the stop function of the pump takes over. Unlike the built-in low-flow detector, the flow switch measures the minimum flow at which the pump must stop. The pump will not check the flow regularly by reducing the speed.

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

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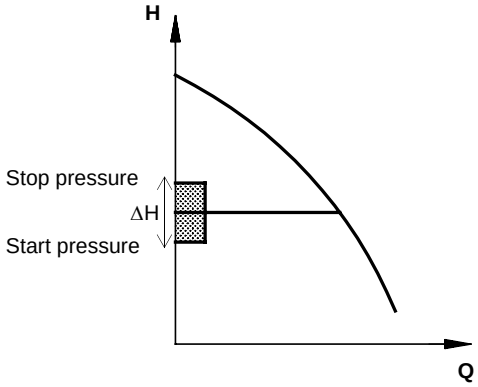
ΔH indicates the difference between start and stop pressures, fig. 21.

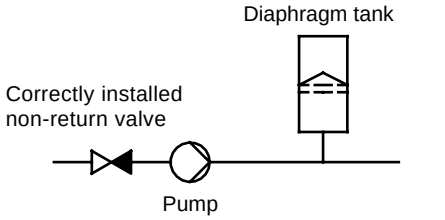
Fig. 21



ΔH is factory-set to **10% of actual setpoint**.
ΔH can be set within the range from 5% to 30% of actual setpoint.

Note: The non-return valve must be fitted immediately before the pump, fig. 22. If the non-return valve is fitted between pump and diaphragm tank, the pressure sensor must be fitted after the non-return valve.

Fig. 22



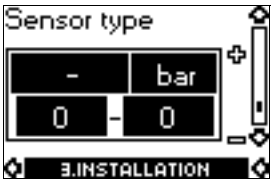
The stop function requires a diaphragm tank of a certain minimum size. The tank must be installed immediately after the pump and the precharge pressure must be 0.7 x actual setpoint.

Recommended diaphragm tank size when no flow switch is connected.

Nominal flow of pump [m³/h]	Diaphragm tank size [litres]
0-6	8
7-24	18
25-40	50
41-70	120

If a diaphragm tank of the above size is installed in the system, the factory setting of ΔH is the correct setting.
If the tank installed is too small, the pump will start and stop too often. This can be remedied by increasing ΔH.

5.3.9 Setting of sensor

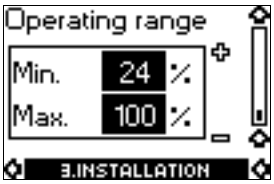


The setting of the sensor is only carried out in the case of controlled operation.

Select the following:

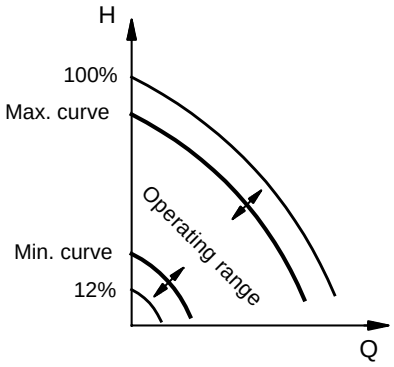
- Sensor output signal (*0-5 V* (three-phase pumps only), *0-10 V, 0-20 mA* or *4-20 mA),*
- sensor measuring unit (*bar, mbar, m, kPa, psi, ft, m³/h, m³/s, l/s, gpm, °C, °F* or *%)* and
- sensor measuring range.

5.3.10 Setting of min. and max. curves



Set the min. and max. curves in % of maximum performance if the operating range must be reduced, fig. 23.

Fig. 23



- The max. curve can be adjusted within the range from maximum performance (100%) to min. curve.
- The min. curve can be adjusted within the range from max. curve to 12% of maximum performance. The pump has been factory-set to 24% of maximum performance.
- The operating range lies between the min. and max. curves.

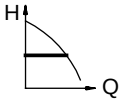
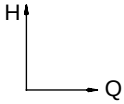
6. External forced-control signals

The pump has inputs for external signals for the forced-control functions:

- Start/stop of pump.
- Digital function.

6.1 Start/stop input

Functional diagram: Start/stop input:

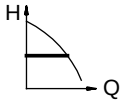
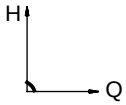
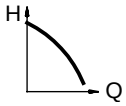
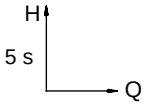
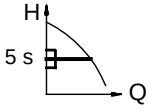
Start/stop (terminals 2 and 3)		
		**Normal duty**
		**Stop**

6.2 Digital input

By means of the R100, one of the following functions can be selected for the digital input:

- Min. curve.
- Max. curve.
- External fault.
- Flow switch.

Functional diagram: Input for digital function:

Digital function (terminals 1 and 9 – single-phase pumps) (terminals 1 and 3 – three-phase pumps)		
		**Normal duty**
		**Min. curve**
		**Max. curve**
		**External fault**
		**Flow switch**

7. External setpoint signal

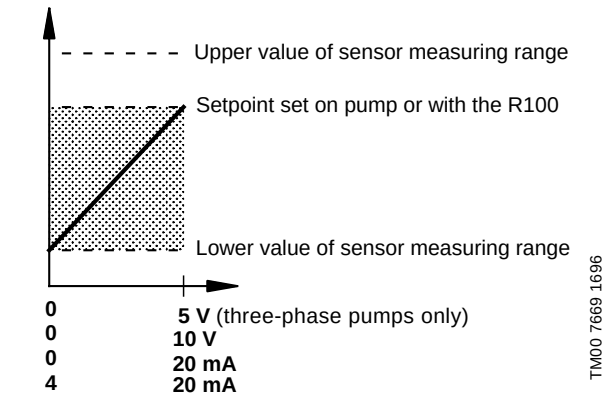
By connecting an analog signal transmitter to the input for the setpoint signal (terminal 4), it is possible to remote-set the setpoint.

The actual external signal (*0-5 V* (three-phase pumps only), *0-10 V, 0-20 mA, 4-20 mA)* must be selected via the R100, see section *5.3.3 Selection of external setpoint signal.*

If uncontrolled operation is selected by means of the R100, the pump can be controlled by any controller.

In **controlled**-operation mode, the setpoint can be set externally within the range from the lower value of the sensor measuring range to the setpoint set on the pump or by means of the R100, fig. 24.

Fig. 24



Example: At a lower pressure-sensor value of 0 bar, a setpoint set of 5 bar and an external setpoint of 80%, the actual setpoint will be as follows:

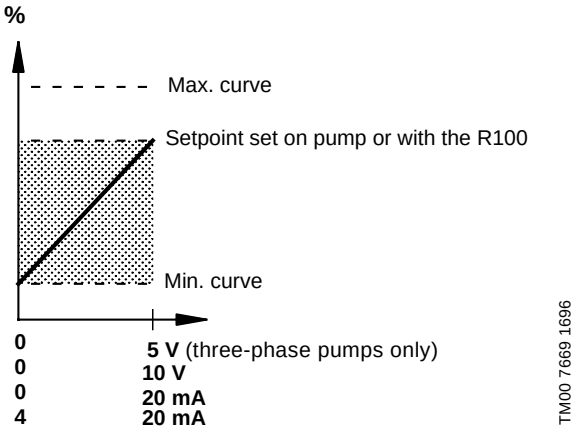
$H_{actual} = (H_{set} - H_{lower}) \times \%_{external\ setpoint} + H_{lower}$

$= (5 - 0) \times 80\% + 0$

$= 4$ bar

In **uncontrolled**-operation mode, the setpoint can be set externally within the range from the min. curve to the setpoint set on the pump or by means of the R100, fig. 25.

Fig. 25



8. Bus signal

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

Via the bus signal, it is possible to remote-set pump operating parameters, like setpoint, operating mode, etc. At the same time, the pump 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.

9. Priority of settings

The start/stop and digital inputs will influence the number of possible settings.

By means of the R100, the pump can always be set to max. curve duty or to stop.

If two or more functions are activated at the same time, the pump will operate according to the function with the highest priority.

The priority of the settings is as shown in the following tables:

Without bus signal		
Priority	**Possible settings**	
	Control panel on pump or R100	**External signals**
1	Stop	
2	Max. curve	
3		Stop
4		Max. curve
5	Min. curve	Min. curve
6	Setpoint setting	Setpoint setting

Example: If, via the digital input, the pump has been forced to operate according to the max. curve, the pump control panel and the R100 can only set the pump to stop.

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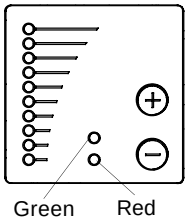
With bus signal			
Priority	Possible settings		
	Control panel on pump or R100	External signals	Bus signal
1	Stop		
2	Max. curve		
3		Stop	Stop
4			Max. curve
5			Min. curve
6			Setpoint setting

Example: If, via the digital input, the pump has been forced to operate according to the max. curve, the pump control panel, the R100 and the bus signal can only set the pump to stop.

10. Indicator lights and signal relay

The operating condition of the pump is indicated by the green and red indicator lights on the pump control panel, fig. 26.

Fig. 26



TM00 7600 1196

The pump 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 *5.3.4 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	C NO NC	C NO NC	C NO NC	The electricity supply has been switched off.
Off	Permanently on	C NO NC	C NO NC	C NO NC	The pump is operating.
Off	Flashing	C NO NC	C NO NC	C NO NC	The pump has been set to stop.
Permanently on	Off	C NO NC	C NO NC	C NO NC	The pump has stopped because of a fault. Restarting will be attempted (it may be necessary to restart the pump by resetting the fault indication). In case of the fault causes “dry running” and “external fault”, the pump must be restarted manually by resetting the fault indication.
Permanently on	Permanently on	C NO NC	C NO NC	C NO NC	The pump is operating, but it has been stopped because of a fault. If the cause is “sensor signal outside signal range”, the pump will continue operating according to the max. curve and the fault indication cannot be reset until the signal is inside the signal range. If the cause is “setpoint signal outside signal range”, the pump will continue operating according to the min. curve and the fault indication cannot be reset until the signal is inside the signal range.
Permanently on	Flashing	C NO NC	C NO NC	C NO NC	The pump has been set to stop, but it has been stopped because of a fault.

A fault indication can be reset in one of the following ways:

- By briefly pressing the button “+” or “–” on the pump. This will not change the setting of the pump.
  A fault indication cannot be reset by means of “+” or “–” if the buttons have been locked.
- By switching off the electricity supply until the indicator lights are off.
- By means of the R100, see section *5.1.3 Fault indications.*

When the R100 communicates with the pump, the red indicator light will flash rapidly.

11. Megging

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

12. Technical data – single-phase pumps

12.1 Supply voltage

1 x 200-240 V ±10%, 50/60 Hz, PE.

See nameplate.

Back-up fuse
Motor sizes from 0.37 to 1.1 kW: Max. 10 A.

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

12.2 Leakage current

Earth leakage current < 3.5 mA.

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

12.3 Inputs/output

Start/stop
External potential-free switch.
Voltage: 5 VDC.
Current: < 5 mA.
Screened cable.*

Digital
External potential-free switch.
Voltage: 5 VDC.
Current: < 5 mA.
Screened cable.*

Setpoint signals

- Potentiometer
  0-10 VDC, 50 kΩ (via internal voltage supply).
  Screened cable.*
  Maximum cable length: 100 m.
- Voltage signal
  0-10 VDC, R_i > 50 kΩ.
  Tolerance: +0%/–3% at maximum voltage signal.
  Screened cable.*
  Maximum cable length: 500 m.
- Current signal
  DC 0-20 mA/4-20 mA, R_i = 175 Ω.
  Tolerance: +0%/–3% at maximum current signal.
  Screened cable.*
  Maximum cable length: 500 m.

Sensor signals

- Voltage signal
  0-10 VDC, R_i > 50 kΩ (via internal voltage supply).
  Tolerance: +0%/–3% at maximum voltage signal.
  Screened cable.*
  Maximum cable length: 500 m.
- Current signal
  DC 0-20 mA/4-20 mA, R_i = 175 Ω.
  Tolerance: +0%/–3% at maximum current signal.
  Screened cable.*
  Maximum cable length: 500 m.
- 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, 1 mA.
Screened cable: 0.5 - 2.5 mm².
Maximum cable length: 500 m.

Bus input
GRUNDFOS bus protocol, GENIbus protocol, RS-485.
0.5 - 1.5 mm² screened 2-core cable.
Maximum cable length: 500 m.

* Cross section min. 0.5 mm² and max. 1.5 mm².

13. Technical data – three-phase pumps

13.1 Supply voltage

3 x 380-415 V ±10%, 50/60 Hz, PE.

See nameplate.

Back-up fuse
Motor sizes from 0.75 to 5.5 kW: Max. 16 A.
Motor size 7.5 kW: Max. 32 A.

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

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13.2 Leakage current

Motor size [kW]	Leakage current [mA]
0.75 to 3.0	< 3.5
4.0 to 5.5 5.5 kW, 1400-1800 min^{-1}	< 5 < 10
7.5	< 10

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

13.3 Inputs/output

Start/stop
External potential-free switch.
Voltage: 5 VDC.
Current: < 5 mA.
Screened cable.*

Digital
External potential-free switch.
Voltage: 5 VDC.
Current: < 5 mA.
Screened cable.*

Setpoint signals

- Potentiometer
  0-5 VDC, 10 kΩ (via internal voltage supply).
  Screened cable.*
  Maximum cable length: 100 m.
- Voltage signal
  0-5 VDC/0-10 VDC, R_i > 50 kΩ.
  Tolerance: +0%/–3% at maximum voltage signal.
  Screened cable.*
  Maximum cable length: 500 m.
- Current signal
  DC 0-20 mA/4-20 mA, R_i = 250 Ω.
  Tolerance: +0%/–3% at maximum current signal.
  Screened cable.*
  Maximum cable length: 500 m.

Sensor signals

- Voltage signal
  0-5 VDC/0-10 VDC, R_i > 50 kΩ (via internal voltage supply).
  Tolerance: +0%/–3% at maximum voltage signal.
  Screened cable.*
  Maximum cable length: 500 m.
- Current signal
  DC 0-20 mA/4-20 mA, R_i = 250 Ω.
  Tolerance: +0%/–3% at maximum current signal.
  Screened cable.*
  Maximum cable length: 500 m.
- 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, 1 mA.
Screened cable: 0.5 - 2.5 mm².
Maximum cable length: 500 m.

Bus input
GRUNDFOS bus protocol, GENIbus protocol, RS-485.
0.5 - 1.5 mm² screened 2-core cable.
Maximum cable length: 500 m.

* Cross section min. 0.5 mm² and max. 1.5 mm².

13.4 Other technical data

EMC (electromagnetic compatibility)
EN 61 800-3.

Motors of 0.37 to 5.5 kW, except for 5.5 kW, 1400-1800 min^{-1}:
Residential areas - unlimited distribution,
corresponding to CISPR 11, class B, group 1.

Motors of 7.5 kW and 5.5 kW, 1400-1800 min^{-1}:
Residential areas - limited distribution.
Industrial areas - unlimited distribution,
corresponding to CISPR 11, class A, group 1.
When pumps fitted with motors of 7.5 kW and 5.5 kW, 1400-1800 min^{-1}, are installed in residential areas, an additional EMC filter is required to obtain class B, group 1 status.

The motor fulfils EN 50 178.

Contact GRUNDFOS for further information.

Enclosure class
Standard: IP 55 (IEC 34-5).

Insulation class
F (IEC 85).

Ambient temperature
During operation: –20°C to +40°C.
During storage/transport: –40°C to +60°C.

Relative air humidity
Maximum 95%.

Sound pressure level

Single-phase pumps:

<70 dB(A).

Three-phase pumps:

Motor [kW]	Speed stated on nameplate [min^{-1}]	Sound pressure level [dB(A)]
0.75	2800-3000	63
	3400-3600	68
1.1	2800-3000	63
	3400-3600	68
1.5	2800-3000	63
	3400-3600	68
2.2	2800-3000	64
	3400-3600	68
3.0	2800-3000	64
	3400-3600	68
4.0	2800-3000	68
	3400-3600	73
	4200-4500	75
5.5	2800-3000	68
	3400-3600	73
	4200-4500	75
7.5	2800-3000	74
	3400-3600	79
	4200-4500	80

14. Disposal

Disposal of this product or parts of it must be carried out according to the following guidelines:

1. Use the local public or private waste collection service.
2. In case such waste collection service does not exist or cannot handle the materials used in the product, please deliver the product or any hazardous materials from it to your nearest GRUNDFOS company or service workshop.

Subject to alterations.

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