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# GRUNDFOS MAGNA

## Series 2000

MAGNA 32-120, 40-120, 50-120, 65-120, 50-60, 65-60

### Installation and operating instructions

GB D F I E P GR NL S FIN DK PL RU



## **(GB)** Declaration of Conformity

We, Grundfos, declare under our sole responsibility that the product MAGNA Series 2000, to which this declaration relates, is in conformity with these Council directives on the approximation of the laws of the EC member states:

- Machinery Directive 2006/42/EC.  
Standard used: EN809:1998
- Low Voltage Directive 2006/95/EC.  
Standards used: EN 60335-1: 2002 and EN 60335-2-51: 2003, SAP96732176.
- Electromagnetic compatibility (2004/108/EC).  
Standard used: EN 61800-3.

## **(F)** Déclaration de Conformité

Nous, Grundfos, déclarons sous notre seule responsabilité, que le produit MAGNA Series 2000, auquel se réfère cette déclaration, est conforme aux Directives du Conseil concernant le rapprochement des législations des Etats membres CE relatives aux normes énoncées ci-dessous :

- Directive Machines 2006/42/CE.  
Standard utilisé : EN809:1998
- Directive Basse Tension 2006/95/CE.  
Standards utilisés: EN 60335-1 : 2002 et EN 60335-2-51 : 2003, SAP96732176.
- Compatibilité électromagnétique (2004/108/CE).  
Standard utilisé : EN 61800-3.

## **(E)** Declaración de Conformidad

Nosotros, Grundfos, declaramos bajo nuestra propia responsabilidad que el producto MAGNA Series 2000, al cual se refiere esta declaración, está conforme con las Directivas del Consejo en la aproximación de las leyes de los Estados Miembros del EM:

- Directiva de Maquinaria 2006/42/CE.  
Norma aplicada: EN809:1998
- Directiva de Baja Tensión 2006/95/CE.  
Normas aplicadas: EN 60335-1: 2002 y EN 60335-2-51: 2003, SAP96732176.
- Compatibilidad electromagnética (2004/108/CE).  
Norma aplicada: EN 61800-3.

## **(GR)** Δήλωση Συμμόρφωσης

Εμείς, η Grundfos, δηλώνουμε με αποκλειστικά δική μας ευθύνη ότι τα προϊόντα MAGNA Series 2000, στα οποία αναφέρεται η παρούσα δήλωση, συμμορφώνονται με τις εξής Οδηγίες του Συμβουλίου περί προσέγγισης των νομοθεσιών των κρατών μελών της ΕΕ:

- Οδηγία για μηχανήματα 2006/42/ΕC.  
Πρότυπο που χρησιμοποιήθηκε: EN809:1998
- Οδηγία χαμηλής τάσης 2006/95/ΕC.  
Πρότυπα που χρησιμοποιήθηκαν: EN 60335-1: 2002 και EN 60335-2-51: 2003, SAP96732176.
- Ηλεκτρομαγνητική συμβατότητα (2004/108/ΕC).  
Πρότυπο που χρησιμοποιήθηκε: EN 61800-3.

## **(S)** Försäkran om överensstämmelse

Vi, Grundfos, försäkrar under ansvar att produkten MAGNA Series 2000, som omfattas av denna försäkran, är i överensstämmelse med rådets direktiv om inbördes närmande till EU-medlemsstaternas lagstiftning, avseende:

- Maskindirektivet 2006/42/EG.  
Använd standard: EN809:1998
- Lågspanningsdirektivet 2006/95/EG.  
Använda standarder: EN 60335-1: 2002 och EN 60335-2-51: 2003, SAP96732176.
- Elektromagnetisk kompatibilitet (2004/108/EG).  
Använd standard: EN 61800-3.

## **(D)** Konformitätserklärung

Wir, Grundfos, erklären in alleiniger Verantwortung, dass das Produkt MAGNA Series 2000, auf das sich diese Erklärung bezieht, mit den folgenden Richtlinien des Rates zur Angleichung der Rechtsvorschriften der EU-Mitgliedsstaaten übereinstimmt:

- Maschinenrichtlinie 2006/42/EG.  
Norm, die verwendet wurde: EN809:1998
- Niederspannungsrichtlinie 2006/95/EG.  
Normen, die verwendet wurden: EN 60335-1: 2002 und EN 60335-2-51: 2003, SAP96732176.
- Elektromagnetische Verträglichkeit (2004/108/EG).  
Norm, die verwendet wurde: EN 61800-3.

## **(I)** Dichiarazione di Conformità

Grundfos dichiara sotto la sua esclusiva responsabilità che il prodotto MAGNA Series 2000, al quale si riferisce questa dichiarazione, è conforme alle seguenti direttive del Consiglio riguardanti il riavvicinamento delle legislazioni degli Stati membri CE:

- Direttiva Macchine 2006/42/CE.  
Standard usato: EN809:1998
- Direttiva Bassa Tensione 2006/95/CE.  
Standard usato: EN 60335-1: 2002 e EN 60335-2-51: 2003, SAP96732176.
- Compatibilità elettromagnetica (2004/108/CE).  
Standard usato: EN 61800-3.

## **(P)** Declaração de Conformidade

A Grundfos declara sob sua única responsabilidade que o produto MAGNA Series 2000, ao qual diz respeito esta declaração, está em conformidade com as seguintes Directivas do Conselho sobre a aproximação das legislações dos Estados Membros da CE:

- Directiva Máquinas 2006/42/CE.  
Norma utilizada: EN809:1998
- Directiva Baixa Tensão 2006/95/CE.  
Normas utilizadas: EN 60335-1: 2002 e EN 60335-2-51: 2003, SAP96732176.
- Compatibilidade electromagnética (2004/108/CE).  
Norma utilizada: EN 61800-3.

## **(NL)** Overeenkomstigheidsverklaring

Wij, Grundfos, verklaren geheel onder eigen verantwoordelijkheid dat het product MAGNA Series 2000 waarop deze verklaring betrekking heeft, in overeenstemming is met de Richtlijnen van de Raad in zake de onderlinge aanpassing van de wetgeving van de EG lidstaten betreffende:

- Machine Richtlijn 2006/42/EC.  
Norm: EN809:1998
- Laagspannings Richtlijn 2006/95/EC.  
Normen: EN 60335-1: 2002 en EN 60335-2-51: 2003, SAP96732176.
- Elektromagnetische compatibiliteit (2004/108/EG).  
Norm: EN 61800-3.

## **(FIN)** Vastaavuusvakuutus

Me, Grundfos, vakuutamme omalla vastuullamme, että tuote MAGNA Series 2000, jota tämä vakuutus koskee, on EY:n jäsenvaltioiden lainsäädännön yhdenmukaistamiseen tähtäävien Euroopan neuvoston direktiivien vaatimusten mukainen seuraavasti:

- Konedirektiivi 2006/42/EY.  
Sovellettu standardi: EN809:1998
- Pienjännitedirektiivi 2006/95/EY.  
Sovellettavat standardit: EN 60335-1: 2002 ja EN 60335-2-51: 2003, SAP96732176.
- Elektromagneettinen vastaavuus (2004/108/EY).  
Sovellettu standardi: EN 61800-3.

## **DK** Overensstemmelseserklæring

Vi, Grundfos, erklærer under ansvar at produktet MAGNA Series 2000 som denne erklæring omhandler, er i overensstemmelse med disse af Rådets direktiver om indbyrdes tilnærmelse til EF-medlemsstaternes lovgivning:

- Maskindirektivet 2006/42/EF.  
Anvendt standard: EN809:1998
- Lavspændingsdirektivet 2006/95/EF.  
Anvendte standarder: EN 60335-1: 2002 og EN 60335-2-51: 2003, SAP96732176.
- Elektromagnetisk kompatibilitet (2004/108/EF).  
Anvendt standard: EN 61800-3.

## **RU** Декларация о соответствии

Мы, компания Grundfos, со всей ответственностью заявляем, что изделия MAGNA Series 2000, к которым относится настоящая декларация, соответствуют следующим Директивам Совета Евросоюза об унификации законодательных предписаний стран-членов ЕС:

- Механические устройства 2006/42/EC.  
Применявшиеся стандарты: EN809:1998
- Низковольтное оборудование 2006/95/EC.  
Применявшиеся стандарты: Евростандарт EN 60335-1: 2002 и EN 60335-2-51: 2003, SAP96732176.
- Электромагнитная совместимость (2004/108/EC).  
Применявшиеся стандарты: Евростандарт EN 61800-3.

## **PL** Deklaracja zgodności

My, Grundfos, oświadczamy z pełną odpowiedzialnością, że nasze wyroby MAGNA Series 2000, których deklaracja niniejsza dotyczy, są zgodne z następującymi wytycznymi Rady d/s ujednoczenia przepisów prawnych krajów członkowskich WE:

- Dyrektywa Maszynowa 2006/42/WE.  
zastosowana norma: EN809:1998
- Dyrektywa Niskonapięciowa (LVD) 2006/95/WE.  
zastosowane normy: EN 60335-1: 2002 i EN 60335-2-51: 2003, SAP96732176.
- zgodność elektromagnetyczna (2004/108/WE),  
zastosowana norma: EN 61800-3.

Bjerringbro, 30th October 2009



Svend Aage Kaae  
Technical Director



# GRUNDFOS MAGNA

## Series 2000

MAGNA 32-120, 40-120, 50-120, 65-120, 50-60, 65-60

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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.*

### Warning

*The use of this product requires experience with and knowledge of the product. Persons with reduced physical, sensory or mental capabilities must not use this product, unless they are under supervision or have been instructed in the use of the product by a person responsible for their safety. Children must not use or play with this product.*



## 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. General description

The GRUNDFOS MAGNA Series 2000 is a complete range of circulator pumps with integrated differential pressure control enabling adjustment of pump performance to the actual system requirements.

In many systems, this will reduce the power consumption considerably, reduce noise from thermostatic valves and similar fittings, and improve the control of the system.

The desired head can be set on the pump control panel.

### 3. Applications

The GRUNDFOS MAGNA is designed for circulating liquids in heating and air-conditioning systems. The pump can also be used in domestic hot-water systems.

The pump range is primarily used in

- systems with a **variable flow**.

The pump range can also be used in

- systems with a **constant flow** where it is desirable to optimise the setting of the pump duty point,
- systems with **variable flow-pipe temperature**.

#### 3.1 Pumped liquids

Thin, clean, non-aggressive and non-explosive liquids, not containing solid particles, fibres or mineral oil.

In **heating systems**, the water should meet the requirements of accepted standards on water quality in heating systems, e.g. the German standard VDI 2035.

In **domestic hot-water systems**, it is advisable to use GRUNDFOS MAGNA pumps only for water with a degree of hardness lower than approx. 14 °dH.



#### Warning

**The pump must not be used for the transfer of inflammable liquids such as diesel oil, petrol or similar liquids.**

### 4. Installation

Arrows on the pump housing indicate the liquid flow direction through the pump.

#### 4.1 Positioning

GRUNDFOS MAGNA must be installed with the pump head in horizontal position. See page 347.

#### 4.2 Changing the control box position

#### Warning



**Before any dismantling of the pump, the system must be drained or the isolating valves on either side of the pump must be closed as the pumped liquid may be scalding hot and under high pressure.**

Change the control box position as follows:

1. Remove the inspection screw (1) and the four screws (2) in the stator housing, see fig. 1.
2. Lift off the stator housing (3). Keep the rotor (4) in place using a suitable tool, e.g. a T-key (M8) (5), see fig. 2.
3. Check that the O-ring (6) is intact. A defective O-ring must be replaced.
4. Hold the stator housing/control box (3) in the desired position.
5. Lower the stator housing over the rotor. Keep the rotor in place as described in point 2.
6. Fit and tighten the four screws and the inspection screw.

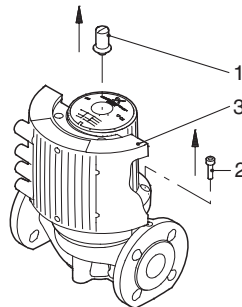


Fig. 1 Removing the control box

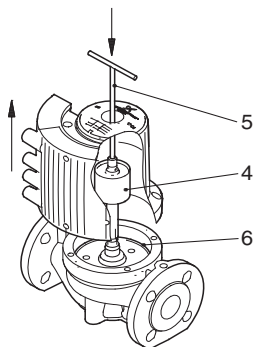


Fig. 2 Changing the control box position

Pos.	Description
1	Inspection screw
2	Screw
3	Stator housing/control box
4	Rotor
5	T-key
6	O-ring

### 4.3 Twin-head pumps

Twin-head pumps are supplied fitted with a GENI module on each control box. The modules are connected via a cable. The modules determine the operating mode of the pump, see section 7.12.1 *Control of twin-head pumps*.

**Caution** *Twin-head pumps mounted in horizontal pipes must be fitted with an automatic air vent (Rp 1/4) in the upper part of the pump housing, see fig. 3.*

The automatic air vent is not supplied with the pump.

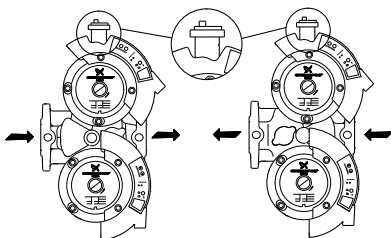


Fig. 3 Automatic air vent

### 4.4 Non-return valve

If a non-return valve is fitted in the pipe system, see fig. 4, it must be ensured that the set minimum discharge pressure of the pump is always higher than the closing pressure of the valve. This is especially important in proportional-pressure control mode (reduced head at low flows).

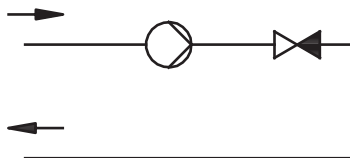


Fig. 4 Non-return valve

### 4.5 Frost protection

If the pump is not used during periods of frost, necessary steps must be taken to prevent frost bursts.

**Note** *Additives with a density and/or kinematic viscosity higher than those of water will reduce the hydraulic performance.*

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TM03 8831 2607



## 5. Electrical connection

The electrical connection and protection should be carried out in accordance with local regulations.

### Warning

**Never make any connections in the pump control box unless the electricity supply has been switched off for at least 5 minutes.**

**The earth terminal of the pump must be earthed.**

**The pump must be connected to an external mains switch with a contact separation of at least 3 mm in each pole.**

**Earthing or neutralisation can be used for protection against indirect contact.**

**Megging must be carried out as described in section 10. Megging.**

**If the pump is connected to an electric installation where an earth leakage circuit breaker (ELCB) is used as additional protection, this circuit breaker must trip out when earth fault currents with DC content (pulsating DC) occur.**

**The earth leakage circuit breaker must be marked with the symbol shown:**



- The pump requires no external motor protection.
- The operating 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.

Open the control box cover as shown in fig. 5.

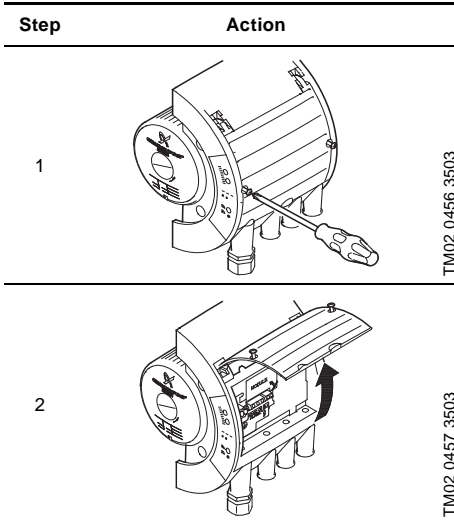


Fig. 5 Opening the control box

If the control box cover cannot be lifted sufficiently, it can be removed as shown in fig. 6.

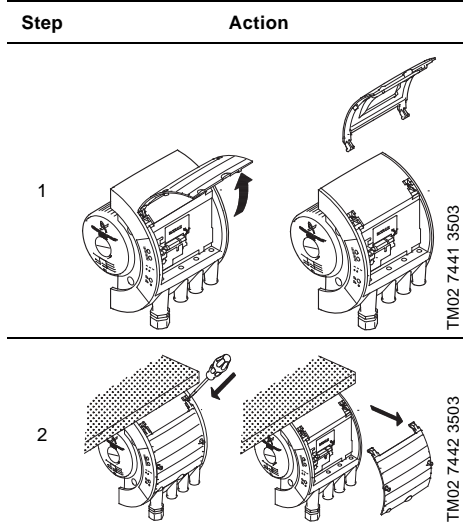


Fig. 6 Removing the control box cover

### 5.1 Supply voltage

1 x 230-240 V – 10 %/+ 6 %, 50/60 Hz.

## 5.2 Connection diagram

GB

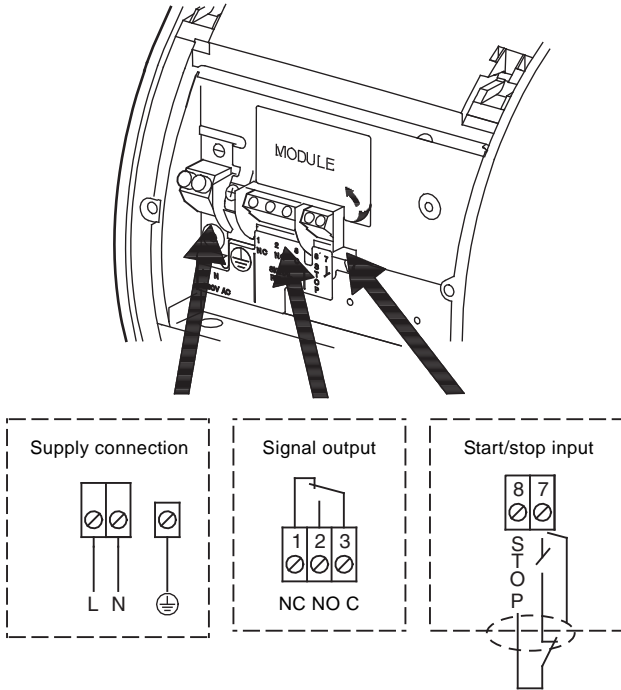


Fig. 7 Connection diagram

### Warning

- **Wires connected to**
  - **supply terminals,**
  - **outputs NC, NO, C and**
  - **start/stop input****must be separated from each other and from the supply by reinforced insulation.**
- **All wires connected to a terminal block must be tied up at the terminals.**



### Note:

- If no external on/off switch is connected, the connection across terminals STOP and  $\downarrow$  should be maintained.
- All cables used must be heat-resistant up to +85 °C.
- All cables used must be installed in accordance with EN 60204-1 and EN 50174-2: 2000.
- If a GENI module is fitted, the screen must be connected to  $\oplus$ . See page 344.

Concerning demands on signal wires and signal transmitters, see section 11. *Technical data*.

A connection example can be found on page 342.

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## 6. Start-up

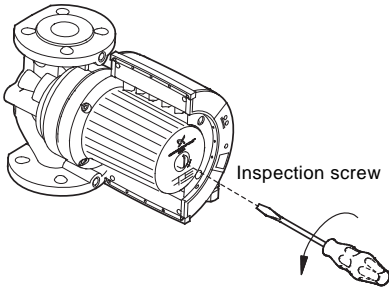
Do not start the pump until the system has been filled with liquid and vented. Furthermore, the required minimum inlet pressure must be available at the pump inlet, see section 11. *Technical data*. The system cannot be vented through the pump.

The pump can be vented by slackening the inspection screw.

### **Warning**



***If the inspection screw is to be slackened, see fig. 8, care should be taken to ensure that the escaping, scalding hot liquid does not cause personal injury or damage to components.***



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**Fig. 8** Venting the pump

## 7. Functions

Most functions can be selected on the pump control panel. However, some functions can only be selected with the R100 or via expansion modules.

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**On the pump control panel, see fig. 19, page 20:**

- **AUTO<sup>ADAPT</sup>** (factory setting)  
Recommended for most heating installations.  
During operation, the pump automatically makes the necessary adjustment to the actual system characteristic. This setting ensures minimum energy consumption and noise level which reduces operating costs and increases comfort.
  - **Proportional-pressure control**  
The pump head is changed continuously in accordance with the water demand in the system. The desired setpoint can be set on the pump control panel.
  - **Constant-pressure control**  
A constant head is maintained, irrespective of water demand. The desired setpoint can be set on the pump control panel.
  - **Automatic night-time duty**  
The pump changes automatically between normal duty and night-time duty depending on the flow-pipe temperature. Automatic night-time duty can be combined with the above-mentioned control modes.
- 

**Further functions:**

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**Via the digital input:**

- **External start/stop**  
The pump can be started or stopped via the digital input.
- 

**With the R100 remote control:**

- **Constant-curve duty**  
The pump runs at a constant speed, on or between the max. and min. curves.
  - **Temperature influence**  
The head varies depending on the liquid temperature.
  - **External fault and operating signal**  
The pump controls an external fault or operating signal device via a potential-free output.
- 

**Via expansion modules:**

**GENI module**

- **External analog control** of head or speed via a signal from an external 0-10 V signal transmitter.
- **External forced control** via inputs for:
  - Max. curve,
  - Min. curve.
- **Bus communication via GENIbus**  
The pump can be controlled and monitored by a Grundfos Control MPC Series 2000, a building management system or another type of external control system.
- **Control of twin-head pumps**  
The control of twin-head pumps is described in section 7.12.1.

**LON module**

- **Bus communication via LON**  
This module enables connection to a network based on LonWorks<sup>®</sup> technology and to other units which are based on this communication standard.
-

## 7.1 Control modes

A GRUNDFOS MAGNA pump can be set to the control mode which is most suitable for the individual system.

Possible control modes:

- $AUTO_{ADAPT}$  (factory setting)
- Proportional pressure
- Constant pressure.

Each of the control modes can be combined with automatic night-time duty, see section 7.3 *Automatic night-time duty*.

### $AUTO_{ADAPT}$

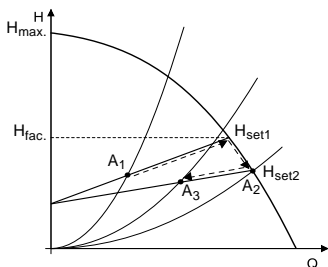
To be set on the control panel or with the R100, see section 8. *Setting the pump*.

The control mode  $AUTO_{ADAPT}$  continuously adapts the pump performance.

The setpoint of the pump has been factory-set as follows and cannot be changed manually:


- MAGNA 32-120, 40-120, 50-120, 65-120 to 6.5 metres.
- MAGNA 50-60, 65-60 to 3.5 metres.

When the pump registers a lower pressure on the max. curve,  $A_2$ , the  $AUTO_{ADAPT}$  function automatically selects a correspondingly lower control curve,  $H_{set2}$ , thus reducing the energy consumption.



**Fig. 9**  $AUTO_{ADAPT}$

- $A_1$ : Original duty point.
- $A_2$ : Lower registered pressure on the max. curve.
- $A_3$ : New duty point after  $AUTO_{ADAPT}$  control.
- $H_{set1}$ : Original setpoint.
- $H_{set2}$ : New setpoint after  $AUTO_{ADAPT}$  control.
- $H_{fac.}$ : Factory-set setpoint.

The  $AUTO_{ADAPT}$  function can be reset by pressing the button  for approx. 10 seconds until the control mode is back to the starting point ( $AUTO_{ADAPT}$  or  $AUTO_{ADAPT}$  with automatic night-time duty).

### Proportional-pressure control

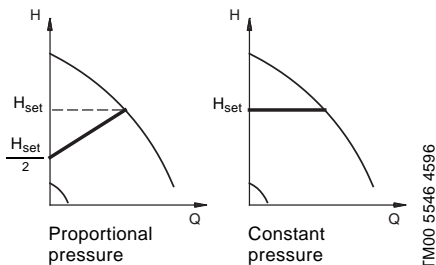
To be set on the control panel or with the R100, see section 8. *Setting the pump*.

The pump head is reduced at decreasing water demand and increased at rising water demand, see fig. 10.

### Constant-pressure control

To be set on the control panel or with the R100, see section 8. *Setting the pump*.



The pump maintains a constant pressure, irrespective of water demand, see fig. 10.



**Fig. 10** Pressure control



TM02 0251 4800

## 7.2 Selection of control mode

System type	Description	Select this control mode
Typical heating systems	Grundfos recommends to let the pump remain in AUTO <sub>ADAPT</sub> mode. This ensures optimum performance at the lowest possible energy consumption.	AUTO <sub>ADAPT</sub>
Relatively great head losses in the distribution pipes and air-conditioning systems	1. Two-pipe heating systems with thermostatic valves and: <ul style="list-style-type: none"> <li>with a dimensioned pump head higher than 4 metres,</li> <li>very long distribution pipes,</li> <li>strongly throttled pipe balancing valves,</li> <li>differential pressure regulators,</li> <li>great head losses in those parts of the system through which the total quantity of water flows (e.g. boiler, heat exchanger and distribution pipe up to the first branching).</li> </ul>	Proportional pressure 
	2. Primary circuit pumps in systems with great head losses in the primary circuit. 3. Air-conditioning systems with <ul style="list-style-type: none"> <li>heat exchangers (fan coils),</li> <li>cooling ceilings,</li> <li>cooling surfaces.</li> </ul>	
Relatively small head losses in the distribution pipes	1. Two-pipe heating systems with thermostatic valves and: <ul style="list-style-type: none"> <li>with a dimensioned pump head lower than 2 metres,</li> <li>dimensioned for natural circulation,</li> <li>with small head losses in those parts of the system through which the total quantity of water flows (e.g. boiler, heat exchanger and distribution pipe up to the first branching) or</li> <li>modified to a high differential temperature between flow pipe and return pipe (e.g. district heating).</li> </ul>	Constant pressure 
	2. Underfloor heating systems with thermostatic valves.	
	3. One-pipe heating systems with thermostatic valves or pipe balancing valves.	
	4. Primary circuit pumps in systems with small head losses in the primary circuit.	

### 7.2.1 Setpoint setting

If AUTO<sub>ADAPT</sub> is selected, the setpoint cannot be set.

The setpoint can be set by pressing  or  when the pump is in control mode:

- proportional pressure
- constant pressure
- constant-curve duty.

Set the setpoint so that it matches the system.

A too high setting may result in noise in the system whereas a too low setting may result in insufficient heating or cooling in the system.

### 7.3 Automatic night-time duty

To be set on the control panel or with the R100, see section 8. *Setting the pump.*

Once automatic night-time duty has been activated, the pump automatically changes between normal duty and night-time duty (duty at low performance).

Changeover between normal duty and night-time duty is dependent on the flow-pipe temperature.

The pump automatically changes over to night-time duty when the built-in sensor registers a flow-pipe temperature drop of more than 10-15 °C within approx. 2 hours. The temperature drop must be at least 0.1 °C/min.

Changeover to normal duty takes place without a time lag when the temperature has increased by approx. 10 °C.

**Note** *Automatic night-time duty cannot be used in air-conditioning systems.*

### 7.4 Constant-curve duty

To be set with the R100, see section 8. *Setting the pump.*

The pump can be set to operate according to a constant curve, like an uncontrolled pump, see fig. 11.

#### MAGNA 32-120, 40-120, 50-120, 65-120

Select one of 91 curves between the max. and min. curves.

#### MAGNA 50-60, 65-60

Select one of 41 curves between the max. and min. curves.

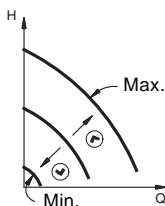


Fig. 11 Operating curves

### 7.5 Max. or min. curve duty

To be set on the control panel, with the R100 or via GENI module, see section 8. *Setting the pump.*

The pump can be set to operate according to the max. or min. curve, like an uncontrolled pump, see fig. 12.

This operating mode is available, irrespective of the control mode.

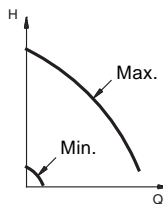


Fig. 12 Max. and min. curves

The **max. curve** mode can be selected if an uncontrolled pump is required.

The **min. curve** mode can be used in periods in which a minimum flow is required. This operating mode is for instance suitable for manual night-time duty if automatic night-time duty is not desired.

### 7.6 Temperature influence

To be set with the R100, see section 8. *Setting the pump.*

When this function is activated in proportional- or constant-pressure control mode, the setpoint for head will be reduced according to the liquid temperature.

It is possible to set temperature influence to function at liquid temperatures below 80 °C or below 50 °C. These temperature limits are called  $T_{max}$ . The setpoint is reduced in relation to the head set (= 100 %) according to the characteristics below.

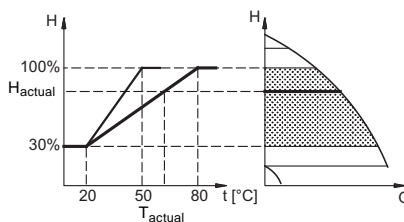


Fig. 13 Temperature influence

In the above example,  $T_{max} = 80$  °C has been selected. The actual liquid temperature  $T_{actual}$  causes the setpoint for head to be reduced from 100 % to  $H_{actual}$ .

The temperature influence function requires:

- Proportional- or constant-pressure control mode.
- The pump must be installed in the flow pipe.
- System with flow-pipe temperature control.

Temperature influence is suitable in:

- systems with variable flows (e.g. two-pipe heating systems), in which the activation of the temperature influence function will ensure a further reduction of the pump performance in periods with small heating demands and consequently a reduced flow-pipe temperature.
- systems with almost constant flows (e.g. one-pipe heating systems and underfloor heating systems), in which variable heating demands cannot be registered as changes in the head as is the case with two-pipe heating systems. In such systems, the pump performance can only be adjusted by activating the temperature influence function.

### Selection of $T_{max}$ .

In systems with a dimensioned flow-pipe temperature of:

- up to and including 55 °C, select  $T_{max} = 50$  °C,
- above 55 °C, select  $T_{max} = 80$  °C.

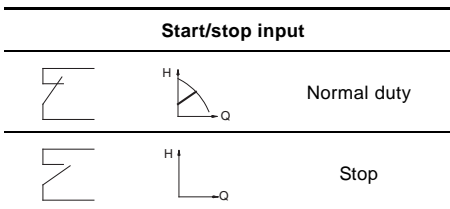
Note

**The temperature influence function cannot be used in air-conditioning systems.**

## 7.7 External start/stop

The pump can be started or stopped via an external potential-free contact or a relay connected to terminals 7 and 8, see section 5.2 *Connection diagram*.

### Functional diagram: Start/stop input



## 7.8 Signal relay

The pump incorporates a signal relay, terminals 1, 2 and 3, for a potential-free fault and operating signal. The function of the signal relay, fault signal (factory setting), ready signal or operating signal, is set with the R100.

The output, terminals 1, 2 and 3, is electrically separated from the rest of the controller.

The signal relay is activated as follows:

- **Fault signal**  
The signal relay is activated together with the red indicator light on the pump, see section 8.2 *Control panel*.
- **Ready signal**  
The signal relay is active when the pump is running or has been set to stop, but is ready to run, see section 8.2 *Control panel*.
- **Operating signal**  
The signal relay is activated together with the green indicator light on the pump, see section 8.2 *Control panel*.

## Functions of signal relay

### Signal relay Fault signal



Not activated:

- The electricity supply has been switched off.
- The pump has not registered a fault.



Activated:

- The pump has registered a fault.

### Signal relay Ready signal



Not activated:

- The pump has registered a fault and is unable to run.



Activated:

- The pump has been set to stop, but is ready to run.
- The pump is running.

### Signal relay Operating signal



Not activated:

- The pump has been set to stop.
- The pump has registered a fault and is unable to run.



Activated:

- The pump is running.
- The pump has registered a fault, but is able to run.

## Resetting of fault indications

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

- Briefly press , or on the pump. This will not influence the pump performance set.
- Briefly switch off the electricity supply to the pump.
- With the R100, see section 8.4 *R100 display overview*.

Before the pump can revert to normal duty, the fault cause must be eliminated.

If the fault disappears by itself, the fault indication will automatically be reset.

The fault cause will be stored in the pump alarm log. The latest five faults can be called up with the R100.



## 7.9 Indicator lights

For position on pump, see fig. 19, section 8.2 *Control panel*.

The indicator lights, pos. 2, are used for operating and fault indication. Furthermore, they indicate whether the pump is externally controlled.

### Note

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

The function of the operating and fault indicator lights can be found in section 9. *Fault finding chart*.

The indicator light for external control is on

- if the pump control panel is inactive,
- if the pump is in constant-curve operating mode,
- if the temperature influence is active or
- if the pump is controlled by an external unit.

## 7.10 Expansion modules

The pump can be fitted with an expansion module enabling communication with external signals (signal transmitters).

Two types of expansion module are available:

- GENI module.
- LON module.

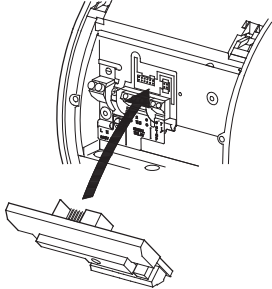
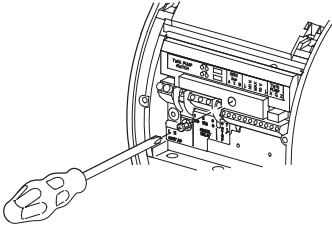
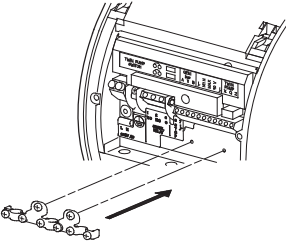
The fitting of a module is illustrated in fig. 14.

Open the control box cover and fit the module as shown in fig. 14.



### Warning

**Before removing the control box cover, make sure that the electricity supply has been switched off for at least 5 minutes.**

Step	Action
1	
2	
3	

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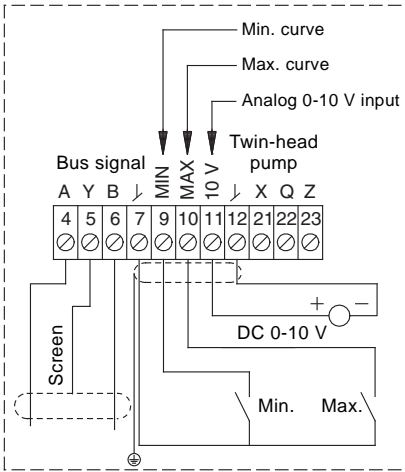
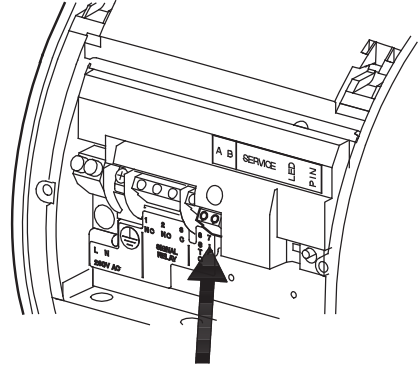
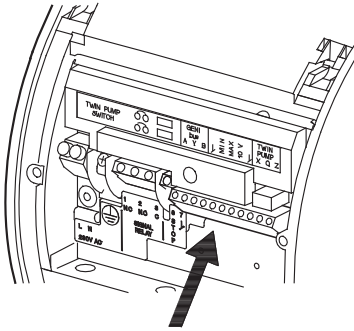
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Fig. 14 Fitting an expansion module

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## 7.11 Wiring diagrams for expansion modules

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### Warning

- Wires connected to
  - supply terminals,
  - outputs NC, NO, C and
  - start/stop inputs, A, Y, B, MIN, MAX, 10 V
 must be separated from each other and from the supply by reinforced insulation.
- All wires connected to a terminal block must be tied up at the terminals.



### Warning

- Twisted-pair cable.
- Wires connected to
  - supply terminals,
  - outputs NC, NO, C and
  - start/stop inputs, A, B
 must be separated from each other and from the supply by reinforced insulation.
- All wires connected to a terminal block must be tied up at the terminals.



Fig. 15 GENI module

Fig. 16 LON module

### Note:

- If the 0-10 V input is used, there must be a connection across terminals MIN and  $\downarrow$  (input for min. curve must be closed).
  - All cables used must be heat-resistant up to +85 °C.
  - All cables used must be installed in accordance with EN 60204-1 and EN 50174-2: 2000.
- Concerning demands on signal wires and signal transmitters, see section 11. *Technical data*. Connection examples (GENI module) can be found on pages 343 to 346.

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## 7.12 GENI module

The GENI module offers the following functions:

- External analog 0-10 V control
- External forced control
- Bus communication via GENIBus
- Control of twin-head pumps.

### 7.12.1 Control of twin-head pumps

Twin-head pumps have a GENI module incorporated in each control box. The modules are internally connected via a wire.

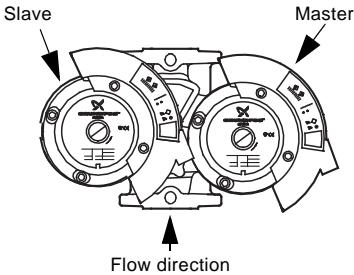


Fig. 17 Master/slave pumps

For connection of the communication cable between the GENI modules, see pages 345 and 346.

Twin-head pumps are factory-set to the control mode AUTO<sub>ADAPT</sub> and the operating mode "alternating operation", which is described below.

Operating modes:

- **Alternating operation**  
Pump operation alternates every 24 hours. If the duty pump stops due to a fault, the other pump will start.
- **Standby operation**  
One pump is operating continuously. In order to prevent seizing-up, the other pump will start at a fixed frequency and run for a short period. If the duty pump stops due to a fault, the other pump will start.

Note

*In air-conditioning systems, standby operation is recommended to minimise condensation inside the pump.*

### 7.12.2 Selection of operating mode

Select the operating mode by means of the mechanical contact in each module.

Operating mode	Left pump head	Right pump head
Alternating	Alternating	Alternating
Standby	Alternating	Standby
Standby	Standby	Alternating
Standby	Standby	Standby

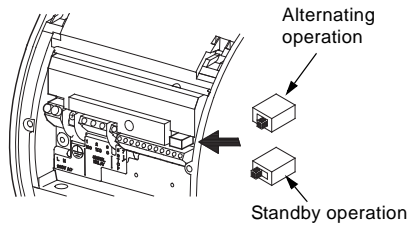


Fig. 18 Mechanical contact

### Operating the pump

Twin-head pumps can be set and operated in the same way as single-head pumps. The duty pump uses its setpoint setting, whether it is made on the control panel, with the R100 or via bus.

Note

*Both pumps should be set to the same setpoint and control mode. Different settings will result in different operation when changing between the two pumps.*

## 7.13 LON module

The LON module offers the possibility of connecting the pump to a LonWorks network. The module is used for data transmission between a network and pumps of the type MAGNA 32-120, 40-120, 50-120, 65-120, 50-60 and 65-60.

For further information, see the documentation files on the floppy disk supplied with the LON module.

## 8. Setting the pump

For the setting of the pump, use:

- control panel
- R100 remote control
- bus communication (not described in detail in these instructions, contact Grundfos).

The table shows the application of the individual operating units and in which section the function has been described.

Possible settings	Control panel	R100
AUTO <sub>ADAPT</sub>	8.2.1	8.7.1
Automatic night-time duty	8.2.1	8.7.2
Proportional-pressure control	8.2.1	8.7.1
Constant-pressure control	8.2.1	8.7.1
Setpoint setting	8.2.2	8.5.1
Max. curve duty	8.2.3	8.5.2
Min. curve duty	8.2.4	8.5.2
Constant-curve duty	–	8.5.2
Temperature influence	–	8.7.3
Activation/deactivation of pump buttons	–	8.7.4
Allocation of pump number	–	8.7.6
Start/stop	8.2.5	8.5.2
<b>Resetting of fault indications</b>	8.2.6	8.5.3
<b>Reading of various data</b>	–	8.6.1 - 8.6.7

"–" = not available with this operating unit.

### 8.1 Factory setting

The pump is factory-set to AUTO<sub>ADAPT</sub> without automatic night-time duty.

## 8.2 Control panel



### Warning

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

The control panel, fig. 19, incorporates:

Pos.	Description
1	Buttons for setting
2	<ul style="list-style-type: none"> <li>• Indicator lights for operating and fault indication and</li> <li>• symbol for indication of external control</li> </ul>
3	Button for change of control mode
4	Light symbols for indication of control mode and night-time duty
5	Light fields for indication of head, flow and operating mode

For further information, see section 9. *Fault finding chart.*

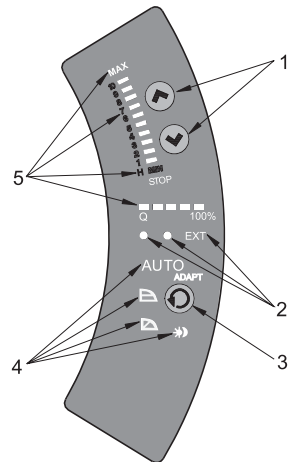



Fig. 19 Control panel

### 8.2.1 Control mode setting

Description of function, see section 7.1 *Control modes*.

To change the control mode, press , pos. 3, according to this cycle:

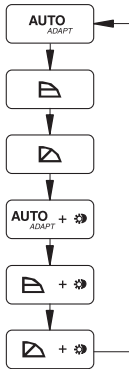










Fig. 20 Cycle of control modes

Automatic night-time duty can be activated together with each of the control modes.



The light symbols in pos. 4, see fig. 19, indicate the pump settings:

Light in	Control mode	Automatic night-time duty
AUTO ADAPT	AUTO ADAPT	NO
	Proportional pressure	NO
	Constant pressure	NO
-	Constant curve	NO
AUTO ADAPT 	AUTO ADAPT	YES
 	Proportional pressure	YES
 	Constant pressure	YES
- 	Constant curve	YES

"-" = no light.

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### 8.2.2 Setpoint setting

Set the setpoint of the pump by pressing  or  when the pump has been set to proportional-pressure control, constant-pressure control or constant-curve duty.

The light fields, pos. 5, on the control panel indicate the setpoint set.

#### MAGNA 32-120, 40-120, 50-120, 65-120

The light fields can indicate a maximum setpoint of 10 metres.

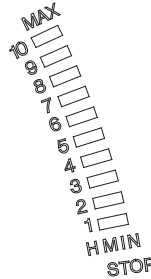


Fig. 21 Light fields MAGNA xx-120

#### MAGNA 50-60, 65-60



The light fields can indicate a maximum setpoint of 5 metres.



Fig. 22 Light fields MAGNA xx-60

### 8.2.3 Setting to max. curve duty

Description of function, see section 7.5 *Max. or min. curve duty*.

To change over to the max. curve, press  continuously until "MAX" illuminates, see fig. 23. To change back, press  continuously until the desired setpoint is indicated.

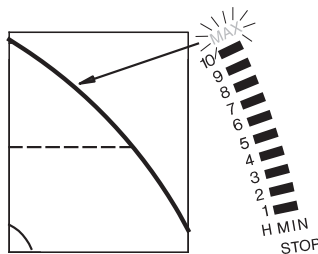


Fig. 23 Max. curve



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### 8.2.4 Setting to min. curve duty

Description of function, see section 7.5 *Max. or min. curve duty*.

To change over to the min. curve, press  continuously until "MIN" illuminates, see fig. 24. To change back, press  continuously until the desired setpoint is indicated.

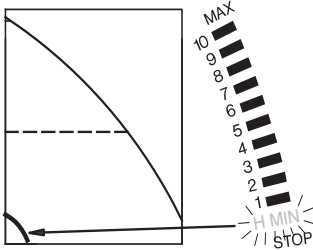




Fig. 24 Min. curve

### 8.2.5 Start/stop of pump

To stop the pump, press  continuously until "STOP" illuminates. When the pump is stopped, the green indicator light will be flashing.

To start the pump, press  continuously.

***If the pump is to be stopped, it is recommended to use the start/stop input, the R100 or to switch off the electricity supply. In this way, the setpoint will remain unchanged when the pump is started again.***

Note

### 8.2.6 Resetting of fault indications

The fault indications are reset by briefly pressing any button. The settings remain unchanged. If the fault has not disappeared, the fault indication will reappear. The time until the fault reappears may vary from 0 to 255 seconds.

### 8.3 R100 remote control

The pump is designed for wireless communication with the Grundfos R100 remote control. The R100 communicates with the pump via infra-red light.

During communication, the R100 must be pointed at the pump control panel. When the R100 is communicating 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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## 8.4 R100 display overview

The R100 displays are divided into four parallel menus, see fig. 25:

- 0. GENERAL, see operating instructions for R100
- 1. OPERATION
- 2. STATUS
- 3. INSTALLATION

The number stated at each individual display in fig. 25 refers to the section in which the display is described.

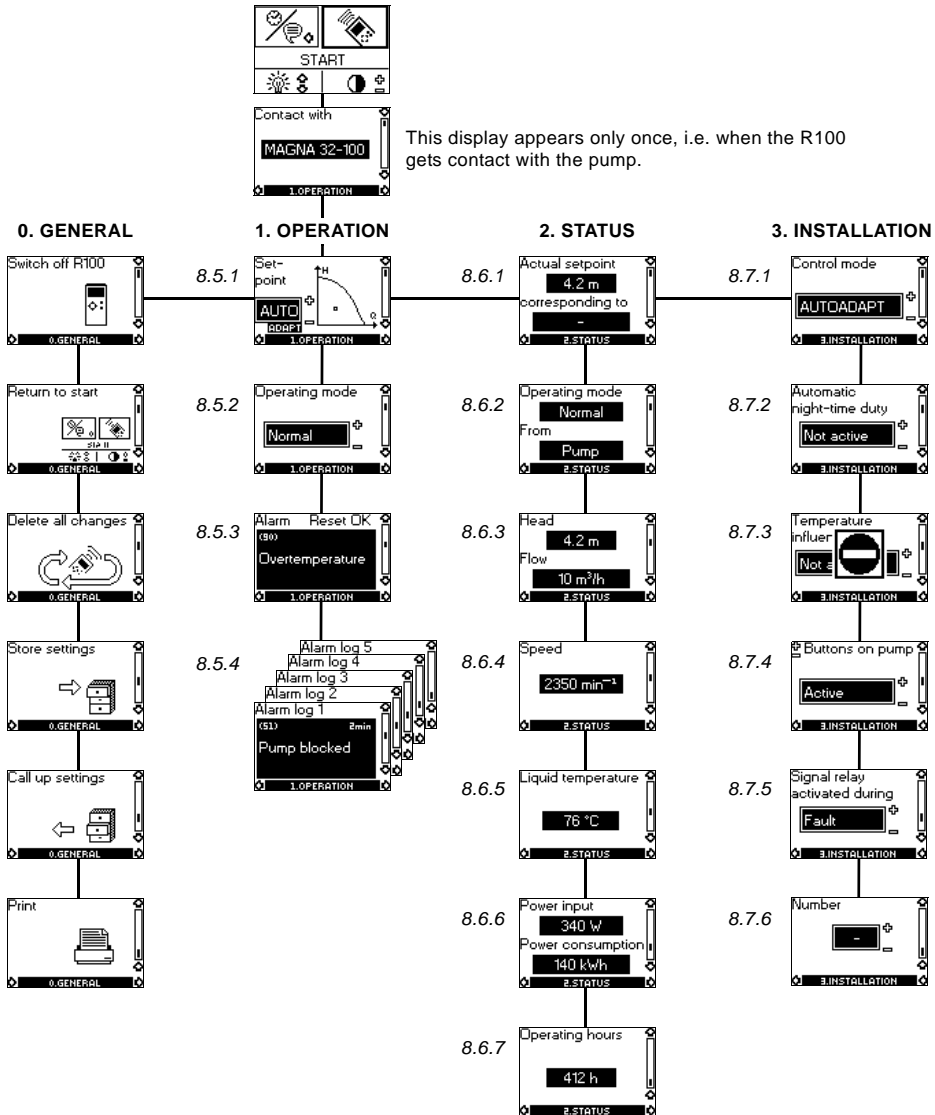


Fig. 25 Menu overview

## 8.5 Menu OPERATION

When the communication between the R100 and the pump has been established, "Contact with" appears in the display. When the "arrow down" on the R100 is pressed, menu OPERATION appears.

Note

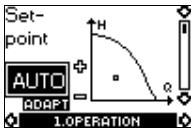
**The display "Contact with" appears only once, i.e. when the R100 gets contact with the pump.**

### 8.5.1 Setpoint

This display depends on the control mode selected in the display "Control mode" in menu INSTALLATION.

If the pump is forced-controlled via external signals, the number of possible settings will be reduced, see section 8.8 *Priority of settings*. Attempts to change the settings will result in an indication in the display saying that the pump is forced-controlled and changes therefore cannot be made.

This display will appear when the pump is in AUTO<sub>ADAPT</sub> mode.



Set the desired setpoint by pressing the buttons "+" and "-" on the R100 (not possible when the pump is in AUTO<sub>ADAPT</sub> mode).

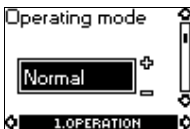
Furthermore, it is possible to select one of the these operating modes:

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

The display is different if proportional pressure, constant pressure or constant curve has been selected.

The actual duty point of the pump is indicated by a square in the Q/H field. No indication at low flow.

### 8.5.2 Operating mode



Select an operating mode:

- Stop
- Min. (min. curve)
- Normal (AUTO<sub>ADAPT</sub>, proportional pressure, constant pressure or constant curve)
- Max. (max. curve).

### 8.5.3 Fault indications



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

Possible causes:

- Pump blocked
- Internal fault
- Overvoltage
- Undervoltage
- Overtemperature
- Module fault
- Fault in module communication.

The fault indication can be reset in this display. If the fault has not disappeared when resetting is attempted, the fault indication will reappear in the display when communicating with the pump.

### 8.5.4 Alarm log



The alarm code with text appears in this display. The display also shows the number of minutes the pump has been connected to the electricity supply after the fault occurred.

The last five fault indications will appear in the alarm log.



## 8.6 Menu STATUS

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

The actual values in the display are indicative and based on estimation.

### 8.6.1 Actual setpoint



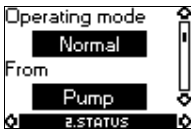
#### Field "Actual setpoint":

Actual setpoint of pump.

#### Field "corresponding to":

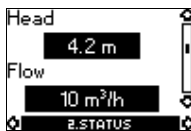
Actual setpoint in % of the setpoint set if the pump is connected to an external analog 0-10 V signal transmitter or if temperature influence or proportional-pressure control is activated.

### 8.6.2 Operating mode



This display shows the actual operating mode (*Stop*, *Min.*, *Normal* or *Max.*) and where it was selected (*Pump*, *R100*, *BUS* or *External*).

### 8.6.3 Head and flow



The actual head and flow of the pump.

If "<" is indicated in front of the flow, the flow is less than the displayed value.

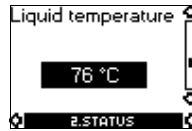
If the pump is unable to determine head and flow, this is indicated by "-".

### 8.6.4 Speed



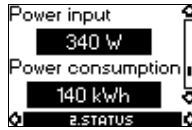
The actual pump speed.

### 8.6.5 Liquid temperature



The actual temperature of the pumped liquid.

### 8.6.6 Power input and power consumption



Actual power input and power consumption of the pump.

The value of power consumption is an accumulated value and cannot be set to zero.

### 8.6.7 Operating hours



Operating hours of the pump.

The value of operating hours is an accumulated value and cannot be set to zero.

## 8.7 Menu INSTALLATION

This menu shows the settings that should be considered when installing the pump.

### 8.7.1 Control mode

Description of function, see section 7.1 *Control modes* or section 7.4 *Constant-curve duty*.



Select one of the control modes:

- *AUTOADAPT*
- *Prop. pressure* (proportional pressure)
- *Const. pressure* (constant pressure)
- *Const. curve* (constant curve).

Setting of setpoint and curve is carried out in display 8.5.1 *Setpoint* in menu OPERATION (not possible when the pump is in *AUTOADAPT* mode).

### 8.7.2 Automatic night-time duty



In this display, automatic night-time duty can be activated or deactivated.

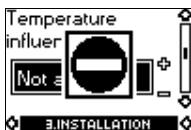
Automatic night-time duty can be set to:

- *Active*
- *Not active*,

irrespective of the control mode selected.

### 8.7.3 Temperature influence

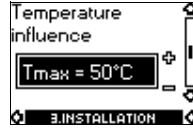
Description of function, see section 7.6 *Temperature influence*.



**Note** If the pump is in control mode *AUTOADAPT* or *constant curve*, the *temperature influence* cannot be set with the R100.

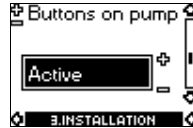
The temperature influence function can be activated in this display when the control mode is proportional pressure or constant pressure, see section 8.7.1 *Control mode*.

In the case of temperature influence, the pump must be installed in the flow pipe. It is possible to choose between maximum temperatures of 50 °C and 80 °C.



When the temperature influence is active, a small thermometer is shown in the display "Setpoint" in menu OPERATION, see section 8.5.1 *Setpoint*.

### 8.7.4 Buttons on pump



To prevent unauthorised persons from operating the pump, the function of the buttons (⏻, ⏹ and ⏺) can be deactivated in this display. The buttons can be reactivated only with the R100.

The buttons can be set to:

- *Active*
- *Not active*.

### 8.7.5 Signal relay



In this display, the function of the internal signal relay can be set:

- *Fault* (functions as a fault signal relay)
- *Ready* (functions as a ready signal relay)
- *Operation* (functions as an operating signal relay).

### 8.7.6 Pump number



A number from 1 up to and including 64 can be allocated to a pump or can be changed so that the R100, Grundfos Control MPC Series 2000 or other systems can distinguish between two or more pumps.

## 8.8 Priority of settings

The external forced-control signals will influence the settings available on the pump control panel and with the R100. However, the pump can always be set to max. curve duty or to stop on the pump control panel or with the R100.

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

The priority of the settings is as shown in the table.

### Without expansion module

Priority	Possible settings	
	Pump control panel or R100	External signals
1	Stop	
2	Max. curve	
3		Stop
4	Min. curve	
5	Setpoint setting	

**Example:** If the pump has been forced to stop via an external signal, the pump control panel or the R100 can only set the pump to max. curve.

### With expansion module

Priority	Possible settings		
	Pump control panel or R100	External signals	Bus signal
1	Stop		
2	Max. curve		
3		Stop	Stop
4		Max. curve	Max. curve
5	Min. curve	Min. curve	Min. curve
6	Setpoint setting		Setpoint setting

	Not active when the pump is controlled via bus.
	Only active when the pump is controlled via bus.

As illustrated in the table, the pump does not react to external signals (max. curve and min. curve) when the pump is controlled via bus.

If the pump is to react to external signals (max. curve and min. curve), the system must be configured for that function.

For further details, please contact Grundfos.

## 9. Fault finding chart

### Warning





Before removing the control box cover, make sure that the electricity supply has been switched off for at least 5 minutes.

The pumped liquid may be scalding hot and under high pressure. Before any removal or dismantling of the pump, the system must therefore be drained or the isolating valves on either side of the pump must be closed.

GB

- Indicator light is off.
- Indicator light is on.
- Indicator light is flashing.

Indicator lights		Fault	Cause	Remedy
Green	Red			
		The pump is not running.	One fuse in the installation is blown/tripped out.	Replace/cut in the fuse. Check that the electricity supply falls within the specified range.
			The current-operated or voltage-operated circuit breaker has tripped out.	Cut in the circuit breaker. Check that the electricity supply falls within the specified range.
			The pump may be defective.	Replace the pump or call GRUNDFOS SERVICE for assistance.
		The pump is not running.	The pump has been stopped in one of the following ways: <ol style="list-style-type: none"> <li>With the button .</li> <li>With the R100.</li> <li>External on/off switch in position off.</li> <li>Via bus signal.</li> </ol>	<ol style="list-style-type: none"> <li>Start the pump by pressing .</li> <li>Start the pump with the R100 or by pressing .</li> <li>Switch on the on/off switch.</li> <li>Start the pump via bus signal.</li> </ol>
		The pump has stopped due to a fault.	Electricity supply failure.	Check that the electricity supply falls within the specified range.
			Pump blocked and/or impurities in the pump.	Dismantle and clean the pump.
			The pump may be defective.	Use the R100 for fault finding, see section 8.5.3 <i>Fault indications</i> . Replace the pump or call GRUNDFOS SERVICE for assistance.
		The pump is running but is faulty.	The pump is faulty, but is able to operate.	The pump is able to operate. Try to reset the fault indication by briefly switching off the electricity supply or by pressing the button ,  or .
		The pump has been set to stop and is faulty.	The pump is faulty, but is able to operate (has been set to STOP).	Use the R100 for fault finding, see section 8.5.3 <i>Fault indications</i> . In the case of repeated faults, contact GRUNDFOS SERVICE.

Indicator lights	Fault	Cause	Remedy
Green Red			
	Noise in the system.	Air in the system.	Vent the system.
		The flow is too high.	Reduce the setpoint and possibly change over to AUTO <sub>ADAPT</sub> or constant pressure.
		The pressure is too high.	Reduce the setpoint and possibly change over to AUTO <sub>ADAPT</sub> or proportional pressure.
	Noise in the pump.	Air in the pump.	Vent the pump.
		The inlet pressure is too low.	Increase the inlet pressure and/or check air volume in the expansion tank (if installed).

**Note** The R100 can also be used for fault finding.

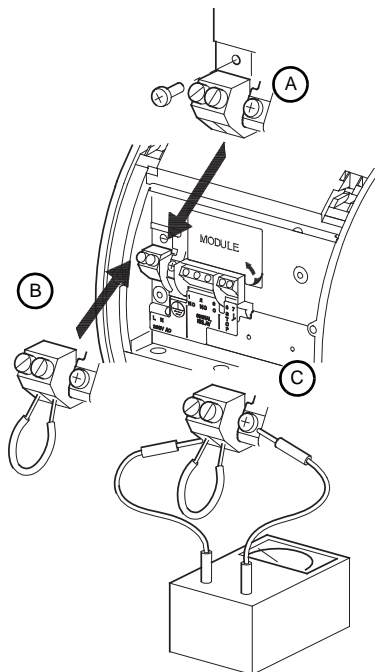
## 10. Megging

Megging of an installation incorporating a GRUNDFOS MAGNA pump is not allowed, as the built-in electronics may be damaged. If megging of the pump is necessary, the pump should be electrically separated from the installation.

Megging of the pump can be carried out as described below.

### Megging of pumps

1. Switch off the electricity supply.
2. Remove the wires from terminals L and N and the earth conductor.
3. Short-circuit terminals L and N using a short wire (see B).
4. Remove the screw for electronics frame connection (see A).
5. Test between terminals L/N and earth (see C).  
Maximum test voltage: 1000 VAC/1500 VDC.  
**Note:** Never test between supply terminals (L and N).  
**Maximum permissible leakage current: < 35 mA.**
6. Fit the screw for electronics frame connection (see A).
7. Remove the short wire between terminals L and N (see B).
8. Fit the supply wires to terminals L and N and the earth conductor.
9. Switch on the electricity supply.



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## 11. Technical data

### Supply voltage

1 x 230-240 V – 10 %/+ 6 %, 50/60 Hz.

### Motor protection

The pump requires no external motor protection.

### Enclosure class

IP44.

### Insulation class

F.

### Relative air humidity

Maximum 95 %.

### Ambient temperature

0 °C to +40 °C.

### Temperature class

TF110 to EN 60335-2-51.

### Liquid temperature

Maximum +110 °C.

Continuously: +2 °C to +95 °C.

Pumps in domestic hot-water systems:

Continuously: +2 °C to +60 °C.

Ambient temperature [°C]	Liquid temperature	
	Min. [°C]	Max. [°C]
0	2	95/110
30	2	95/110
35	2	90/90
40	2	70/70

### Maximum system pressure

The maximum system pressure is indicated on the pump flanges: PN 6 / PN 10: 10 bar/1.0 MPa.

Number of bolt holes in the pump flange: 4.

### Inlet pressure

Recommended inlet pressures:

- Min. 0.90 bar at +75 °C.
- Min. 1.20 bar at +95 °C.

### EMC (electromagnetic compatibility)

EN 61800-3.

### Sound pressure level

The sound pressure level of the pump is lower than 38 dB(A).

### Leakage current

The pump mains filter will cause a discharge current to earth during operation.  $I_{\text{leakage}} < 3.5 \text{ mA}$ .

### Standby loss

Single-head pumps: Lower than 3 W.

Twin-head pumps: Lower than 7 W.

## Pump inputs and outputs

Signal output	Internal potential-free change-over contact. Maximum load: 250 V, 2 A, AC1. Minimum load: 5 V, 100 mA. Screened cable depending on signal level.
Input for external start/stop	External potential-free switch. Contact load: 5 V, 10 mA. Screened cable. Loop resistance: Maximum 130 Ω.

## Inputs of pump with GENI module

Inputs for max. and min. curves	External potential-free switch. Contact load: 5 V, 1 mA. Screened cable. Loop resistance: Maximum 130 Ω.
Input for analog 0-10 V signal	External signal: 0-10 VDC. Maximum load: 1 mA. Screened cable.
Bus input	Grundfos bus protocol, GENIbus protocol, RS-485. Screened cable. Wire cross section: 0.25 - 1 mm <sup>2</sup> . Cable length: Maximum 1200 m.

## Input of pump with LON module

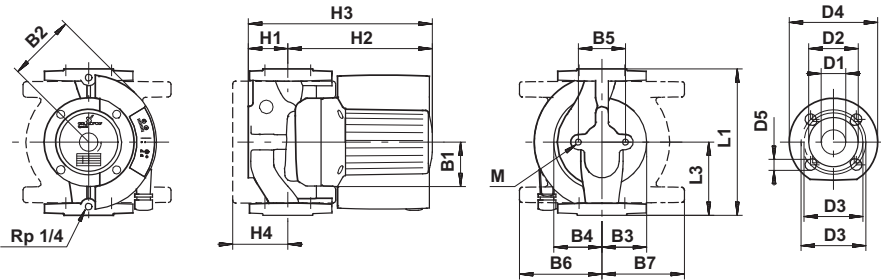
Bus input	LonTalk® protocol, FTT 10. Twisted-pair cable. Wire cross section: 0.25 - 1 mm <sup>2</sup> .
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## 12. Disposal

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

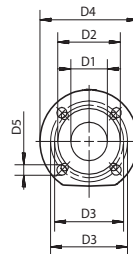
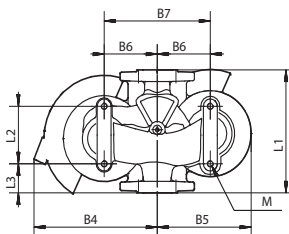
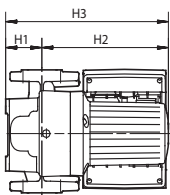
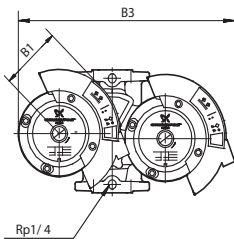
1. Use the public or private waste collection service.
2. If this is not possible, contact the nearest Grundfos company or service workshop.

Subject to alterations.



TM02.0239.4707

	MAGNA 32-120	MAGNA 40-120	MAGNA 50-120	MAGNA 65-120	MAGNA 50-60	MAGNA 65-60
	PN 6 / PN 10	PN 6 / PN 10	PN 6 / PN 10	PN 6 / PN 10	PN 6 / PN 10	PN 6 / PN 10
<b>L1</b>	220	250	280	340	280	340
<b>L3</b>	110	125	140	170	140	170
<b>B1</b>	77	77	77	77	77	77
<b>B2</b>	115	115	125	125	115	115
<b>B3</b>	75	75	84	88	84	88
<b>B4</b>	76	80	98	104	98	104
<b>B5</b>	96	96	96	96	96	96
<b>B6</b>	140	140	141	141	141	141
<b>B7</b>	110	112	121	121	121	121
<b>H1</b>	66	68	79	82	79	82
<b>H2</b>	244	242	245	252	245	252
<b>H3</b>	310	310	324	334	324	334
<b>H4</b>	98	94	103	107	103	107
<b>D1</b>	32	40	50	65	50	65
<b>D2</b>	76	84	102	119	102	119
<b>D3</b>	90/100	100/110	110/125	130/145	110/125	130/145
<b>D4</b>	140	150	165	185	165	185
<b>D5</b>	14/19	14/19	14/19	14/19	14/19	14/19

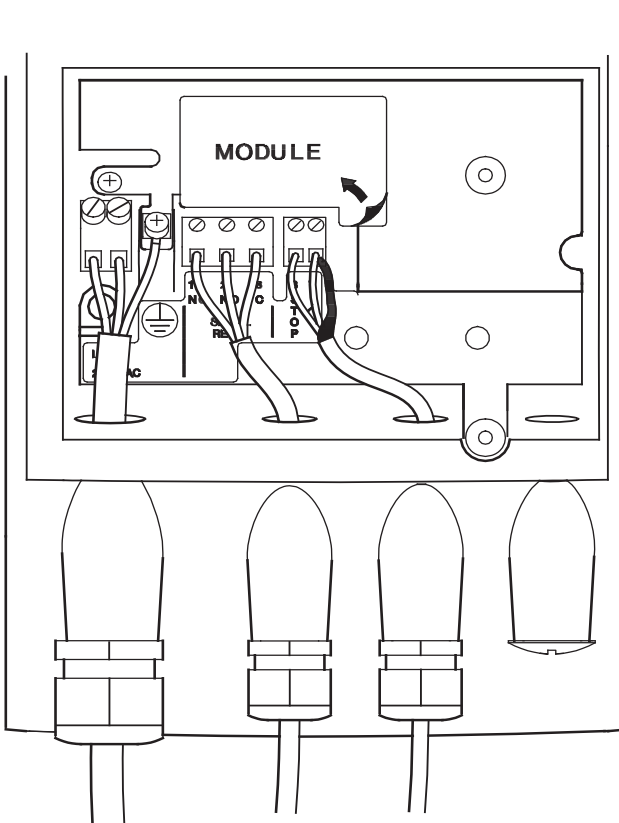
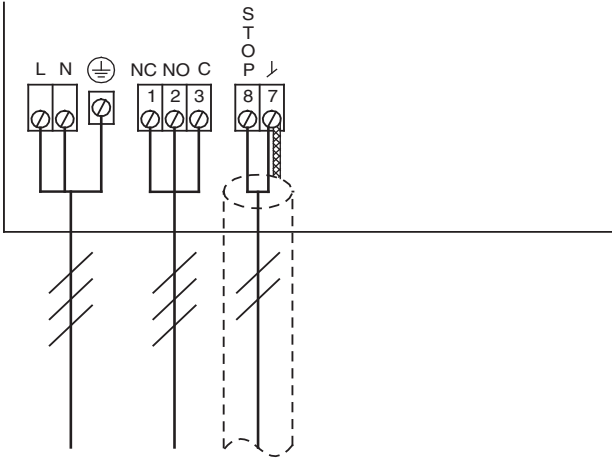


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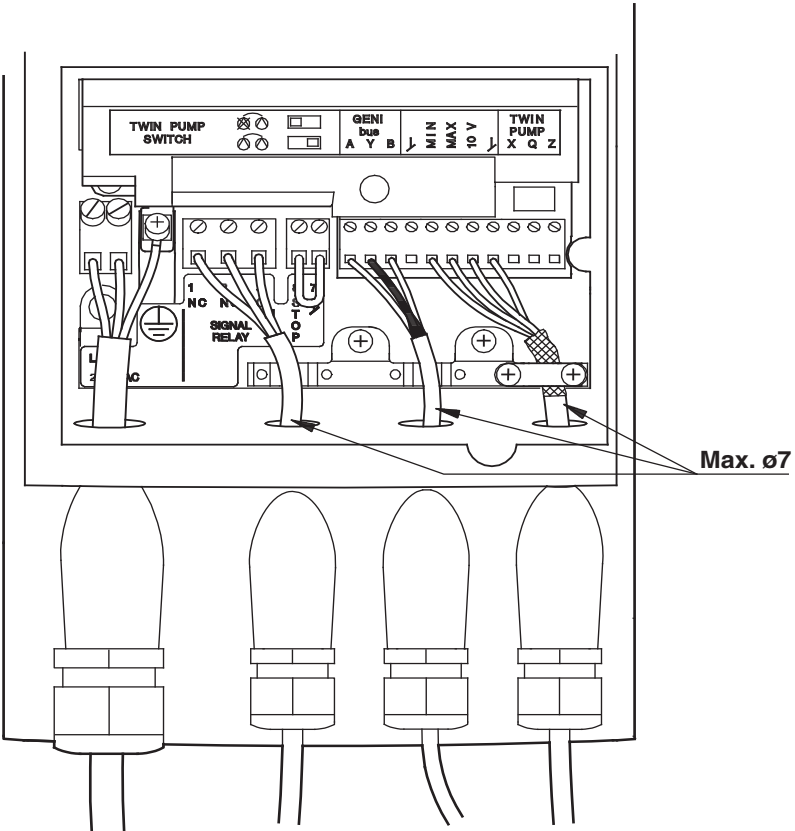
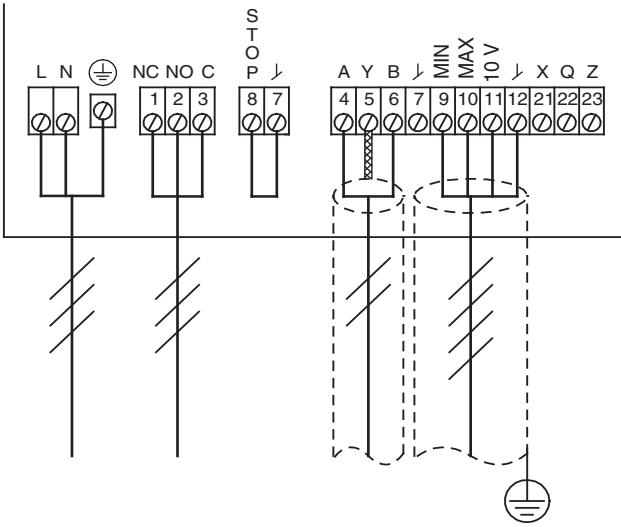
	<b>MAGNA Twin 32-120</b>	<b>MAGNA Twin 40-120</b>	<b>MAGNA Twin 50-120</b>	<b>MAGNA Twin 65-120</b>	<b>MAGNA Twin 50-60</b>	<b>MAGNA Twin 65-60</b>
	<b>PN 6 / PN 10</b>	<b>PN 6 / PN 10</b>	<b>PN 6 / PN 10</b>	<b>PN 6 / PN 10</b>	<b>PN 6 / PN 10</b>	<b>PN 6 / PN 10</b>
<b>L1</b>	220	250	280	340	280	340
<b>L2</b>	103	125	126	126	126	126
<b>L3</b>	52	45	60	60	60	60
<b>B1</b>	115	115	125	125	115	115
<b>B3</b>	465	465	490	490	485	480
<b>B4</b>	260	260	275	275	270	270
<b>B5</b>	190	187	215	215	215	215
<b>B6</b>	100	100	120	120	120	120
<b>B7</b>	200	200	240	240	240	240
<b>H1</b>	85	87	88	88	88	88
<b>H2</b>	240	234	234	242	234	242
<b>H3</b>	325	321	322	330	322	330
<b>D1</b>	32	40	50	65	50	65
<b>D2</b>	76	84	102	119	102	119
<b>D3</b>	90/100	100/110	110/125	130/145	110/125	130/145
<b>D4</b>	140	150	165	185	165	185
<b>D5</b>	14/19	14/19	14/19	14/19	14/19	14/19



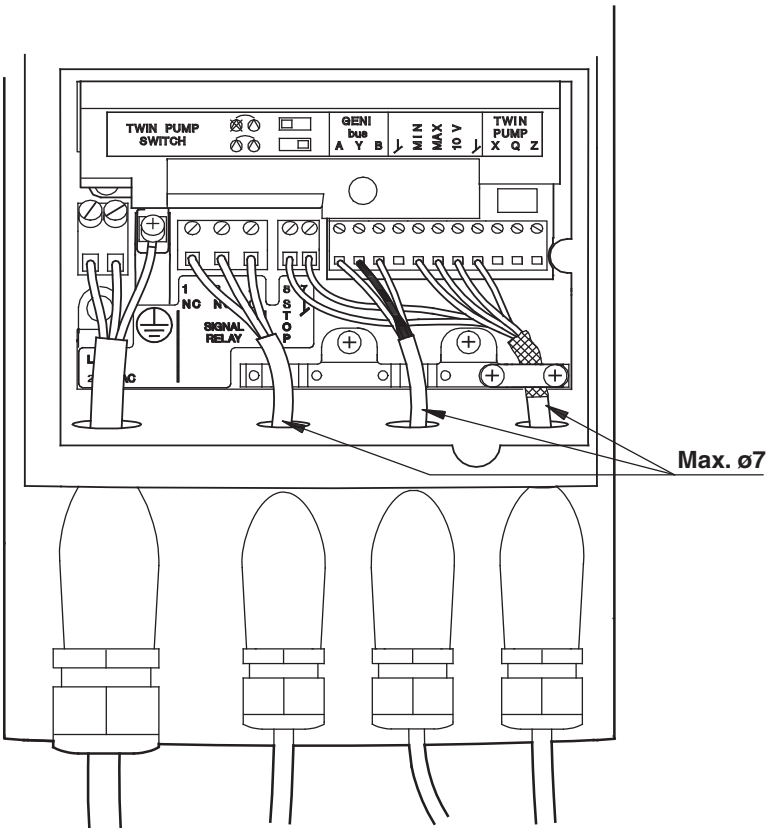
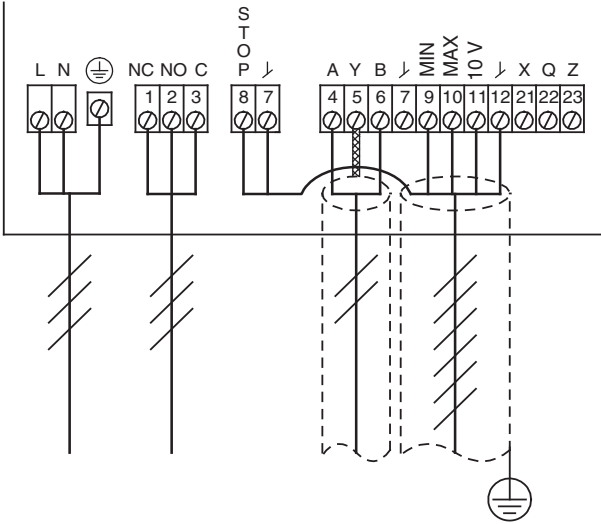
**MAGNA 32-120, 40-120, 50-120, 65-120, 50-60, 65-60**



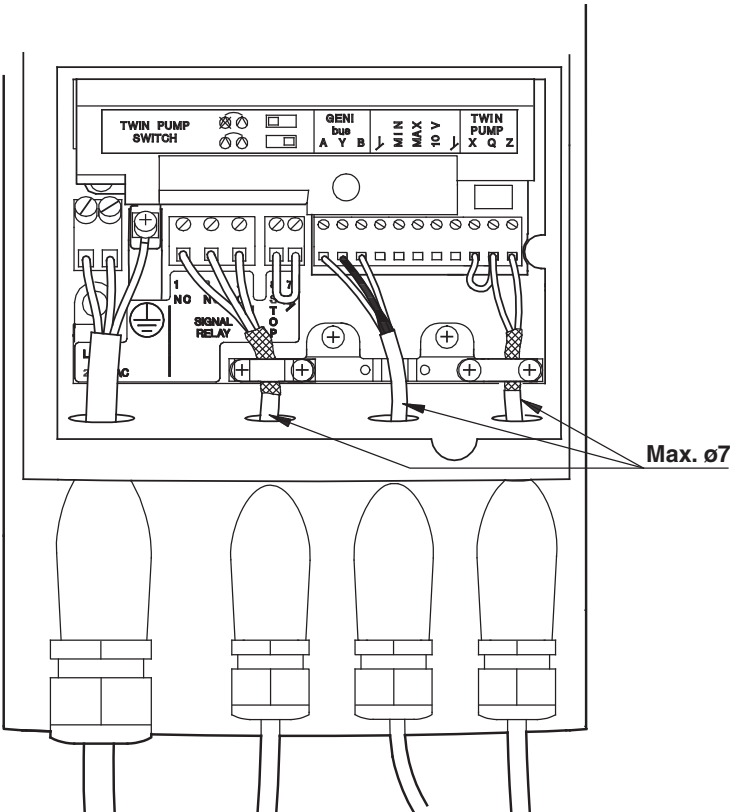
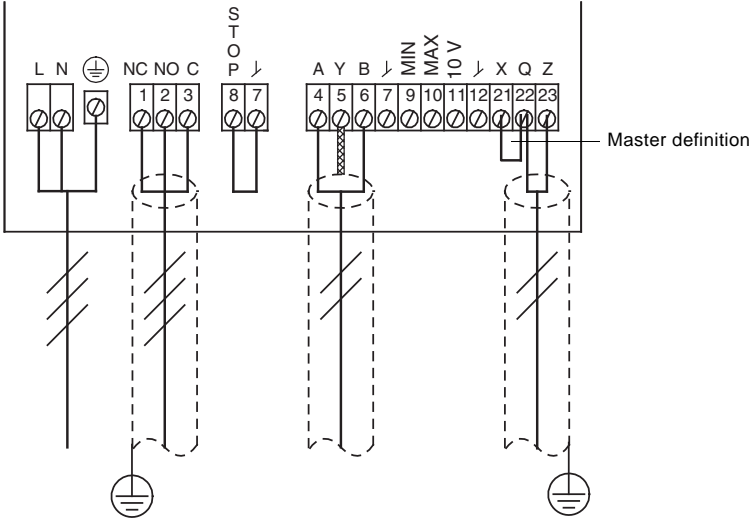
**MAGNA 32-120, 40-120, 50-120, 65-120, 50-60, 65-60, GENI module**



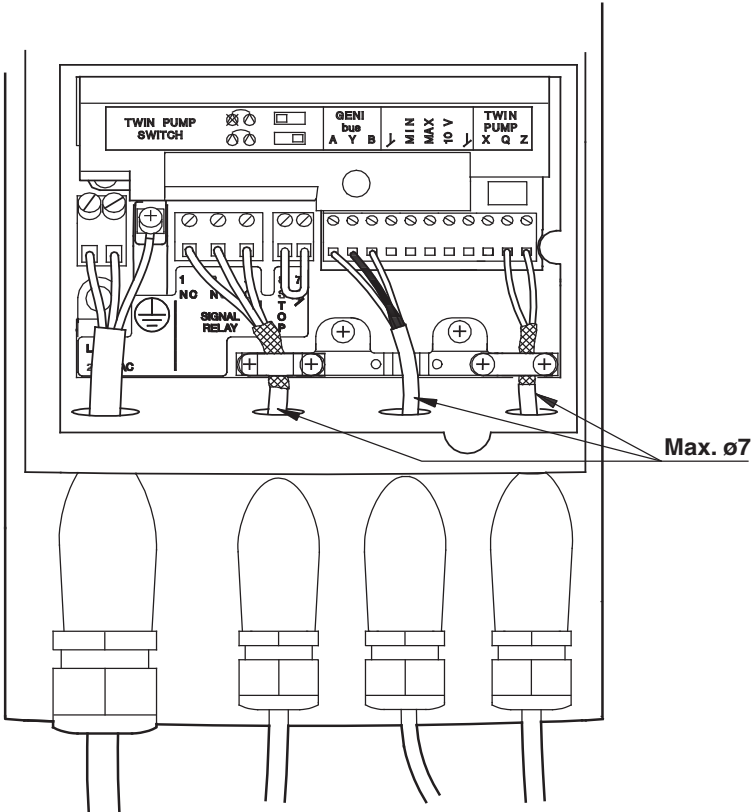
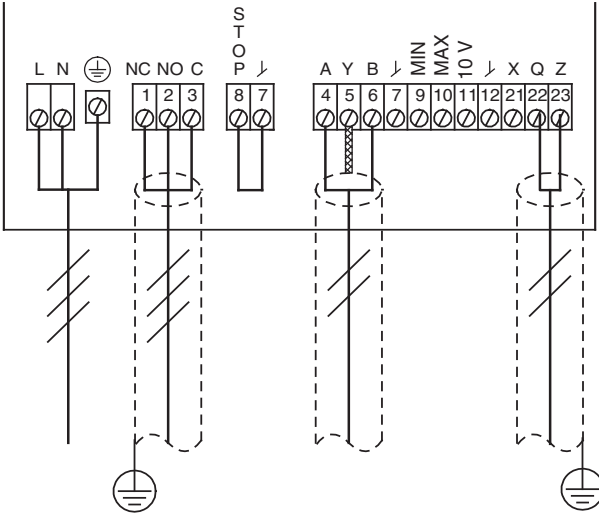
**MAGNA 32-120, 40-120, 50-120, 65-120, 50-60, 65-60, GENI module**



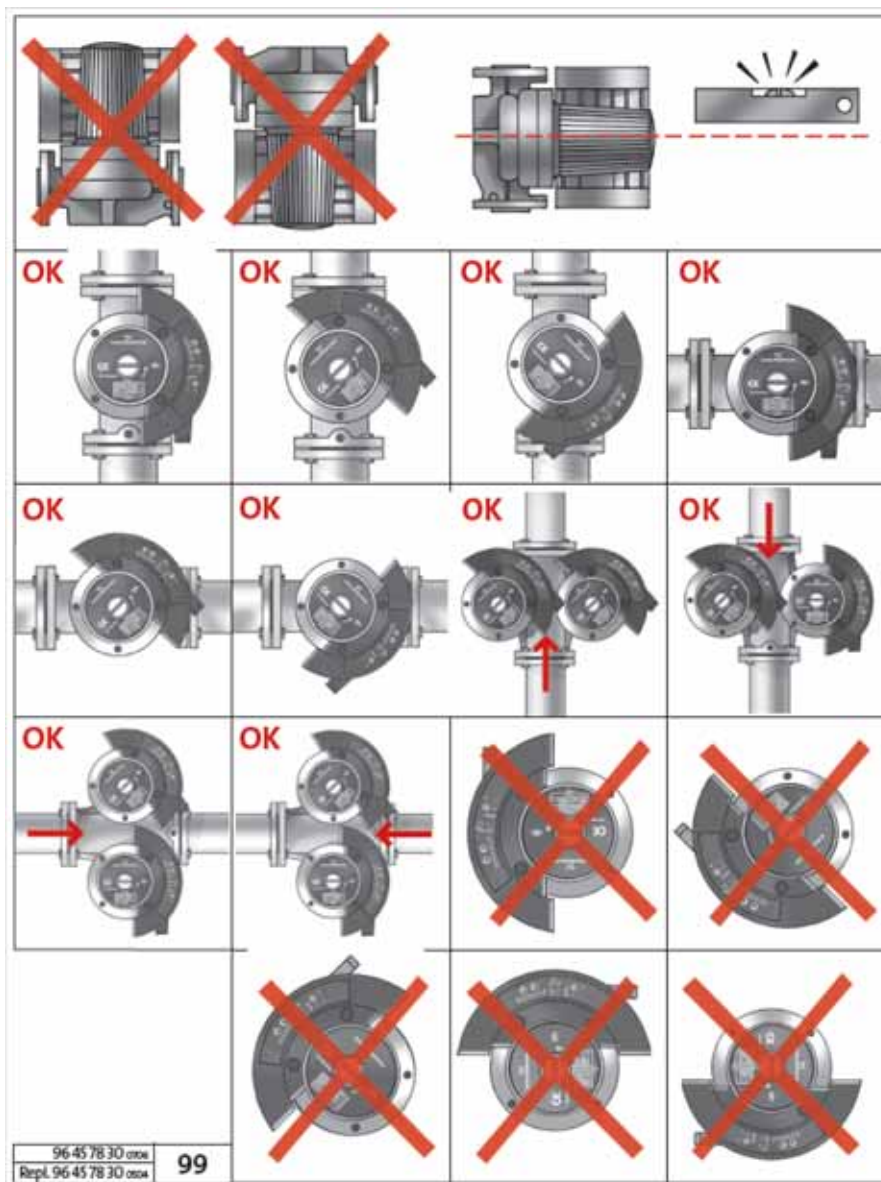
**MAGNA, Twin, 32-120, 40-120, 50-120, 65-120, 50-60, 65-60 GENI module, Master**



**MAGNA, Twin, 32-120, 40-120, 50-120, 65-120, 50-60, 65-60, GENI module, Slave**



## Positioning



TM04 3266 4108









**Argentina**

Bombas GRUNDFOS de Argentina S.A.  
Ruta Panamericana km. 37.500 Lote 34A  
1619 - Garin  
Poia. de Buenos Aires  
Phone: +54-3327 414 444  
Telefax: +54-3327 411 111

**Australia**

GRUNDFOS Pumps Pty. Ltd.  
P.O. Box 2040  
Regency Park  
South Australia 5942  
Phone: +61-8-8461-4611  
Telefax: +61-8-8340 0155

**Austria**

GRUNDFOS Pumpen Vertrieb Ges.m.b.H.  
Grundfosstraße 2  
A-5082 Gröding/Salzburg  
Tel.: +43-6246-883-0  
Telefax: +43-6246-883-30

**Belgium**

N.V. GRUNDFOS Bellux S.A.  
Boomssesteeweg 81-83  
B-2630 Aartselaar  
Tél.: +32-3-870 7300  
Télécopie: +32-3-870 7301

**Belorussia**

Представительство ГРУНДФОС в  
Минске  
220123, Минск,  
ул. В. Хоружей, 22, оф. 1105  
Тел.: +(37517) 233 97 65,  
Факс: +(37517) 233 97 69  
E-mail: grundfos\_minsk@mail.ru

**Bosnia/Herzegovina**

GRUNDFOS Sarajevo  
Trg Heroja 16,  
BIH-71000 Sarajevo  
Phone: +387 33 713 290  
Telefax: +387 33 659 079  
e-mail: grundfos@bih.net.ba

**Brazil**

Mark GRUNDFOS Ltda.  
Av. Humberto de Alencar Castelo Branco,  
630  
CEP 09850 - 300  
São Bernardo do Campo - SP  
Phone: +55-11 4393 5533  
Telefax: +55-11 4343 5015

**Bulgaria**

GRUNDFOS Pumpen Vertrieb  
Representative Office - Bulgaria  
Bulgaria, 1421 Sofia  
Lozenetz District  
105-107 Arsenalski Blvd.  
Phone: +359 2963 3820, 2963 5653  
Telefax: +359 2963 1305

**Canada**

GRUNDFOS Canada Inc.  
2941 Brighton Road  
Oakville, Ontario  
L8H 6C9  
Phone: +1-905 829 9533  
Telefax: +1-905 829 9512

**China**

GRUNDFOS Pumps (Shanghai) Co. Ltd.  
51 Floor, Raffles City,  
No. 268 Xi Zang Road. (M)  
Shanghai 200001  
PRC  
Phone: +86-021-612 252 22  
Telefax: +86-021-612 253 33

**Croatia**

GRUNDFOS CROATIA d.o.o.  
Srebini 37, Buzin  
HR-10010 Zagreb  
Phone: +385 1 6595 400  
Telefax: +385 1 6595 499  
www.grundfos.hr

**Czech Republic**

GRUNDFOS s.r.o.  
Čajkovského 21  
779 00 Olomouc  
Phone: +420-585-716 111  
Telefax: +420-585-716 299

**Denmark**

GRUNDFOS DK A/S  
Martini Bachs Vej 3  
DK-8850 Bjerringbo  
Tlf.: +45-87 50 50 50  
Telefax: +45-87 50 51 51  
E-mail: info\_GDK@grundfos.com  
www.grundfos.com/DK

**Estonia**

GRUNDFOS Pumps Eesti OÜ  
Piteburi tee 82G  
11415 Tallinn  
Tel.: + 372 606 1690  
Fax: + 372 606 1691

**Finland**

OY GRUNDFOS Pumput AB  
Mestarinieki 11  
FIN-01730 Vantaa  
Phone: +358-3066 5650  
Telefax: +358-3066 5650

**France**

Pompes GRUNDFOS Distribution S.A.  
Parc d'Activités de Chenes  
57, rue de Malacombes  
F-38290 St. Quentin Fallavier (Lyon)  
Tél.: +33-4-74 82 15 15  
Télécopie: +33-4-74 94 10 51

**Germany**

GRUNDFOS GMBH  
Schlüterstr. 33  
40699 Erkrath  
Tel.: +49-(0) 211 929 69-0  
Telefax: +49-(0) 211 929 69-3799  
e-mail: info-service@grundfos.de  
Service in Deutschland:  
e-mail: kundendienst@grundfos.de

**Greece**

GRUNDFOS Hellas A.E.B.E.  
20th km. Athinon-Markopoulou Av.  
P.O. Box 71  
GR-19002 Peania  
Phone: +0030-210-66 83 400  
Telefax: +0030-210-66 46 273

**Hong Kong**

GRUNDFOS Pumps (Hong Kong) Ltd.  
Unit 1, Ground floor  
Siu Wai Industrial Centre  
29-33 Wing Hong Street &  
68 King Lam Street, Cheung Sha Wan  
Kowloon  
Phone: +852-27861706 / 27861741  
Telefax: +852-27858664

**Hungary**

GRUNDFOS Hungária Kft.  
Park u. 8  
H-2045 Törökbalint,  
Phone: +36-23 511 110  
Telefax: +36-23 511 111

**India**

GRUNDFOS Pumps India Private Limited  
118 Old Mahabaliapuram Road  
Thoraipakkam  
Chennai 600 096  
Phone: +91-44 2496 6800  
Telefax: +91-44 2496 6800

**Indonesia**

PT GRUNDFOS Pompa  
Jl. Rawa Sumur III, Blok III / CC-1  
Kawasan Industri, Pulogadung  
Jakarta 13930  
Phone: +62-21-460 6909  
Telefax: +62-21-460 6910 / 460 6901

**Ireland**

GRUNDFOS (Ireland) Ltd.  
Unit A, Merrywell Business Park  
Ballymount Road Lower  
Dublin 12  
Phone: +353-1-4089 800  
Telefax: +353-1-4089 830

**Italy**

GRUNDFOS Pompe Italia S.r.l.  
Via Gran Sasso 4  
I-20060 Trucazzano (Milano)  
Tel.: +39-02-96583812  
Telefax: +39-02-95309290 / 95838461

**Japan**

GRUNDFOS Pumps K.K.  
Gotanda Metalion Bldg., 5F,  
5-21-15, Higashi-gotanda  
Shiagawa-ku, Tokyo  
141-0022 Japan  
Phone: +81 35 448 1391  
Telefax: +81 35 448 9619

**Korea**

GRUNDFOS Pumps Korea Ltd.  
6th Floor, Aju Building 679-5  
Yooksam-dong, Kangnam-ku, 135-916  
Seoul, Korea  
Phone: +82-2-5317 600  
Telefax: +82-2-5633 725

**Latvia**

SIA GRUNDFOS Pumps Latvia  
Deglava biznesa centrs  
Augusta Deglava iela 60, LV-1035, Rīga,  
Tālr.: + 371 714 9640, 7 149 641  
Fakss: + 371 914 9646

**Lithuania**

GRUNDFOS Pumps UAB  
Smolensko g. 6  
LT-03201 Vilnius  
Tel.: + 370 52 395 430  
Fax: + 370 52 395 431

**Malaysia**

GRUNDFOS Pumps Sdn. Bhd.  
7 Jalan Pegasus U1/25  
Glenmarie Industrial Park  
40150 Shah Alam  
Selangor  
Phone: +60-3-5569 2922  
Telefax: +60-3-5569 2866

**México**

Bombas GRUNDFOS de México S.A. de  
C.V.  
Boulevard TLC No. 15  
Parque Industrial Stiva Aeropuerto  
Apodaca, N.L. 66600  
Phone: +52-81-8144 4000  
Telefax: +52-81-8144 4010

**Netherlands**

GRUNDFOS Netherlands  
Veluwezoom 35  
1326 AE Almere  
Postbus 22015  
1302 CA ALMERE  
Tel.: +31-88-478 6336  
Telefax: +31-88-478 6332  
e-mail: info\_gnl@grundfos.com

**New Zealand**

GRUNDFOS Pumps NZ Ltd.  
17 Beatrice Tinsley Crescent  
North Harbour Industrial Estate  
Albany, Auckland  
Phone: +64-9-415 3240  
Telefax: +64-9-415 3250

**Norway**

GRUNDFOS Pumper A/S  
Strømsveien 344  
Postboks 235, Leirdal  
N-1011 Oslo  
Tlf.: +47-22 90 47 00  
Telefax: +47-22 32 21 50

**Poland**

GRUNDFOS Pompy Sp. z o.o.  
ul. Klonowa 23  
Baranowo k. Poznania  
Pl. 62-081 Przemyslawow  
Tel.: (+48-61) 650 13 00  
Fax: (+48-61) 650 13 50

**Portugal**

Bombas GRUNDFOS Portugal, S.A.  
Rua Calvet de Magalhães, 241  
Apartado 1079  
P-2770-153 Paços de Arcos  
Tel.: +351-21-440 78 00  
Telefax: +351-21-440 76 90

**România**

GRUNDFOS Pompe România SRL  
Bd. Biruinţel, nr 103  
Pantelimon county Ilfov  
Phone: +40 21 200 4100  
Telefax: +40 21 200 4101  
E-mail: romania@grundfos.ro

**Russia**

ООО Грундфос  
Россия, 109544 Москва, ул. Шольная 39  
Тел. (+7) 495 737 30 00, 564 88 00  
Факс (+7) 495 737 75 36, 564 88 11  
E-mail grundfos.moscow@grundfos.com

**Serbia**

GRUNDFOS Predstavništvo Beograd  
Dr. Milutina Ivkovića 2a/29  
YU-11000 Beograd  
Phone: +381 11 26 47 877 / 11 26 47 496  
Telefax: +381 11 26 48 340

**Singapore**

GRUNDFOS (Singapore) Pte. Ltd.  
24 Tuas West Road  
Jurong Town  
Singapore 638381  
Phone: +65-6865 1222  
Telefax: +65-6861 8402

**Slovenia**

GRUNDFOS PUMPEN VERTRIEB  
Ges.m.b.H.  
Podružnica Ljubljana  
Štandrova bb, SI-1231 Ljubljana-Črnuče  
Phone: +386 1 568 0610  
Telefax: +386 1 568 0619  
E-mail: slovenia@grundfos.si

**Spain**

Bombas GRUNDFOS España S.A.  
Camino de la Fuenteclita, s/n  
E-28110 Algete (Madrid)  
Tel.: +34-91-848 8800  
Telefax: +34-91-628 0465

**Sweden**

GRUNDFOS AB  
Box 333 (Lunnagårdsgatan) 6  
431 24 Mölndal  
Tel.: +46(0)771-32 23 00  
Telefax: +46(0)31-331 94 60

**Switzerland**

GRUNDFOS Pumpen AG  
Bruggacherstrasse 10  
CH-8117 Fallanden/ZH  
Tel.: +41-1-806 8111  
Telefax: +41-1-806 8115

**Taiwan**

GRUNDFOS Pumps (Taiwan) Ltd.  
7 Floor, 219 Min-Chuan Road  
Taichung, Taiwan, R.O.C.  
Phone: +886-4-2305 0868  
Telefax: +886-4-2305 0878

**Thailand**

GRUNDFOS (Thailand) Ltd.  
92 Chaloem Phrakiat Rama 9 Road,  
Dokmai, Pravej, Bangkok 10250  
Phone: +66-2-725 8999  
Telefax: +66-2-725 8998

**Turkey**

GRUNDFOS POMPA San. ve Tic. Ltd. Sti.  
Gebze Organize Sanayi Bölgesi  
İhsan dede Caddesi  
2. yöl 200, Sokak No. 204  
41490 Gebze/Kocaeli  
Phone: +90 - 262-679 7979  
Telefax: +90 - 262-679 7905  
E-mail: satis@grundfos.com

**Ukraine**

ТОВ ГРУНДФОС УКРАЇНА  
01010 Київ, вул. Моквоїська 86,  
Тел.:(+38 044) 390 40 59  
Факс: (+38 044) 390 40 59  
E-mail: ukraine@grundfos.com

**United Arab Emirates**

GRUNDFOS Gulf Distribution  
P.O. Box 16768  
Jebel Ali Free Zone  
Dubai  
Phone: +971-4- 8815 166  
Telefax: +971-4-8815 136

**United Kingdom**

GRUNDFOS Pumps Ltd.  
Grovebury Road  
Leighton Buzzard/Beds. LU7 8TL  
Phone: +44-1525-850000  
Telefax: +44-1525-850011

**U.S.A.**

GRUNDFOS Pumps Corporation  
17100 West 118th Terrace  
Olathe, Kansas 66061  
Phone: +1-913-227-3400  
Telefax: +1-913-227-3500

**Usbekistan**

Представительство ГРУНДФОС в  
Ташкенте  
700000 Ташкент ул.Усмана Носира 1-й  
тулик 5  
Телефон: (3712) 55-68-15  
Факс: (3712) 53-36-35

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