

# MAGNA3

**Circulator pumps**

60 Hz



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# 1. Product introduction

The Grundfos MAGNA3 circulator pumps are designed for circulating liquids in the following systems:

- heating systems
- air-conditioning and cooling systems
- domestic hot water systems
- ground source heat pump systems
- solar heating systems.



Fig. 1 MAGNA3 pump ranges

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## Features and benefits

### Features

- AUTO<sub>ADAPT</sub>.
- FLOW<sub>ADAPT</sub> and FLOW<sub>LIMIT</sub>.
- Intuitive user interface with TFT display.
- Proportional pressure control.
- Constant pressure control.
- Constant temperature control.
- Built-in Grundfos differential pressure and temperature sensor.
- Constant curve duty.
- Max. or min. curve duty.
- Automatic Night Setback.
- Internal motor protection.
- Heat energy meter.
- Work log history.
- Insulating shells supplied with single-head pumps for heating systems.
- Large temperature range where the liquid temperature and the ambient temperature are independent of each other.

### Benefits

- Unparalleled energy efficiency.
- Safe selection.
- Simple installation.
- Maintenance free.
- Guided installation.
- Simple assisted troubleshooting.
- Easy system optimization.
- Multi-pump function.
- External control and monitoring enabled via add-on modules.
- No external motor protection required.
- The complete range is available for a maximum system pressure of 175 psi (12 bar).

## Applications

### Heating systems

- Main pump.
- Mixing loops.
- Domestic hot water.
- Heating surfaces.
- Air-conditioning surfaces.

The MAGNA3 circulator pumps are designed for circulating liquids in systems with variable flows where it is desirable to optimize the setting of the pump duty point, thus reducing energy costs.

The pump is especially suitable for installation in existing systems where the differential pressure across the pump is too high in periods with reduced flow demand.

The pump is also suitable for new systems where automatic adjustment of pump head to actual flow demand is desired, without using expensive bypass valves or similar components.

Furthermore, the pump is suitable for systems with hot water priority as an external signal can immediately force the pump to operate according to the max. curve, for example in solar heating systems.

### Duty range

Data	MAGNA3 (N) Single-head pumps	MAGNA3 D Twin-head pumps
Max. flow rate, Q	346 gpm (78.5 m <sup>3</sup> /h)	570 gpm (150 m <sup>3</sup> /h)
Max. head, H	60 ft (18 m)	
Max. system pressure	175 psi (12 bar) (1.2 MPa)	
Liquid temperature	+14 to +230 °F (-10 to +110 °C)	

## 2. Performance range

### MAGNA3

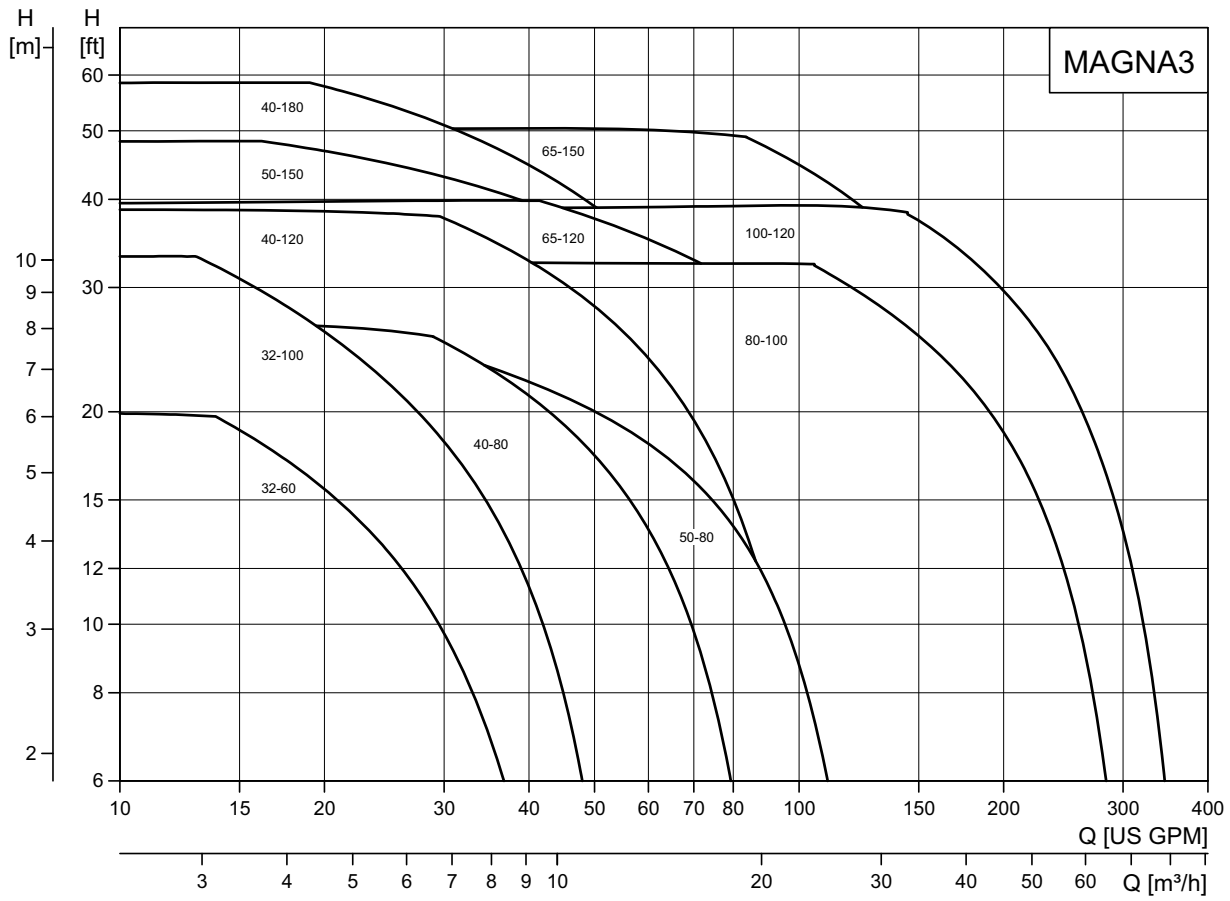
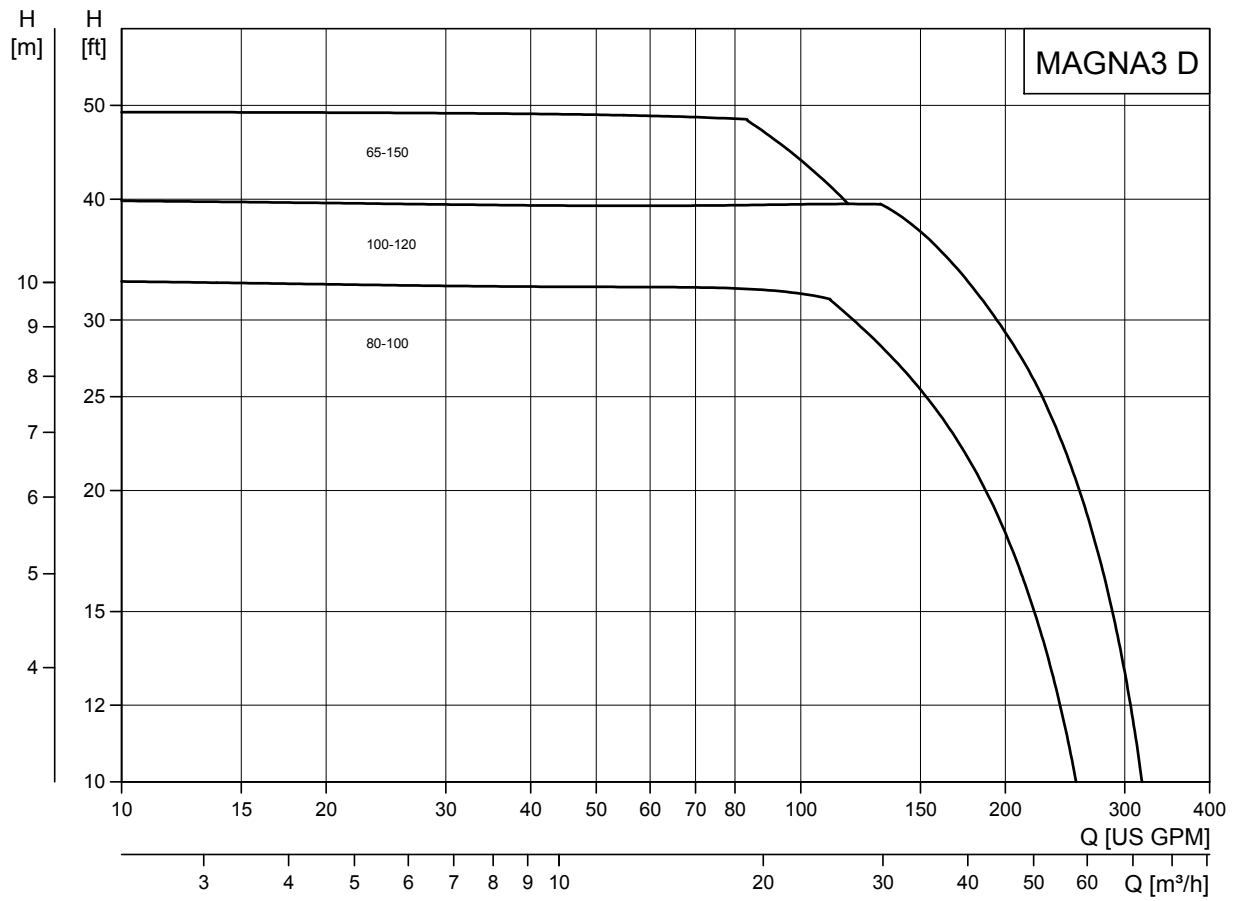


Fig. 2 Performance range, MAGNA3

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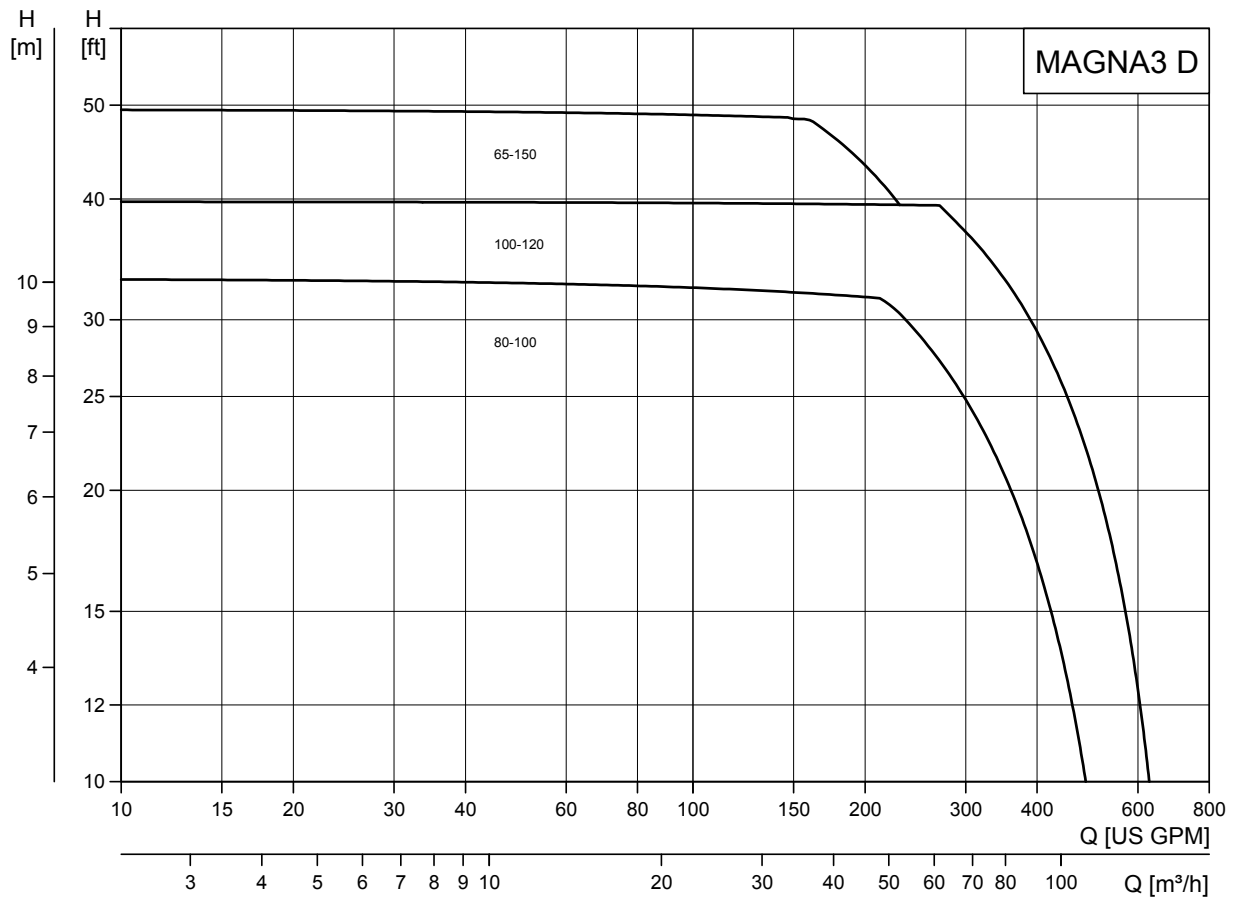
### MAGNA3 D single-head operation



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Fig. 3 Performance range, MAGNA3 D single-head operation

MAGNA3 D twin-head operation



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Fig. 4 Performance range, MAGNA3 D twin-head operation

### 3. Product range

Single-head pump	Cast iron		Stainless steel (N)		Page reference
	115 V	208-230 V	115 V	208-230 V	
MAGNA3 32-60 F (N)	98126820		98126822		42
MAGNA3 32-100 F (N)	98126824		98126826		43
MAGNA3 40-80 F (N)	98126800	98126828	98126802	98126830	44
MAGNA3 40-120 F (N)	98126804	98126832	98126806	98126834	45
MAGNA3 40-180 F (N)	98126808	98126836	98126810	98126838	46
MAGNA3 50-80 F (N)	98126812	98126840	98126814	98126842	47
MAGNA3 50-150 F (N)	98126816	98126844	98126818	98126846	48
MAGNA3 65-120 F (N)	98124696	98126848	98124702	98126850	49
MAGNA3 65-150 F (N)	-	98126852	-	98126854	50
MAGNA3 80-100 F (N)	-	98126856	-	98126858	52
MAGNA3 100-120 F (N)	-	98126860	-	98126862	54
MAGNA3 D 65-150 F	-	98126863	-	-	51
MAGNA3 D 80-100 F	-	98126864	-	-	53
MAGNA3 D 100-120 F	-	98126865	-	-	55

### Pump selection

Frequently, pumps are selected based on a maximum flow and pressure loss in a system as well as peak efficiency of the pump. For circulators in variable demand systems such as a heating system where the heat load varies with the season and time of day it is more optimal to select a pump for this varying demand rather than one specific duty point.

The MAGNA3 has been optimized for variable demand systems. For variable loads, when possible it is most ideal to size and select the pump such that the maximum flow and pressure required is on the right hand side of the pump performance curve.

This enables the pump to have higher efficiency at partial load and allows the pumps to slow down more at these partial loads yielding significant energy savings.

### Pump size

The system characteristic is used together with the pump's performance curve for sizing and correct pump selection.

The selection of pump size should be based on the following:

- required maximum flow
- maximum pressure loss in the system.

Refer to the system characteristics to determine the duty point. See fig. 5.

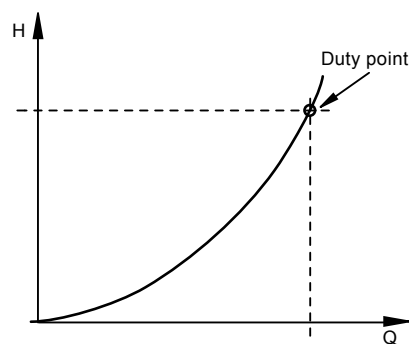


Fig. 5 System characteristic

### Operating conditions

When selecting a pump, always verify the operating conditions are fulfilled. Refer to section [Guide to performance curves](#) on page 40 for:

- liquid quality and temperature
- ambient conditions
- minimum inlet pressure
- maximum operating pressure.

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## Control modes

- $AUTO_{ADAPT}$  (factory setting): Is suitable for most installations. Auto adapt is proportional pressure control where the pump sets and adapts its own set point based on maximum system conditions.
- $FLOW_{ADAPT}$ ,  $FLOW_{LIMIT}$ : in systems where a flow limitation is required.
- Proportional pressure control in systems with considerable pressure loss variation in relation to large flow variations; i.e. if more than 50 % of pressure loss is due to friction loss in the pipe system.
- Constant pressure control in systems with insignificant pressure loss variation in relation to large flow variations; i.e. if less than 50 % of pressure loss is due to friction loss in the pipe system
- Constant temperature control in heating systems with a fixed system characteristic, for example domestic hot water systems.
- Constant curve duty.

## Determination of precise setpoint

To determine precise setpoint for proportional pressure control, consult WebCAPS ([www.grundfos.us/WebCAPS](http://www.grundfos.us/WebCAPS)). See fig. 6.

The desired proportional pressure setpoint can be determined by selecting the duty point on the pump curve. In the upper right hand corner, the setpoint can be read.

In order to see the setpoint, in CAPS on the product detail page, select:

Options>Curve settings>Curve types>Check local control>Proportional pressure.

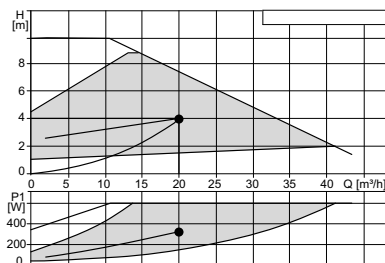


Fig. 6 Grundfos WebCAPS tool

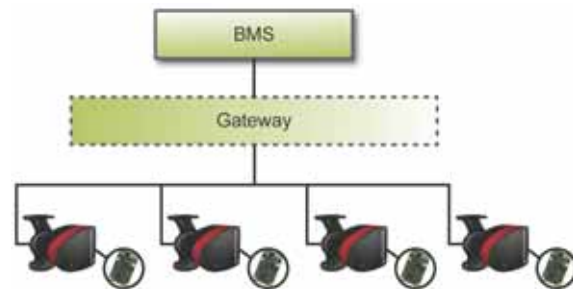
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## Communication

The Grundfos CIM modules (CIM = Communication Interface Module) enable the MAGNA3 to connect to standard fieldbus networks, offering substantial benefits:

- complete process control and monitoring
- modular design, prepared for future requirements
- based on standard functional profiles
- simple configuration and easy installation
- open communication standards
- reading warning and alarm indications.

For further details, see section [CIM modules](#) on page 37.



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Fig. 7 Example of typical building management system (BMS)

**Note:** A gateway is a device that facilitates the transfer of data between two different networks based on different communication protocols.



## 4. Identification

### Type key

Code	Example	MAGNA3	(D)	100	-120	(F)	(N)	360
	<b>Type range</b> MAGNA3							
D	Single-head pump Twin-head pump							
	Nominal diameter (DN) of suction and discharge ports [mm]							
	Maximum head [dm]							
F	<b>Pipe connection</b> Flange							
N	<b>Pump housing material</b> Cast iron Stainless steel							
	Port-to-port length [mm]							

## 5. Construction

### Sectional drawing

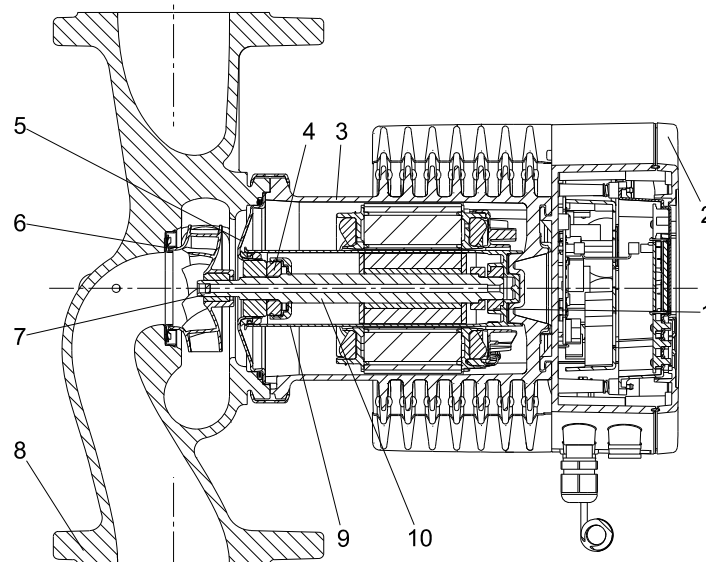


Fig. 8 MAGNA3

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### Material specification

Pos.	Component	Material
1	Outer bearing ring	Aluminium oxide
2	Control box	Polycarbonate
3	Stator housing O-rings	Aluminium EPDM
4	Thrust bearing	Aluminium oxide/carbon
5	Bearing plate	Stainless steel (304)
6	Neck ring	Stainless steel (304)
7	Impeller	PES
8	Pump housing	Cast iron/stainless steel (316)
9	Rotor can	PPS
10	Shaft	Stainless steel (316L)

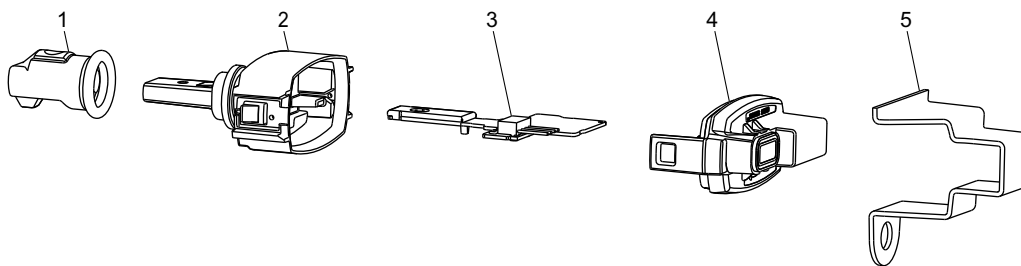


Fig. 9 Sensor

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Pos.	Component	Material
1	Sealing cap	EPDM
2	Housing	PPS
3	Printed-circuit board	-
4	Cover snap-on	PA/TPV
5	Bracket for sensor	Stainless steel

## Mechanical construction

The MAGNA3 is of the canned-rotor type, i.e. pump and motor form an integral unit without shaft seal and with only two gaskets for sealing. The bearings are lubricated by the pumped liquid.

The pump is characterized by the following:

- controller integrated in the control box
- control panel on the control box
- control box prepared for optional CIM modules
- built-in differential pressure and temperature sensor
- cast-iron or stainless-steel pump housing
- twin-head versions
- no external motor protection required
- insulating shells supplied with single-head pumps for heating systems.

## Motor and electronic controller

The MAGNA3 incorporates a 4-pole synchronous, permanent magnet motor (PM motor). This motor type is characterized by higher efficiency than a conventional asynchronous squirrel cage motor.

The pump speed is controlled by an integrated variable frequency drive.

A differential pressure and temperature sensor is incorporated in the pump.

## Pump connections

See individual product pages.

## Surface treatment

The pump housing and pump head are electrocoated to improve the corrosion resistance.

Electrocoating includes:

- alkaline cleaning
- pretreatment with zinc phosphate coating
- cathodic electrocoating (epoxy)
- curing of paint film at +392 to +482 °F (+200 to +250 °C).

### Color

Color codes for the pump:

Color	Code
Red	NCS40-50R
Black	NCS9000

## 6. Operating conditions

### Pumped liquids

The pump is suitable for thin, clean, non-aggressive and non-explosive liquids, not containing solid particles or fibers that may attack the pump mechanically or chemically.

In heating systems, the water should meet the requirements of accepted standards on water quality in heating systems.

In domestic hot water systems, we recommend to use MAGNA3 pumps only for water with a degree of hardness lower than approx. 14 °dH.

In domestic hot water systems, we recommend to keep the liquid temperature below +149 °F (+65 °C) to eliminate the risk of lime precipitation.

The MAGNA3 pumps can be used for pumping water/glycol mixtures up to 50 %.

Example of a water/ethylene glycol mixture:

Maximum viscosity: 50 cSt ~ 50 % water / 50 % ethylene glycol mixture at +14 °F (-10 °C).

The pump is controlled by a power-limiting function that protects against overload.

The pumping of glycol mixtures will affect the max. curve and reduce the performance, depending on the water/ethylene glycol mixture and the liquid temperature.

To prevent the ethylene glycol mixture from degrading, avoid temperatures exceeding the rated liquid temperature and minimize the operating time at high temperatures.

It is important to clean and flush the system before the ethylene glycol mixture is added.

To prevent corrosion or lime precipitation, check and maintain the ethylene glycol mixture regularly. If further dilution of the supplied ethylene glycol is required, follow the glycol supplier's instructions.

### General recommendations

<b>Water in heating systems</b>	Water quality according to local standards
<b>Domestic hot water</b>	Degree of hardness up to 14 °dH
<b>Water containing glycol</b>	Maximum viscosity = 50 cSt ~ 50 % water / 50 % ethylene glycol at +14 °F (-10 °C)

### Temperatures

#### Liquid temperature

Application	Temperature range
General	+14 to +230 °F (-10 to +110 °C)
Domestic hot water systems	+150 °F (Up to +65 °C) recommended

#### Ambient temperature

Ambient conditions	
Ambient temperature during operation	+32 to +140 °F (0 to +40 °C)
Ambient temperature during storage and transport	-40 to +158 °F (-40 to +70 °C)
Relative air humidity	Maximum 95 %

### Pressures

#### Maximum operating pressure

175 psi (12 bar).

#### Minimum inlet pressure

The following relative minimum pressure must be available at the pump inlet during operation to avoid cavitation noise and damage to the pump bearings.

The values in the table below apply to single-head pumps and twin-head pumps in single-head operation.

MAGNA3 DN	Liquid temperature		
	[167 °F (75 °C)]	[203 °F (95 °C)]	[230 °F (110 °C)]
Inlet pressure [psi (bar)]			
32-60/100	1.5 (0.10)	5.0 (0.35)	14.5 (1.0)
40-80	1.5 (0.10)	7.3 (0.50)	16.0 (1.1)
40-120/150/180	1.5 (0.10)	5.8 (0.40)	14.5 (1.0)
50-80	1.5 (0.10)	1.5 (0.10)	10.2 (0.7)
50-150	2.9 (0.20)	8.7 (0.60)	17.4 (1.2)
65-120	1.5 (0.10)	7.3 (0.50)	16.0 (1.1)
65-150	5.8 (0.40)	11.6 (0.80)	17.4 (1.2)
80-100	7.3 (0.50)	13.1 (0.90)	21.8 (1.5)
100-120	7.3 (0.50)	13.1 (0.90)	21.8 (1.5)

In the case of twin-head operation, the required relative inlet pressure must be increased by 1.45 psi (0.1 bar) compared to the stated values for single-head pumps or twin-head pumps in single-head operation.

**Note:** Actual inlet pressure plus pump pressure against a closed valve must be lower than the maximum permissible system pressure.

The relative minimum inlet pressures apply to pumps installed up to 984 ft (300 m) above sea level. For altitudes above 984 ft (300 m), the required relative inlet pressure must be increased by 1.45 psi per 330 ft (0.1 bar / 0.01 MPa per 100 m) altitude. The MAGNA3 pump is only approved for an altitude of 6560 ft (2000 m).

## Differential pressure and temperature sensor

The MAGNA3 incorporates a differential pressure and temperature sensor. The sensor is located in the pump housing in a channel between the suction and discharge ports. The sensors of twin-head pumps are connected to the same channel and the pumps therefore register the same differential pressure and temperature.

Via a cable, the sensor sends an electrical signal for the differential pressure across the pump and for the liquid temperature to the controller in the control box.

In case of missing sensor signal, the pump will run at maximum speed. When the fault has been corrected, the pump will continue operating according to the parameters set.

The differential pressure and temperature sensor offers substantial benefits:

- direct feedback on the pump display
- complete pump control
- measurement of the pump workload for precise and optimum control resulting in higher energy efficiency.

## 7. Installation

### Mechanical installation

The MAGNA3 is designed for indoor installation. The pump must be installed with horizontal motor shaft.

The pump may be installed in horizontal as well as vertical pipes.



Fig. 10 Installation positions

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

The control box must be in horizontal position with the Grundfos logo in vertical position. See fig. 10.

This is described in the installation and operating instructions.



<http://GRUNDFOS.COM/MANUAL-MAGNA3>

The pump must be installed in such a way that it is not stressed by the pipework.

The pump may be suspended direct in the pipes, provided that the pipework can support the pump.

Twin-head pumps are prepared for installation on a mounting bracket or base plate.

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

- Position the pump in such a way that sufficient cooling is ensured.
- The temperature of the ambient air must not exceed +104 °F (+40 °C).

### Insulating shells

The insulating shells supplied with single-head MAGNA3 pumps are for heating systems and should be fitted as part of the installation.

Insulating shells for air-conditioning and cooling systems are available as an accessory.

For cooling systems, see section *Insulating for air-conditioning and cooling systems*, page 57.

**Note:** Insulating shells are not available for twin-head pumps.

### Electrical installation

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

- The pump must be connected to an external mains switch.
- The pump must always be correctly earthed.
- The pump requires no external motor protection.
- The pump incorporates thermal protection against slow overloading and blocking.
- When switched on via the power supply, the pump will start pumping after approx. 5 seconds.

**Note:** The number of starts and stops via the power supply must not exceed four times per hour.

The pump has a digital input that can be used for external control of start/stop without switching the power supply on/off.

The pump mains connection must be made as shown in the diagrams on the following pages.

### Cables

Use screened cables for external on/off switch, digital input, sensor and setpoint signals.

- All cables used must be heat-resistant up to at least +185 °F (+85 °C).
- All cables used must be installed in accordance with EN 60204-1 and EN 50174-2:2000.

### Additional protection

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

The earth leakage circuit breaker must be marked with the first or both of the symbols as shown:



Symbol	Description
	High-sensitivity ELCB, type A, according to IEC 60775
	High-sensitivity ELCB, type B, according to IEC 60775

### Examples of connections

#### Supply connection

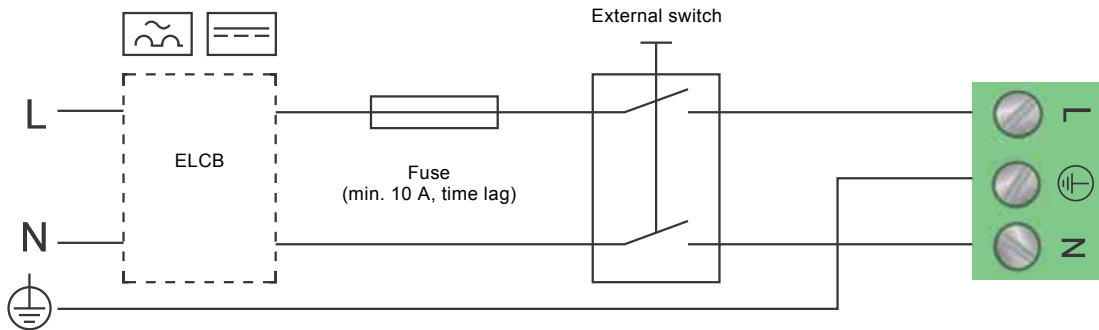


Fig. 11 Example of typical connection, 1 x 230 V ± 10 %, 50/60 Hz

As a minimum, a 10 A time-lag fuse must be installed due to the start-up power of the MAGNA3.

#### Connection to external controllers

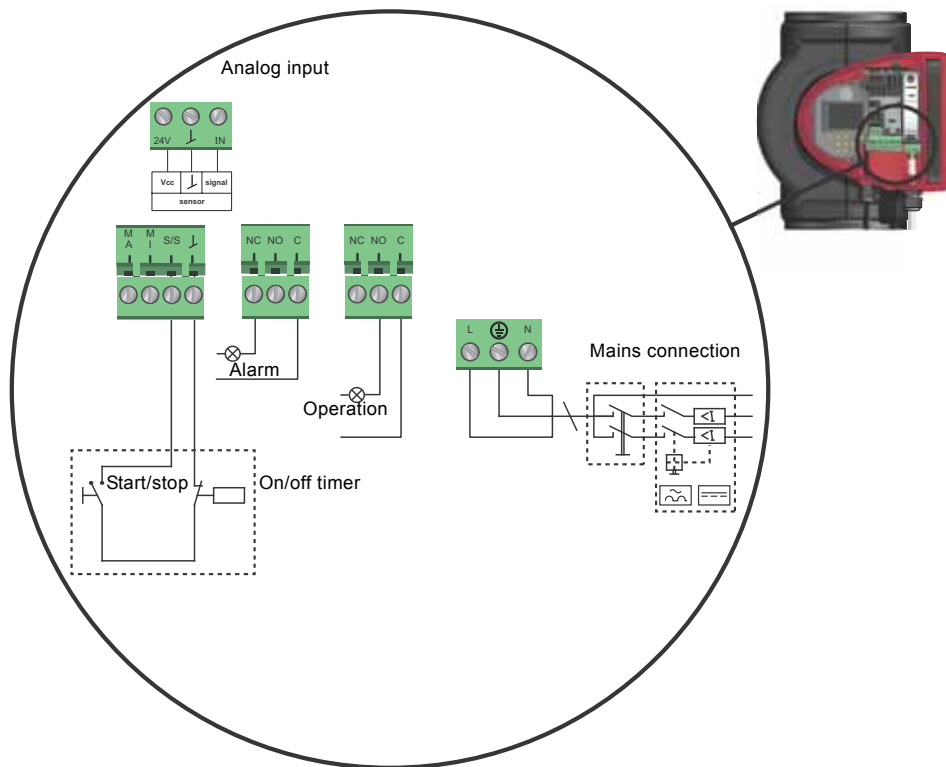


Fig. 12 Example of connections in the control box

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## Digital inputs

The digital input can be used for external control of start/stop or forced max. or min. curve.

**Note:** If no external on/off switch is connected, the jumper between terminals Start/Stop (S/S) and frame ( $\downarrow$ ) should be maintained. This connection is the factory setting.

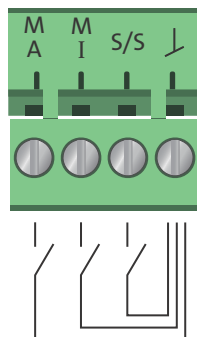


Fig. 13 Digital input in control box

Contact symbol	Function
M A	Max. curve
M I	Min. curve
S/S	Start/Stop
$\downarrow$	Frame connection

## External start/stop

The pump can be started or stopped via the digital input.

Start/stop	
	 Normal duty
	 Stop

## External forced max. or min curve

The pump can be forced to operate on the max. or min. curve via the digital input.

Max. curve	
	 Normal duty
	 Max. curve

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Min. curve	
	 Normal duty
	 Min. curve

## Relay outputs

The pump has two signal relays with a potential-free changeover contact for external fault indication.

The function of the signal relay can be set to "Alarm", "Ready" or "Operation" on the pump control panel or with the Grundfos GO Remote.

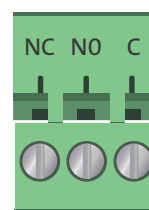


Fig. 14 Relay output in control box

Contact symbol	Function
NC	Normally closed
NO	Normally open
C	Common

The functions of the signal relays are as shown in the table below:

Signal relay	Alarm signal
	Not activated: <ul style="list-style-type: none"> <li>The power supply has been switched off.</li> <li>The pump has not registered a fault.</li> </ul>
	Activated: <ul style="list-style-type: none"> <li>The pump has registered a fault.</li> </ul>
Signal relay	Ready signal
	Not activated: <ul style="list-style-type: none"> <li>The pump has registered a fault and is unable to run.</li> </ul>
	Activated: <ul style="list-style-type: none"> <li>The pump has been set to stop, but is ready to run.</li> <li>The pump is running.</li> </ul>
Signal relay	Operating signal
	Not activated: <ul style="list-style-type: none"> <li>The pump is not running.</li> </ul>
	Activated: <ul style="list-style-type: none"> <li>The pump is running.</li> </ul>

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### Analog input for external sensor

The analog input can be used for the connection of an external sensor for measuring temperature, pressure, flow or other parameter.

The analog input can also be used for an external signal for the control from a BMS system or similar control system.

The electrical signal for the input can be 0-10 VDC or 4-20 mA.

The selection of electrical signal (0-10 V or 4-20 mA) can be changed on the control panel or with the Grundfos GO Remote.

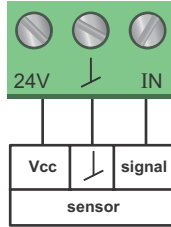


Fig. 15 Analog input for external sensor or control

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In order to optimize the pump performance, external sensors can advantageously be used in the following cases:

Function/control mode	Sensor type
Heat energy meter	Temperature sensor
Constant temperature	Temperature sensor (external)
Constant pressure remote	Pressure sensor (external)

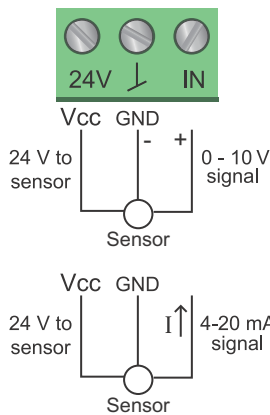


Fig. 16 Wiring, analog input

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PIN	Description	Load
IN	Analog input	150 Ω (4-20 mA signal) 78k Ω (0-10 V signal)
24 V	24 V supply to external sensor	Max. 22 mA
⌋	Ground for external sensor	

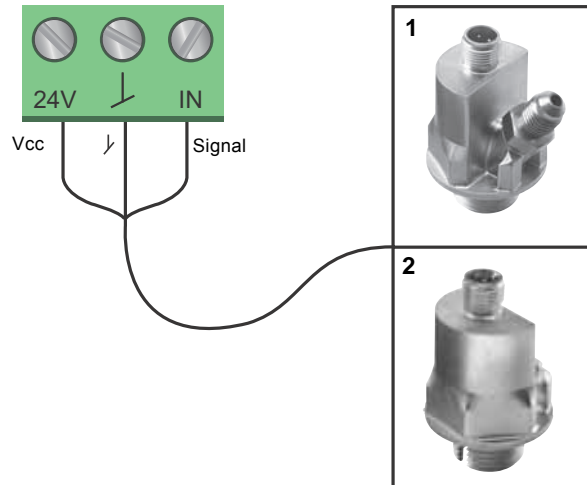


Fig. 17 Examples of external sensors

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Pos.	Sensor type
1	Differential pressure transmitter, Grundfos type DPI V.2 1/2" connection and 4-20 mA signal.
2	Relative pressure transmitter, combined pressure and temperature sensor, Grundfos type RPI/T G 1/2" connection and 4-20 mA signal.

For further details, see section [Guide to performance curves](#), page 40.

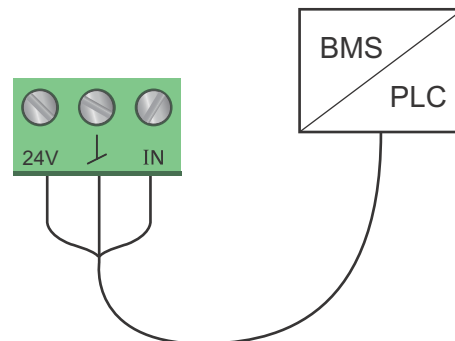
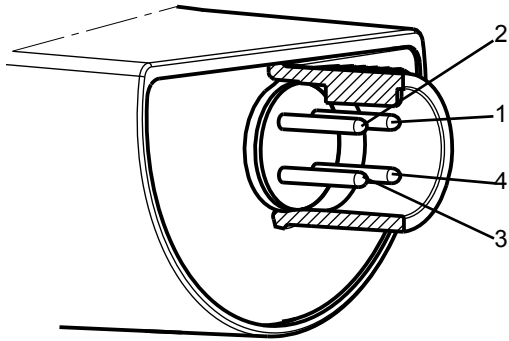


Fig. 18 Example of external signal for the control via BMS or PLC

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## Electrical connection for external sensor



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**Fig. 19** Example electrical connections for external sensor

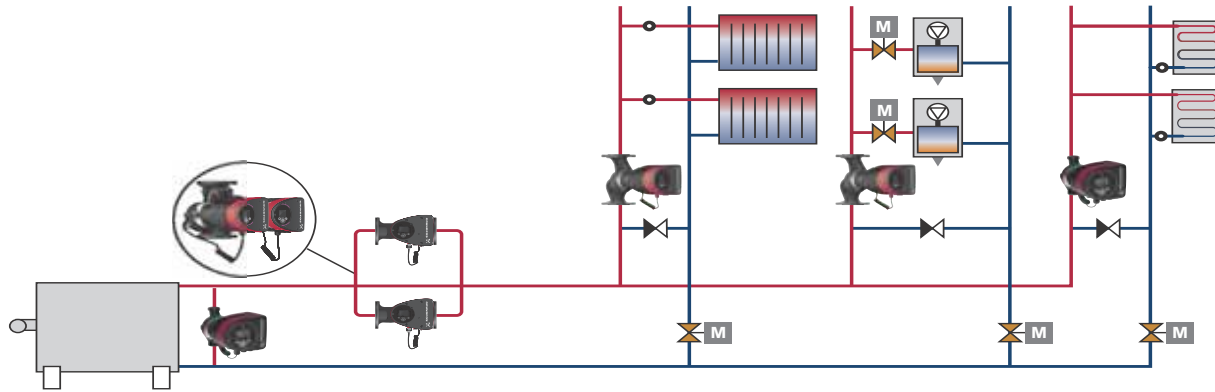
PIN	1	2	3	4
Wire color	Brown	Grey	Blue	Black
Output 4 to 20 mA	+	not used	-	not used
Output 2 x 0 to 10 V	+	Pressure signal	_*	Temperature signal

- \* Common ground for both pressure and temperature signal.
- \* Power supply (screened cable): SELV or PELV.

## 8. Functions

### System application

#### Heating systems



TM05 2155 1312

Fig. 20 Functional drawing of a heating system in a commercial building

Pos.	Description
<b>1</b>	<b>Main pumps</b>
A	Boiler
<b>2</b>	<b>Air handler heating coils</b>
<b>3</b>	<b>Domestic hot water</b>
B	Hot water circulation
C	Cold water
<b>4</b>	<b>Mixing loops</b>
D	Radiators
E	Fan coils
F	Underfloor heating

#### Main pumps

Due to variations in the heat demand and water flow rate, we always recommend to use speed-controlled MAGNA3 pumps in a heating system, either single-head pumps connected in parallel or twin-head pumps. Single-head pumps connected in parallel have several advantages. In alternating operation, each pump is sized for 100 % flow. In this operating mode, the second pump functions as back-up for higher reliability. As the pumps alternate, an equal number of operating hours is ensured. Cascade operation of pumps connected in parallel meets demands in high-flow systems with low differential temperature ( $\Delta t$ ), and 50 % back-up is ensured at the same time.

The twin-head pump saves installation time and costs. By speed-controlling all pumps, it is possible to obtain maximum energy saving as the pumps will run at their best efficiency point (BEP).

In a variable-flow system, we recommend to control main pumps in proportional pressure or  $AUTO_{ADAPT}$  mode with a differential pressure sensor in the flow pipe with the lowest pressure. This ensures maximum energy saving.

By using the  $FLOW_{ADAPT}$  function to ensure correct balancing of the system, the need for pump throttling valves can be reduced significantly.

The built-in heat energy meter allows monitoring of the heat energy consumption in the system for pure optimisation purposes.

#### Air handler heating coils

The performance of heating surfaces is controlled by the heating-water temperature and flow. For this purpose, we recommend to install variable-flow mixing loops at the heating surfaces. A speed-controlled mixing-loop pump is ideal for adaptation to the varying load in a heating surface. In this case, the MAGNA3 will have full authority, making external pump throttling valves superfluous.

#### Domestic hot water

For domestic hot water circulation, the constant temperature control mode will ensure a constant temperature in the recirculation pipe, without the use of separate thermostatic valves, thus obtaining the maximum comfort.

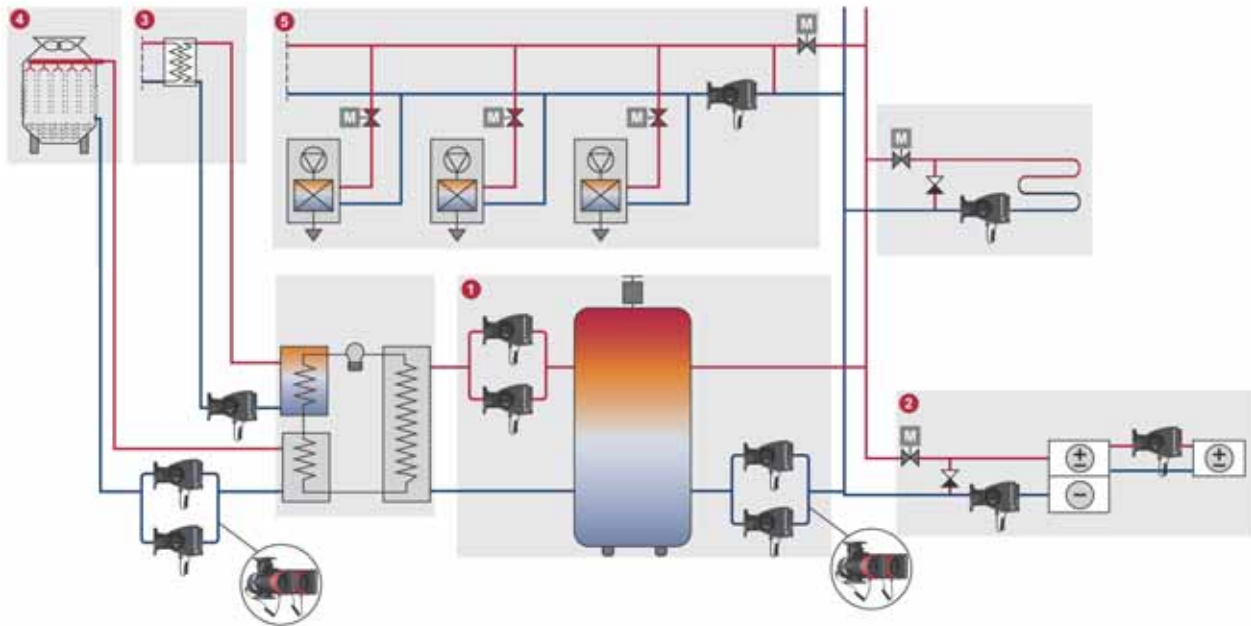
### Mixing loops

Due to variations in use, flow temperature and heat demand in different parts of the building, the heating system should be divided into zones controlled by independent mixing loops. Due to the flow variations, a speed-controlled mixing-loop pump will have the authority in the system. This will help obtain a better hydraulic balance in the total system. Speed control of the pump via selection of a control mode, depending on system application, ensures maximum energy saving. See section [Selection of control mode](#), page 24.

Advantages of using mixing loops:

- Reduced excessive differential pressure in the system and hereby reduced risk of overflow.
- Increased control ability as the loop is provided with the exact flow and temperature demand.

## Cooling systems



TM05 2156 1312

Fig. 21 Functional drawing of a cooling system in a commercial building

Pos.	Description
1	Primary and secondary pumps
2	Air handler cooling coils
3	Heat recovery system
4	Cooling tower
5	Mixing loops

### Primary and secondary pumps

Due to variations in the cooling demand and water flow rate, we recommend to use speed-controlled MAGNA3 pumps in a cooling system, either single-head pumps connected in parallel or twin-head pumps. Single-head pumps connected in parallel have several advantages. In alternating operation, each pump is sized for 100 % flow. In this operating mode, the second pump functions as back-up for higher reliability. As the pumps alternate, an equal number of operating hours is ensured. Cascade operation of pumps connected in parallel meets demands in high-flow systems with low differential temperature ( $\Delta t$ ), and 50 % back-up is ensured at the same time.

The twin-head pump saves installation time and costs. By speed-controlling all pumps, it is possible to obtain maximum energy saving as the pumps will run at their best efficiency point (BEP).

In a variable-flow system, we recommend to control secondary pumps in proportional pressure or  $AUTO_{ADAPT}$  mode with a differential pressure sensor in the flow pipe with the lowest pressure. This ensures maximum energy saving.

The built-in heat energy meter allows monitoring of the heat energy consumption in the system.

### Air handler cooling coils

The performance of cooling surfaces is controlled by the cooling-water temperature and flow. For this purpose, we recommend to install variable-flow mixing loops at the cooling surfaces. A speed-controlled mixing-loop pump is ideal for adaptation to the varying load in a cooling surface. In this case, the MAGNA3 will have full authority, making external pump throttling valves superfluous. The  $FLOW_{LIMIT}$  ensures that the rated flow is never exceeded.

### Heat recovery system

The heat recovery system is of paramount importance for the overall energy efficiency of an air-conditioning or cooling system. Pumps used for this purpose should be controlled by a setpoint from the building management system. Due to high load and temperature variations in the system, it is important to use variable-speed pumps in a heat recovery system.

### Cooling tower

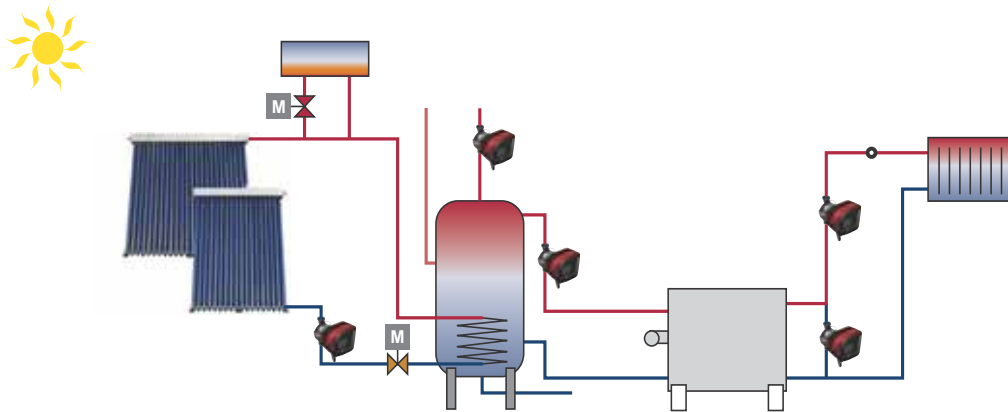
Due to chiller load variations and changes in the temperature and moisture of the ambient air, the cooling-tower flow rate is continuously changing. In order to achieve maximum energy saving, cooling-tower pumps have to be able to adapt to these varying conditions. The pumps are controlled by a temperature setpoint which is measured at the chiller's condenser. In this system, the MAGNA3 will have full authority, making pump throttling valves superfluous. The  $FLOW_{LIMIT}$  ensures that the rated flow is never exceeded.

**Mixing loops**

Due to the risk of condensation, the flow temperature through a cooling ceiling or floor must never be lower than the dew point temperature of the indoor air. The dew point temperature is varying due to variations in indoor moisture load and outdoor thermal conditions. The result is that the cooling-water setpoint has to be controlled. A mixing loop is ideal for obtaining the correct temperature in order to adapt to the varying setpoint.

Due to continuous cooling-load variations in the building cooling zones, the cooling performance in cooling ceilings and floors is controlled by motor valves via zone control units, and a speed-controlled mixing-loop pump should always be used.

## Solar heating systems



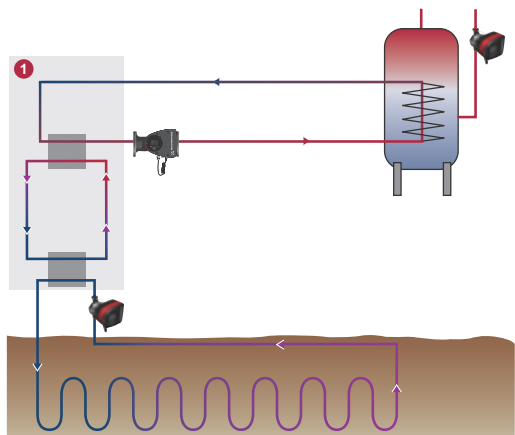
TM05 3421 1312

Fig. 22 Functional drawing of a solar heating system

### Main pumps

Solar heating systems operate with very low flows compared to other heating systems, however, with relatively large pressure losses. With a conventional circulator pump, the flow must be minimized with a valve resulting in a significantly higher power consumption. To achieve major reductions in power consumption, the MAGNA3 is optimized with the  $FLOW_{ADAPT}$  /  $FLOW_{LIMIT}$  control mode for operation specifically under these conditions.

### Ground source heat pump systems (GSHP)



TM05 3422 1312

Fig. 23 Ground source heat pump system in a commercial building

Pos.	Description
①	Heat pump

### Main pump

The MAGNA3 is optimized for operation as circulator pump in a closed-loop pipe system which is buried in the ground and filled with a mixture of water and antifreeze. The MAGNA3 is therefore ideal for large ground source heat pump systems for commercial buildings.

The MAGNA3 is designed for pumping liquids down to +14 °F (-10 °C). It can cope with all known antifreeze compositions.

It is very important that all components are highly energy-efficient. No other circulator pump performs better in GSHP systems than the MAGNA3 with the  $FLOW_{ADAPT}$  /  $FLOW_{LIMIT}$  control mode.

Use the benefit of the inputs/outputs of the MAGNA3 to control the pump together with the heat pump.

### Installation and commissioning

When installing MAGNA3, no external pressure sensor or motor protection is required. Installation is simple thanks to the built-in differential pressure and temperature sensor, which enables proportional pressure control without the installation of a sensor in the system.

In systems where a differential pressure is desired at a certain point of the system, an external pressure sensor must be installed.

Pump selection is based on required flow and calculated pressure losses. We recommend not to oversize the pump as it will lead to unnecessarily high energy consumption.

The MAGNA3 features the  $FLOW_{LIMIT}$  function. In circuits where the MAGNA3 has full authority, the need for external pump throttling valves is reduced. The  $FLOW_{LIMIT}$  ensures that the rated flow is never exceeded.

## Selection of control mode

### System application

Recommended for most heating systems, especially in systems with relatively large pressure losses in the distribution pipes. See description under proportional pressure.

In replacement situations where the proportional pressure duty point is unknown.

The duty point has to be within the  $AUTO_{ADAPT}$  operating range. During operation, the pump automatically makes the necessary adjustment to the actual system characteristic.

This setting ensures minimum energy consumption and noise level from valves, which reduces operating costs and increases comfort.

The  $FLOW_{ADAPT}$  control mode is a combination of  $AUTO_{ADAPT}$  and  $FLOW_{LIMIT}$ .

This control mode is suitable for systems where a maximum flow limit,  $FLOW_{LIMIT}$ , is desired. The pump continuously monitors and adjusts the flow, thus ensuring that the selected  $FLOW_{LIMIT}$  is not exceeded.

Main pumps in boiler applications where a steady flow through the boiler is required. No extra energy is used for pumping too much liquid into the system.

In systems with mixing loops, the control mode can be used to control the flow in each loop.

Benefits:

- The dimensioned flow for each zone (required heat energy) is determined by the flow from the pump. This value can be set precisely in the  $FLOW_{ADAPT}$  control mode without the use of pump throttling valves.
- When the flow is set lower than the balancing valve setting, the pump will ramp down instead of losing energy by pumping against a balancing valve.
- Cooling surfaces in air-conditioning systems can operate at high pressure and low flow.
- **Note:** The pump cannot reduce the flow on the suction side, but is able to control that the flow on the discharge side is at least the same as on the suction side. This is due to the fact that the pump has no built-in valve.

In systems with relatively large pressure losses in the distribution pipes and in air-conditioning and cooling systems.

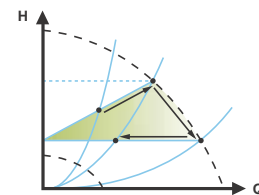
- Two-pipe heating systems with thermostatic valves and
  - very long distribution pipes
  - strongly throttled pipe balancing valves
  - differential pressure regulators
  - large pressure losses in those parts of the system through which the total quantity of water flows (for example boiler, heat exchanger and distribution pipe up to the first branching).
- Primary circuit pumps in systems with large pressure losses in the primary circuit.
- Air-conditioning systems with
  - heat exchangers (fan coils)
  - cooling ceilings
  - cooling surfaces.

In systems with relatively small pressure losses in the distribution pipes.

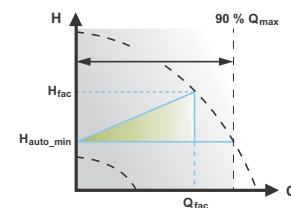
- Two-pipe heating systems with thermostatic valves and
  - dimensioned for natural circulation
  - small pressure losses in those parts of the system through which the total quantity of water flows (for example boiler, heat exchanger and distribution pipe up to the first branching) or
  - modified to a high differential temperature between flow pipe and return pipe (for example district heating).
- Underfloor heating systems with thermostatic valves.
- One-pipe heating systems with thermostatic valves or pipe balancing valves.
- Primary circuit pumps in systems with small pressure losses in the primary circuit.

### Select this control mode

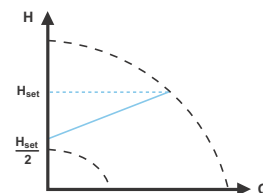
#### $AUTO_{ADAPT}$



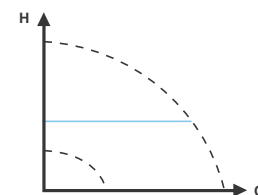
#### $FLOW_{ADAPT}$



#### Proportional pressure



#### Constant pressure





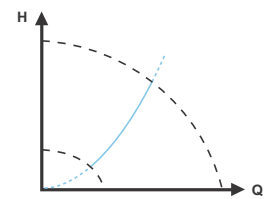
**System application**

In heating systems with a fixed system characteristic, for example domestic hot water systems, the control of the pump according to a constant return-pipe temperature may be relevant.

$FLOW_{LIMIT}$  can be used with advantage to control the maximum circulation flow.

**Select this control mode**

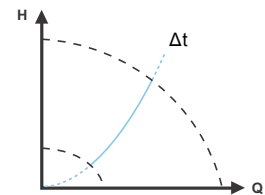
Constant temperature



Select this control mode if the pump performance is to be controlled according to a differential temperature in the system where the pump is installed.

This control mode requires two temperature sensors, either the internal temperature sensor together with an external sensor or two external sensors.

Differential temperature

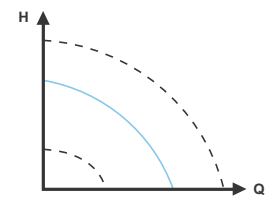


If an external controller is installed, the pump is able to change from one constant curve to another, depending on the value of the external signal.

The pump can also be set to operate according to the max. or min. curve, like an uncontrolled pump:

- The max. curve mode can be used in periods in which a maximum flow is required. This operating mode is for instance suitable for hot water priority.
- 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 setback if Automatic Night Setback is not desired.

Constant curve



In systems with pumps operating in parallel.

The multi-pump function enables the control of single-head pumps connected in parallel (two pumps) and twin-head pumps without the use of external controllers. The pumps in a multi-pump system communicate with each other via the wireless GENlair connection.

"Assist" menu  
Multi-pump setup

## Functions

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## Operating modes

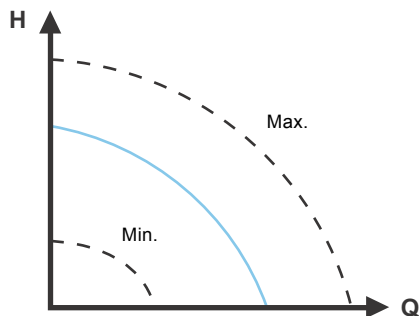


Fig. 24 Max. or min. curves

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**Normal:** The pump runs according to the selected control mode.

**Note:** The control mode and setpoint can be selected even if the pump is not running in "Normal" mode.

**Stop:** The pump stops.

**Min.:** 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 setback if Automatic Night Setback is not desired.

**Max.:** The max. curve mode can be used in periods in which a maximum flow is required.

This operating mode is for instance suitable for hot water priority.

The operating modes can be selected directly by use of the built-in digital inputs. See section [Digital inputs](#), page 16.

## Control modes

### Factory setting

The pumps have been factory-set to  $AUTO_{ADAPT}$  without Automatic Night Setback.

The setpoint has been factory-set. See section [Setting values for control modes](#), page 32.

The factory setting is suitable for most installations.

**Note:** When switched on via the power supply, the pump will start in  $AUTO_{ADAPT}$  after approx. 5 seconds. If the buttons on the control panel are not touched for 15 minutes, the display will go into sleep mode. When a button is touched, the "Home" display will appear.

## $AUTO_{ADAPT}$

Recommended for most heating systems.

During operation, the pump automatically makes the necessary adjustment to the actual system characteristic.

This setting ensures minimum energy consumption and noise level from valves, which reduces operating costs and increases comfort.

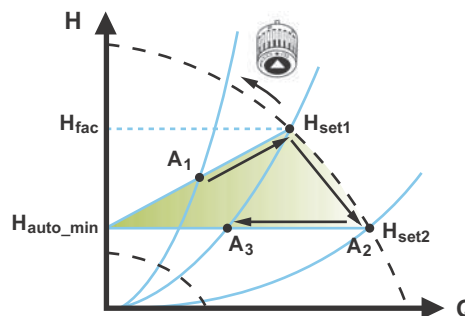


Fig. 25  $AUTO_{ADAPT}$  control

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**Note:** Manual setting of the setpoint is not possible. When the  $AUTO_{ADAPT}$  control mode has been enabled, the pump will start with the factory setting,  $H_{fac} = H_{set1}$ , corresponding to approx. 55 % of its maximum head, and then adjust its performance to  $A_1$ . See fig. 25.

When the pump registers a lower head on the max. curve,  $A_2$ , the  $AUTO_{ADAPT}$  function automatically selects a correspondingly lower control curve,  $H_{set2}$ . If the valves in the system close, the pump adjusts its performance to  $A_3$ .

- $A_1$ : Original duty point.
- $A_2$ : Lower registered head on the max. curve.
- $A_3$ : New duty point after  $AUTO_{ADAPT}$  control.
- $H_{set1}$ : Original setpoint setting.
- $H_{set2}$ : New setpoint after  $AUTO_{ADAPT}$  control.
- $H_{fac}$ : See page 32.
- $H_{auto\_min}$ : A fixed value of 1.5 m.

The  $AUTO_{ADAPT}$  control mode is a form of proportional pressure control where the control curves have a fixed origin,  $H_{auto\_min}$ .

The  $AUTO_{ADAPT}$  control mode has been developed specifically for heating systems and is not recommended for air-conditioning and cooling systems.

## FLOW<sub>ADAPT</sub>

The typical pump selection is based on required flow and calculated pressure losses. The pump is typically oversized by 30 to 40 % to ensure that it can overcome the pressure losses in the system. Under these conditions, the full benefit of AUTO<sub>ADAPT</sub> cannot be obtained.

To adjust the maximum flow of this "oversized" pump, balancing valves are built into the circuit to increase the resistance and thus reduce the flow. The FLOW<sub>ADAPT</sub> function reduces the need for a pump throttling valve.

**Note:** This function cannot eliminate the need for balancing valves in heating systems.

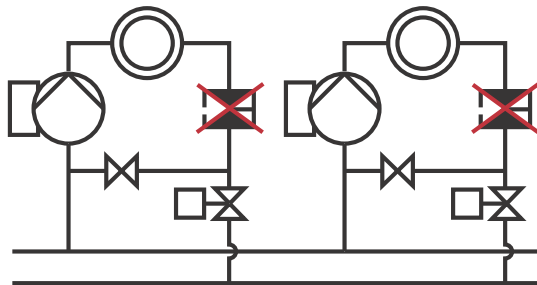


Fig. 26 Reduced need for a pump throttling valve

The FLOW<sub>ADAPT</sub> control mode combines a control mode and a function:

- The pump is running AUTO<sub>ADAPT</sub>.
- The flow will never exceed a selected FLOW<sub>LIMIT</sub> value, which reduces the need for a pump throttling valve connected in series with the pump.

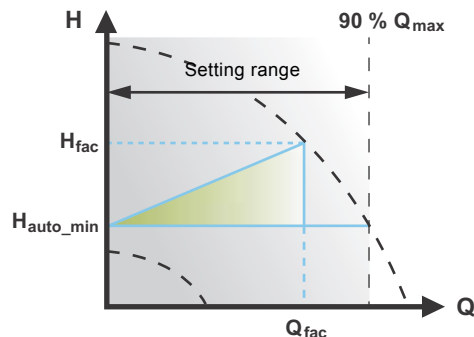


Fig. 27 FLOW<sub>ADAPT</sub> control

When FLOW<sub>ADAPT</sub> is selected, the pump will run AUTO<sub>ADAPT</sub> and ensure that the flow never exceeds the entered FLOW<sub>LIMIT</sub> value.

The factory setting of the FLOW<sub>ADAPT</sub> is the flow where the AUTO<sub>ADAPT</sub> factory setting meets the max. curve. See fig. 27 and section [Selection of control mode](#), page 24.

## Proportional pressure

This control mode is used in systems with relatively large pressure losses in the distribution pipes. The head of the pump will increase proportionally to the flow in the system to compensate for the large pressure losses in the distribution pipes. The setpoint can be set with an accuracy of 0.1 meter.

The head against a closed valve is half the setpoint  $H_{set}$ .

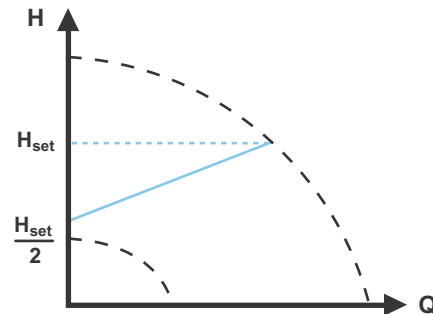


Fig. 28 Proportional pressure control

## Constant pressure

We recommend this control mode in systems with relatively small pressure losses.

The pump head is kept constant, independent of the flow in the system.

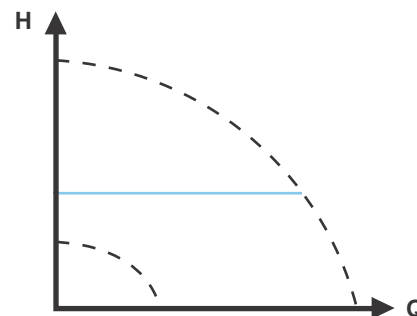


Fig. 29 Constant pressure control

## Differential temperature

The differential-temperature control mode is available from model B which will be released in 2014. The production code is stated on the nameplate. See fig. 30.



Fig. 30 Production code on nameplate

This control mode ensures a constant differential temperature drop across heating and cooling systems. In this control mode, the pump will maintain a constant differential temperature between the pump and the external sensor. See fig. 31 and fig. 32.

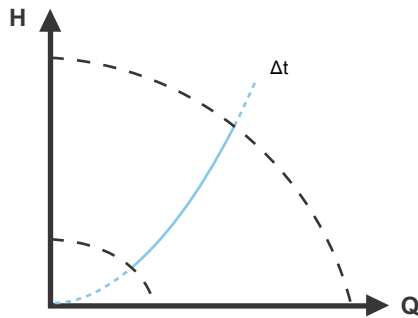


Fig. 31 Differential temperature

### Temperature sensor

If the pump is installed in the flow pipe, the internal temperature sensor can be used. An external temperature sensor must be installed in the return pipe of the system. The sensor must be installed as close as possible to the consumer (radiator, heat exchanger, etc.). See fig. 32.

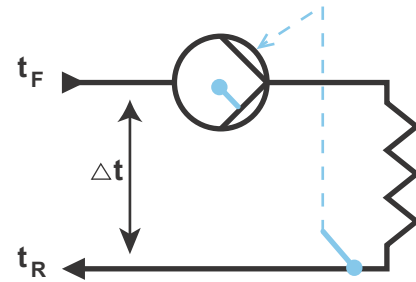


Fig. 32 Differential temperature

### Constant temperature

In heating systems with a fixed system characteristic, for example domestic hot water systems, the control of the pump according to a constant return-pipe temperature is relevant.

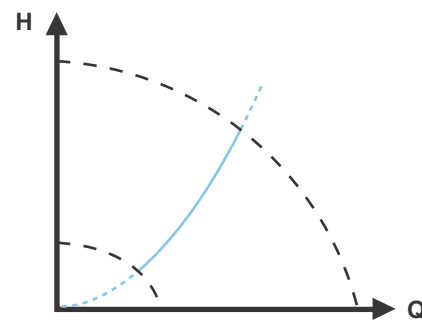


Fig. 33 Constant temperature control

The inverse control for cooling application is available from model B.

### Temperature sensor

If the pump is installed in the flow pipe, an external temperature sensor must be installed in the return pipe of the system. See fig. 34. The sensor must be installed as close as possible to the consumer (radiator, heat exchanger, etc.).

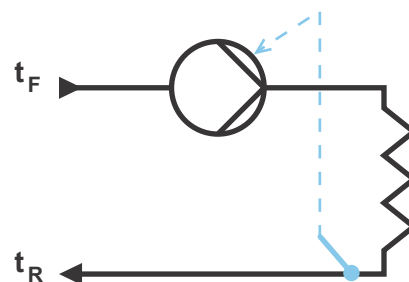


Fig. 34 Pump with external sensor

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TM05 2451 5111

TM05 8235 2113

TM05 2451 5111

TM05 2615 0312

If the pump is installed in the return pipe of the system, the internal temperature sensor can be used. In this case, the pump must be installed as close as possible to the consumer (radiator, heat exchanger, etc.).

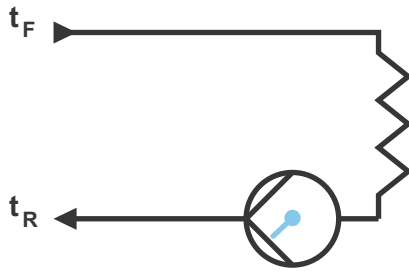


Fig. 35 Pump with internal sensor

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### Constant curve

The pump can be set to operate according to a constant curve, like an uncontrolled pump. See fig. 36. The desired speed can be set in % of maximum speed in the range from 25 to 100 %.

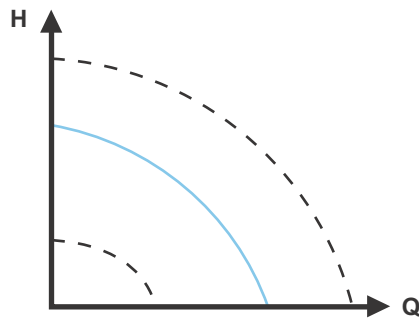


Fig. 36 Constant curve duty

TM05 2446 5111

**Note:** If the pump speed is set in the range between minimum and maximum, the power and pressure are limited when the pump is running on the max. curve. This means that the maximum performance can be achieved at a speed lower than 100 %. See fig. 37.

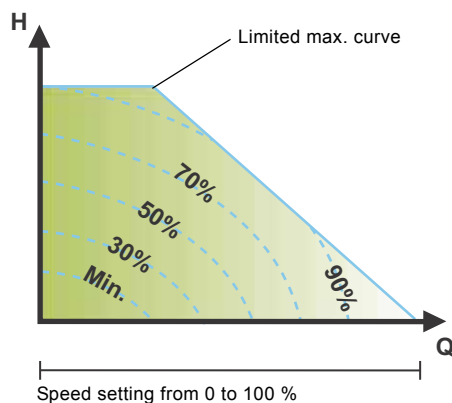


Fig. 37 Power and pressure limitations influencing the max. curve

TM05 4266 2212

The pump can also be set to operate according to the max. or min. curve, like an uncontrolled pump:

- The max. curve mode can be used in periods in which a maximum flow is required. This operating mode is for instance suitable for hot water priority.
- 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 setback if Automatic Night Setback is not desired.

These two operating modes can be selected via the digital inputs.

### Additional features for control modes

The MAGNA3 offers additional features for the control modes to meet specific demands.

#### FLOW<sub>LIMIT</sub>

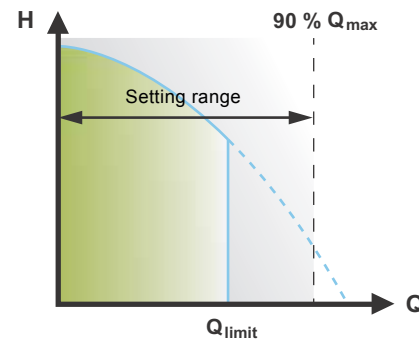


Fig. 38 FLOW<sub>LIMIT</sub>

TM05 2445 1312

The setting range for the FLOW<sub>LIMIT</sub> is 0 to 90 % of the  $Q_{max}$  of the pump.

**Note:** Do not set the FLOW<sub>LIMIT</sub> lower than the dimensioned duty point.

The FLOW<sub>LIMIT</sub> function offers the possibility of limiting the maximum flow delivered by the pump.

The FLOW<sub>LIMIT</sub> function can be enabled when the pump is in one of the following control modes:

- proportional pressure
- constant pressure
- constant temperature
- constant curve.

In the flow range between 0 and  $Q_{max}$ , the pump will run according to the selected control mode.

When  $Q_{max}$  is reached, the  $FLOW_{LIMIT}$  function will reduce the pump speed to ensure that the flow never exceeds the  $FLOW_{LIMIT}$  set, no matter if the system requires a higher flow due to a reduced resistance in the system. See fig. 39, 40 or 41.

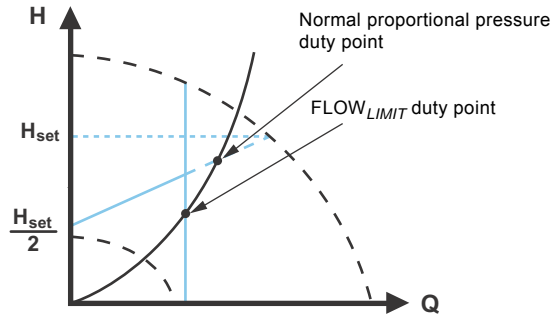


Fig. 39 Proportional pressure control with  $FLOW_{LIMIT}$

TM05 2543 0412

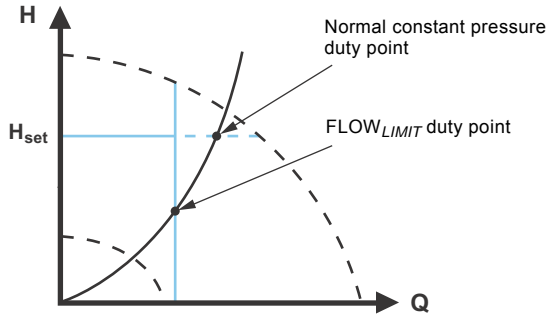


Fig. 40 Constant pressure control with  $FLOW_{LIMIT}$

TM05 2544 0312

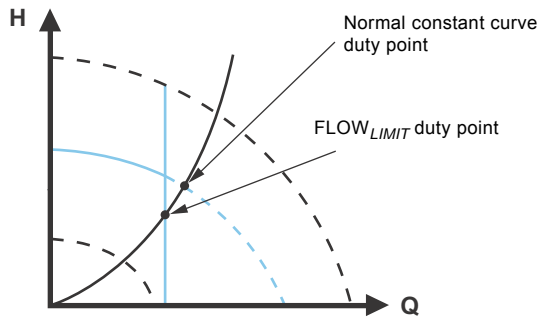


Fig. 41 Constant curve with  $FLOW_{LIMIT}$

TM05 2542 0412

### Automatic Night Setback

Once Automatic Night Setback has been enabled, the pump automatically changes between normal duty and night setback (duty at low performance).

When Automatic Night Setback has been enabled, the pump will run on the min. curve.

Changeover between normal duty and night setback depends on the flow-pipe temperature.

The pump automatically changes over to night setback when the built-in sensor registers a flow-pipe temperature drop of more than 18 to 27 °F (10 to 15 °C) within approx. two hours. The temperature drop must be at least 1.8 °F/min (0.1 °C/min).

Changeover to normal duty takes place without a time lag when the temperature has increased by approx. 18 °F (10 °C).

**Note:** Automatic Night Setback cannot be enabled when the pump is in constant curve mode.

## Setting values for control modes

The setting values for  $FLOW_{ADAPT}$  and  $FLOW_{LIMIT}$  are indicated as percent of  $Q_{max}$ , but the value has to be entered in  $m^3/h$  in the "Settings" menu.

Pump type	AUTO <sub>ADAPT</sub> H <sub>fac</sub>	Q <sub>max</sub>	FLOW <sub>ADAPT</sub> / FLOW <sub>LIMIT</sub>		
			Q <sub>fac</sub>	Q <sub>min</sub> 25 %	Q <sub>max</sub> 90 %
			[gpm (m <sup>3</sup> /h)]	[gpm (m <sup>3</sup> /h)]	[gpm (m <sup>3</sup> /h)]
	[ft (m)]	[gpm (m <sup>3</sup> /h)]	[gpm (m <sup>3</sup> /h)]	[gpm (m <sup>3</sup> /h)]	[gpm (m <sup>3</sup> /h)]
MAGNA3 32-60 F (N)	11.5 (3.5)	48.5 (11.0)	26.0 (5.9)	12.4 (2.8)	43.6 (9.9)
MAGNA3 32-100 F (N)	18.1 (5.5)	57.3 (13.0)	29.5 (6.7)	14.6 (3.3)	51.6 (11.7)
MAGNA3 40-80 F (N)	14.8 (4.5)	94.7 (21.5)	57.2 (13)	23.8 (5.4)	85.4 (19.4)
MAGNA3 40-120 F (N)	21.3 (6.5)	112.2 (25.5)	70.4 (16)	28.2 (6.4)	101.2 (23)
MAGNA3 40-180 F (N)	31.2 (9.5)	125.4 (28.5)	66.0 (15)	31.2 (7.1)	113.1 (25.7)
MAGNA3 50-80 F (N)	14.8 (4.5)	129.8 (29.5)	74.8 (17)	32.6 (7.4)	117.0 (26.6)
MAGNA3 50-150 F (N)	26.2 (8.0)	165.0 (37.5)	88.0 (20)	41.4 (9.4)	148.7 (33.8)
MAGNA3 65-120 F (N)	21.3 (6.5)	209.0 (47.5)	132.0 (30)	52.4 (11.9)	188.3 (42.8)
MAGNA3 (D) 65-150 F (N)*	26.2 (8.0)	248.6 (56.5)	176.0 (40)	62.0 (14.1)	224.0 (50.9)
MAGNA3 (D) 80-100 F (N)*	18.0 (5.5)	297.0 (67.5)	206.8 (47)	74.4 (16.9)	267.5 (60.8)
MAGNA3 (D) 100-120 F (N)*	21.3 (6.5)	345.4 (78.5)	250.8 (57)	86.2 (19.6)	311.1 (70.7)

The duty ranges for proportional pressure and constant pressure control appear from the individual data sheet.

Constant curve duty: 0 to 100 % speed.

\* Stainless steel version available for single head unit only.



## Additional operating modes for multi-pump setup

### Multi-pump function

The multi-pump function enables the control of single-head pumps connected in parallel and twin-head pumps without the use of external controllers. The pumps in a multi-pump system communicate with each other via the wireless GENlair connection.

A multi-pump system is set up via a selected pump, i.e. the master pump (first selected pump). All Grundfos pumps with a wireless GENlair connection can be connected to the multi-pump system.

The multi-pump functions are described in the following sections.

### Alternating operation

Only one pump is operating at a time. The change from one pump to the other depends on time or energy. If a pump fails, the other pump will take over automatically.

Pump system:

- Twin-head pump.
- Two single-head pumps connected in parallel. The pumps must be of equal size and type. Each pump requires a non-return valve in series with the pump.

### Back-up operation

One pump is operating continuously. The back-up pump is operated at intervals to prevent seizing up. If the duty pump stops due to a fault, the back-up pump will start automatically.

Pump system:

- Twin-head pump.
- Two single-head pumps connected in parallel. The pumps must be of equal size and type. Each pump requires a non-return valve in series with the pump.

### Cascade operation

Cascade operation ensures that the pump performance is automatically adapted to the consumption by switching pumps on or off. The system thus runs as energy-efficiently as possible with a constant pressure and a limited number of pumps.

The back-up of a twin-head pump will start at 90 % and stop at 30 % performance when operating in constant pressure mode.

It can be advantageous to choose a twin-head pump, as the back-up pump will start for a short period in peak-load situations. If an oversized single-head pump is chosen, it may run outside its best efficiency range most of the time.

All pumps in operation will run at equal speed. Pump changeover is automatic and depends on speed, operating hours and fault.

Pump system:

- Twin-head pump.
- Two single-head pumps connected in parallel. The pumps must be of equal size and type. Each pump requires a non-return valve in series with the pump.
- The control mode must be set to "Const. press." or "Constant curve".

## Readings and settings on the pump

### Control panel and display

The MAGNA3 pump features a 4" TFT display with intuitive and user-friendly interface. The control panel has self-explanatory push-buttons made of high-quality silicone for precise navigation in the menu structure. The control panel is designed to give the user quick and easy access to pump and performance data on site.

When the pump is started up for the first time, the user is presented with a start-up guide enabling easy setting of the pump. Additionally, the "Assist" menu can guide the user through the various settings of the pump.



TM05 3820 1612

Fig. 42 Control panel

Button	Function
	Goes to the "Home" menu.
	Returns to the previous action.
	Navigates between main menus, displays and digits. When the menu is changed, the display will always show the top display of the new menu.
	Navigates between submenus.
	Saves changed values, resets alarms and expands the value field.

## Factory setting

The pumps have been factory-set to AUTO<sub>ADAPT</sub> without Automatic Night Setback.

## Start-up guide

The start-up guide is used for the general settings of the pump. The start-up guide is started the first time the pump is connected to the power supply.

**Note:** If there has been no user action after pump start-up, the pump will automatically leave the start-up guide after 15 minutes with the language set to English.

The start-up guide can be run again in the "Settings" menu. If the start-up guide is run again, all previous settings will be lost.

## "Home" menu

This menu gives an overview of up to four user-defined parameters or a graphical illustration of a Q/H performance curve.

This menu offers the following (factory setting):

- Shortcut to Control mode settings
- Shortcut to Setpoint settings
- Flow rate
- Head.

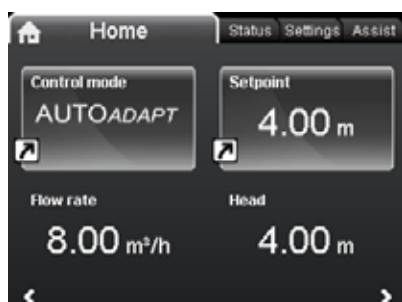


Fig. 43 "Home" menu

Home

## "Status" menu

This menu shows the status of the pump and system as well as warnings and alarms.

**Note:** No settings can be made in this menu.

This menu offers the following:

- Operating status
- Pump performance
- Power and energy consumption
- Warning and alarm
- Heat energy meter
- Work log
- Fitted modules
- Date and time
- Pump identification
- Multi-pump system.

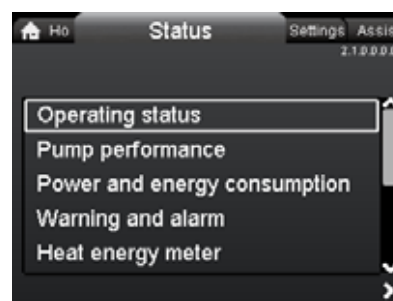


Fig. 44 "Status" menu

Status

## "Settings" menu

This menu gives access to all setting parameters. A detailed setting of the pump can be made in this menu.

This menu offers the following setting options:

- Setpoint
- Operating mode
- Control mode
- FLOW<sub>LIMIT</sub>
- Automatic Night Setback
- Relay outputs
- Setpoint influence
- Bus communication
- General settings.

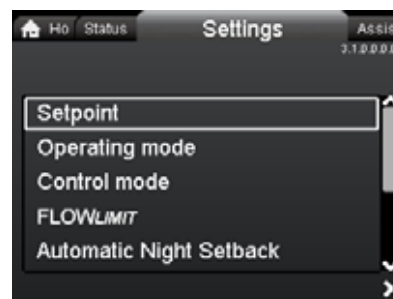


Fig. 45 "Settings" menu

Settings

## "Assist" menu

The "Assist" menu guides the user through the setting of the pump. In each submenu, the user is presented with a guide that assists throughout the setting.

This menu offers the following:

- Step-by-step instructions in how to set up the pump.
- A short description of the six control modes and recommended applications.
- Assistance in fault correction.

Submenus:

- Assisted pump setup
- Setting of date and time
- Multi-pump setup
- Setup, analog input
- Description of control mode
- Assisted fault advice.

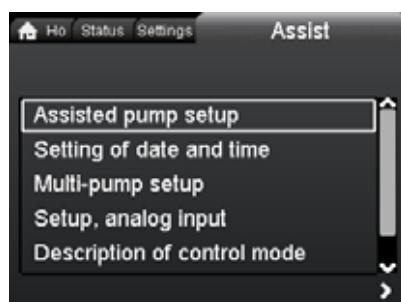


Fig. 46 "Assist" menu

## Operating status

"Operating status" shows the current operating mode and the selected control mode, if any.

## Pump performance

"Pump performance" offers the following:

- Q/H graph showing current duty point, flow, head, power and liquid temperature.
- "Resulting setpoint" shows the setpoint set on the pump, the external influence and the resulting setpoint.
- Liquid temperature.
- Speed.
- Operating hours.

## Warning and alarm

"Warning and alarm" offers the following:

- Actual warning or alarm, if any.
- Information about when the warning/alarm occurred and disappeared and about corrective actions.
- Warning and alarm logs.

## Heat energy meter

"Heat energy meter" is a monitoring function which makes it possible to track the heat energy distribution and consumption within a system. This prevents excessive energy costs caused by system imbalances.

The internal sensor has an accuracy of  $\pm 1\%$  in the general working area. In the "critical" working areas, the measurement can vary by 10%. This is one of the reasons why the heat energy value cannot be used for billing purposes. However, the value is perfect for simple optimisation purposes.

The pump requires a temperature sensor in the flow pipe or return pipe. This temperature sensor is not supplied with the pump.

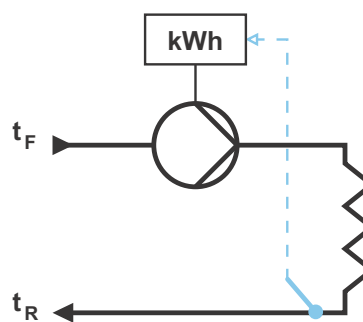


Fig. 47 MAGNA3 with built-in heat energy meter

**Note:** MAGNA3 incorporates a calculator for flow and flow-pipe temperature.

## Work log history

"Work log history" offers the following:

- Every duty point and the operating conditions are tracked and stored in the pump.
- The 3D work log and duty curve (over time) provide instant overviews of historical pump performance and operating conditions.
- The perfect tool for pump optimisation, replacement and fault finding.

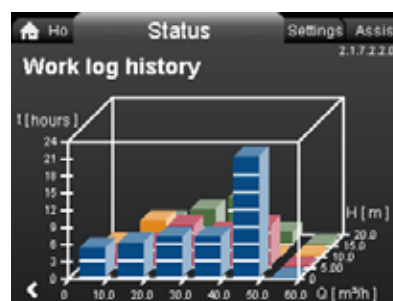


Fig. 48 Example of "Work log history"

Assist

TM05 5367 3612

Work log history

## Input for external sensor

An external differential pressure sensor can be used to control the flow in the system to obtain the externally set pressure, which results in following benefits:

- Minimises operating costs.
- Prevents valve noise.
- Ensures comfort (enough pressure).

## Grundfos Eye

The Grundfos Eye at the top of the control panel is a pump status indicator light providing information about the pump operating status.

The indicator light will flash in different sequences and provide information about the following:

- power on/off
- pump warnings
- pump alarms
- remote control.

The function of the Grundfos Eye is described in detail in the installation and operating instructions.



<http://GRUNDFOS.COM/MANUAL-MAGNA3>



Fig. 49 Grundfos Eye

TM05 3810 1612

## Communication

The MAGNA3 enables communication via the following:

- wireless Grundfos GO Remote
- fieldbus communication via CIM modules
- digital inputs
- relay outputs
- analog input.

## Grundfos GO Remote



Fig. 50 Grundfos GO Remote

TM05 3825 1712

The MAGNA3 is designed for wireless communication with the Grundfos GO Remote.

For more details, see section [Grundfos GO Remote](#), page 58.

The Grundfos GO Remote offers additional possibilities of setting and status displays for the pump.

The Grundfos GO Remote can be used for the following functions:

- Reading of operating data.
- Reading of warning and alarm indications.
- Setting of control mode.
- Setting of setpoint.
- Selection of external setpoint signal.
- Allocation of pump number making it possible to distinguish between pumps that are connected via Grundfos GENibus.
- Selection of function for digital input.
- Generation of reports (PDF).
- Assist function.
- Multi-pump setup.
- Displaying relevant documentation.

## Wireless GENlair

The pump is designed for multi-pump connection via the wireless GENlair connection.

The built-in wireless GENlair module enables communication between pumps and with the Grundfos GO Remote without the use of add-on modules.

- Multi-pump function.  
See section [Multi-pump function](#).
- Grundfos GO Remote.  
See section [Grundfos GO Remote](#).

## CIM modules



TM05 3811 1612

**Fig. 51** Grundfos CIM modules

A CIM module is an add-on Communication Interface Module. The CIM module enables data transmission between the pump and an external system, for example a BMS (Building Management System) or SCADA system.

The CIM module communicates via fieldbus protocols. See section [Available CIM modules](#), page 38.

## Connection to network

The pump can be connected to a LON network via the wireless GENlair connection or by fitting a CIM module. Other types of network connections are also possible. Contact Grundfos for further information on how to connect to your network.






## Grundfos Remote Management




Grundfos Remote Management is an easy-to-install, low-cost solution for wireless monitoring and management of Grundfos products. It is based on a centrally hosted database and a web server with wireless data collection via GSM/GPRS modem. The system only requires an internet connection, a web browser, a GRM modem and an antenna as well as a contract with Grundfos allowing you to monitor and manage Grundfos pump systems.

You have wireless access to your account anywhere, anytime when you have an internet connection, for example via a smartphone, tablet PC, laptop or computer. Warnings and alarms can be sent by email or SMS to your mobile phone or computer.

For CIM communication interface module and GSM antennas, see section [Grundfos Remote Management](#), page 57.

## Available CIM modules

Module	Fieldbus protocol	Description	Functions
<b>CIM 050</b> 	GENIbus TM05 3812 1612	The CIM 050 is a Grundfos communication interface module used for communication with a GENIbus network.	The CIM 050 has terminals for the GENIbus connection.
<b>CIM 100</b> 	LonWorks TM05 3813 1612	The CIM 100 is a Grundfos communication interface module used for communication with a LonWorks network.	The CIM 100 has terminals for the LonWorks connection. Two LEDs are used to indicate the actual status of the CIM 100 communication. One LED is used for indication of correct connection to the pump, and the other is used to indicate LonWorks communication status.
<b>CIM 150</b> 	PROFIBUS DP TM05 3814 1612	The CIM 150 is a Grundfos communication interface module used for communication with a PROFIBUS network.	The CIM 150 has terminals for the PROFIBUS DP connection. DIP switches are used to set line termination. Two hexadecimal rotary switches are used to set the PROFIBUS DP address. Two LEDs are used to indicate the actual status of the CIM 150 communication. One LED is used for indication of correct connection to the pump, and the other is used to indicate PROFIBUS communication status.
<b>CIM 200</b> 	Modbus RTU TM05 3815 1612	The CIM 200 is a Grundfos communication interface module used for communication with a Modbus RTU network.	The CIM 200 has terminals for the Modbus connection. DIP switches are used to select parity and stop bits, to select transmission speed and to set line termination. Two hexadecimal rotary switches are used to set the Modbus address. Two LEDs are used to indicate the actual status of the CIM 200 communication. One LED is used for indication of correct connection to the pump, and the other is used to indicate Modbus communication status.
<b>CIM 250</b> 	GSM/GPRS TM05 4432 2212	The CIM 250 is a Grundfos communication interface module used for GSM/GPRS communication. The CIM 250 is used to communicate via a GSM network.	The CIM 250 has a SIM-card slot and an SMA connection to the GSM antenna. The CIM 250 also has an internal backup battery. Two LEDs are used to indicate the actual status of the CIM 250 communication. One LED is used for indication of correct connection to the pump, and the other is used to indicate GSM/GPRS communication status. <b>Note:</b> The SIM card is not supplied with the CIM 250. The SIM card from the service provider must support data/fax service to use call service from PC Tool or SCADA. The SIM card from the service provider must support GPRS service to use Ethernet service from PC Tool or SCADA.

Module	Fieldbus protocol	Description	Functions
<p><b>CIM 270</b></p> 	<p>Grundfos Remote Management</p> <p>TM05 4432 2212</p>	<p>The CIM 270 is a Grundfos GSM/GPRS modem used for communication with a Grundfos Remote Management system. It requires a GSM antenna, a SIM card and a contract with Grundfos.</p>	<p>With the CIM 270 you have wireless access to your account anywhere, anytime when you have an internet connection, for example via a smartphone, tablet PC, laptop or computer. Warnings and alarms can be sent by e-mail or SMS to your mobile phone or computer. You will get a complete status overview of the entire GRM system. It allows you to plan maintenance and service based on actual operating data.</p>
<p><b>CIM 300</b></p> 	<p>BACnet MS/TP</p> <p>TM05 3815 1612</p>	<p>The CIM 300 is a Grundfos communication interface module used for communication with a BACnet MS/TP network.</p>	<p>The CIM 300 has terminals for the BACnet MS/TP connection. DIP switches are used to set transmission speed and line termination and to select the custom Device Object Instance Number. Two hexadecimal rotary switches are used to set the BACnet address. Two LEDs are used to indicate the actual status of the CIM 300 communication. One LED is used for indication of correct connection to the pump, and the other is used to indicate BACnet communication status.</p>
<p><b>CIM 500</b></p> 	<p>Ethernet</p> <p>TM05 8825 2713</p>	<p>The CIM 500 is a Grundfos communication interface module used for data transmission between an industrial Ethernet network and a Grundfos product.</p>	<p>The CIM 500 supports various industrial Ethernet protocols. The CIM 500 is configured via the built-in web server, using a standard web browser on a PC. See the specific functional profile on the DVD-ROM supplied with the Grundfos CIM module.</p>

For product numbers, see section [CIM modules](#), page 57.

## 9. Guide to performance curves

### Curve conditions

The guidelines below apply to the performance curves on pages 42 to 55:

- Test liquid: airless water.
- The curves apply to a density of  $\rho = 61.38 \text{ lb/ft}^3$  ( $983.2 \text{ kg/m}^3$ ) and a liquid temperature of  $140 \text{ }^\circ\text{F}$  ( $+60 \text{ }^\circ\text{C}$ ).
- All curves show average values and should not be used as guarantee curves. If a specific minimum performance is required, individual measurements must be made.
- The curves apply to a kinematic viscosity of  $\nu = 0.474 \text{ mm}^2/\text{s}$  ( $0.474 \text{ cSt}$ ).
- Reference supply voltage:  $1 \times 230 \text{ V}$ ,  $50 \text{ Hz}$ .
- EEI obtained according to EN 16297.

**Note:** Within the MAGNA3 performance range, the constant pressure and proportional pressure curves can be set in steps of  $0.1 \text{ m head}$  on the control panel or with the Grundfos GO Remote.

### Symbols used on the following pages



Fig. 52 Energy efficiency index (EEI)

The MAGNA3 is energy-optimized and complies with the EuP Directive (Commission Regulation (EC) No 641/2009) which will be effective as from 1 January 2013.

For MAGNA3 pumps, the average energy efficiency index (EEI) is  $0.18$  with values down to  $0.17$ , categorized as best in class.

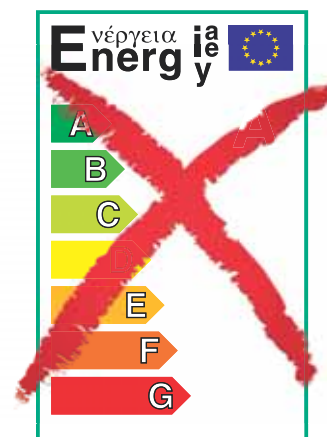


Fig. 53 Old energy label

From 1 January 2013, the old A to G energy label will be replaced by the new energy efficiency index (EEI). Only the best of today's A-labelled circulator pumps will meet the new requirements.

The MAGNA3 with its  $\text{AUTO}_{ADAPT}$  function is the preferred choice for large heating systems and a true efficiency frontrunner.

Figure 54 shows the energy consumption index for a typical circulator pump compared to the various EEI limits.

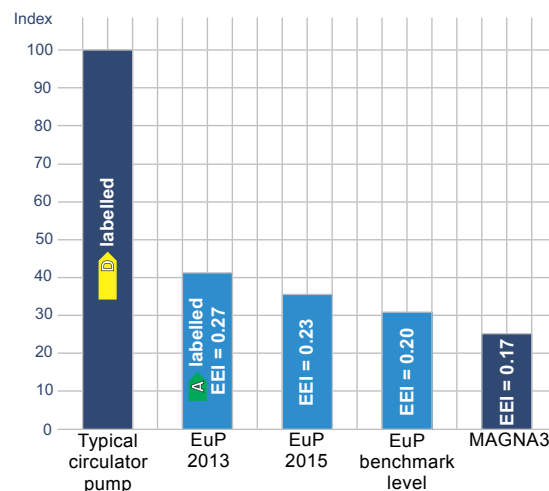


Fig. 54 Energy consumption index

With an energy efficiency index (EEI) well below the EuP benchmark level. With  $\text{AUTO}_{ADAPT}$  the savings can be as much as  $85 \%$ , compared to a typical circulator pump and thus a remarkably fast return on investment. This means, of course, that the MAGNA3 more than meets the standards of the EuP legislation.



For more information about the new energy directive, please visit:



<http://energy.Grundfos.com>



**Fig. 55** Grundfos blueflux®

The Grundfos blueflux® label is your guarantee that the MAGNA3 incorporates the most energy-efficient motor currently available. Grundfos blueflux® motors are designed to cut the power consumption by up to 60 % and thus reduce CO<sub>2</sub> emissions and operating costs.

TM05 2683 0412

TM05 2683 0412

## QR code on pump nameplate



TM05 3826 1712

**Fig. 56** QR code on pump nameplate

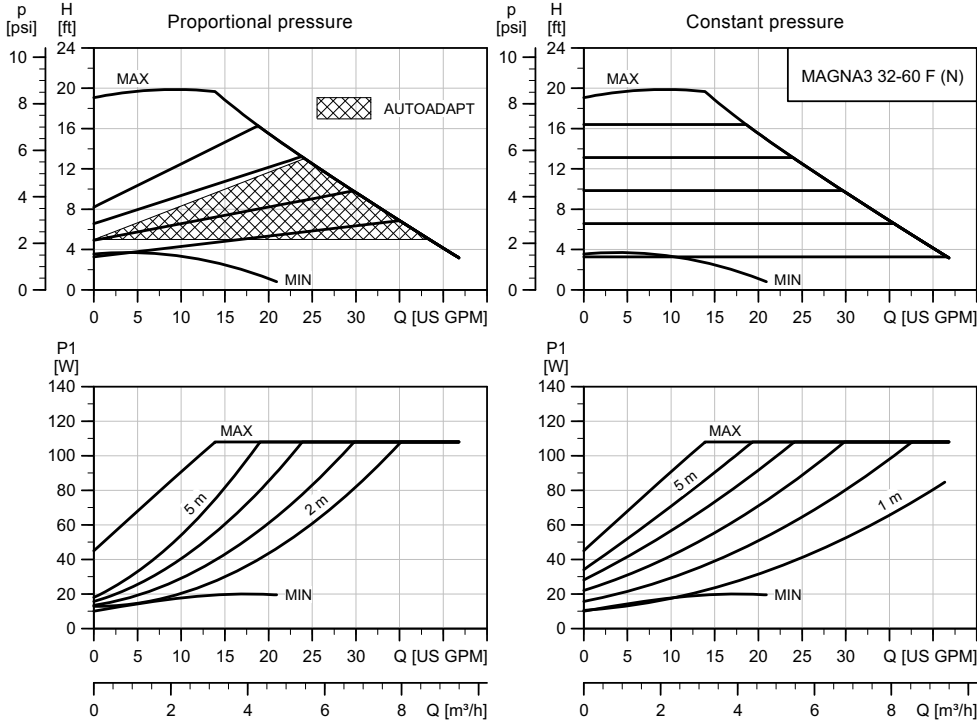
With the Grundfos GO Remote or a smartphone, it is possible to get the following information about the MAGNA3:

- product photo
- pump performance curves
- dimensional sketches
- wiring diagram
- quotation text
- technical data
- service parts list
- PDF files, such as data booklet and installation and operating instructions.

# 10. Performance curves and technical data

## MAGNA3 32-60 F (N)

1 x 115-230 V, 50/60 Hz

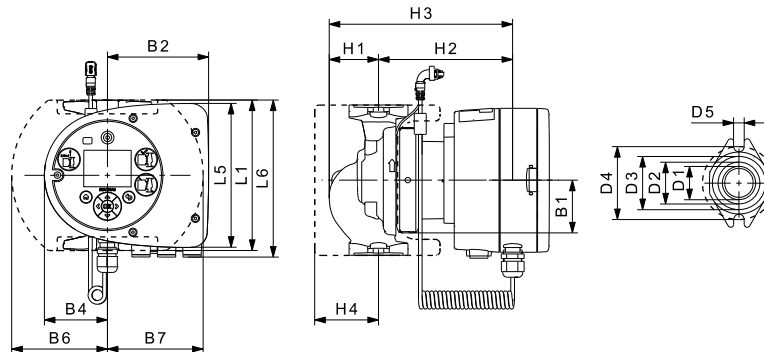


Speed	I <sub>1/1</sub> [A] 115 V	P1 [W] 115 V	I <sub>1/1</sub> [A] 230 V	P1 [W] 230 V
Min.	0.28	8.5	0.09	9
Max.	1.01	107.7	0.91	110

System pressure: Max. 175 psi (12 bar)  
 Liquid temperature: 14 to 230 °F (-10 °C to +110 °C)  
 Also available with: Stainless-steel pump housing, type N  
 Specific EEI: 0.18

The pump incorporates overload protection.

Net weights [lbs (kg)]	Gross weights [lbs (kg)]	Ship. vol. [ft <sup>3</sup> (m <sup>3</sup> )]
12.3 (5.5)	14.4 (6.5)	0.46 (0.014)



Pump type	Dimensions [in (mm)]								
	L1	L5	L6	B1	B2	B4	B6	B7	D1
MAGNA3 32-60 F (N)	6.50 (165)	6.23 (158)	6.62 (168)	2.29 (58)	4.38 (111)	2.72 (69)	4.18 (106)	4.18 (106)	1.26 (32)
	D2	D3	D4	D5	H1	H2	H3	H4	
	1.82 (46)	2.29 (58)	3.15 (80)	0.46 (11.5)	2.13 (54)	7.37 (187)	2.49 (241)	2.76 (70)	

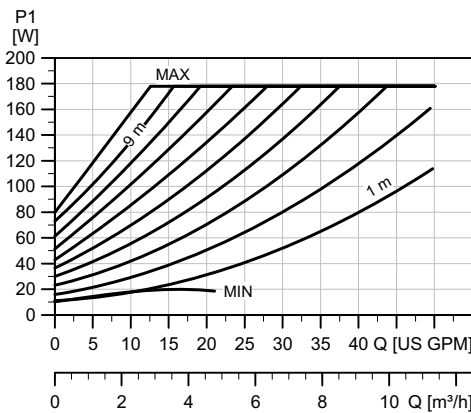
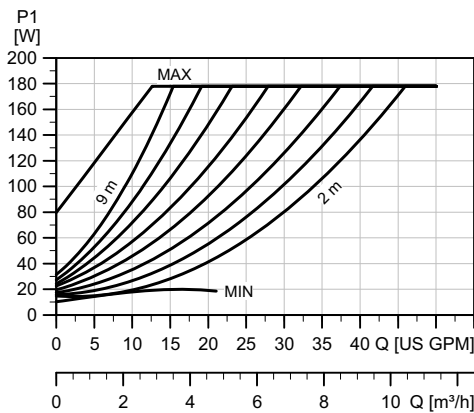
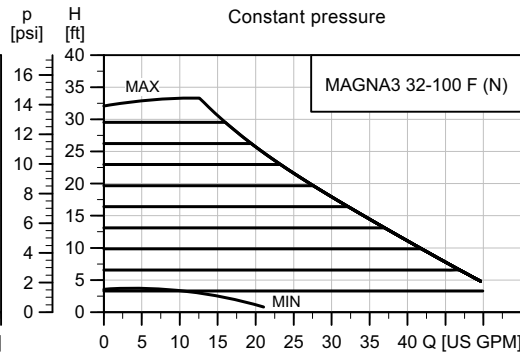
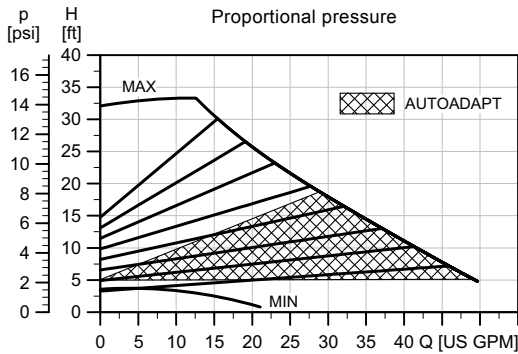
For product numbers, see page 7.

TM06 0657 0714

TM06 0734 0814

MAGNA3 32-100 F (N)

1 x 115-230 V, 50/60 Hz

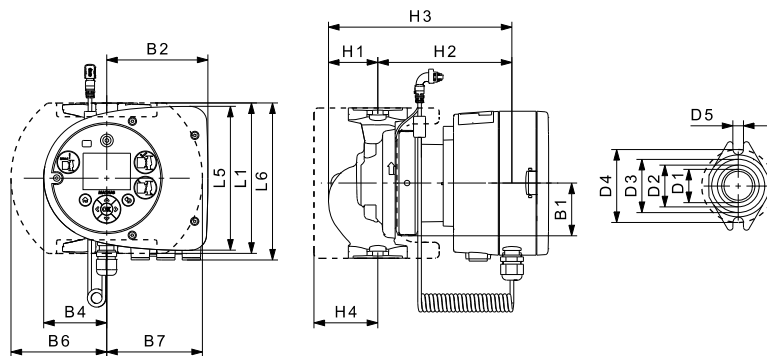


Speed	$I_{1/1}$ [A] 115 V	P1 [W] 115 V	$I_{1/1}$ [A] 230 V	P1 [W] 230 V
Min.	0.29	9.7	0.09	9
Max.	1.61	178.3	1.47	180

System pressure: Max. 175 psi (12 bar)  
 Liquid temperature: 14 to 230 °F (-10 °C to +110 °C)  
 Also available with: Stainless-steel pump housing, type N  
 Specific EEI: 0.18

The pump incorporates overload protection.

Net weights [lbs (kg)]	Gross weights [lbs (kg)]	Ship. vol. [ft³ (m³)]
12.3 (5.5)	14.4 (6.5)	0.46 (0.014)



Pump type	Dimensions [in (mm)]								
	L1	L5	L6	B1	B2	B4	B6	B7	D1
MAGNA3 32-100 F (N)	6.50 (165)	6.23 (158)	6.62 (168)	2.29 (58)	4.38 (111)	2.72 (69)	4.18 (106)	4.18 (106)	1.26 (32)
	D2	D3	D4	D5	H1	H2	H3	H4	
	1.82 (46)	2.29 (58)	3.15 (80)	0.46 (11.5)	2.13 (54)	7.37 (187)	2.49 (241)	2.76 (70)	

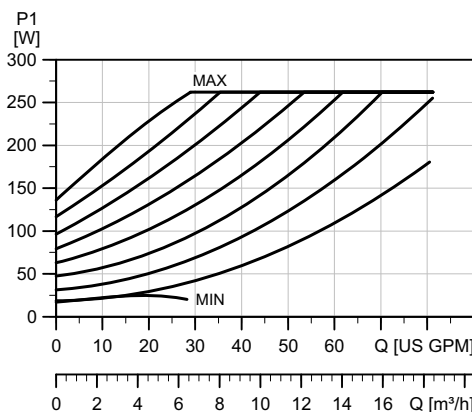
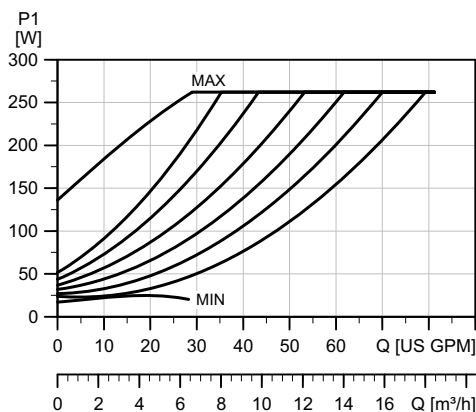
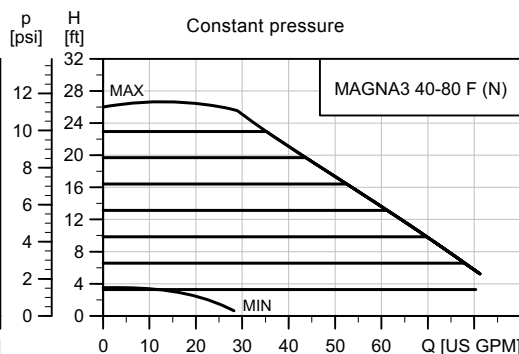
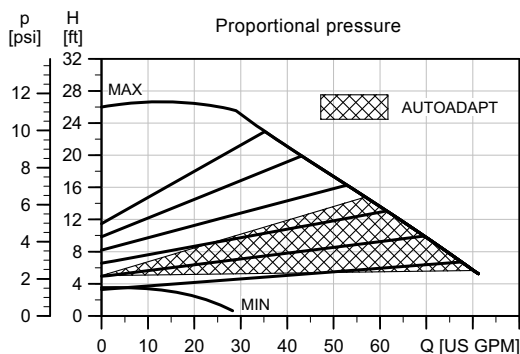
For product numbers, see page 7.

TM06 0659 0714

TM06 0734 0814

MAGNA3 40-80 F (N)

1 x 115 & 208-230 V, 50/60 Hz

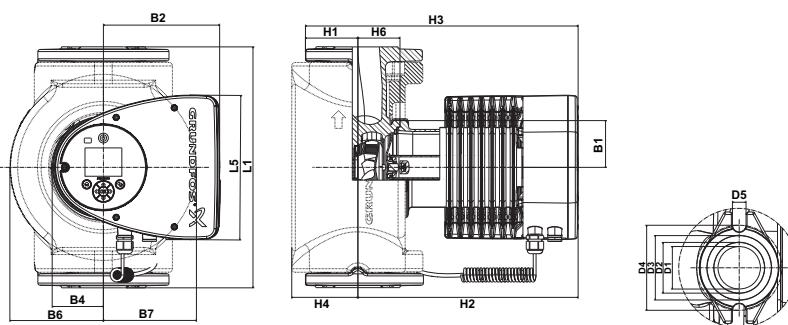


Speed	I <sub>1/1</sub> [A] 115 V	P1 [W] 115 V	I <sub>1/1</sub> [A] 230 V	P1 [W] 230 V
Min.	0.3	16	0.19	16
Max.	2.45	276	1.20	265

System pressure: Max. 175 psi (12 bar)  
 Liquid temperature: 14 to 230 °F (-10 °C to +110 °C)  
 Also available with: Stainless-steel pump housing, type N  
 Specific EEI: 0.19

The pump incorporates overload protection.

Net weights [lbs (kg)]	Gross weights [lbs (kg)]	Ship. vol. [ft³ (m³)]
35 (15.9)	41 (18.7)	1.41 (0.04)



Pump type	Dimensions [in (mm)]								
	L1	L5	B1	B2	B4	B6	B7	D1	D2
MAGNA3 40-80 F (N)	8.5 (216)	8.03 (204)	3.31 (84)	6.46 (164)	2.87 (73)	4.37 (111)	4.37 (111)	1.57 (40)	1.93 (49)
	D3	D4	D5	H1	H2	H3	H4	H6	
	2.4 (60)	3.15 (80)	0.5 (12.8)	-	11.97 (304)	-	2.76 (70)	1.97 (50)	

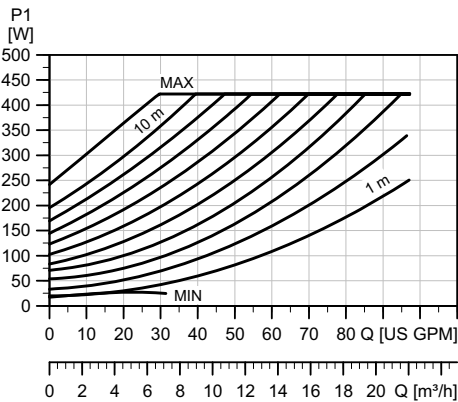
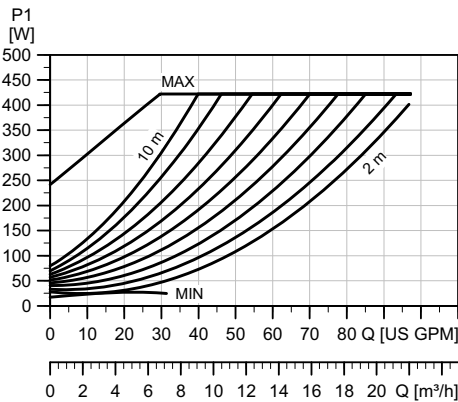
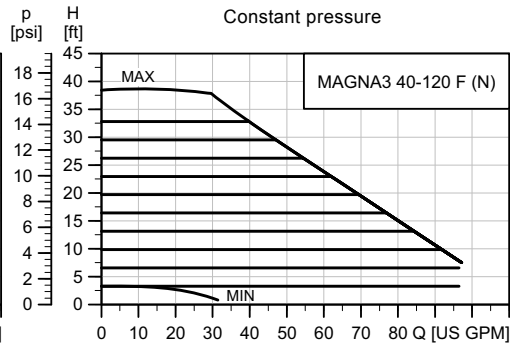
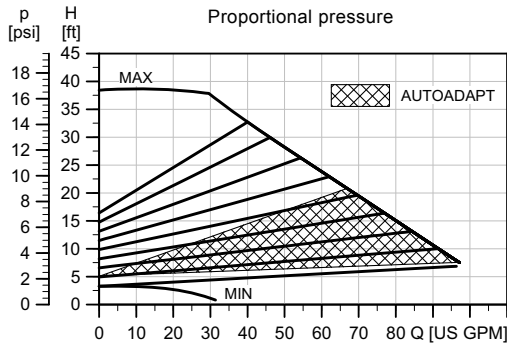
For product numbers, see page 7.

TM05 8103 1214

TM05 7651 1413

MAGNA3 40-120 F (N)

1 x 115 & 208-230 V, 50/60 Hz

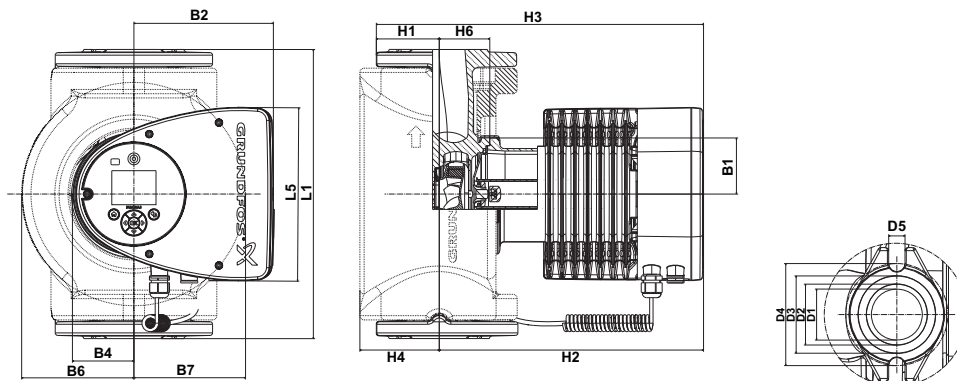


Speed	$I_{1/1}$ [A] 115 V	P1 [W] 115 V	$I_{1/1}$ [A] 230 V	P1 [W] 230 V
Min.	0.26	16	0.19	16
Max.	3.88	442	1.95	440

System pressure: Max. 175 psi (12 bar)  
 Liquid temperature: 14 to 230 °F (-10 °C to +110 °C)  
 Also available with: Stainless-steel pump housing, type N  
 Specific EEI: 0.18

The pump incorporates overload protection.

Net weights [lbs (kg)]	Gross weights [lbs (kg)]	Ship. vol. [ft <sup>3</sup> (m <sup>3</sup> )]
35 (15.9)	41 (18.7)	1.41 (0.04)



Pump type	Dimensions [in (mm)]								
	L1	L5	B1	B2	B4	B6	B7	D1	D2
MAGNA3 40-120 F (N)	8.5 (216)	8.03 (204)	3.31 (84)	6.46 (164)	2.87 (73)	4.37 (111)	4.37 (111)	1.57 (40)	1.93 (49)
	D3	D4	D5	H1	H2	H3	H4	H6	
	2.4 (60)	3.15 (80)	0.5 (12.8)	-	11.97 (304)	-	2.76 (70)	1.97 (50)	

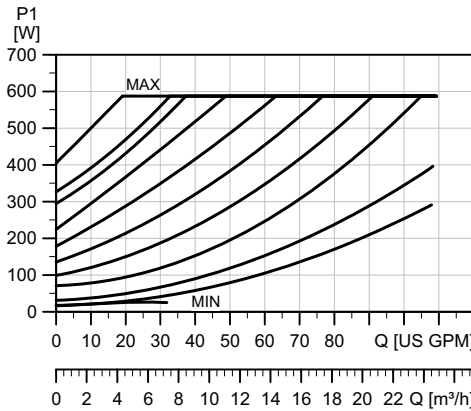
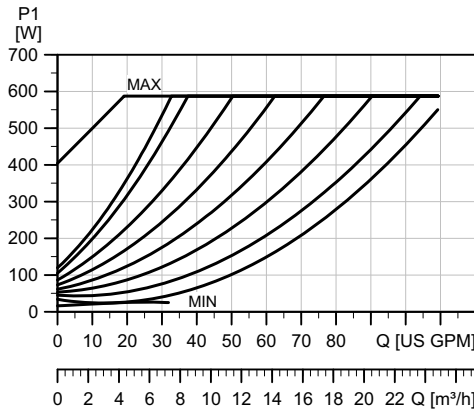
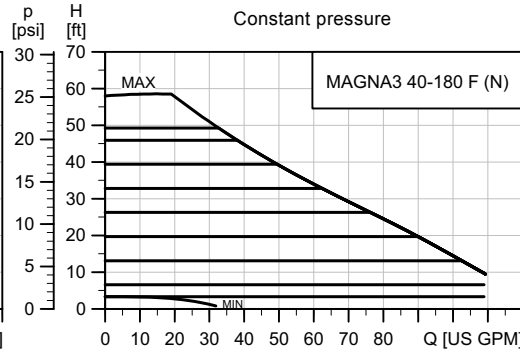
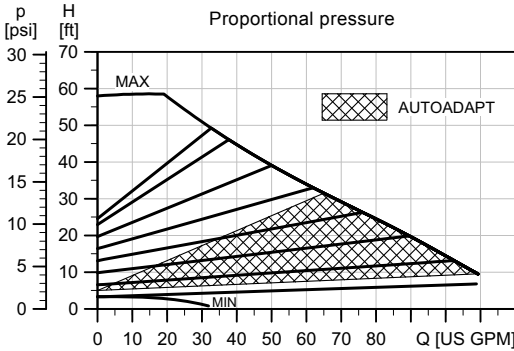
For product numbers, see page 7.

TM05 8104 1214

TM05 7651 1413

MAGNA3 40-180 F (N)

1 x 115 & 208-230 V, 50/60 Hz

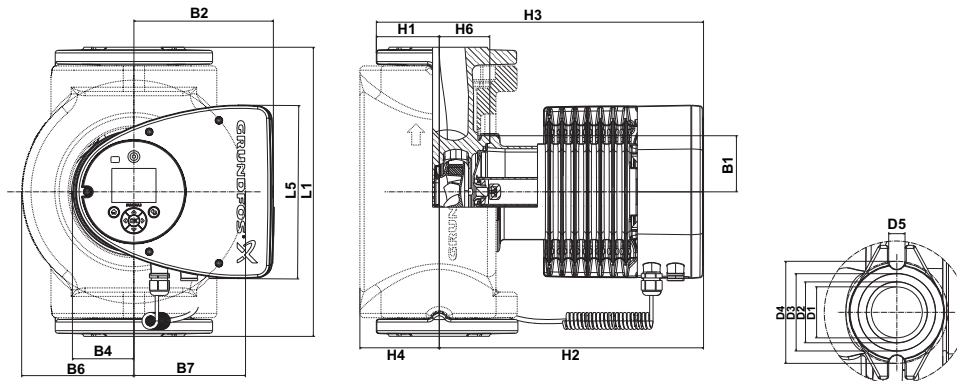


Speed	I <sub>1/1</sub> [A] 115 V	P1 [W] 115 V	I <sub>1/1</sub> [A] 230 V	P1 [W] 230 V
Min.	0.26	16	0.18	16
Max.	5.39	614	2.68	607

System pressure: Max. 175 psi (12 bar)  
 Liquid temperature: 14 to 230 °F (-10 °C to +110 °C)  
 Also available with: Stainless-steel pump housing, type N  
 Specific EEI: 0.18

The pump incorporates overload protection.

Net weights [lbs (kg)]	Gross weights [lbs (kg)]	Ship. vol. [ft³ (m³)]
35 (15.9)	41 (18.7)	1.41 (0.04)



Pump type	Dimensions [in (mm)]								
	L1	L5	B1	B2	B4	B6	B7	D1	D2
MAGNA3 40-180 F (N)	8.5 (216)	8.03 (204)	3.31 (84)	6.46 (164)	2.87 (73)	4.37 (111)	4.37 (111)	1.57 (40)	1.93 (49)
	D3	D4	D5	H1	H2	H3	H4	H6	
	2.4 (61)	3.15 (80)	0.5 (12.8)	-	11.97 (304)	-	2.76 (70)	1.97 (50)	

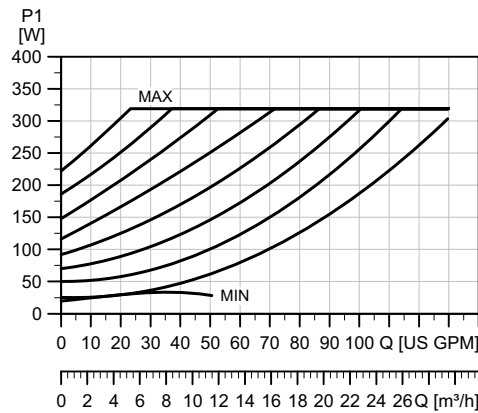
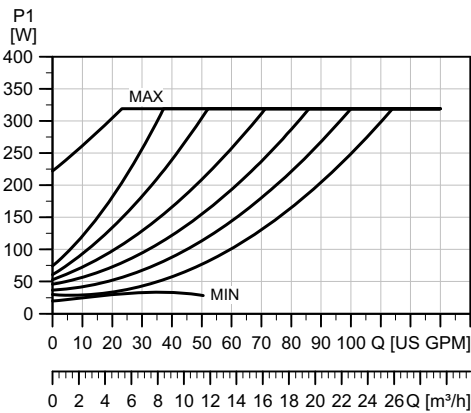
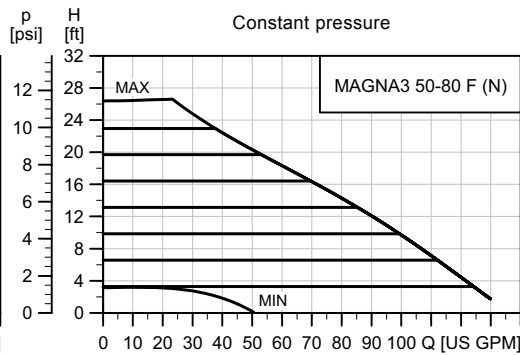
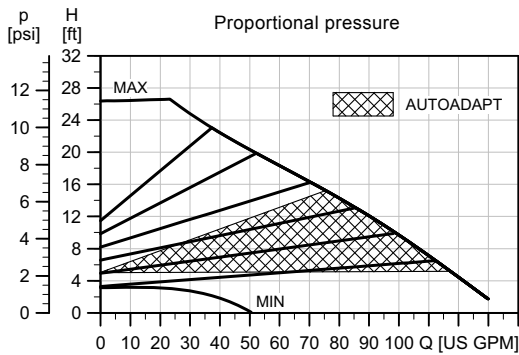
For product numbers, see page 7.

TM05 8105 1214

TM05 7651 1413

MAGNA3 50-80 F (N)

1 x 115 & 208-230 V, 50/60 Hz

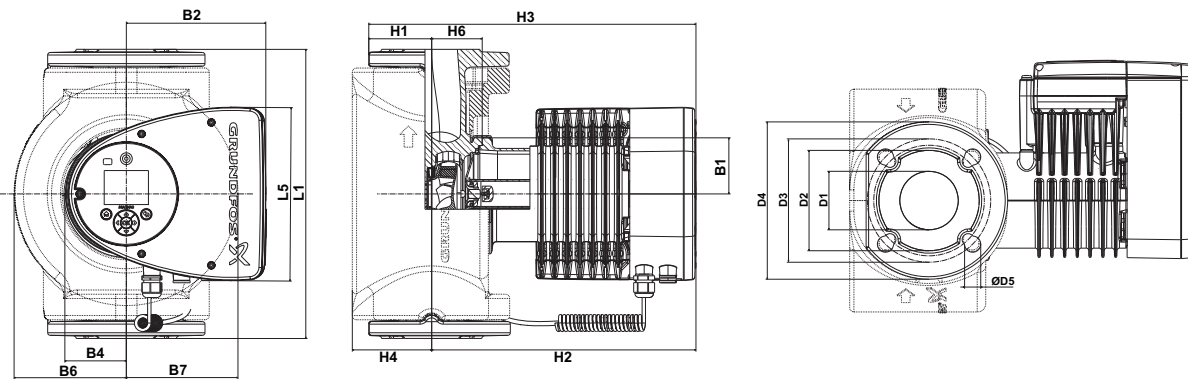


Speed	I <sub>1/1</sub> [A] 115 V	P1 [W] 115 V	I <sub>1/1</sub> [A] 230 V	P1 [W] 230 V
Min.	0.31	18.5	0.22	18.5
Max.	2.81	318	1.46	325

The pump incorporates overload protection.

Net weights [lbs (kg)]	Gross weights [lbs (kg)]	Ship. vol. [ft³ (m³)]
37 (17.0)	45 (20.4)	1.77 (0.05)

System pressure: Max. 175 psi (12 bar)  
 Liquid temperature: 14 to 230 °F (-10 °C to +110 °C)  
 Also available with: Stainless-steel pump housing, type N  
 Specific EEI: 0.18



Pump type	Dimensions [in (mm)]								
	L1	L5	B1	B2	B4	B6	B7	D1	D2
MAGNA3 50-80 F (N)	9.45 (240)	8.03 (204)	3.31 (84)	6.46 (164)	2.87 (73)	5 (127)	5 (127)	1.97 (50)	3.90 (99)
	D3	D4	D5	H1	H2	H3	H4	H6	
	4.33/4.92 (110/125)	6.5 (165)	0.55/0.75 (14/19)	2.8 (71)	12.05 (306)	14.84 (377)	3.82 (97)	2.05 (52)	

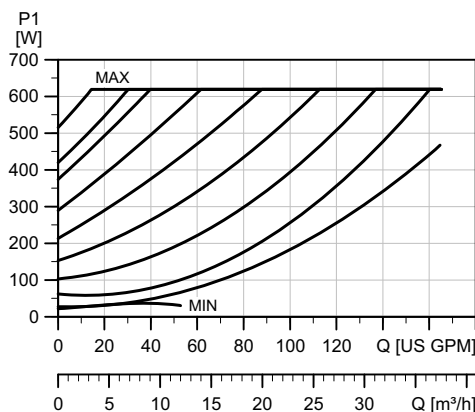
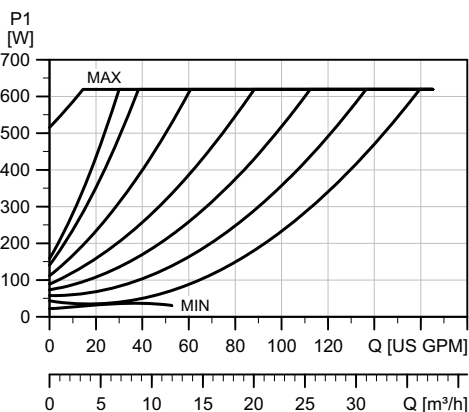
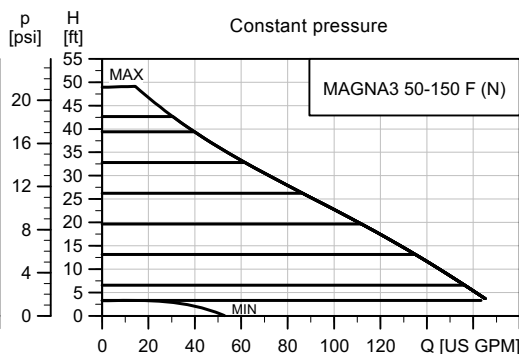
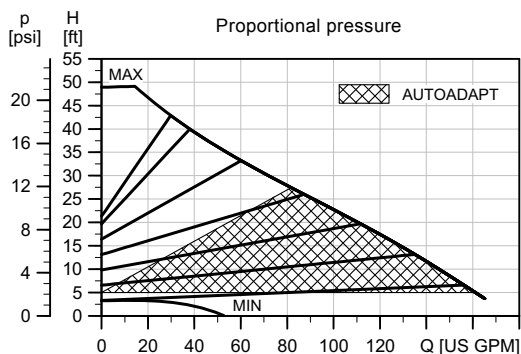
For product numbers, see page 7.

TM05 8106 1214

TM05 7652 1413

MAGNA3 50-150 F (N)

1 x 115 & 208-230 V, 50/60 Hz

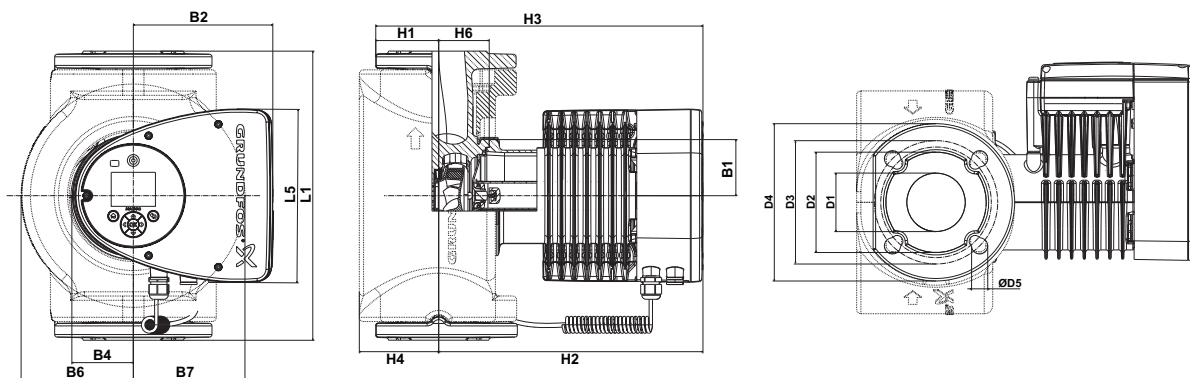


Speed	I <sub>1/1</sub> [A] 115 V	P1 [W] 115 V	I <sub>1/1</sub> [A] 230 V	P1 [W] 230 V
Min.	0.31	18.5	0.23	18.5
Max.	5.54	630	2.78	630

System pressure: Max. 175 psi (12 bar)  
 Liquid temperature: 14 to 230 °F (-10 °C to +110 °C)  
 Also available with: Stainless-steel pump housing, type N  
 Specific EEI: 0.17

The pump incorporates overload protection.

Net weights [lbs (kg)]	Gross weights [lbs (kg)]	Ship. vol. [ft <sup>3</sup> (m <sup>3</sup> )]
40 (18.3)	49 (22.0)	1.77 (0.05)



Pump type	Dimensions [in (mm)]								
	L1	L5	B1	B2	B4	B6	B7	D1	D2
MAGNA3 50-150 F (N)	11.02 (280)	8.03 (204)	3.31 (84)	6.46 (164)	2.87 (73)	5 (127)	5 (127)	1.97 (50)	3.90 (99)
	D3	D4	D5	H1	H2	H3	H4	H6	
	4.33/4.92 (110/125)	6.5 (165)	0.55/0.75 (14/19)	2.83 (72)	12.05 (306)	14.9 (378)	3.82 (97)	2.05 (52)	

For product numbers, see page 7.

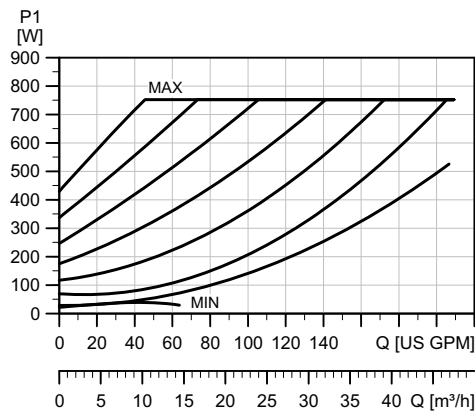
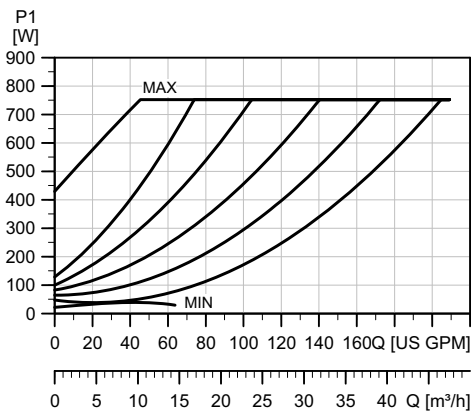
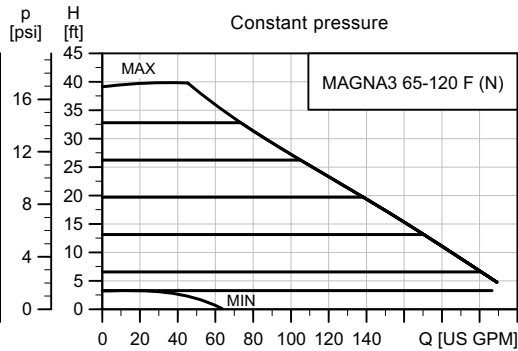
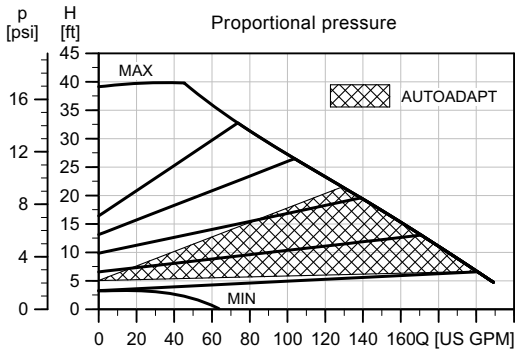
TM05 8107 1214

TM05 7652 1413



MAGNA3 65-120 F (N)

1 x 115 & 208-230 V, 50/60 Hz

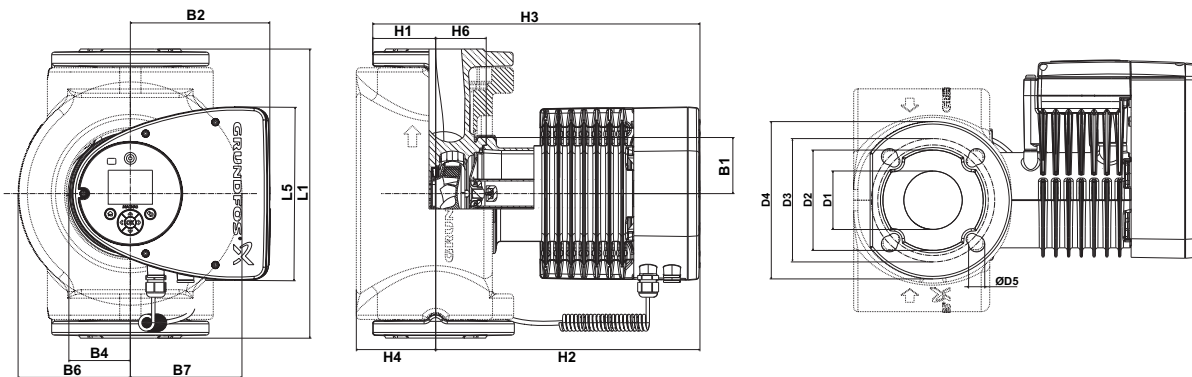


Speed	I <sub>fl</sub> [A] 115 V	P1 [W] 115 V	I <sub>fl</sub> [A] 230 V	P1 [W] 230 V
Min.	0.36	20.5	0.18	20.5
Max.	6.67	772	3.38	769

System pressure: Max. 175 psi (12 bar)  
 Liquid temperature: 14 to 230 °F (-10 °C to +110 °C)  
 Also available with: Stainless-steel pump housing, type N  
 Specific EEI: 0.17

The pump incorporates overload protection.

Net weights [lbs (kg)]	Gross weights [lbs (kg)]	Ship. vol. [ft³ (m³)]
46 (21.0)	54 (24.7)	2.12 (0.06)



Pump type	Dimensions [in (mm)]								
	L1	L5	B1	B2	B4	B6	B7	D1	D2
MAGNA3 65-120 F (N)	13.4 (340)	8.03 (204)	3.31 (84)	6.46 (164)	2.87 (73)	5.24 (133)	5.24 (133)	2.56 (65)	4.65 (118)
	D3	D4	D5	H1	H2	H3	H4	H6	
	5.0/5.51 (127/140)	7.28 (185)	0.63/0.75 (16/19)	2.91 (74)	12.28 (312)	15.2 (386)	3.7 (94)	2.32 (59)	

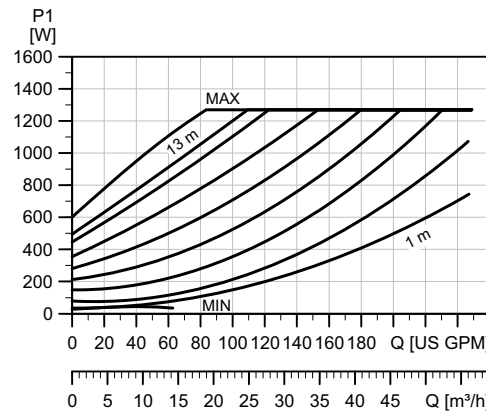
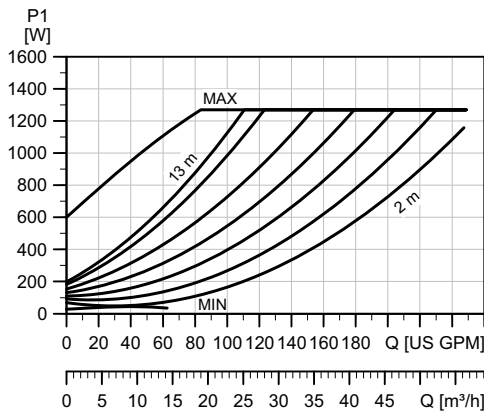
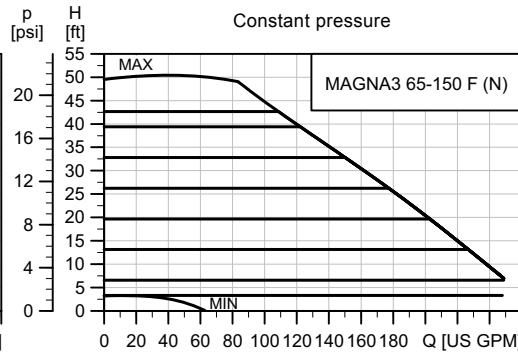
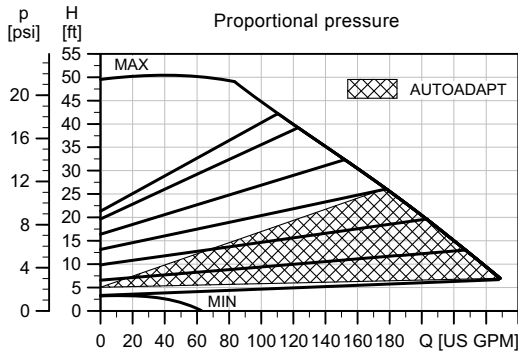
For product numbers, see page 7.

TM05 8108 1214

TM05 7652 1413

MAGNA3 65-150 F (N)

1 x 208-230 V, 50/60 Hz

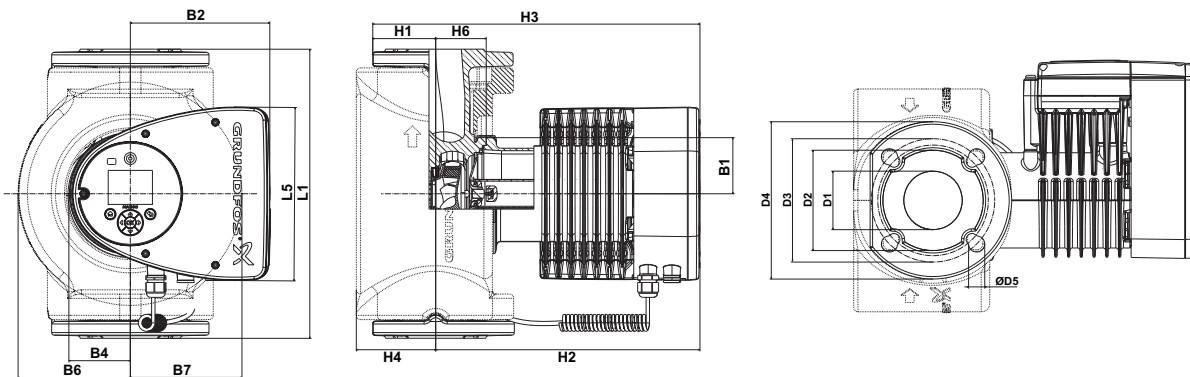


Speed	P1 [W]	I <sub>1/1</sub> [A]
Min.	29	0.30
Max.	1301	5.68

System pressure: Max. 175 psi (12 bar)  
 Liquid temperature: 14 to 230 °F (-10 °C to +110 °C)  
 Also available with: Stainless-steel pump housing, type N  
 Specific EEI: 0.17

The pump incorporates overload protection.

Net weights [lbs (kg)]	Gross weights [lbs (kg)]	Ship. vol. [ft³ (m³)]
53 (24.0)	61 (27.8)	2.12 (0.06)

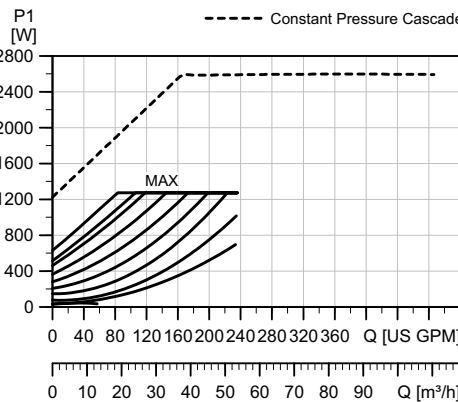
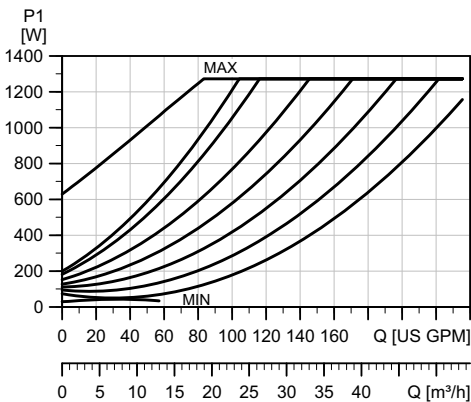
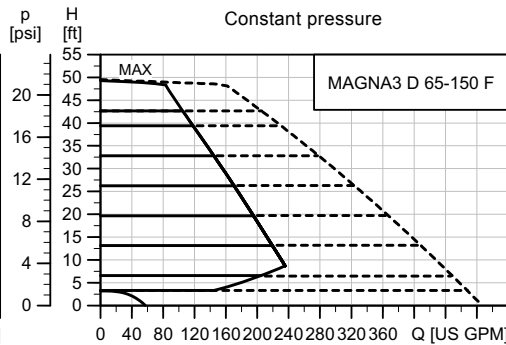
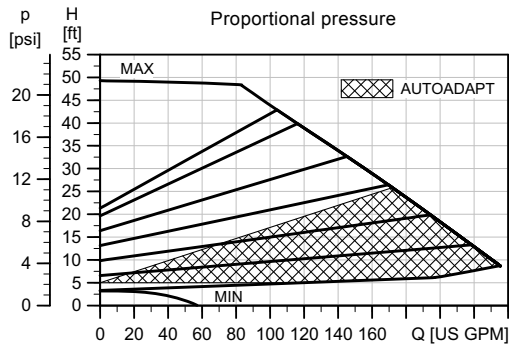


Pump type	Dimensions [in (mm)]								
	L1	L5	B1	B2	B4	B6	B7	D1	D2
MAGNA3 65-150 F (N)	13.4 (340)	8.03 (204)	3.31 (84)	6.46 (164)	2.87 (73)	5.24 (133)	5.24 (133)	2.56 (65)	4.65 (118)
	5.0/5.51 (127/140)	7.28 (185)	0.63/0.75 (16/19)	2.91 (74)	12.28 (312)	15.2 (386)	3.7 (94)	2.32 (59)	

For product numbers, see page 7.

MAGNA3 D 65-150 F

1 x 208-230 V, 50/60 Hz

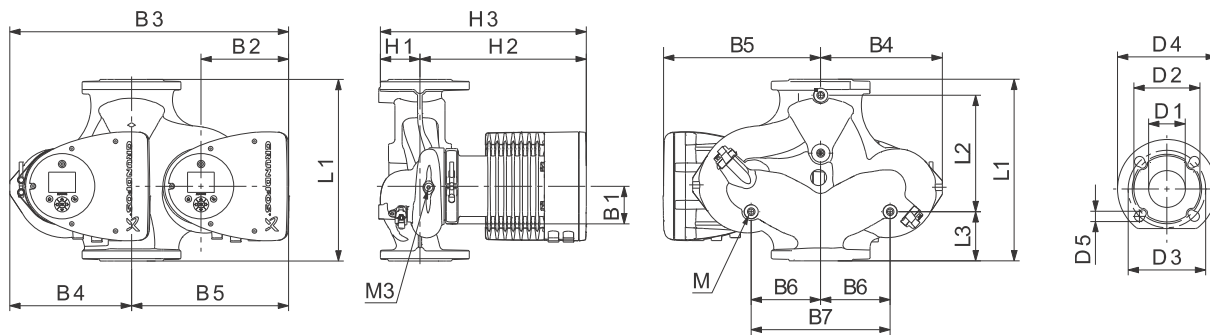


Speed	P1 [W]	I <sub>1/1</sub> [A]
Min.	29	0.30
Max.	1301	5.68

System pressure: Max. 175 psi (12 bar)  
 Liquid temperature: 14 to 230 °F (-10 °C to +110 °C)  
 Specific EEI: 0.17

The pump incorporates overload protection.

Net weights [lbs (kg)]	Gross weights [lbs (kg)]	Ship. vol. [ft³ (m³)]
98 (44.6)	118 (53.7)	2.12 (0.06)



Pump type	Dimensions [in (mm)]									
	L1	L2	L3	L4	L5	B1	B3	B4	B5	
MAGNA3 D 65-150 F	13.4 (340)	8.58 (218)	3.62 (92)	3.62 (92)	8.03 (204)	3.31 (84)	20.55 (522)	8.98 (228)	11.57 (294)	
	D1	D2	D3	D4	D5	D5 (2)	M	M1	H1	
	2.56 (65)	4.69 (119)	5.12/5.71 (130/145)	7.28 (185)	0.55 (14)	0.75 (19)	M12	Rp 1/4	3.03 (77)	

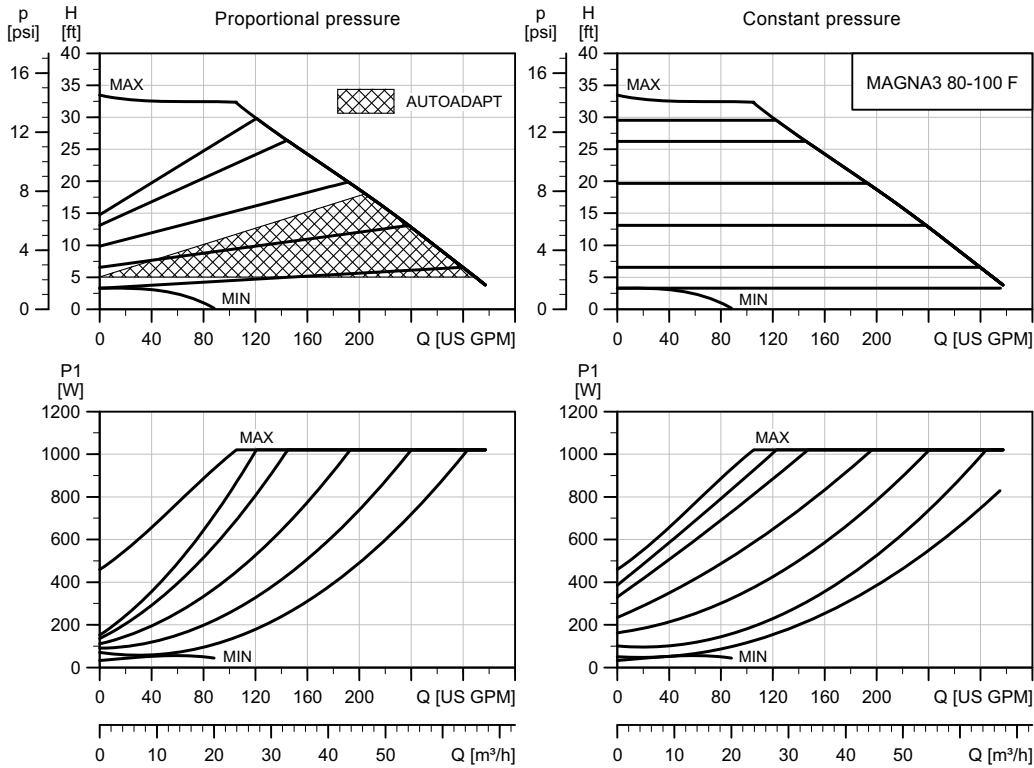
For product numbers, see page 7.

TM05 8112 1214

TM05 2205 2214

MAGNA3 80-100 F

1 x 208-230 V, 50/60 Hz

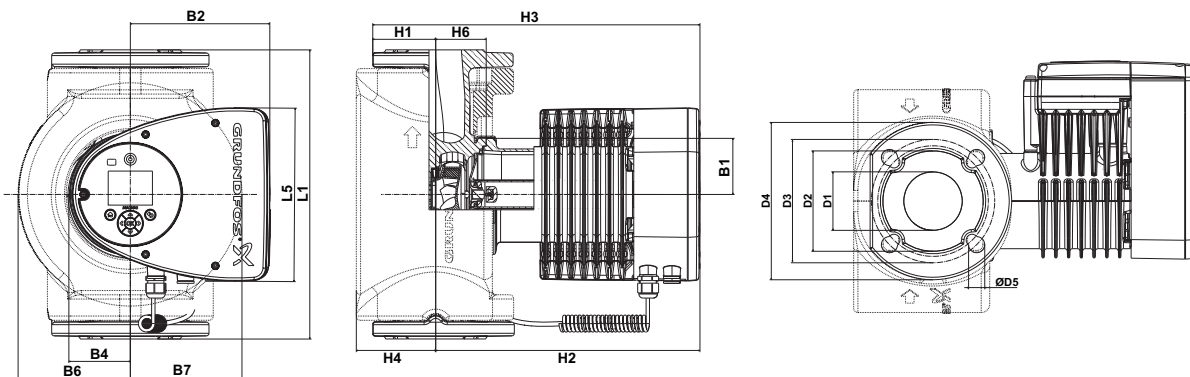


Speed	P1 [W]	I <sub>1/1</sub> [A]
Min.	31	0.32
Max.	1041	4.60

System pressure: Max. 175 psi (12 bar)  
 Liquid temperature: 14 to 230 °F (-10 °C to +110 °C)  
 Specific EEI: 0.17

The pump incorporates overload protection.

Net weights [lbs (kg)]	Gross weights [lbs (kg)]	Ship. vol. [ft³ (m³)]
63 (28.8)	72 (32.6)	2.47 (0.07)



Pump type	Dimensions [in (mm)]								
	L1	L5	B1	B2	B4	B6	B7	D1	D2
MAGNA3 80-100 F (N)	14.17 (360)	8.03 (204)	3.31 (84)	6.46 (164)	2.87 (73)	6.42 (163)	6.42 (163)	3.15 (80)	5.2 (132)
	D3	D4	D5	H1	H2	H3	H4	H6	
	5.91 (150)	7.87 (200)	0.75 (19)	3.7 (94)	12.52 (318)	16.22 (412)	4.53 (115)	2.6 (66)	

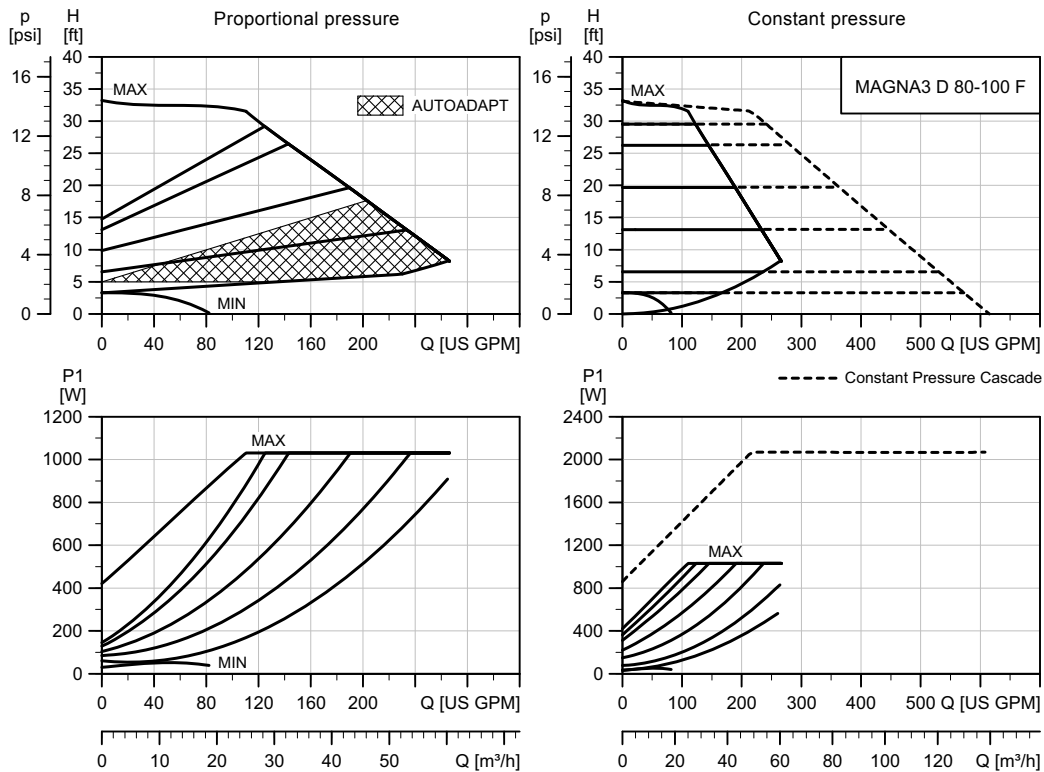
For product numbers, see page 7.

TM05 8110 1214

TM05 7652 1413

MAGNA3 D 80-100 F

1 x 208-230 V, 50/60 Hz



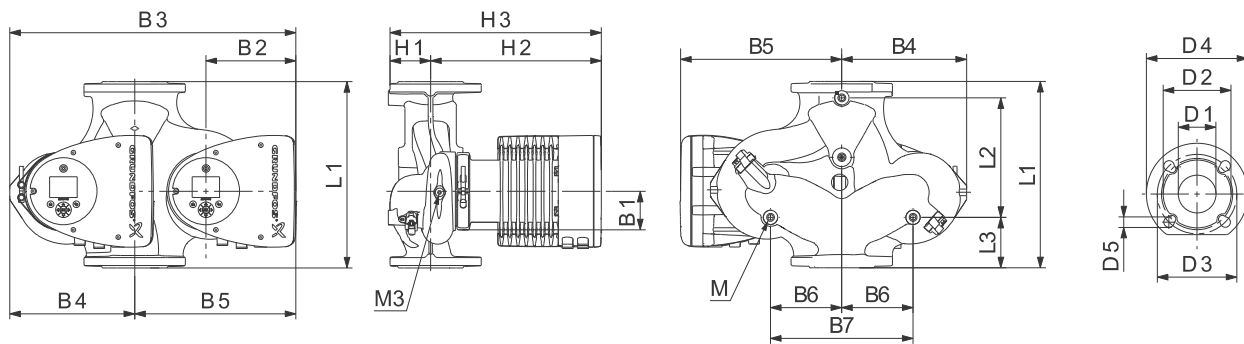
TM05 8113 1913

Speed	P1 [W]	I <sub>1/1</sub> [A]
Min.	32	0.32
Max.	1052	4.62

System pressure: Max. 175 psi (12 bar)  
 Liquid temperature: 14 to 230 °F (-10 °C to +110 °C)  
 Specific EEI: 0.17

The pump incorporates overload protection.

Net weights [lbs (kg)]	Gross weights [lbs (kg)]	Ship. vol. [ft³ (m³)]
114 (51.6)	140 (63.4)	2.47 (0.07)



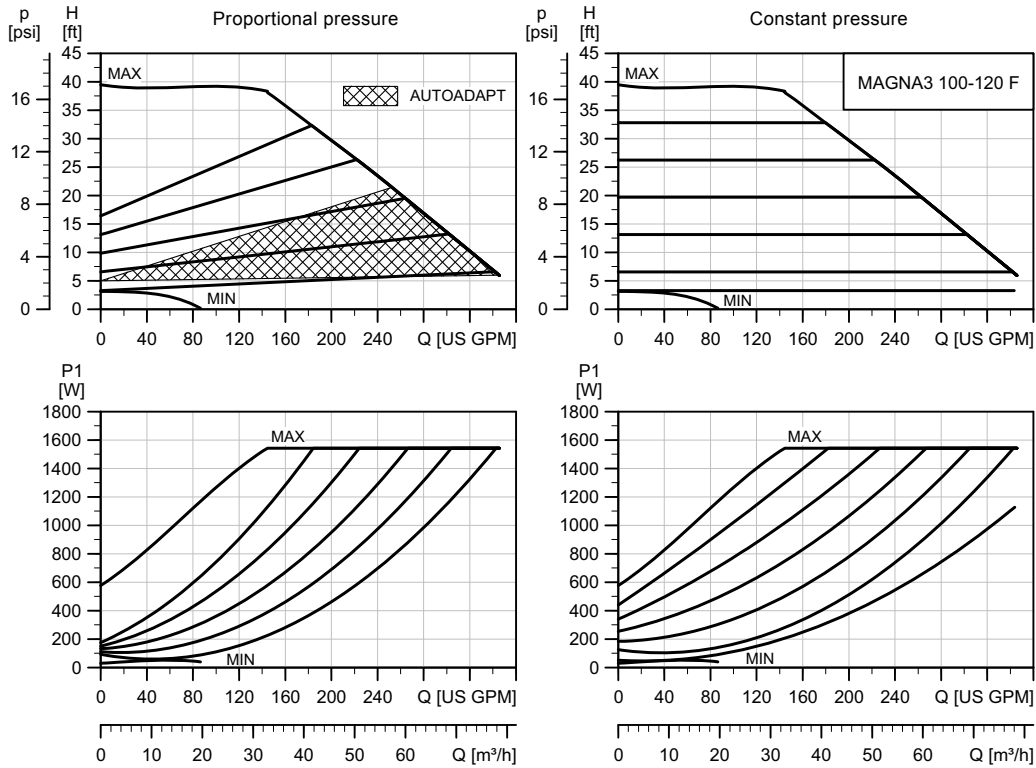
TM05 2205 2214

Pump type	Dimensions [in (mm)]									
	L1	L2	L3	L4	L5	B1	B3	B4	B5	
MAGNA3 D 80-100 F	14.17 (360)	8.58 (218)	4.02 (102)	4.02 (102)	8.03 (204)	3.31 (84)	21.18 (538)	9.61 (244)	11.57 (294)	
	D1	D2	D3	D3 (2)	D4	D5	M	M1	H1	
	3.15 (80)	5.04 (128)	5.91 (150)	6.30 (160)	7.87 (200)	0.75 (19)	M12	Rp 1/4	3.82 (97)	

For product numbers, see page 7.

MAGNA3 100-120 F

1 x 208-230 V, 50/60 Hz

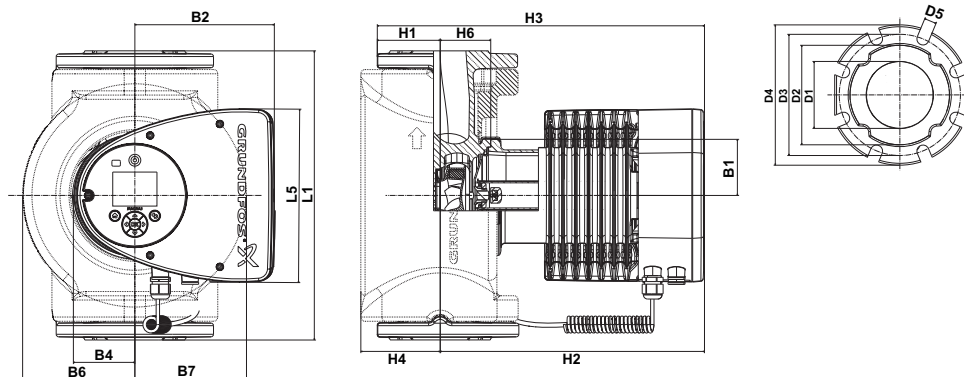


Speed	P1 [W]	I <sub>1/1</sub> [A]
Min.	31	0.32
Max.	1576	6.97

System pressure: Max. 175 psi (12 bar)  
 Liquid temperature: 14 to 230 °F (-10 °C to +110 °C)  
 Specific EEI: 0.17

The pump incorporates overload protection.

Net weights [lbs (kg)]	Gross weights [lbs (kg)]	Ship. vol. [ft³ (m³)]
73 (33.1)	82 (37.0)	3.53 (0.1)



Pump type	Dimensions [in (mm)]								
	L1	L5	B1	B2	B4	B6	B7	D1	D2
MAGNA3 100-120 F (N)	17.72 (450)	8.03 (204)	3.31 (84)	6.46 (164)	2.87 (73)	7.01 (178)	7.01 (178)	3.94 (100)	6.14 (156)
	D3	D4	D5	H1	H2	H3	H4	H6	
	7.52 (191)	8.66 (220)	0.75 (19)	4.02 (102)	12.99 (330)	17.01 (432)	4.72 (120)	3.11 (79)	

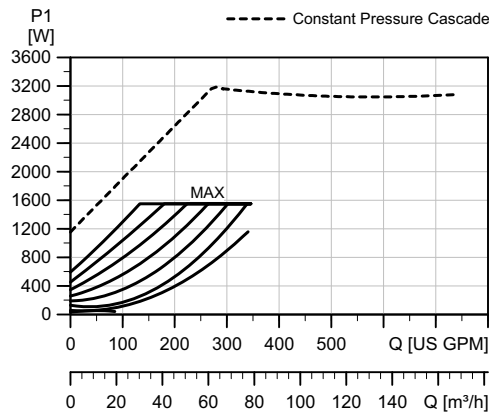
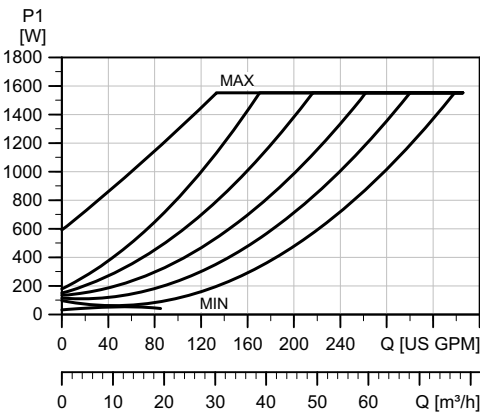
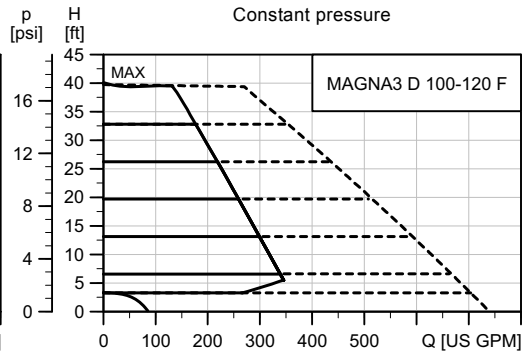
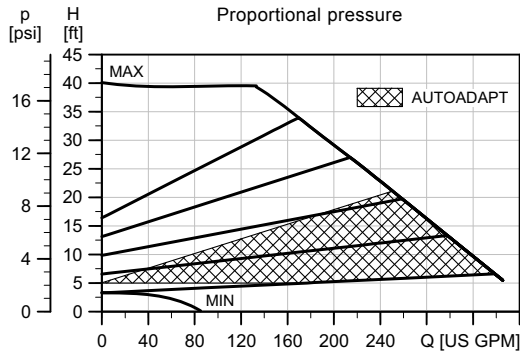
For product numbers, see page 7.

TM05 8111 1214

TM05 7650 1413

MAGNA3 D 100-120 F

1 x 208-230 V, 50/60 Hz

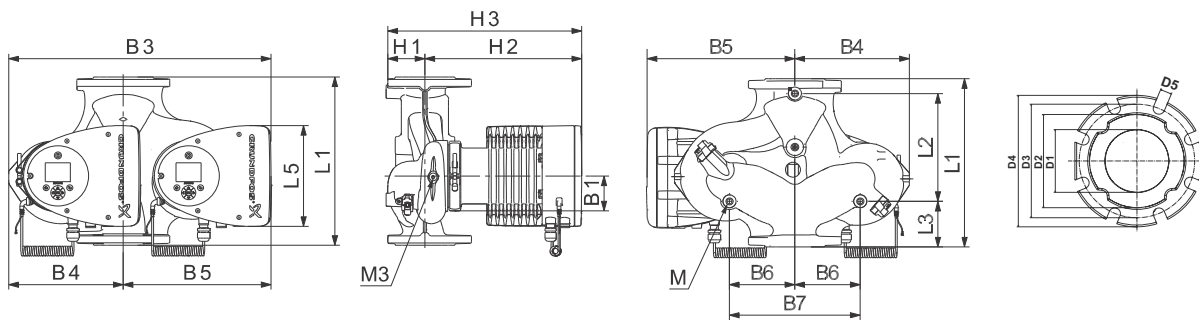


Speed	P1 [W]	I <sub>1/1</sub> [A]
Min.	35	0.35
Max.	1582	6.98

System pressure: Max. 175 psi (12 bar)  
 Liquid temperature: 14 to 230 °F (-10 °C to +110 °C)  
 Specific EEI: 0.17

The pump incorporates overload protection.

Net weights [lbs (kg)]	Gross weights [lbs (kg)]	Ship. vol. [ft³ (m³)]
133 (60.4)	161 (72.8)	3.53 (0.1)



Pump type	Dimensions [in (mm)]								
	L1	L2	L3	L4	L5	B1	B3	B4	B5
MAGNA3 D 100-120 F	17.72 (450)	9.57 (243)	5.79 (147)	5.79 (147)	8.03 (204)	3.31 (84)	21.69 (551)	9.92 (252)	11.77 (299)
	D1	D2	D3	D4	D5	M	M1	H1	H2
	3.94 (100)	6.3 (160)	6.69 (170)	8.66 (220)	0.75 (19)	M12	Rp 1/4	4.06 (103)	12.99 (330)

For product numbers, see page 7.

TM05 8121 1913

TM05 7701 1214

## Technical data

### Electrical data

<b>Pump type</b>	<b>MAGNA3 (D)</b>
<b>Enclosure class</b>	Type 2
<b>Insulation class</b>	F.
<b>Supply voltage</b>	1 x 115 V ± 10 %, 50/60 Hz, PE; 1 x 208-230 V ± 10 %, 50/60 Hz, PE
<b>Two digital inputs</b>	External potential-free contact. Contact load: 5 V, 10 mA. Screened cable. Loop resistance: Maximum 130 Ω.
<b>Analog input</b>	4-20 mA (load: 150 Ω). 0-10 VDC (load: > 10 kΩ).
<b>Two relay outputs</b>	Internal potential-free changeover contact. Maximum load: 250 V, 2 A, AC1. Minimum load: 5 VDC, 20 mA. Screened cable, depending on signal level.
<b>Bus input</b>	Grundfos Communication Interface Modules (add-on CIM modules) for <ul style="list-style-type: none"> <li>• GENibus</li> <li>• LonWorks</li> <li>• Profibus DP</li> <li>• Modbus RTU</li> <li>• BACnet MS/TP</li> <li>• Grundfos Remote Management.</li> </ul>
<b>Earth leakage current</b>	$I_{leakage} < 3.5$ mA. The leakage currents are measured in accordance with EN 60335-1.
<b>EMC</b>	EN 55014-1:2006, EN 55014-2:1998, EN 61800-3-3:2008 and EN 61000-3-2:2006.
<b>cos φ</b>	The MAGNA3 has a built-in active PFC (Power Factor Control) which gives a cos φ from 0.98 to 0.99, i.e. very close to 1.
<b>Consumption when the pump is stopped</b>	1 to 10 W, depending on activity, i.e. reading the display, use of Grundfos GO Remote, interaction with modules, etc. 4 W, when pump is stopped and no activity.

### Sound pressure data

<b>Sound pressure level</b>	≤ 43 dB(A)
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### External sensors

Sensor	Type	Measuring range [°F (°C)]	Power supply [VDC]	Transmitter output [V]	Process connection	Product number
Delta T sensor	RPI/T	+32 to +248 °F (0 to +120 °C)	11 to 30	0 - 10 V	G1/2 - 1/2" NPT	98477669
					G1/2 - 1/4" NPT	98477668

Sensor	Type	Measuring range [psi]	Measuring range [bar]	Transmitter output [mA]	Power supply [VDC]	Process connection	Product number
Pressure transmitter	RPI	0-9	(0 - 0.6)	4 to 20	12-to 30	G 1/2	97748907
		0-15	(0 - 1.0)				97748908
		0-25	(0 - 1.6)				97748909
		0-35	(0 - 2.5)				97748910

### Adapters

Adapter	Product number
Adapter for 1/4" NPT	98344015
Adapter for 1/4" NPT	98255244

### Blanking flange\*

Blanking flange	Product number
All pumps	98159372

\* A blanking flange is used to blank off the opening when one of the pumps of a twin-head pump is removed for service to enable uninterrupted operation of the other pump.



## 11. Accessories

### Insulating for air-conditioning and cooling systems

For cooling applications, if the supplied insulation shell is to be used then a silicon sealant must be liberally applied to the inside of the insulation shell to ensure all air gaps are eliminated between the shell and pump housing to prevent condensation inside the shell.



TM05 2874 0412

Fig. 57 Fitting the insulating shells to a MAGNA3 pump

### CIM modules

A CIM module is an add-on Communication Interface Module. The CIM module enables data transmission between the pump and an external system, for example a BMS or SCADA system.

The CIM module communicates via fieldbus protocols. The following CIM modules are available:

Module	Fieldbus protocol	Product number
CIM 050	GENIbus	96824631
CIM 100	LonWorks	96824797
CIM 150	Profibus DP	96824793
CIM 200	Modbus RTU	96824796
CIM 300	BACnet MS/TP	96893770

For further information about data communication via CIM modules, see the CIM documentation available in WebCAPS.

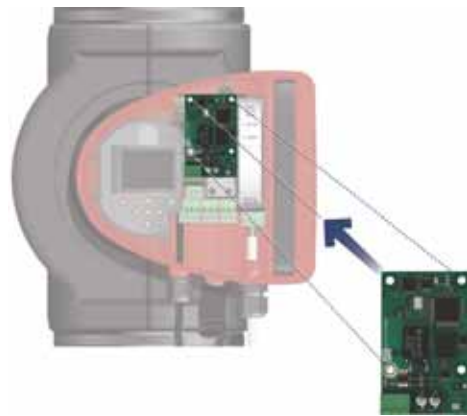
### Location of CIM module

The CIM module is fitted behind the front cover. See fig. 58.

For installation, see separate installation and operating instructions.



<http://GRUNDFOS.COM/MANUAL-MAGNA3>



TM05 2914 1112

Fig. 58 Location of CIM module

## Grundfos GO Remote

The pump is designed for wireless communication with the Grundfos GO Remote app which communicates with the pump via radio communication.

**Note:** The radio communication between the pump and the Grundfos GO Remote is encrypted to protect against misuse.

The Grundfos GO Remote app is available from Apple App Store and Android market.

The Grundfos GO Remote app must be used in conjunction with one of the following Mobile Interface devices:

Mobile interface	Product number
Grundfos MI 202	98046376
Grundfos MI 204	98424092
Grundfos MI 301	98046408

The Grundfos GO Remote concept replaces the Grundfos R100 remote control. This means that all products supported by the R100 are supported by the Grundfos GO Remote.

For function and connection to the pump, see separate installation and operating instructions for the desired type of Grundfos GO Remote setup.

### Mobile interface

The available mobile interface devices are described in the following.

#### MI 202 and MI 204

The MI 202 and MI 204 are add-on modules with built-in infrared and radio communication. The MI 202 can be used in conjunction with Apple devices with 30-pin connector (iPhone 4, 4S and iPod touch 4G).

The MI 204 can be used in conjunction with Apple devices with lightning connector (iPhone 5, 5C, 5S and iPod touch 5G).



Fig. 59 MI 202 and MI 204

Supplied with the product:

- Grundfos MI 202 or 204
- sleeve
- quick guide
- charger cable.

### MI 301

The MI 301 is a module with built-in infrared and radio communication. The MI 301 must be used in conjunction with an Android or iOS-based Smartphone with a Bluetooth connection. The MI 301 has a rechargeable Li-ion battery that must be charged separately.



Fig. 60 MI 301

Supplied with the product:

- Grundfos MI 301
- sleeve
- battery charger
- quick guide.

### Supported units

Make	Model	Operating system	MI 202	MI 204	MI 301
Apple	iPod touch 4G	iOS 5.0 or later	•	-	•
	iPhone 4, 4S		•	-	•
	iPod touch 5G	iOS 6.0 or later	-	•	•
	iPhone 5, 5C, 5S		-	•	•
HTC	Desire S	Android 2.3.3 or later	-	-	•
	Sensation	Android 2.3.4 or later	-	-	•
	Galaxy S II		-	-	•
Samsung	Galaxy Nexus	Android 4.0 or later	-	-	•
	Google Nexus 4	Android 4.2 or later	-	-	•

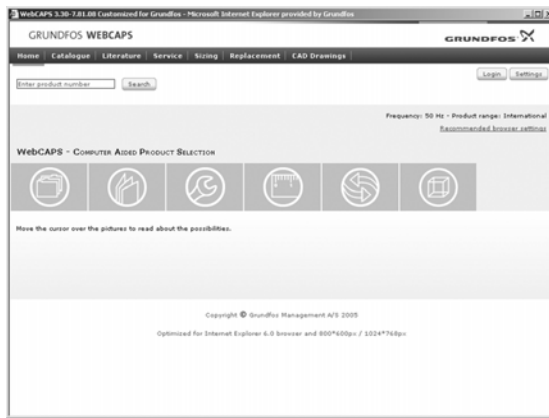
**Note:** Similar Android and iOS-based devices may work as well, but are not supported by Grundfos.

TM05 3887 1612 - TM05 7704 1513

TM05 3887 1612

# 12. Further product information

## WebCAPS

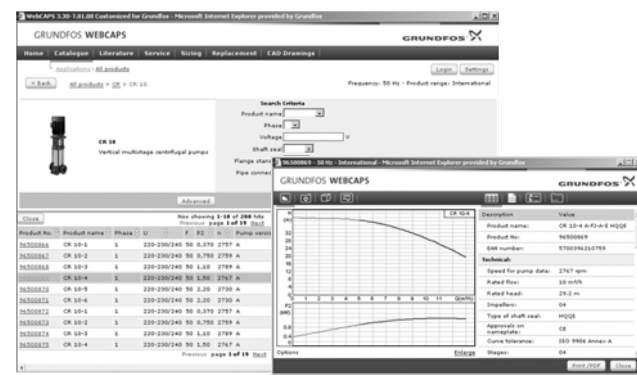


WebCAPS is a **Web-based Computer Aided Product Selection** program available on [www.grundfos.us](http://www.grundfos.us).

WebCAPS contains detailed information on more than 220,000 Grundfos products in more than 30 languages.

Information in WebCAPS is divided into six sections:

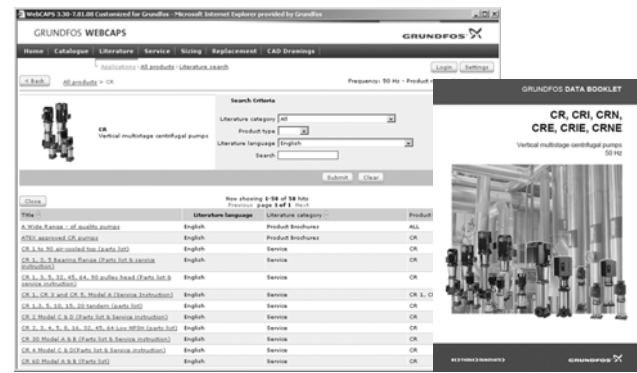
- catalog
- literature
- service
- sizing
- replacement
- cad drawings



### Catalog

Based on fields of application and pump types, this section contains the following:

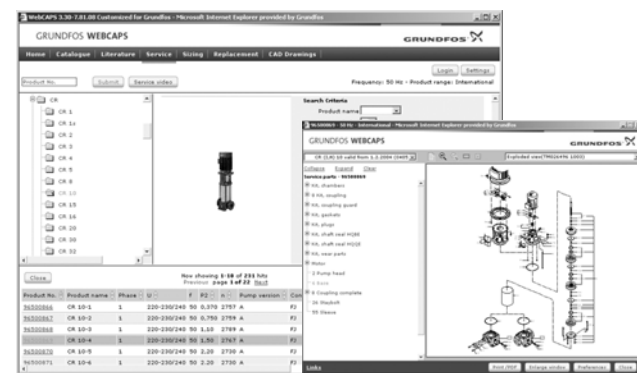
- technical data
- curves (QH, Eff, P1, P2, etc.) which can be adapted to the density and viscosity of the pumped liquid and show the number of pumps in operation
- product photos
- dimensional drawings
- wiring diagrams
- quotation texts, etc.



### Literature

This section contains all the latest documents of a given pump, such as

- data booklets
- installation and operating instructions
- service documentation, such as service kit catalog and service kit instructions
- quick guides
- product brochures.



### Service

This section contains an easy-to-use interactive service catalog. Here you can find and identify service parts of both existing and discontinued Grundfos pumps.

Furthermore, the section contains service videos showing you how to replace service parts.



**Sizing**

This section is based on different fields of application and installation examples and gives easy step-by-step instructions in how to size a product:

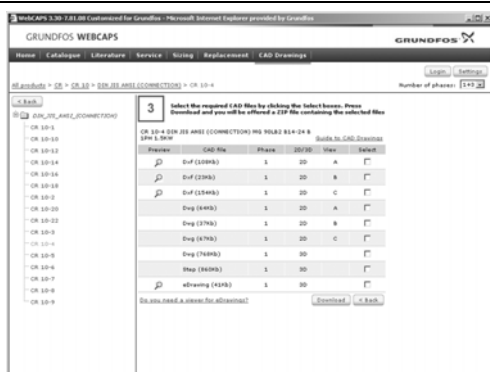
- Select the most suitable and efficient pump for your installation.
- Carry out advanced calculations based on energy, consumption, payback periods, load profiles, life cycle costs, etc.
- Analyze your selected pump via the built-in life cycle cost tool.
- Determine the flow velocity in wastewater applications, etc.



**Replacement**

In this section you find a guide to selecting and comparing replacement data of an installed pump in order to replace the pump with a more efficient Grundfos pump. The section contains replacement data of a wide range of pumps produced by other manufacturers than Grundfos.

Based on an easy step-by-step guide, you can compare Grundfos pumps with the one you have installed on your site. When you have specified the installed pump, the guide will suggest a number of Grundfos pumps which can improve both comfort and efficiency.



**CAD drawings**

In this section, it is possible to download 2-dimensional (2D) and 3-dimensional (3D) CAD drawings of most Grundfos pumps.

These formats are available in WebCAPS:

- 2-dimensional drawings:
- .dxf, wireframe drawings
  - .dwg, wireframe drawings.
- 3-dimensional drawings:
- .dwg, wireframe drawings (without surfaces)
  - .stp, solid drawings (with surfaces)
  - .eprt, E-drawings.

**WinCAPS**



Fig. 61 WinCAPS DVD

WinCAPS is a **Windows-based Computer Aided Product Selection** program containing detailed information on more than 220,000 Grundfos products in more than 30 languages.

The program contains the same features and functions as WebCAPS, but is an ideal solution if no internet connection is available.

WinCAPS is available on DVD and updated once a year.

## Grundfos GO

### Mobile solution for professionals on the GO!

Grundfos GO is the mobile tool box for professional users on the go. It is the most comprehensive platform for mobile pump control and pump selection including sizing, replacement and documentation. It offers intuitive, handheld assistance and access to Grundfos online tools, and it saves valuable time for reporting and data collection.



Subject to alterations.





**98439208** 0414

ECM: 1131616

**Grundfos Kansas City**

17100 West 118th Terrace  
Olathe, Kansas 66061  
Phone: 913-227-3400  
Fax: 913-227-3500  
[www.grundfos.us](http://www.grundfos.us)

**Grundfos Canada**

2941 Brighton Road  
Oakville, Ontario L6H 6C9 Canada  
Phone: +1-905-829-9533  
Fax: +1-905-829-9512  
[www.grundfos.ca](http://www.grundfos.ca)

**Grundfos México**

Boulevard TLC No. 15  
Parque Industrial Stiva Aeropuerto  
C.P. 66600 Apodaca, N.L. Mexico  
Phone: 011-52-81-8144 4000  
Fax: 011-52-81-8144 4010  
[www.grundfos.mx](http://www.grundfos.mx)