# 1. Product description

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.

The pump range can also be used in the following systems:

- ground source heat pump systems
- solar-heating systems.

## Duty range

| Data | MAGNA3 (N) Single-head pumps | MAGNA3 D Twin-head pumps |
|---|---|---|
| Maximum flow rate, Q | 78.5 $m^3/h$ | 150 $m^3/h$ |
| Maximum head, H | 18 metres | |
| Maximum system pressure | 1.6 MPa (16 bar) | |
| Liquid temperature | -10 to 110 °C | |



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**Fig. 1** MAGNA3 pumps

## Characteristic features

- $AUTO_{ADAPT}$
- $FLOW_{ADAPT}$
- Proportional-pressure control
- Constant-pressure control
- Constant-temperature control
- Differential-temperature control
- Constant-curve duty
- Maximum or minimum curve duty
- $FLOW_{LIMIT}$
- Automatic night setback
- No external motor protection required
- Insulating shells supplied with single-head pumps for heating systems
- Wide temperature range due to thermal separation of the control box and pump media
- Multipump function.

## Benefits

- Low energy consumption. The $AUTO_{ADAPT}$ function ensures energy savings.
- $FLOW_{ADAPT}$ which is a combination of the well-known $AUTO_{ADAPT}$ control mode and a new $FLOW_{LIMIT}$ function.
- Built-in Grundfos differential-pressure and temperature sensor.
- Simple installation.
- No maintenance and long life.
- Extended user interface with TFT display.
- Control panel with self-explanatory push-buttons made of high-quality silicone.
- Operating log.
- Easy system optimisation.
- Heat energy monitor.
- External control and monitoring enabled via add-on modules.
- The complete range is available for a maximum system pressure of 16 bar (PN 16).

## Main 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 heating systems with variable flows where you want to optimise the setting of the pump duty point, thus reducing energy costs. The pumps are also suitable for domestic hot-water systems. Observe local legislation regarding pump house material. Grundfos strongly recommend that you use stainless-steel pumps in domestic hot-water applications to avoid corrosion.

To ensure correct operation, it is important that the sizing range of the system falls within the duty range of the pump.

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 the head to the actual flow demand is required, 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 maximum curve, for example in solar-heating systems.

## Operating modes

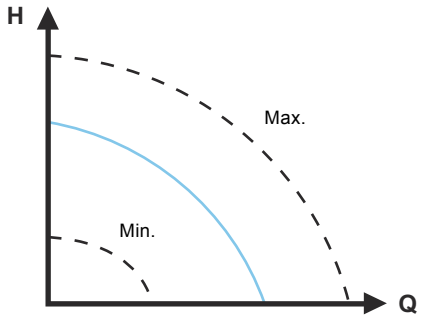



**Fig. 13** Maximum and minimum curves

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

**Note:** You can select the control mode and setpoint even if the pump is not running in Normal mode.

**Stop:** The pump stops.

**Min.:** You can use the minimum curve mode 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.:** You can use the maximum curve mode in periods in which a maximum flow is required.

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

You can select the normal, stop, min. and max. operating modes directly by use of the built-in digital inputs. See section *Connection to power supply, terminal-connected versions*, page 40.

## 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 23.

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.

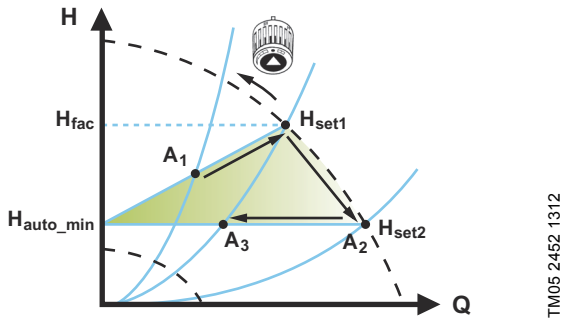



**Fig. 14** AUTO$_{ADAPT}$ control

**Note:** Manual setting of the setpoint is not possible.

When you have enabled the AUTO$_{ADAPT}$ control mode, 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. 14.

When the pump registers a lower head on the maximum 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 23.
$H_{auto_min}$: 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 we do not recommend it for air-conditioning and cooling systems.

# 4. Operating conditions

## General recommendations

| | |
|---|---|
| **Water in heating systems** | Water quality according to local standards such as the German standard VDI 2035 |
| **Domestic hot water** | Degree of hardness up to 14 °dH |
| **Water containing glycol** | Maximum viscosity = 10-50 cSt ~ 50 % water / 50 % ethylene glycol at -10 °C |

## Liquid temperature

| Application | Temperature range |
|---|---|
| General | -10 to 110 °C |
| Domestic hot-water systems | Up to 65 °C recommended |

## Ambient conditions

| Ambient conditions | |
|---|---|
| Ambient temperature during operation | 0 to 40 °C |
| Ambient temperature during storage and transport | -40 to 70 °C |
| Relative air humidity | Maximum 95 % |

## Maximum operating pressure

PN 6: 6 bar / 0.6 MPa

PN 10: 10 bar / 1.0 MPa

PN 16: 16 bar / 1.6 MPa.

## 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 | | |
|---|---|---|---|
| | 75 °C | 95 °C | 110 °C |
| | Inlet pressure [bar] / [MPa] | | |
| 25-40/60/80/100/100 | 0.10 / 0.01 | 0.35 / 0.035 | 1.0 / 0.10 |
| 32-40/60/80/100/120 | 0.10 / 0.01 | 0.35 / 0.035 | 1.0 / 0.10 |
| 32-120 F | 0.10 / 0.01 | 0.50 / 0.05 | 1.1 / 0.11 |
| 40-40/60 F | 0.10 / 0.01 | 0.35 / 0.035 | 1.0 / 0.10 |
| 40-80/100 F | 0.10 / 0.01 | 0.50 / 0.05 | 1.1 / 0.11 |
| 40-120/150/180 F | 0.10 / 0.01 | 0.40 / 0.04 | 1.0 / 0.10 |
| 50-40/60/80 F | 0.10 / 0.01 | 0.10 / 0.01 | 0.7 / 0.07 |
| 50-100 F | 0.10 / 0.01 | 0.50 / 0.05 | 1.1 / 0.11 |
| 50-120 F | 0.10 / 0.01 | 0.40 / 0.04 | 1.0 / 0.10 |
| 50-150/180 F | 0.20 / 0.02 | 0.60 / 0.06 | 1.2 / 0.12 |
| 65-40/60/80/100 F | 0.20 / 0.02 | 0.60 / 0.06 | 1.2 / 0.12 |
| 65-120 F | 0.10 / 0.01 | 0.50 / 0.05 | 1.1 / 0.11 |
| 65-150 F | 0.40 / 0.04 | 0.80 / 0.08 | 1.2 / 0.12 |
| 80-40/60/80/100/120 F | 0.50 / 0.05 | 0.90 / 0.09 | 1.5 / 0.15 |
| 100-40/60/80/100/120 F | 0.50 / 0.05 | 0.90 / 0.09 | 1.5 / 0.15 |

In the case of cascade twin-head operation, increase the required relative inlet pressure by 0.1 bar / 0.01 MPa compared to the stated values for single-head pumps or twin-head pumps in single-head operation.

**Note:** The 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 300 metres above sea level. For altitudes above 300 metres, increase the required relative inlet pressure by 0.1 bar / 0.01 MPa per 100 metres altitude. The MAGNA3 pump is only approved for an altitude of 2000 metres.

## Pumped liquids

The pump is suitable for thin, clean, non-aggressive and non-explosive liquids, not containing solid particles or fibres 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, for example the German standard VDI 2035.

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

In domestic hot-water systems, we recommend that you keep the liquid temperature below 65 °C to eliminate the risk of lime precipitation.

You can use MAGNA3 pumps for pumping water/glycol mixtures up to 50 %.

Example of a water/ethylene glycol mixture:

Maximum viscosity: 10-50 cSt ~ 50 % water / 50 % ethylene glycol mixture at -10 °C.

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

The pumping of glycol mixtures will affect the maximum 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 minimise the operating time at high temperatures.

You must 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.

## Differential-pressure and temperature sensor

MAGNA3 incorporates a Grundfos differential-pressure and temperature sensor. The sensor is located in the pump housing in a channel between the inlet and outlet ports.

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.

If the Grundfos sensor is faulty, it will keep the last known feedback signal. The differential-pressure sensor and temperature sensor offer 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.

### Sensor specifications

**Temperature**

| Temperature range during operation | Accuracy |
|---|---|
| -10 to +35 °C | ± 4 °C |
| +35 to +90 °C | ± 2 °C |
| +90 to +110 °C | ± 4 °C |

# Electrical data

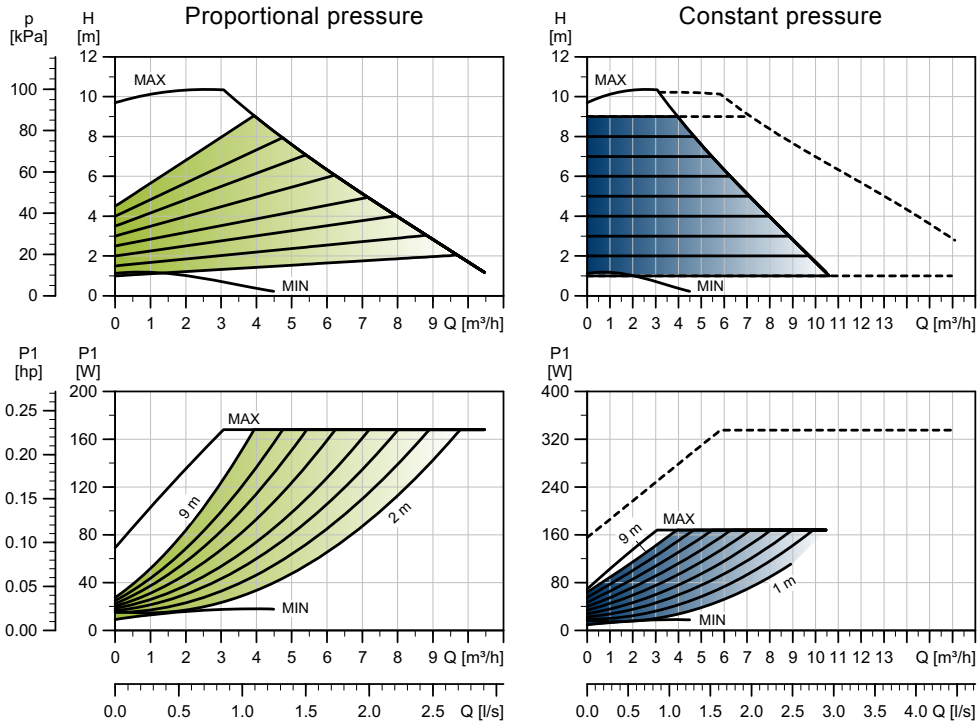
| Pump type | MAGNA3 (D) |
|---|---|
| Enclosure class | IPX4D (EN 60529). |
| Insulation class | F. |
| Supply voltage | 1 x 230 V ± 10 %, 50/60 Hz, PE. |
| Three digital inputs | External potential-free contact.<br>Contact load: 5 V, 10 mA.<br>Screened cable.<br>Loop resistance: Maximum 130 Ω. |
| Analog input | 4-20 mA (load: 150 Ω).<br>0-10 VDC (load: > 10 kΩ). |
| Two relay outputs | Internal potential-free changeover contact.<br>Maximum load: 250 V, 2 A, AC1.<br>Minimum load: 5 VDC, 20 mA.<br>Screened cable, depending on signal level. |
| Bus input | Grundfos Communication Interface Modules (add-on CIM modules) for<br>• GENIbus<br>• LonWorks<br>• PROFIBUS DP<br>• Modbus RTU<br>• GSM/GPRS<br>• Grundfos Remote Management<br>• BACnet MS/TP<br>• Ethernet. |
| Leakage current | $I_{leakage}$ < 3.5 mA.<br>The leakage currents are measured in accordance with EN 60335-1. |
| EMC | Standards used: EN 55014-1:2006+A1:2009+A2:2011, EN 55014-2:1997+A1:2001+A2:2008, EN 61000-3-2:2006+A1:2009+A2:2009 and EN 61000-3-3:2013. |
| Cos φ | Terminal-connected versions have 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.<br>Plug-connected versions have no PFC and therefore the power factor is from 0.50 to 0.99. |
| Consumption when the pump is stopped | 4 to 10 W, depending on activity, i.e. reading the display, use of Grundfos GO, interaction with modules, etc.<br>4 W, when the pump is stopped and there is no activity. |

## Sound pressure level

| Pump type | MAGNA3 (D) |
|---|---|
| Sound pressure level | ≤ 43 dB(A) |

## MAGNA3 D 32-100

**1 x 230 V, 50/60 Hz**



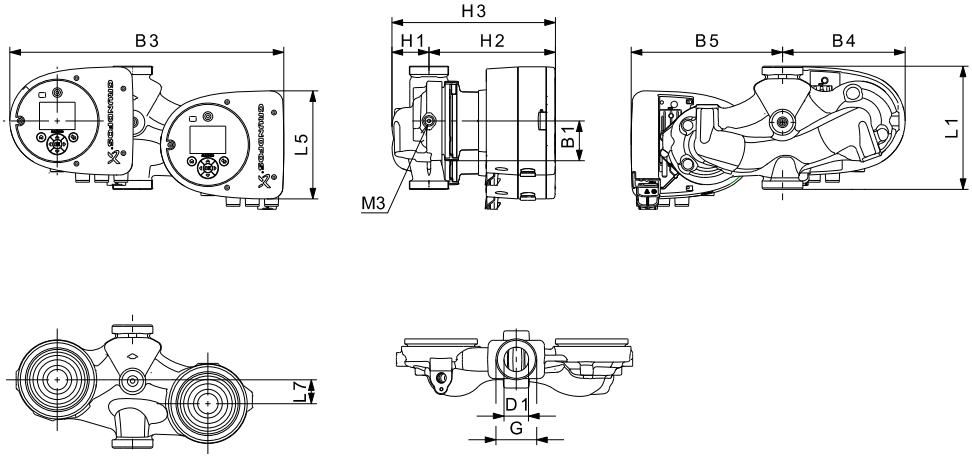

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| Speed | P1 [W] | $I_{1/1}$ [A] |
|---|---|---|
| **Min.** | 9 | 0.09 |
| **Max.** | 180 | 1.47 |

The pump incorporates overload protection.

| Net weights [kg] | Gross weights [kg] | Ship. vol. [$m^3$] |
|---|---|---|
| 13.2 | 14.0 | 0.04 |

Connections: See *Pipe connections*, page 134.
System pressure: Max. 1.0 MPa (10 bar). Also available as max. 1.6 MPa (16 bar).
Liquid temperature: -10 to 110 °C (TF 110).
Specific EEI: 0.20.




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| Pump type | Dimensions [mm] | | | | | | | | | | | [inch] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | L1 | L5 | L7 | B1 | B3 | B4 | B5 | H1 | H2 | H3 | D1 | G | M3 |
| MAGNA3 D 32-100 | 180 | 158 | 35 | 58 | 400 | 179 | 221 | 54 | 185 | 239 | 32 | 2 | 1/4 |

For product numbers, see page 139.

## Twin-head pumps

| Pump type | Port-to-port length [mm] | Threaded pipe connection | | Data sheet Page |
|---|---|---|---|---|
| | | Cast iron | | |
| | | PN 10 | PN 16 | |
| MAGNA3 D 32-40 | 180 | 97924449 | 97924455 | 51 |
| MAGNA3 D 32-60 | 180 | 97924450 | 97924456 | 53 |
| MAGNA3 D 32-80 | 180 | 97924451 | 97924457 | 55 |
| MAGNA3 D 32-100 | 180 | 97924452 | 97924458 | 57 |

| Pump type | Port-to-port length [mm] | Flange connection | | | | Data sheet Page |
|---|---|---|---|---|---|---|
| | | Cast iron | | | | |
| | | PN 6 | PN 10 | PN 6/10 | PN 16 | |
| MAGNA3 D 32-40 F | 220 | | | 98333840 | 98333838 | 60 |
| MAGNA3 D 32-60 F | 220 | | | 98333860 | 98333858 | 62 |
| MAGNA3 D 32-80 F | 220 | | | 98333880 | 98333878 | 64 |
| MAGNA3 D 32-100 F | 220 | | | 97924453 | 97924459 | 66 |
| MAGNA3 D 32-120 F | 220 | | | 97924454 | 97924460 | 68 |
| MAGNA3 D 40-40 F | 220 | | | 97924461 | 97924468 | 70 |
| MAGNA3 D 40-60 F | 220 | | | 97924462 | 97924469 | 72 |
| MAGNA3 D 40-80 F | 220 | | | 97924463 | 97924470 | 74 |
| MAGNA3 D 40-100 F | 220 | | | 97924464 | 97924471 | 76 |
| MAGNA3 D 40-120 F | 250 | | | 97924465 | 97924472 | 78 |
| MAGNA3 D 40-150 F | 250 | | | 97924466 | 97924473 | 80 |
| MAGNA3 D 40-180 F | 250 | | | 97924467 | 97924474 | 82 |
| MAGNA3 D 50-40 F | 240 | | | 97924475 | 97924482 | 84 |
| MAGNA3 D 50-60 F | 240 | | | 97924476 | 97924483 | 86 |
| MAGNA3 D 50-80 F | 240 | | | 97924477 | 97924484 | 88 |
| MAGNA3 D 50-100 F | 280 | | | 97924478 | 97924485 | 90 |
| MAGNA3 D 50-120 F | 280 | | | 97924479 | 97924486 | 92 |
| MAGNA3 D 50-150 F | 280 | | | 97924480 | 97924487 | 94 |
| MAGNA3 D 50-180 F | 280 | | | 97924481 | 97924488 | 96 |
| MAGNA3 D 65-40 F | 340 | | | 97924489 | 97924495 | 98 |
| MAGNA3 D 65-60 F | 340 | | | 97924490 | 97924496 | 100 |
| MAGNA3 D 65-80 F | 340 | | | 97924491 | 97924497 | 102 |
| MAGNA3 D 65-100 F | 340 | | | 97924492 | 97924498 | 104 |
| MAGNA3 D 65-120 F | 340 | | | 97924493 | 97924499 | 106 |
| MAGNA3 D 65-150 F | 340 | | | 97924494 | 97924500 | 108 |
| MAGNA3 D 80-40 F | 360 | 97924501 | 97924511 | | 97924521 | 110 |
| MAGNA3 D 80-60 F | 360 | 97924502 | 97924512 | | 97924522 | 112 |
| MAGNA3 D 80-80 F | 360 | 97924503 | 97924513 | | 97924523 | 114 |
| MAGNA3 D 80-100 F | 360 | 97924504 | 97924514 | | 97924524 | 116 |
| MAGNA3 D 80-120 F | 360 | 97924505 | 97924515 | | 97924525 | 118 |
| MAGNA3 D 100-40 F | 450 | 97924506 | 97924516 | | 97924526 | 120 |
| MAGNA3 D 100-60 F | 450 | 97924507 | 97924517 | | 97924527 | 122 |
| MAGNA3 D 100-80 F | 450 | 97924508 | 97924518 | | 97924528 | 124 |
| MAGNA3 D 100-100 F | 450 | 97924509 | 97924519 | | 97924529 | 126 |
| MAGNA3 D 100-120 F | 450 | 97924510 | 97924520 | | 97924530 | 128 |

**Note:** Click on the product number and go directly to the performance curve in Grundfos Product Center.