PM Rain

Installation and operating instructions

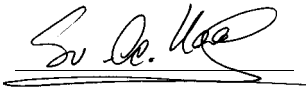
Declaration of conformity

EC declaration of conformity

We, Grundfos, declare under our sole responsibility that the products PM Rain, to which this declaration relates, are in conformity with these Council directives on the approximation of the laws of the EC member states:

– Low Voltage Directive (2006/95/EC).
  Standards used: EN 60730-1: 2000 and EN 60730-2-6: 2008.
– EMC Directive (2004/108/EC).
  Standards used: EN 60730-1: 2000 and EN 60730-1, A16: 2007.

Bjerringbro, 20th September 2011



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Person authorised to compile technical file and
empowered to sign the EC declaration of conformity.

Original installation and operating instructions.

CONTENTS

Warning

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

Warning

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

1. Symbols used in this document

Warning

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

Warning

If these instructions are not observed, it may lead to electric shock with consequent risk of serious personal injury or death.

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

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

2. Scope of supply

- Grundfos PM Rain unit.
- Grundfos PM Rain unit and SB pump.
- Grundfos PM Rain unit and JP pump.
  Supplied with an automatic air release valve fitted in the priming hole and unions.

3. Applications

The Grundfos PM Rain is designed to automatically switch between rainwater and mains water supply. This is done when the rainwater collecting tank is empty, for example during long periods without rain. When the rainwater tank is filled with rainwater again, the PM Rain will automatically switch back so that it supplies rainwater instead of mains water.

The PM Rain automatically starts and stops the pump according to the water demand.

Typical applications are rainwater supply systems in

- single-family houses
- summer houses and holiday cottages
- horticulture and gardening.

3.1 Liquids

Clean mains water or rainwater without solid particles or fibres that may attack the unit mechanically or chemically.

3.2 Temperatures

3.2.1 Liquid temperature

0 to +60 °C.

3.2.2 Ambient temperature

0 to +55 °C.

3.3 Operating pressure

Max. 10 bar (1000 kPa).

4. Installation

4.1 Connections

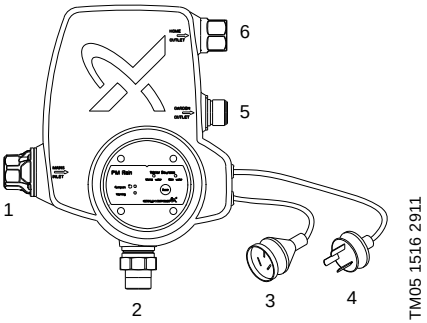

Fig. 1 Connections of the PM Rain

Pos.	Description
1	Mains water inlet. For example mains water or other constant water source.
2	Rainwater inlet. Rainwater without solid particles.
3	Power supply from PM Rain to pump.
4	Power supply to PM Rain and pump.
5	Garden outlet fitted with a blanking cover. Only rainwater. Optional use.
6	Home outlet. Mains water or rainwater whichever is available.

Material, type and size

Inlet/outlet	Material	Type and size
Mains water inlet	Brass	Female G 3/4
Rainwater inlet	Brass	Male G 1
Home outlet	Brass	Female G 3/4
Garden outlet	Plastic	Male G 1

4.2 Mechanical installation

Note

Use a suitable thread seal tape on the male and female threads of the PM Rain.

Install the unit on the discharge side of the pump. The unit has a built-in non-return valve.

The unit can be connected directly to the pump discharge port or between the pump and the first tapping point.

4.3 Location

The unit must be positioned so that it is protected from rain and direct sunlight.

The unit can be installed in systems with or without a pressure tank.

Note

A mounting bracket for wall mounting can be ordered separately.

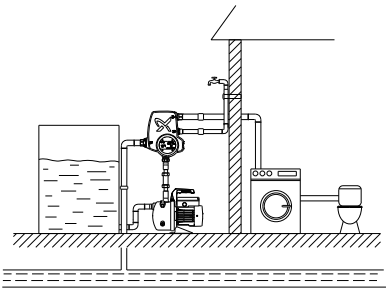

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Fig. 2 PM Rain and JP pump

Note

We recommend PM Rain and JP pump for positively fed systems only, for example above-ground collecting tanks.

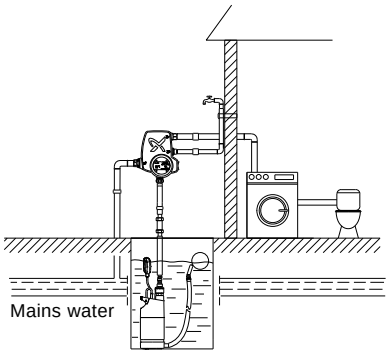

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Fig. 3 PM Rain and SB pump

Note

We recommend PM Rain and SB pump for suction applications, for example underground collecting tanks.

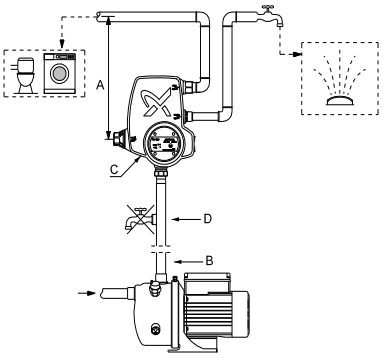

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Fig. 4 Installation example

Pos. A in fig. 4:

We recommend you to install the unit so that the height between the unit and the highest tapping point does not exceed the values in the table below.

Start pressure set		Maximum height
[bar]	[kPa]	[m]
2.5*	250	21
3.0	300	26
3.5	350	31
4.0	400	36
4.5	450	41
5.0	500	46
5.5	550	51
6.0	600	56

* Default setting.
See section *5.1 DIP switches*.

Pos. B in fig. 4:

To achieve correct operation, the pump must be able to provide the discharge pressures in the table below.

Minimum discharge pressure

Start pressure set		Operating mode			
		Start/stop according to water consumption*		Start/stop with 1 bar (100 kPa) differential pressure**	
[bar]	[kPa]	[bar]	[kPa]	[bar]	[kPa]
2.5*	250	2.9	290	3.9	390
3.0	300	3.4	340	4.4	440
3.5	350	3.9	390	4.9	490
4.0	400	4.4	440	5.4	540
4.5	450	4.9	490	5.9	590
5.0	500	5.4	540	6.4	640
5.5	550	5.9	590	6.9	690
6.0	600	6.4	640	6.9	690

* Default setting.
See section *7.2 Start/stop according to water consumption*.

** See section *7.3 Start/stop with 1 bar (100 kPa) differential pressure*.

See also section *4.4.1 Setting the pressure-reducing valve*.

Pos. C in fig. 4:

The unit should be installed so that the control panel is visible and easily accessible. Ensure that the inlets and outlets are connected correctly.

Caution ***To prevent water from entering the unit, do not install the unit so that the cable connections are pointing upwards.***

Pos. D in fig. 4:

No taps must be installed between the pump and the unit.

4.4 Pressure settings

The default setting of the pressure-reducing valve is 2.5 bar (250 kPa). However, it may be necessary to increase this pressure if a higher pressure is required, for example in a multi-storey building or other applications requiring a higher pressure.
Note that the pump start pressure must be adjusted accordingly. See section *5.1 DIP switches*.
Ensure before installation that the pump is capable of delivering the necessary pressure.

4.4.1 Setting the pressure-reducing valve

There must be no pressure on the system while the pressure-reducing valve is adjusted.

Note ***Set the pressure-reducing valve by adjusting the adjustment screw. Turn clockwise to increase the pressure and counter-clockwise to decrease the pressure.***

1. Remove the pump cable plug from the PM Rain unit.
2. Turn off the mains water supply.
3. Depressurise the home outlet piping system by opening a tap.
4. Close the tap.
5. Remove the PM Rain cover.
6. Install a pressure gauge on the home outlet.
7. Adjust the pressure-reducing valve accordingly.
8. Turn on the mains water supply.
9. Read the pressure gauge. If further adjustment is necessary, repeat from point 2.
   When the pressure-reducing valve has been adjusted correctly, adjust the start pressure accordingly. See section *5.1 DIP switches*.
10. Refit the PM Rain cover.
11. Insert the pump cable plug into the PM Rain unit.

4.4.2 Aligning pressure settings

The setting of the pressure-reducing valve must not exceed the pressure setting of the PM Rain control unit. See section *5.1 DIP switches*. If the pressure is exceeded, rainwater cannot be used on the home outlet.

Even if the setting of the pressure-reducing valve is not allowed to exceed the PM Rain control unit setting, it must be close to the required pressure in order to deliver mains water at sufficient pressure when rainwater is not available. Recommended pressure difference is 10 %.

Example

Required minimum system pressure: 3.5 bar (350 kPa).

- PM Rain control unit setting: 4 bar (400 kPa)
- Pressure-reducing valve setting: 3.6 bar (360 kPa).

4.4.3 Air release valve

If not available, install an air release valve in the priming port of non-submersible pumps. The valve is factory-fitted to Grundfos JP pumps.

Vent the system by turning the plug on the air outlet counter-clockwise by one complete turn from the fully closed position. Air is automatically vented if the cap is kept in this position.

4.5 Electrical installation

Carry out the electrical connection according to local regulations.

Warning

During electrical installation, make sure that the power supply cannot be accidentally switched on.

The unit must be connected to an external mains switch with a minimum contact gap of 3 mm in all poles.

As a precaution, the unit must be connected to a socket with earth connection.

We recommend you to fit the permanent installation with an earth leakage circuit breaker (ELCB) with a tripping current < 30 mA.

The PM Rain unit has a male plug for power supply and a female socket for pump supply.

4.6 Connecting units with cable and plug fitted

1. Connect the pump to the female socket of the PM Rain.
2. Connect the male plug of the PM Rain to the power supply.

4.7 Alternative power supply

The PM Rain can be powered by a generator or other alternative power supplies, provided that the requirements for the power supply are fulfilled. See section *11. Technical data*.

5. Control panel

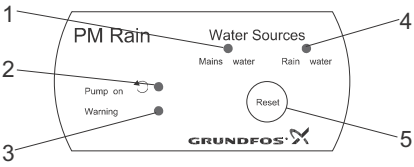

Fig. 5 Control panel

Pos.	Description	Function
1	"Mains water"	The green indicator light is permanently on when mains water back-up is active. **Note:** If the pump pressure is below 2.25 bar (225 kPa), the green indicator light will be on even when rainwater is used.
2	"Pump on"	The green indicator light is permanently on when the pump is running.
3	"Warning"	The red indicator light is permanently on or flashes in case of a fault. See section *12. Fault finding*. The indicator light also illuminates briefly when the power supply is switched on.
4	"Rain water"	The green indicator light is permanently on when rainwater is available. **Note:** If the pump pressure is below 2.25 bar (225 kPa), the green indicator light will be off even when rainwater is used.
5	[Reset]	Button for resetting of fault indications.

5.1 DIP switches

The PM Rain has a number of settings which can be made with the DIP switches behind the control panel. See fig. 6.

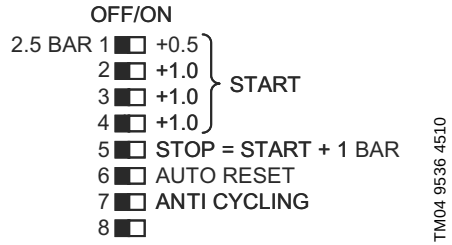

Fig. 6 DIP switches

5.2 Enabling the DIP switch settings

When the desired DIP switch settings have been made, they must be enabled, otherwise the PM Rain cannot detect the settings.

To enable the DIP switch settings, press [Reset] or disconnect and reconnect the power supply to the unit.

DIP switch		Description	Default setting
No.	**Name**		
1-4	START	**Start pressure (p_{start})** With these DIP switches the start pressure can be set from 2.5 bar (250 kPa) to 6.0 bar (600 kPa) in steps of 0.5 bar (50 kPa). **Example:** DIP switch 1 = "ON" DIP switch 2 = "ON" Start pressure = 2.5 + 0.5 + 1 = **4 bar** Start pressure = 250 + 50 + 100 = 400 kPa See section *7.2.1 Starting and stopping conditions*.	All set to OFF p_{start} = 2.5 bar p_{start} = 250 kPa
5	STOP = START + 1 BAR	**Start/stop with 1 bar (100 kPa) differential pressure** (This operating mode is only suitable for systems with a pressure tank). When the DIP switch has been set to "ON", the pump stop pressure will be equal to p_{start} + 1 bar (100 kPa). See section *7.3 Start/stop with 1 bar (100 kPa) differential pressure*. In systems without a pressure tank, the DIP switch must be set to "OFF".	OFF (start/stop according to water consumption)
6	AUTO RESET	**Automatic resetting of warnings** When the DIP switch has been set to "ON", the cycling and dry-running warnings will automatically be reset if they have been activated. See section *8.2.3 Resetting of dry-running warning*.	ON (manual resetting)
7	ANTI CYCLING	**Anti-cycling** When the DIP switch has been set to "ON", the "Warning" indicator light will illuminate if cycling occurs. See section *8.1 Anti-cycling*.	OFF
8	Not in use		

6. Start-up

1. Open a tap in the system.
2. Switch on the power supply.
3. Check that the "Pump on" and "Warning" indicator lights illuminate briefly.
   – The pump is running.
4. Close the tap.
   – A pressure will be built up in the system.
5. Check that the pump stops after a few seconds and that the "Pump on" indicator light goes out.

The system is now ready for operation.

Note

If a pressure is not built up in the system within 3 minutes after start-up, the dry-running protection will be activated, and the pump is stopped. Check the priming conditions of the pump before attempting to restart the pump.

The pump is restarted automatically if DIP switch 6 (AUTO RESET) has been set to "ON" (factory setting), otherwise the pump can be restarted manually by pressing [Reset].

7. Operation

When rainwater is available, the PM Rain automatically starts and stops the pump. This can be achieved in two different ways:

- On delivery, the unit has a default setting which can be used in systems with or without a pressure tank. See section *7.2 Start/stop according to water consumption*.
- In systems with a pressure tank, it is possible to use the setting described in section *7.3 Start/stop with 1 bar (100 kPa) differential pressure*. This setting will reduce the pump operating time.

7.1 Operating principle

When rainwater is available, the PM Rain automatically starts and stops the pump. As long as the pump can deliver rainwater at a pressure above 2.5 bar (250 kPa), the mains water back-up will remain inactive. See fig. 7.

If rainwater is no longer available, the PM Rain will stop the pump when dry running occurs. When the system pressure drops below 2.5 bar (250 kPa), the mains water back-up will be activated.

When rainwater becomes available again, the pump can be restarted manually or automatically:

- Press [Reset]. The PM Rain will restart the pump to build up pump pressure.
- Wait until the auto-reset function restarts the pump. See section *8.2.3 Resetting of dry-running warning*.

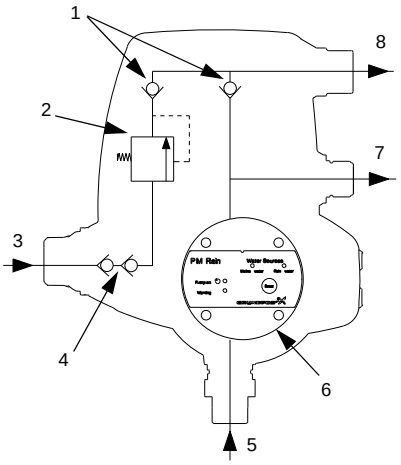

Fig. 7 Principle sketch

Pos.	Description
1	Non-return valve
2	Pressure-reducing valve
3	Mains water back-up
4	Double non-return valve
5	Rainwater from pump
6	PM Rain control panel
7	Rainwater outlet
8	Rainwater and mains water outlet

7.2 Start/stop according to water consumption

As default, the PM Rain is set to this operating mode, i.e. DIP switch 5 set to "OFF".

Caution ***With the default setting the pump will not stop until it reaches its maximum pressure.***

7.2.1 Starting and stopping conditions

Starting conditions

The unit starts the pump when at least one of the following conditions is fulfilled:

- The flow is higher than $Q_{min.}$.
- The pressure is lower than p_{start}.
  The default start pressure is 2.5 bar (250 kPa) and can be increased in steps of 0.5 bar (50 kPa). See section *5.1 DIP switches*.

Stopping conditions

The unit stops the pump with a time delay of 10 seconds when the following conditions are both fulfilled:

- The flow is lower than $Q_{min.}$: 1.0 l/h.
- The pressure is higher than p_{start}:
  2.5 bar (250 kPa) (factory setting).
  See section *11. Technical data*.

7.3 Start/stop with 1 bar (100 kPa) differential pressure

This operating mode can be used in systems with a pressure tank of a sufficient size.

In this operating mode, the pump is started and stopped at a 1 bar (100 kPa) differential pressure, which reduces the pump operating time. If the pressure tank is of an insufficient size, it will cause cycling of the pump.

To enable this operating mode, set DIP switch 5 to "ON". See section *5.1 DIP switches*.

7.3.1 Starting and stopping conditions

The conditions described below require that DIP switch 5 has been set to "ON".

Starting conditions

The unit starts the pump when the pressure is lower than p_{start}.

The default start pressure is 2.5 bar (250 kPa) and can be increased in steps of 0.5 bar (50 kPa). See section *5.1 DIP switches*.

Stopping conditions

The unit stops the pump when the pressure is higher than p_{stop}.

$p_{stop} = p_{start}$ + 1 bar (100 kPa).

7.3.2 Setting the precharge pressure of the pressure tank

The precharge pressure should be 0.14 bar (14 kPa) below the pump start pressure.

8. Functions

When the auto-reset function is enabled, cycling and dry-running warnings will be automatically reset.

To enable the function, set DIP switch 6 to "ON". See section *5.1 DIP switches*.

8.1 Anti-cycling

To detect inadvertent starts and stops of the pump in case of a failure in the installation, the anti-cycling function can be enabled.

The function will detect cycling if it occurs and the red "Warning" indicator light will illuminate.

When the PM Rain has been set to start/stop according to water consumption, cycling may occur in the following situations:

- In case of a minor leakage.
- If a tap has not been entirely closed.

When the PM Rain has been set to start/stop with 1 bar (100 kPa) differential pressure, cycling may occur in the following situations:

- If the pressure tank has lost its precharge pressure.
- If the size of the pressure tank is insufficient.

If the cycling warning has been activated, the pump can be restarted manually by pressing [Reset].

When the auto-reset function is enabled, the pump will be restarted automatically after 12 hours in warning condition.

To enable the function, set DIP switch 7 to "ON". See section *5.1 DIP switches*.

Note ***In case of a very small consumption, the anti-cycling function may register this as a minor leakage and stop the pump inadvertently. If this occurs, the function can be disabled.***

8.2 Dry-running protection

The PM Rain incorporates dry-running protection that automatically stops the pump in case of dry running.
The dry-running protection functions differently during priming and operation.

Caution ***If a dry-running warning has been activated, the cause should be found before the pump is restarted in order to prevent damage to the pump.***

8.2.1 Dry running during priming

If the unit detects no pressure and no flow within 3 minutes after it has been connected to a power supply and the pump has started, the dry-running warning is activated.

8.2.2 Dry running during operation

If the unit detects no pressure and no flow within 40 seconds during normal operation, the dry-running warning is activated.

8.2.3 Resetting of dry-running warning

Manual resetting

If a dry-running warning has been activated, the pump can be restarted manually by pressing [Reset]. If the unit detects no pressure and no flow within 40 seconds after restarting, the dry-running warning is re-activated.

Auto-reset

When the auto-reset function is enabled, the pump will be restarted automatically after 24 hours in warning condition. If, after restarting, the pump has not been primed within 3 minutes of operation, the dry-running warning will reappear. The auto-reset function will attempt to restart the pump after 24 hours. This will be repeated for five days, and if rainwater is still not available, there will be one week between the restarting attempts.

8.2.4 Power supply failure

In case of a power supply failure, the pump restarts automatically when power returns and runs for at least 10 seconds.

9. Frost protection

If the unit is subjected to frost in periods of inactivity, the unit and the piping system should be drained before the unit is taken out of operation.

Note ***The unit has no built-in draining options.***

10. List of warnings

Indication	Warning	Cause
"Warning" is permanently on.	Dry running.	The pump has been running without water.
"Warning" flashes once per period.	Cycling.	The pump is cycling. **Note:** Occurs only if the anti-cycling function has been enabled. See section *8.1 Anti-cycling*.
"Warning" flashes three times per period.	Protection mode.	The pump has had too many start/stop sequences within a short period. Each pump start is delayed a few seconds to protect the installation. The start delay is active until normal operation has been re-established. **Note:** The protection mode will protect the installation when the PM Rain is set to start/stop with 1 bar (100 kPa) differential pressure, i.e. when DIP switch 5 is set to "ON". The protection mode functions independently of the anti-cycling function.
"Warning" flashes more than three times per period.	Internal fault.	Internal fault in the unit.

11. Technical data

Data	230 V model
Supply voltage	1 x 220-240 VAC
Maximum inductive contact load	10 A
Frequency	50/60 Hz
Maximum ambient temperature	0 to 55 °C
Liquid temperature	0 to 60 °C
p_{start} [1)]	2.5 to 6 bar (250 to 600 kPa)
p_{stop} [2)]	p_{start} + 1 bar (100 kPa)
$Q_{min.}$	1.0 litre/min.
Time delay during stopping	10 seconds
Maximum operating pressure	PN 10 / 10 bar / 1000 kPa / 1 MPa
Enclosure class	IP65
Volume of internal pressure tank	0.1 litre
Dimensions	See fig. 9, page 15

1) The start pressure (p_{start}) can be set in steps of 0.5 bar (50 kPa).
The setting is described in section *5.1 DIP switches*.

2) The stop pressure (p_{stop}) is only used in systems with a pressure tank.
See section *7.3 Start/stop with 1 bar (100 kPa) differential pressure*.

The technical data may be limited by the pump data. See installation and operating instructions for the pump.

12. Fault finding

Warning

Before starting work on the pump/PM Rain, make sure that the power supply has been switched off and that it cannot be accidentally switched on.

Fault	Cause	Remedy
1. The pump runs continuously.	a) Air lock in the system.	Release air from the system. Open valves (taps, flush toilets, operate washing machine) from nearest to furthest outlet. Repeat, if necessary.
	b) The pump cable plug is inserted directly into the power supply socket.	Insert the pump cable plug into the PM Rain and the PM Rain plug into the power supply socket.
	c) Water is still being used.	Check all taps, toilets, and appliances connected to the PM Rain to ensure that they are turned off. If the pump does not stop, switch off the pump, and check the discharge pipe for leaks.
	d) Water is leaking on the discharge side.	Check for leaks.
	e) The start pressure is set too high.	Decrease the start pressure. See section *5.1 DIP switches*.
	f) The non-return valve is stuck in open position.	Clean or replace the valve.
	g) The PM Rain is defective.	Repair or replace the PM Rain.
2. The green "Pump on" indicator light is on, but the pump does not start.	a) The power supply to the pump is disconnected after the PM Rain.	Check the plug and cable connections.
	b) The motor protection of the pump has tripped due to overload.	Check if the pump is blocked.
	c) The pump is defective.	Repair or replace the pump.
	d) The PM Rain is defective.	Repair or replace the PM Rain.
3. The pump does not start when water is consumed. "Pump on" is off.	a) Too big difference in height between the PM Rain and the tapping point.	Adjust the installation, or increase the start pressure. See section *5.1 DIP switches*.
	b) The PM Rain is defective.	Repair or replace the PM Rain.
	c) The pump cable plug is not inserted into the PM Rain.	Check the plug and cable connections.
	d) No power supply. No light in Rain water or Mains water indicator lights.	Contact an electrician, or restore the power supply.
4. Frequent starts and stops.	a) DIP switch 5 set to "ON". **Note:** For system without pressure tank.	Set DIP switch 5 to "OFF". See section *5.1 DIP switches*.
	b) Leakage in the pipework.	Check and repair the pipework.
	c) The non-return valve is stuck in open position.	Clean or replace the non-return valve.
	d) The pressure tank has no precharge pressure, or the tank size is insufficient. **Note:** For system with pressure tank.	Check the tank precharge pressure, and recharge the tank, if necessary. If the size of the pressure tank is insufficient, set DIP switch 5 to "OFF", or replace the pressure tank.
5. The pump does not stop.	a) The pump cannot deliver the necessary discharge pressure.	Replace the pump.
	b) The start pressure is set too high.	Decrease the start pressure.
	c) The PM Rain is defective.	Repair or replace the PM Rain.
	d) The non-return valve is stuck in open position.	Clean or replace the non-return valve.

Fault	Cause	Remedy
6. The red "Warning" indicator light is permanently on.	a) Dry running. The pump needs water.	Check the pipework.
	b) The power supply to the pump is disconnected after the PM Rain.	Check the plug and cable connections. If the pump has a built-in circuit breaker, check that it is switched off.
	c) The motor protection of the pump has tripped due to overload.	Check if the motor/pump is blocked.
	d) The pump is defective.	Repair or replace the pump.
	e) The PM Rain is defective.	Repair or replace the PM Rain.
7. The red "Warning" indicator light flashes once per period.	a) Cycling. A tap has not been closed entirely after use. **Note:** For system without pressure tank.	Check that all taps have been closed. See section *8.1 Anti-cycling*.
	b) Cycling. There is a minor leakage in the system. **Note:** For system without pressure tank.	Check the system for leaks. See section *8.1 Anti-cycling*.
	c) Cycling. The pressure tank has no precharge pressure, or the tank size is insufficient. **Note:** For system with pressure tanks.	Check the tank precharge pressure, and recharge the tank, if necessary. If the size of the pressure tank is insufficient, set DIP switch 5 to "OFF", or replace the pressure tank. See section *8.1 Anti-cycling*.
8. The red "Warning" indicator light flashes three times per period, and each pump start is delayed a few seconds.	a) Too many start/stop sequences within a short period. The pressure tank has no precharge pressure, or the tank size is insufficient.	Check the tank precharge pressure, and recharge the tank, if necessary. If the size of the pressure tank is insufficient, set DIP switch 5 to "OFF", or replace the pressure tank.
	b) Too many start/stop sequences within a short period. The PM Rain is set to start/stop with 1 bar (100 kPa) differential pressure, i.e. DIP switch 5 is set to "ON", but no pressure tank has been installed in the system.	Set DIP switch 5 to "OFF".
9. The red "Warning" indicator light flashes four times per period.	a) Pressure sensor fault.	Repair or replace the PM Rain.

13. Further product information

If you have any questions, feel free to contact the nearest Grundfos company or service workshop.

14. Disposal

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

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

Subject to alterations.

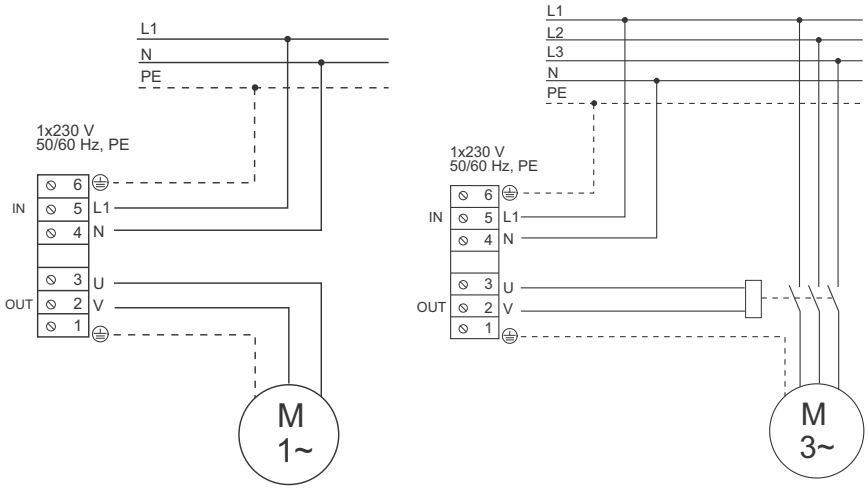

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Fig. 8 Wiring diagrams

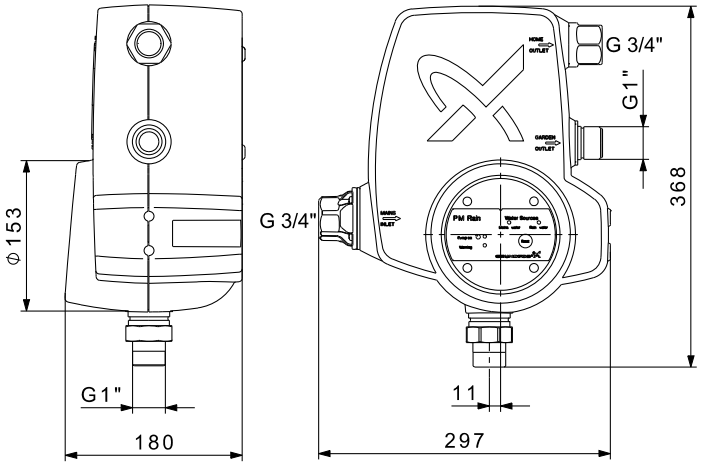

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Fig. 9 Dimensions

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