

# Grundfos RSI

Renewable solar inverter for pump control  
1.5 - 37 kW



|   |           |
|---|-----------|
| <b>1. Product introduction</b>                    | <b>3</b>  |
| General description . . . . .                     | 3         |
| Features and benefits . . . . .                   | 3         |
| Type key . . . . .                                | 4         |
| <b>2. Applications</b>                            | <b>5</b>  |
| <b>3. System components</b>                       | <b>6</b>  |
| Pumps . . . . .                                   | 6         |
| Renewable Solar Inverter . . . . .                | 6         |
| Circuit breaker, AC (optional) . . . . .          | 6         |
| Sine wave filter (optional) . . . . .             | 6         |
| Solar panel . . . . .                             | 6         |
| Dry-running switch . . . . .                      | 6         |
| Circuit breaker, DC . . . . .                     | 7         |
| Combiner box (optional) . . . . .                 | 7         |
| Surge protection, DC . . . . .                    | 7         |
| Level switch (optional) . . . . .                 | 7         |
| <b>4. Technical data</b>                          | <b>8</b>  |
| Dimensions . . . . .                              | 8         |
| Electrical and enclosure data . . . . .           | 11        |
| Technical data for circuit breaker, DC . . . . .  | 11        |
| Technical data for surge protection, DC . . . . . | 11        |
| <b>5. Product numbers</b>                         | <b>12</b> |
| Renewable Solar Inverter . . . . .                | 12        |
| Junction box components kit (optional) . . . . .  | 12        |
| Dry-running switch . . . . .                      | 12        |
| Level switch (optional) . . . . .                 | 12        |
| Sine-wave filter . . . . .                        | 12        |
| <b>6. Appendix</b>                                | <b>13</b> |
| <b>7. Grundfos Product Center</b>                 | <b>14</b> |

# 1. Product introduction

## General description

The Grundfos Renewable Solar Inverter (RSI) is an off-grid solar inverter converting the DC power output from the solar panel to AC power supply for pump operation.

RSI can be used in both new and existing systems as long as the motor specifications are compatible and is suitable for use with a variable frequency drive.

The list below contains the Grundfos pump types for use in applications with RSI:

- CR
- SP
- NB, NK
- MTR
- CM
- TP.

## Features and benefits

### Enclosure class IP66

RSI is designed to achieve enclosure class IP66. This means the inverter is weather proof and can be installed outside.

**Note:** Installing the inverter underneath the solar array reduces the cable length to a minimum, reduces power losses and improves the safety conditions.

### Setup wizard with Grundfos product library

RSI has a built-in Grundfos product library which allows a plug-and-pump experience. The motor library contains all related parameters that simplifies the setup process to just a few clicks and a setup time of a few minutes.

### Detachable control panel

The control panel is mounted on RSI by a magnet and with a communication plug. The inverter can operate without the control panel and will operate with the last saved setup data.

## AC/DC compatibility

RSI is AC and DC compatible. RSI can be connected to the grid or a generator as back-up power during solar panel disruptions.

The AC compatibility also allows the end user to connect the inverter to three-phase power in their workshop for off-site setup which enables a fast and simple on-site installation.

## Maximum power point tracking (MPPT)

The inverter has built-in electronics with four MPPT algorithms. The inverter will continuously optimise according to available solar irradiation as well as various environmental conditions.

## Overvoltage and undervoltage protection

Overvoltage and undervoltage may occur in case of faulty installation. The inverter will cut out the power connection to the motor if the voltage falls outside the allowed voltage limits. The inverter will stay in fault mode with the error code displayed on the inverter until the inverter is reset.

## Overload protection

Overload may occur if the maximum allowed frequency is set too high or a wrong pump is used. The inverter will cut out the power connection to the motor if overload occurs. The inverter will stay in fault mode with the error code displayed on the inverter until the inverter is reset.

## Overcurrent protection

Overcurrent may occur if, for example, a wrong cable size is used. The inverter will cut out the power connection to the motor if the current falls outside the allowed current limits. The inverter will stay in fault mode with the error code displayed on the inverter until the inverter is reset.

**Note:** For the overcurrent protection to function properly, the actual current value must be adjusted according to the maximum current attained at the maximum frequency shortly after the system started operation.

## Overtemperature protection

The inverter may be overheated if appropriate ventilation is not available or the ambient temperature is too high. The inverter will cut out the power connection to the motor if overtemperature occurs in the inverter. The inverter will stay in fault mode with the error code displayed on the inverter until the inverter is reset.

**Note:** The inverter does not detect motor temperature or protect the motor against overtemperature.

## No-load protection

No-load situation of the inverter may occur if, for example, the cable to the motor is broken. The inverter will cut out the power connection to the motor if no-load occurs. The inverter will stay in fault mode with the error code displayed on the inverter until the inverter is reset.

**Note:** For the no-load protection to function properly, please check the RSI installation and operating instructions carefully during the operation.

## Operating history memory

The inverter will store historical operating data. The data can be retrieved through the menu on the inverter. The data can be retrieved for every minute of operation up to two years back.

## Type key

| Code | Example   | RSI 0100 3L 0003 4 X HMGR |
|------|---|---------------------------|
| RSI  | = Renewable Solar Inverter                          |                           |
| 0100 | = Product type                                      |                           |
| 3L   | = Three-phase power                                 |                           |
| 0003 | Rated current [A]                                   |                           |
| 0072 |   |                           |
|      | Voltage   |                           |
| 2    |   | 208-240 V                 |
| 4    | 380-415 V   |                           |
| X    | Enclosure class IP66                                |                           |
| HMGR | Option (HMGR: Control panel with graphical display) |                           |

## 2. Applications

RSI is designed for continuous as well as intermittent operation. The system is suitable for various water supply systems including irrigation.

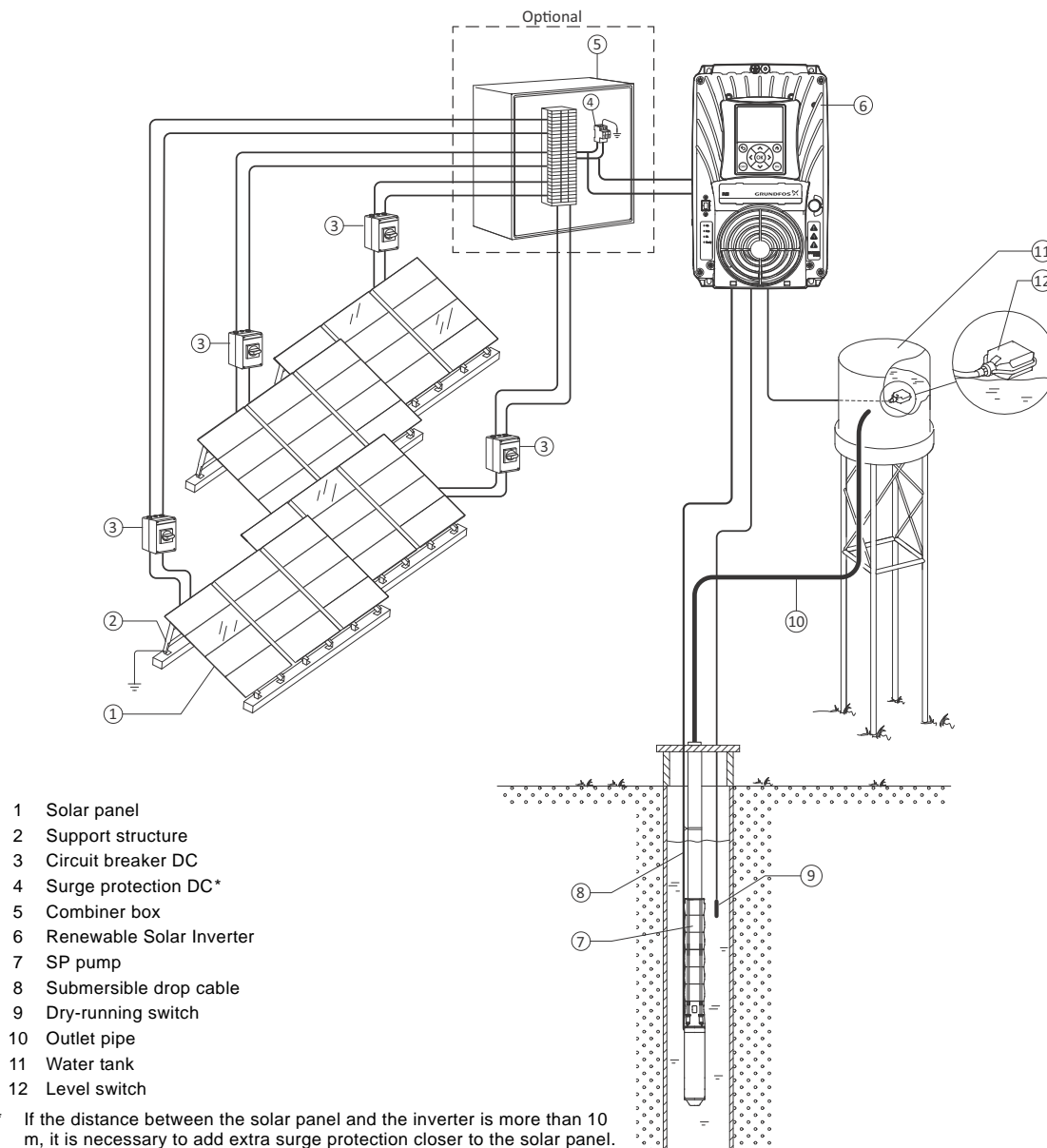
RSI can be used in existing systems with submersible pumps or dry-installed pumps, thus providing a very wide range of applications allowing you to leverage renewable energy sources with the ability to back up the system with grid or generator power.

### Application example

The water production of an RSI system depends on the availability of solar power. The typical result is excess water production in the afternoon and insufficient water production in the morning and evening. A system equipped with a storage water tank will enable a stable water supply throughout the day.

In a combiner box all cables from the solar panels can be connected into one set of power input cables before connecting them to an RSI.

### Installation example, submersible pump



TM06 6677 2014

**Fig. 1** Installation example showing solar panels, solar inverter, submersible pump and water tank

## 3. System components

An RSI system consists of a three-phase Grundfos motor, an RSI solar inverter, and various protection accessories.

The RSI system components include the following components:

- a Grundfos motor
- an RSI
- a circuit breaker, AC (optional)
- a circuit breaker, DC
- a surge protection, DC
- a solar panel
- a dry-running switch
- a level switch (optional)
- a sine wave filter (optional)
- a combiner box.

### Pumps

Pump requirements for an RSI system:

- The rated frequency can be either 50 or 60 Hz.
- The pump must be able to operate with a voltage supply of 3 x 380 VAC or 3 x 220 VAC.

As standard, Grundfos three-phase pumps can only be operated via an AC voltage supply. Therefore, the solar panels must not be connected directly to the pump but must be connected via an RSI.



Fig. 2 Grundfos pumps suitable for RSI systems

TM05 7729 1513 - TM06 1253 1914

### Renewable Solar Inverter

For a general product description, see section 1. *Product introduction*.



Fig. 3 RSI inverter

TM06 6678 1416

RSI combined with various sensors can offer the following functions:

- maximum power point tracking (MPPT)
- DC to three-phase AC conversion
- connection to dry-running switch
- connection to level switch
- operating history inquiry.

### Circuit breaker, AC (optional)

An AC circuit breaker is a standard circuit breaker used for normal three-phase power connection between the RSI output and the motor.

### Sine wave filter (optional)

A sine wave filter is primarily used for protecting the motor against overvoltage and increased operating temperature. Output filters can also be used for reduction of motor acoustics.

### Solar panel

The solar panel offered by Grundfos is specially selected for Grundfos RSI.

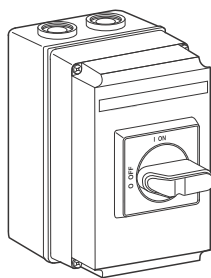
All Grundfos solar panels are equipped with plugs and sockets enabling easy connection. The number of solar panels required depends on the water quantity required, water pressure required and installation location.

### Dry-running switch

The dry-running switch is recommended for submersible pump operation. The switch can prevent the risk of the pump operating in a dry well, which could result in damage of the pump.



### Circuit breaker, DC

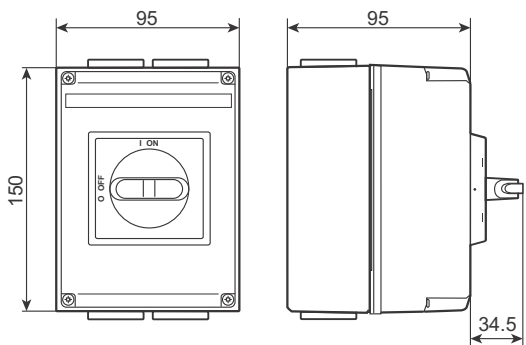


TM05 7581 1213

Fig. 4 Circuit breaker

The DC circuit breaker is suitable for the solar-powered RSI system.

The circuit breaker enables manual starting and stopping of the system. At least one DC circuit breaker is required for each set of solar panels connected in series to an RSI.



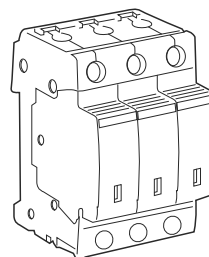
TM05 7585 1213

Fig. 5 Dimensions, circuit breaker

### Combiner box (optional)

A combiner box combines the output of multiple solar panel arrays for connection to RSI, instead of having an array-to-array cable or exceeding the power range for the cable.

### Surge protection, DC

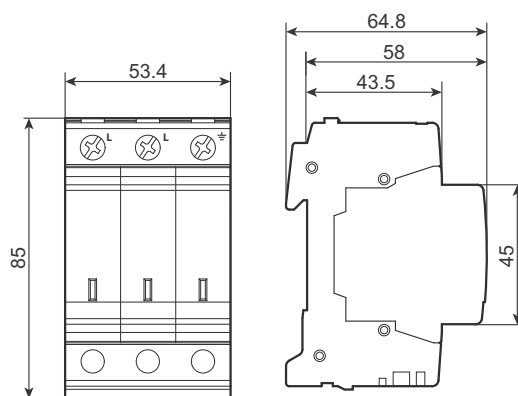


TM05 7582 1213

Fig. 6 Surge protection

The DC surge protection is suitable for the solar-powered RSI system.

The surge protection gives a very safe and reliable protection of the system by having a quick response. At least one DC surge protection is required for the DC input of RSI. We recommend also to have one DC surge protection for each solar array connected to a RSI.



TM05 7586 1213

Fig. 7 Dimensions, surge protection

### Level switch (optional)

A level switch serves as a start/stop control that depends on the water level in the water tank.



TM02 2407 4201

Fig. 8 Level switch

## 4. Technical data

### Dimensions

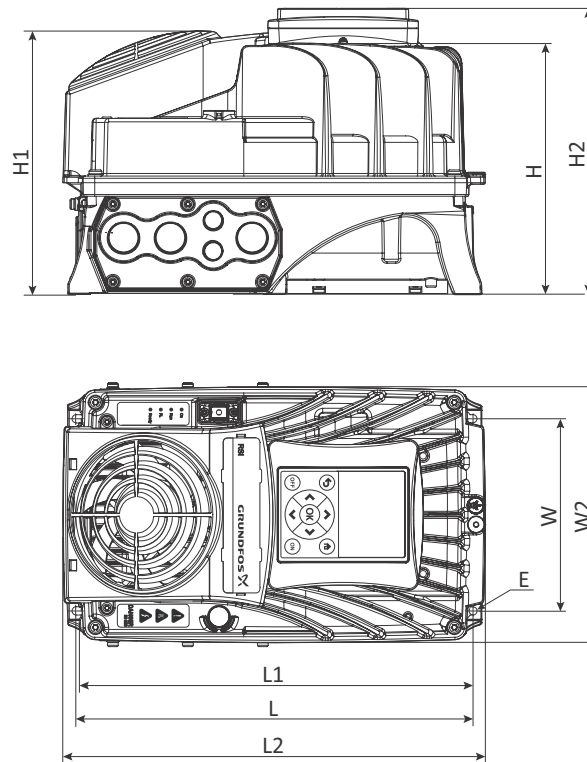


Fig. 9 Frame A, 1.5 - 5.5 kW

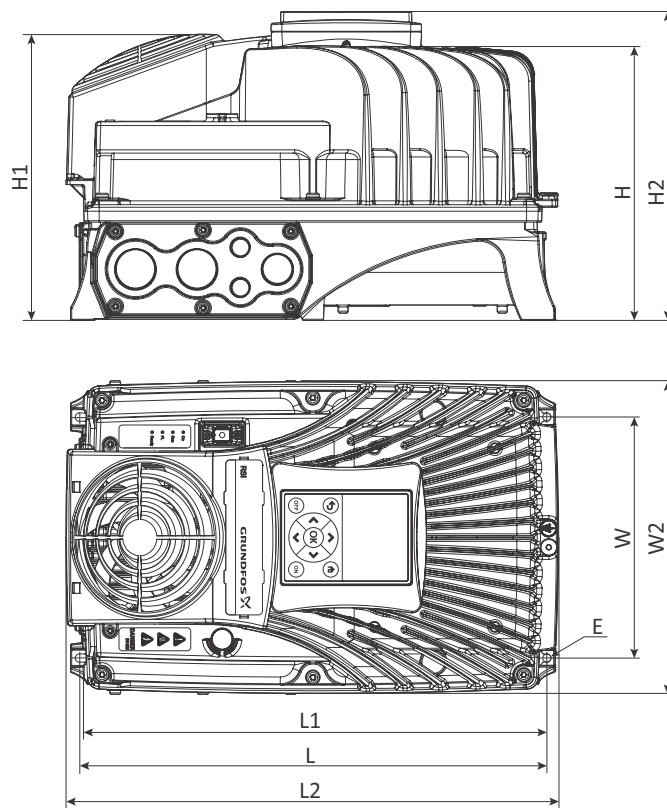
TM06 6526 1813

| Frame size | Product         |        |        |         |        |         |         |        |         |         |
|------------|-----------------|--------|--------|---------|--------|---------|---------|--------|---------|---------|
|            | Net weight [kg] | E [mm] | W [mm] | W2 [mm] | L [mm] | L1 [mm] | L2 [mm] | H [mm] | H1 [mm] | H2 [mm] |
| Frame A    | 8.8             | Ø5.9   | 143.5  | 191.0   | 297.0  | 293.0   | 315.0   | 188.0  | 197.0   | 214.0   |

| Frame size | Packaging         |             |            |             |
|------------|-------------------|-------------|------------|-------------|
|            | Gross weight [kg] | Length [mm] | Width [mm] | Height [mm] |
| Frame A    | 310               | 250         | 200        | 295         |





TM06 6527 1813

Fig. 10 Frame B, 7.5 - 15 kW

|            |                 | Product |        |         |        |         |         |        |         |         |
|------------|-----------------|---------|--------|---------|--------|---------|---------|--------|---------|---------|
| Frame size | Net weight [kg] | E [mm]  | W [mm] | W2 [mm] | L [mm] | L1 [mm] | L2 [mm] | H [mm] | H1 [mm] | H2 [mm] |
| Frame B    | 14.9            | Ø6.1    | 180.0  | 233.0   | 349.0  | 345.2   | 368.0   | 204.0  | 214.0   | 231.0   |

|            |                   | Packaging   |            |             |  |
|------------|-------------------|-------------|------------|-------------|--|
| Frame size | Gross weight [kg] | Length [mm] | Width [mm] | Height [mm] |  |
| Frame B    | 310               | 250         | 200        | 295         |  |

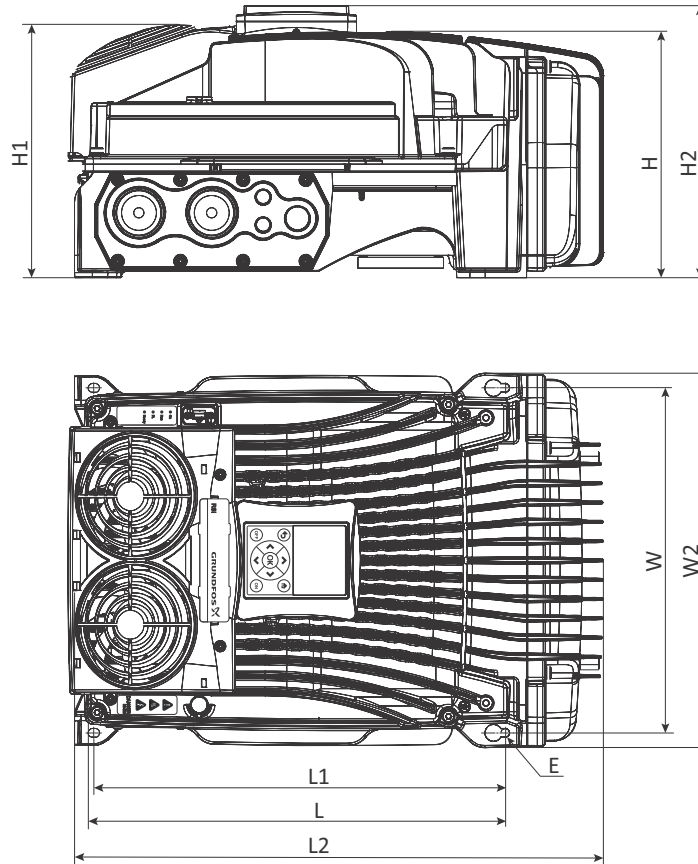


Fig. 11 Frame C, 18.5 - 37 kW

TM06 6528 1914

| Frame size | Product         |        |        |         |        |         |         |        |         |         |
|------------|-----------------|--------|--------|---------|--------|---------|---------|--------|---------|---------|
|            | Net weight [kg] | E [mm] | W [mm] | W2 [mm] | L [mm] | L1 [mm] | L2 [mm] | H [mm] | H1 [mm] | H2 [mm] |
| Frame C    | 31.5            | Ø8.2   | 322.0  | 350.0   | 385.0  | 382.5   | 500.0   | 230.0  | 236.0   | 254.0   |

| Frame size | Packaging         |             |            |             |
|------------|-------------------|-------------|------------|-------------|
|            | Gross weight [kg] | Length [mm] | Width [mm] | Height [mm] |
| Frame C    | 310               | 250         | 200        | 295         |

## Electrical and enclosure data

| Voltage                  |                                 |       | 3 x 208-240 V | 3 x 380-415 V |
|--------------------------|---------------------------------|-------|---------------|---------------|
| Installation environment | Minimum ambient temperature     | [°C]  | -10           | -10           |
|                          | Maximum ambient temperature     | [°C]  | 60            | 60            |
|                          | Maximum relative humidity       | [%]   | 100           | 100           |
| Electrical data          | Minimum recommended MPP voltage | [VDC] | 230           | 400           |
|                          | Maximum Input voltage           | [VDC] | 380           | 800           |
|                          | Minimum frequency               | [Hz]  | 5             | 5             |
|                          | Maximum frequency               | [Hz]  | 60            | 60            |
|                          | Phases                          |       | 3             | 3             |
|                          | Rated output voltage            | [VAC] | 220           | 380           |
|                          | Enclosure class                 |       | IP66          | IP66          |

## Technical data for circuit breaker, DC

|                 |           |
|-----------------|-----------|
| Voltage, DC [V] | 1,000     |
| Current [A]     | 16        |
| Weight [kg]     | 1.05      |
| Marking         | IEC 60047 |

## Technical data for surge protection, DC

|                 |        |
|-----------------|--------|
| Voltage, DC [V] | 1,000  |
| Current [A]     | 40,000 |
| Weight [kg]     | 0.375  |
| Marking         | CE     |

## 5. Product numbers

### Renewable Solar Inverter

#### Low voltage range (3 x 208-240 V)

| Power [kW] | Product number | Electrical data |                          | Frame size |
|------------|----------------|-----------------|--------------------------|------------|
|            |                | Max. P2 [kW]    | Rated output current [A] |            |
| 1.5        | 99090622       | 1.5             | 8                        | A          |
| 2.2        | 99090633       | 2.2             | 11                       | A          |
| 3.0        | 99090634       | 3.0             | 12.5                     | A          |
| 4.0        | 99090635       | 4.0             | 18                       | A          |
| 5.5        | 99090636       | 5.5             | 24.2                     | A          |
| 7.5        | 99090637       | 7.5             | 31                       | B          |
| 11         | 99090638       | 11              | 48                       | B          |
| 15         | 99090639       | 15              | 62                       | B          |

#### High voltage range (3 x 380-415 V)

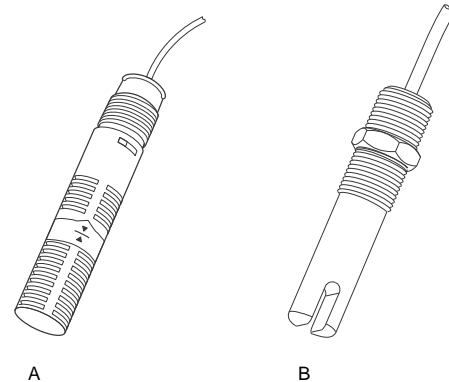
| Power [kW] | Product number | Electrical data |                          | Frame size |
|------------|----------------|-----------------|--------------------------|------------|
|            |                | Max. P2 [kW]    | Rated output current [A] |            |
| 2.2        | 99044348       | 2.2             | 5.6                      | A          |
| 3.0        | 99044349       | 3.0             | 8                        | A          |
| 4.0        | 99044350       | 4.0             | 9.6                      | A          |
| 5.5        | 99044351       | 5.5             | 12                       | A          |
| 7.5        | 99044352       | 7.5             | 16                       | B          |
| 11         | 99044363       | 11              | 23                       | B          |
| 15         | 99044364       | 15              | 31                       | B          |
| 18.5       | 99044365       | 18.5            | 38                       | C          |
| 22         | 99044366       | 22              | 46                       | C          |
| 30         | 99044367       | 30              | 61                       | C          |
| 37         | 99044368       | 37              | 72                       | C          |

### Junction box components kit (optional)

**Note:** The junction box components kit is an optional kit for containing the circuit breaker, DC, and the surge protection, DC, components. For a general component description, see section 3. *System components*.

| Description                     | Product number |
|---------------------------------|----------------|
| Junction box components kit, DC | 98298572       |
| Circuit breaker, DC             | 98341686       |
| Surge protection, DC            | 98341687       |

### Dry-running switch



TM05 7457 1013 - TM06 1270 2014

| Description                                    | Product number |
|--|----------------|
| Dry-running switch for submersible pumps (A)   | 98347579       |
| Dry-running switch for dry-installed pumps (B) | 97911215       |

### Level switch (optional)



TM02 2407 4201

| Description  | Product number |
|--------------|----------------|
| Level switch | 010748         |

High water level: Contact is closed.

Low water level: Contact is open.

### Sine-wave filter

| Voltage     | Max. P2 to motor | Product number |
|-------------|------------------|----------------|
| 3 x 380 VAC | 2.2 kW           | 96754973       |
|             | 3 kW             |                |
|             | 4                | 96754974       |
|             | 5.5 kW           |                |
|             | 7.5 kW           | 96754976       |
|             | 11 kW            | 96754977       |
|             | 15 kW            | 96754978       |
|             | 18.5 kW          |                |
|             | 22 kW            | 96755019       |
|             | 30 kW            | 96755021       |
| 3 x 220 VAC | 37 kW            | 96755032       |
|             | 1.5 kW           | 96754973       |
|             | 2.2 kW           |                |
|             | 3 kW             | 96754976       |
|             | 4 kW             |                |
|             | 5.5 kW           | 96754977       |
|             | 7.5 kW           | 96754978       |
|             | 11 kW            | 96755021       |
|             | 15 kW            | 96755032       |

## 6. Appendix

The tables below show the recommended cable size to be used between solar panel and RSI in order to keep the power loss lower than 2 % at 20 °C.

### High voltage range (3 x 380 VAC)

| Current in cable [A]                      | Distance between solar panel and RSI [m] |     |     |     |     |     |     |     |     |     |     |     |     |
|---|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|   | 30                                       | 60  | 90  | 120 | 150 | 180 | 210 | 240 | 270 | 300 | 330 | 360 | 390 |
| Recommended cable size [mm <sup>2</sup> ] |  |     |     |     |     |     |     |     |     |     |     |     |     |
| 3   | 1.5                                      | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 2.5 | 2.5 | 2.5 | 2.5 | 4   | 4   | 6   |
| 6   | 1.5                                      | 1.5 | 1.5 | 2.5 | 2.5 | 4   | 4   | 4   | 6   | 6   | 6   | 6   | 10  |
| 9   | 1.5                                      | 1.5 | 2.5 | 4   | 4   | 6   | 6   | 6   | 10  | 10  | 10  | 10  | 16  |
| 12  | 1.5                                      | 2.5 | 4   | 4   | 6   | 6   | 10  | 10  | 10  | 10  | 16  | 16  | 16  |
| 15  | 1.5                                      | 2.5 | 4   | 6   | 6   | 10  | 10  | 10  | 16  | 16  | 16  | 16  | 16  |

### Low voltage range (3 x 240 VAC)

| Current in cable [A]                      | Distance between solar panel and RSI [m] |     |     |     |     |     |     |     |     |     |     |     |     |
|---|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|   | 30                                       | 60  | 90  | 120 | 150 | 180 | 210 | 240 | 270 | 300 | 330 | 360 | 390 |
| Recommended cable size [mm <sup>2</sup> ] |  |     |     |     |     |     |     |     |     |     |     |     |     |
| 3   | 1.5                                      | 1.5 | 1.5 | 2.5 | 2.5 | 2.5 | 4   | 4   | 4   | 4   | 6   | 6   | 6   |
| 6   | 1.5                                      | 2.5 | 2.5 | 4   | 4   | 6   | 6   | 6   | 10  | 10  | 10  | 10  | 16  |
| 9   | 1.5                                      | 2.5 | 4   | 6   | 6   | 10  | 10  | 10  | 16  | 16  | 16  | 16  | 16  |
| 12  | 2.5                                      | 4   | 6   | 6   | 10  | 10  | 16  | 16  | 16  | 16  | 25  | 25  | 25  |
| 15  | 2.5                                      | 4   | 6   | 10  | 10  | 16  | 16  | 16  | 25  | 25  | 25  | 25  | 25  |

## 7. Grundfos Product Center

Online search and sizing tool to help you make the right choice.

<http://product-selection.grundfos.com>



"SIZING" enables you to size a pump based on entered data and selection choices.

"REPLACEMENT" enables you to find a replacement product. Search results will include information on the following:

- the lowest purchase price
- the lowest energy consumption
- the lowest total life cycle cost.

The screenshot shows the Grundfos Product Center website. At the top, there is a navigation bar with the Grundfos logo and 'PRODUCT CENTER'. Below this is a search bar with a 'SEARCH' button. The main content area features four large buttons: 'SIZING' (Enter pump sizing), 'CATALOGUE' (Products and services), 'REPLACEMENT' (Replace an old pump with a new), and 'LIQUIDS' (Find pump by liquid). Below these buttons is a 'QUICK SIZING' section with input fields for 'Flow (Q)\*' and 'Head (H)\*', and radio buttons for 'Select what to size by' (Size by application, Size by pump design, Size by pump family). A 'START SIZING' button is also present. At the bottom of the screenshot, there are callouts explaining the 'SIZING', 'REPLACEMENT', 'CATALOGUE', and 'LIQUIDS' features.

www.grundfos.com Login

**GRUNDFOS** | PRODUCT CENTER Product range: United Kingdom | 50 Hz | Language: English  
Change settings

HOME FIND PRODUCT COMPARE YOUR PROJECTS SAVED ITEMS HELP 1.4.23

**FIND PRODUCTS AND SOLUTIONS**

Input product number or a whole or partial product name

**SIZING**  
Enter pump sizing

**CATALOGUE**  
Products and services

**REPLACEMENT**  
Replace an old pump with a new

**LIQUIDS**  
Find pump by liquid

**QUICK SIZING**

Enter duty point:

Flow (Q)\*  m<sup>3</sup>/h

Head (H)\*  m

Select what to size by:

Size by application

Size by pump design

Size by pump family

**START SIZING**

ADVANCED SIZING:  Advanced sizing by application  Guided selection

"SIZING" enables you to size a pump based on entered data and selection choices.

"REPLACEMENT" enables you to find a replacement product. Search results will include information on the following:

- the lowest purchase price
- the lowest energy consumption
- the lowest total life cycle cost.

"CATALOGUE" gives you access to the Grundfos product catalogue.

"LIQUIDS" enables you to find pumps designed for aggressive, flammable or other special liquids.

### All the information you need in one place

Performance curves, technical specifications, pictures, dimensional drawings, motor curves, wiring diagrams, spare parts, service kits, 3D drawings, documents, system parts. The Product Center displays any recent and saved items - including complete projects - right on the main page.

### Downloads

On the product pages, you can download installation and operating instructions, data booklets, service instructions, etc. in PDF format.

Subject to alterations.





|                      |
|----------------------|
| <b>98462976</b> 0616 |
|----------------------|

|              |
|--------------|
| ECM: 1187156 |
|--------------|

**GRUNDFOS A/S**  
DK-8850 Bjerringbro . Denmark  
Telephone: +45 87 50 14 00  
[www.grundfos.com](http://www.grundfos.com)

**GRUNDFOS** 