CU331SP

2, 3, 5 Hp

Installation and operating instructions
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2. Symbols used in this document

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

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

Note
Notes or instructions that make the job easier and ensure safe operation.
3. Introduction
This manual introduces all aspects of your Grundfos CU331SP constant pressure variable frequency drive. Always keep this manual close to the CU331SP.

3.1 General description
The CU331SP is an external variable frequency drive especially designed for submersible pumps. Thanks to the start-up guide in the CU331SP, the installer can quickly set parameters and put the CU331SP into operation. Connected to a sensor, the CU331SP will quickly adapt the pump speed to the actual demand.

3.2 Applications
The CU331SP was developed for use with Grundfos 2, 3, and 5 HP 4” SP pumps. The CU331SP provides for constant pressure operation of your pump across its performance range.

4. Safety and warnings
4.1 Warning

Warning
Any installation, maintenance and inspection must be carried out by trained personnel.

Warning
Touching the electrical parts may be fatal, even after the CU331SP has been switched off. Before making any work on the CU331SP, the mains supply and other input voltages must be switched off at least for 7 minutes.

4.2 Safety regulations
• The On/Off button of the control panel does not disconnect the CU331SP from the power supply and must therefore not be used as a safety switch.
• The CU331SP must be grounded correctly and protected against indirect contact according to national regulations.
• The leakage current to ground exceeds 3.5 mA.
• Enclosure class TYPE 12 must not be installed outdoors without additional protection against water and the sun.
• Always observe national and local regulations as to cable cross-section, short-circuit protection and over current protection.

4.3 Installation requirements
The general safety necessitates special considerations as to these aspects:
• fuses and switches for over current and short-circuit protection
• selection of cables (mains current, motor, load distribution and relay)
• net configuration (IT, TN, grounding)
• safety on connecting inputs and outputs (PELV).

4.3.1 Aggressive environment
The CU331SP should not be installed in an environment where the air contains liquids, particles or gases which may affect and damage the electronic components.

Caution
The CU331SP contains a large number of mechanical and electronic components. They are all vulnerable to environmental effects.

4.4 Reduced performance under certain conditions
The CU331SP will reduce its performance under these conditions:
• low air pressure (at high altitude)
• long motor cables.
The required measures are described in the next two sections.

4.4.1 Reduction at low air pressure

Warning
At altitudes above 6600 ft (2000 m), PELV cannot be met.

PELV = Protective Extra Low Voltage.
At low air pressure, the cooling capacity of air is reduced, and the CU331SP automatically reduces the performance to prevent overload.
It may be necessary to select a CU331SP with a higher performance.

4.4.2 Reduction in connection with long motor cables
The maximum cable length for the CU331SP is 1000 ft (300 m) for unscreened and 500 ft (150 m) for screened cables. In case of longer cables, contact Grundfos.
The CU331SP is designed for a motor cable with a maximum cross-section as stated in section 15.6 Fuses and cable cross-section.

5. Identification
5.1 Nameplate
The CU331SP can be identified by means of the nameplate. An example is shown below.

![Example of nameplate](image-url)

Text Description
---
T/C: CU-331 (product name)
202P1M2... (internal code)
Prod.no: Product number: 12345678
S/N: Serial number: 123456G234
IN: Supply voltage, frequency and maximum input current
OUT: Motor voltage, frequency and maximum output current. The maximum output frequency usually depends on the pump type.
CHASSIS/ Enclosure class
IP20
Tamb. Maximum ambient temperature

---
5.2 Packaging label
The CU331SP can also be identified by means of the label on the packaging.

6. Mechanical installation
The individual CU331SP cabinet sizes are characterized by their enclosures. The table in section 15.2 shows the relationship of enclosure class and enclosure type.

6.1 Reception and storage
Check on receipt that the packaging is intact, and the unit is complete. In case of damage during transport, contact the transport company to file a claim.
Note that the CU331SP is delivered in a packaging which is not suitable for outdoor storage.

6.2 Transportation and unpacking
The CU331SP must only be unpacked at the installation site to prevent damage during the transport to the site.
The packaging contains accessory bag(s), documentation and the unit itself. See fig. 2.

6.3 Space requirements and air circulation
CU331SP units can be mounted side by side, but as a sufficient air circulation is required for cooling these requirements must be met:
• Sufficient free space above and below the CU331SP.
• Ambient temperature up to 122 °F (50 °C).
• Hang the CU331SP directly on the wall, or fit it with a back plate. See fig. 3.

7. Electrical connection

7.1 Electrical protection
7.1.1 Protection against electric shock, indirect contact
Protective conductors must always have a yellow/green (PE) or yellow/green/blue (PEN) color marking.
Instructions according to EN IEC 61800-5-1:
• The CU331SP must be stationary, installed permanently and connected permanently to the mains supply.
• The ground connection must be carried out with duplicate protective conductors or with a single reinforced protective conductor with a cross-section of minimum AWG 7 (10 mm²).

7.1.2 Protection against short-circuit, fuses
The CU331SP and the supply system must be protected against short-circuit.
Grundfos requires that the back-up fuses mentioned in 15.6 Fuses and cable cross-section are used for protection against short-circuit.
The CU331SP offers complete short-circuit protection in case of a short-circuit on the motor output.
7.1.3 Additional protection

**Caution** The leakage current to ground exceeds 3.5 mA.

If the CU331SP is connected to an electrical installation where an earth leakage circuit breaker (ELCB) is used as additional protection, the circuit breaker must be of a type marked with the following symbols:

![ELCB symbol]

The circuit breaker is type B.

The total leakage current of all the electrical equipment in the installation must be taken into account.

The leakage current of the CU331SP in normal operation can be seen in section 15.7.1 Mains supply (L1, L2).

During start and in asymmetrical supply systems, the leakage current can be higher than normal and may cause the ELCB to trip.

7.1.4 Motor protection

The motor requires no external motor protection. The CU331SP protects the motor against thermal overloading and blocking.

7.1.5 Protection against overcurrent

The CU331SP has an internal overcurrent protection for overload protection on the motor output.

7.1.6 Protection against mains voltage transients

The CU331SP is protected against mains voltage transients according to EN 61800-3, second environment.

7.2 Mains and motor connection

The supply voltage and frequency are marked on the CU331SP nameplate. Make sure that the CU331SP is suitable for the power supply of the installation site.

**Note** For single-phase connection, use L1 and L2.

**Mains connection**

**Check that mains voltage and frequency correspond to the values on the nameplate of the CU331SP and the motor.**

1. Connect the ground wire to terminal 95 (PE). See fig. 6.
2. Connect the power leads to the terminals 91 (L1), 92 (L2).
3. Fix the mains cable with a cable clamp.

**Motor connection**

**Caution** The motor cable must be screened for the CU331SP to meet EMC requirements.

1. Connect the ground wire to terminal 99 (PE). See fig. 7.
2. Connect the motor leads to the terminals 96 (U), 97 (V), 98 (W).
3. Fix the screened cable with a cable clamp.

**Note** For single-phase connection, use L1 and L2.

### Terminal Function

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>91 (L1)</td>
<td>Single-phase supply</td>
</tr>
<tr>
<td>92 (L2)</td>
<td></td>
</tr>
<tr>
<td>95/99 (PE)</td>
<td>Ground connection</td>
</tr>
</tbody>
</table>
7.3 Connecting the signal terminals

As a precaution, signal cables must be separated from other groups by reinforced insulation in their entire lengths.

**Note** If no external On/Off switch is connected, short-circuit terminals 18 and 20 using a short wire.

Connect the signal cables according to the guidelines for good practice to ensure EMC-correct installation. See 7.5 EMC-correct installation.

- Use screened signal cables with a conductor cross-section of min. AWG 20 (0.5 mm²) and max. AWG 16 (1.5 mm²).
- Use a 3-conductor screened bus cable in new systems.

7.3.1 Minimum connection, signal terminal

Operation is only possible when the terminals 18 and 20 are connected, for instance by means of an external On/Off switch or a short wire.

![Fig. 8](image)

**Note** The cable screen must be exposed and in physical contact with the mounting plate and clamp.

![Fig. 9](image)

**Fig. 9** Wiring diagram for CU331SP

**Fig. 10** Sensor wiring diagram

7.3.2 Setting the analog input 54

The contact A54 is positioned behind the control panel and is used for setting the signal type of the analog input.

The factory setting of the inputs is voltage signal "U". This setting must be changed to "I" prior to starting the CU331SP. Be sure the power supply is switched off.

**Note** Switch off the power supply before setting the A54.

Remove the control panel to set the contact. See fig. 11.

![Fig. 11](image)

**Fig. 11** Setting contact A54 to current signal "I"
7.3.3 Terminal Key

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Type</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>+24 V</td>
<td>Supply to sensor</td>
</tr>
<tr>
<td>18</td>
<td>DI 1</td>
<td>Digital input, start/stop</td>
</tr>
<tr>
<td>20</td>
<td>GND</td>
<td>Common frame for digital inputs</td>
</tr>
<tr>
<td>55</td>
<td>GND</td>
<td>Common frame for analog inputs</td>
</tr>
<tr>
<td>54</td>
<td>AI 2</td>
<td>Sensor input, sensor 1, 0/4-20 mA</td>
</tr>
<tr>
<td>61</td>
<td>RS-485</td>
<td>GENIbus, frame</td>
</tr>
<tr>
<td>68</td>
<td>RS-485</td>
<td>GENIbus, signal A (+)</td>
</tr>
<tr>
<td>69</td>
<td>RS-485</td>
<td>GENIbus, signal B (-)</td>
</tr>
</tbody>
</table>

Note: The RS-485 screen must be connected to frame.

7.3.4 Access to signal terminals

All signal terminals are behind the terminal cover of the CU331SP front. Remove the terminal cover as shown in Fig. 12.

7.4 Connecting the signal relays

As a precaution, signal cables must be separated from other groups by reinforced insulation in their entire lengths.

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>C 1</td>
<td>C 2</td>
</tr>
<tr>
<td>NO 1</td>
<td>NO 2</td>
</tr>
<tr>
<td>NC 1</td>
<td>NC 2</td>
</tr>
</tbody>
</table>

7.4.1 Signal Relay

The signal relays on the CU331SP are predefined as follows:
Relay 1: Pump running
Relay 2: Alarm.

Note: The RS-485 screen must be connected to frame.

Caution: As a precaution, signal cables must be separated from other groups by reinforced insulation in their entire lengths.
7.5 EMC-correct installation

This section gives guidelines for good practice when installing the CU331SP. Follow these guidelines to meet EN 61800-3, first environment:

- Use only motor and signal cables with a braided metal screen in applications without output filter.
- There are no special requirements to supply cables, apart from local requirements.
- Leave the screen as close to the connecting terminals as possible. See fig. 17.
- Avoid terminating the screen by twisting the ends. See fig. 18. Use cable clamps or EMC screwed cable entries instead.
- Connect the screen to frame at both ends for both motor and signal cables. If the controller has no cable clamps, connect only the screen to the CU331SP.
- Avoid unscreened motor and signal cables in electrical cabinets with variable frequency drives.
- Make the motor cable as short as possible in applications without output filter to limit the noise level and minimise leakage currents.
- Screws for frame connections must always be tightened whether a cable is connected or not.
- Keep main cables, motor cables and signal cables separated in the installation, if possible.

Other installation methods may give similar EMC results if the above guidelines for good practice are followed.

7.6 RFI filters

To meet the EMC requirements, the CU331SP comes with the following types of built-in radio frequency interference filter (RFI).

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Typical shaft P2</th>
<th>RFI filter type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 x 200-240 V</td>
<td>1.5 - 10 hp</td>
<td>C1</td>
</tr>
</tbody>
</table>

*Single-phase input - three-phase output.

Description of RFI filter types

C1: For use in domestic areas.

RFI filter types are according to EN61800-3

8. Operating modes

The following operating modes are set on the control panel in menu OPERATION, display 1.2. See 11.5.2 Operating mode (1.2).

<table>
<thead>
<tr>
<th>Operating mode</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>The pump is running in the control mode selected</td>
</tr>
<tr>
<td>Stop</td>
<td>The pump has been stopped (green indicator light is flashing)</td>
</tr>
<tr>
<td>Min.</td>
<td>The pump is running at minimum speed</td>
</tr>
<tr>
<td>Max.</td>
<td>The pump is running at maximum speed</td>
</tr>
</tbody>
</table>

Example: Max. curve operation can for instance be used in connection with venting the pump during installation.
Example: Min. curve operation can for instance be used in periods with a very small flow requirement.

9. Control mode

The control mode of the CU331SP is:

- Controlled operation (closed loop) with a sensor connected.

Note: This cannot be changed

9.1 Controlled operation (closed loop)
10. Menu overview

Fig. 19 Menu overview
Menu structure

The CU331SP has a start-up guide, which is started at the first start-up. After the start-up guide, the CU331SP has a menu structure divided into four main menus:

1. **GENERAL** gives access to the start-up guide for the general setting of the CU331SP.
2. **OPERATION** enables the setting of setpoint and resetting of alarms. It is also possible to see the latest five warnings and alarms.
3. **STATUS** shows the status of the CU331SP and the pump. It is not possible to change or set values.
4. **INSTALLATION** gives access to available parameters.

11. Setting by means of the control panel

11.1 Control panel

**Warning**

The On/Off button on the control panel does not disconnect the CU331SP from the power supply and must therefore not be used as a safety switch.

The On/Off button has the highest priority. In “Off” condition, pump operation is not possible.

The control panel is used for local setting of the CU331SP. The functions available are preset in the CU331SP.

**Navigating buttons**

<table>
<thead>
<tr>
<th>Button</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; &gt;</td>
<td>Navigates from one menu to another. When the menu is changed, the display shown will always be the top display of the new menu.</td>
</tr>
<tr>
<td>A V</td>
<td>Navigates up and down in the individual menu.</td>
</tr>
</tbody>
</table>

**Adjusting the display contrast**

Press OK and + for darker display.
Press OK and - for brighter display.

**Button lock**

To lock the buttons on the panel press and hold the up and down arrows simultaneously.

**Indicator lights**

The operating condition of the pump is indicated by the indicator lights on the front of the control panel. See fig. 20.

The table shows the function of the indicator lights.

<table>
<thead>
<tr>
<th>Indicator light</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>On (green)</td>
<td>The pump is running or has been stopped by a stop function.</td>
</tr>
<tr>
<td>Off (orange)</td>
<td>The pump has been stopped with the On/Off button.</td>
</tr>
<tr>
<td>Alarm (red)</td>
<td>Indicates an alarm or a warning.</td>
</tr>
</tbody>
</table>

**Displays, general terms**

Figures 21 and 22 show the general terms of the display.

**Editing buttons**

<table>
<thead>
<tr>
<th>Button</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>On/Off</td>
<td>Makes the pump ready for operation/starts and stops the pump.</td>
</tr>
<tr>
<td>OK</td>
<td>Saves changed values, resets alarms and expands the value field.</td>
</tr>
<tr>
<td>+ =</td>
<td>Changes values in the value field.</td>
</tr>
</tbody>
</table>

**Fig. 20** Control panel of the CU331SP

**Fig. 21** Example of display in the start-up guide

**Fig. 22** Example of display in the user menu

11.2 Back to factory setting

Follow this procedure to get back to the factory setting:
1. Switch off the power supply to the CU331SP.
2. Press On/Off, OK and + while switching on the power supply.

The CU331SP will reset all parameters to factory settings. The display will turn on when the reset is completed.
11.3 Start-up guide

Check that equipment connected is ready for start-up, and that the CU331SP has been connected to the power supply.

Have nameplate data for motor, pump and CU331SP at hand.

Use the start-up guide for the general setting of the CU331SP including the setting of the correct direction of rotation.

The start-up guide is started the first time when the CU331SP is connected to the power supply. It can be restarted in menu GENERAL. Please note that in this case all previous settings will be erased.

Bulleted lists show possible settings. Factory settings are shown in bold.

11.3.1 Welcoming display

- Press OK. You will now be guided through the start-up guide.

11.3.2 Language

Select the language to be used in the display:
- English US
- French
- Spanish.

11.3.3 Supply Voltage

Select supply voltage according to the rated supply voltage of the installation site.

Unit 1 x 200-240 V
- 1 x 200 V
- 1 x 208 V
- 1 x 220 V
- 1 x 230 V
- 1 x 240 V

11.3.4 Priming and venting

See the installation and operating instructions of the pump.

The general setting of the CU331SP is now completed, and the start-up guide is ready for setting the direction of rotation:
- Press OK to go on to automatic or manual setting of the direction of rotation.

11.3.5 Automatic setting of the direction of rotation

Warning
During the test, the pump will run for a short time. Ensure no personnel or equipment is in danger!

The CU331SP automatically tests and sets the correct direction of rotation without changing the cable connections.

This test is not suitable for certain pump types and will in certain cases not be able to determine for certainty the correct direction of rotation. In these cases, the CU331SP changes over to manual setting where the direction of rotation is determined on the basis of the installer’s observations.

The drive will now make a motor parameter test and check if the pump is turning in the right...

Direction of rotation will automatically be changed.

Make sure...

...that the system is open for flow. The pump will be running during the test. Press OK to continue.

Information displays.
- Press OK to continue.

The pump will start in 10 s. To cancel, press any button.

The pump will start in 10 s. To cancel, press any button.

The correct direction of rotation has now been set.
- Press OK to set the setpoint (8/11) See 11.3.6 Setpoint

The automatic setting of the direction of rotation has failed.
- Press OK to go to manual setting of the direction of rotation.
11.3.6 Setpoint

Set the setpoint according to the desired discharge pressure.

11.3.7 Setting the stop and dry-run functions

**Warning** During the test, the pump will run for a short time. Ensure no personnel or equipment is in danger!

The CU331SP automatically determines and sets the stop and dry-run functions for the pump and motor combination.

Information displays. Assure all discharge valves in the system are closed so that no water can flow.

- Press OK to continue.

The pump will run against the closed valves and determine the power settings for the Stop and Dry-Run functions. It is possible to cancel this operation and start over in case of a problem such as a water leak. The setup cannot be completed without running this test.

11.3.8 General settings are completed

Information displays. The pump starts after 10 seconds. It is possible to interrupt the test and return to the previous display.

11.3.9 Manual setting when the direction of rotation is not visible

It must be possible to observe the pressure.

- Write down the pressure and/or flow rate, and press OK to continue the manual test with the opposite direction of rotation. The pump starts after 10 seconds. It is possible to interrupt the test and return to the previous display.

**Warning** During the test, the pump will run for a short time. Ensure no personnel or equipment is in danger!
The second test is completed. Write down the pressure and/or flow rate, and state which test gave the highest pump performance:
• First test
• Second test
• Make new test.

The correct direction of rotation has now been set.
• Press OK to set the setpoint (8/11). See 11.3.6 Setpoint.

11.4 Menu GENERAL

If the start-up guide is started, all previous settings will be erased!
The start-up guide must be carried out on a cold motor!

Repeating the start-up guide may lead to a heating of the motor.

The menu makes it possible to return to the start-up guide, which is usually only used during the first start-up of the CU331SP.

11.4.1 Return to start-up guide (0.1)

State your choice:
• Yes
• No.
• If Yes is selected, all settings will be erased, and the entire start-up guide must be completed.

11.4.2 Type code change (0.2)

This display is for service use only.

11.5 Menu OPERATION

11.5.1 Setpoint (1.1)

Set the setpoint in units of the feedback sensor.

11.5.2 Operating mode (1.2)

Set one of the following operating modes:
• Normal
• Max
• Min
• Stop

The operating modes can be set without changing the setpoint setting.

11.5.3 Fault indications

Faults may result in two types of indication: Alarm or warning. An "alarm" will activate an alarm indication in CU331SP and cause the pump to change operating mode, typically to stop. However, for some faults resulting in alarm, the pump is set to continue operating even if there is an alarm.

A "warning" will activate a warning indication in CU331SP, but the pump will not change operating or control mode.

Alarm (1.3)

In case of an alarm, the cause will appear in the display. See 14.1 Warning and alarm list.

Warning (1.4)

In case of warning, the cause will appear in the display. See section 14.1 Warning and alarm list.

11.5.4 Fault log

For both fault types, alarm and warning, the CU331SP has a log function.

Alarm log (1.5-1.9)

In case of an "alarm", the last five alarm indications will appear in the alarm log. "Alarm log 1" shows the latest alarm, "Alarm log 2" shows the latest alarm but one, etc.

The display shows three pieces of information:
• the alarm indication
• the alarm code
• the number of minutes the pump has been connected to the power supply after the alarm occurred.
Warning log (1.10 - 1.14)

In case of a “warning”, the last five warning indications will appear in the warning log. “Warning log 1” shows the latest fault, “Warning log 2” shows the latest fault but one, etc.
The display shows three pieces of information:
- the warning indication
- the warning code
- the number of minutes the pump has been connected to the power supply after the warning occurred.

11.6 Menu STATUS

The displays appearing in this menu are status displays only. It is not possible to change or set values.
The tolerance of the displayed value is stated under each display. The tolerances are stated as a guide in % of the maximum values of the parameters.

11.6.1 Actual setpoint (2.1)

This display shows the actual setpoint and the external setpoint.
The actual setpoint is shown in units of feedback sensor.
The external setpoint is not used with the CU331SP.

11.6.2 Operating mode (2.2)

This display shows the actual operating mode (Normal, Stop, Min. or Max.). Furthermore, it shows where this operating mode was selected (CU331SP menu, Bus, External or On/Off button).

11.6.3 Actual value (2.3)

This display shows the actual value controlled.

11.6.4 Measured value, sensor 1 (2.4)

This display shows the actual value measured by sensor 1 connected to terminal 54.
If no sensor is connected to the CU331SP, “-“ will appear in the display.

11.6.5 Speed (2.5)

Tolerance: ± 5 %
This display shows the actual pump speed.

11.6.6 Input power and motor current (2.6)

Tolerance: ± 10 %
This display shows the actual pump input power in W or kW and the actual motor current in Ampere [A].

11.6.7 Operating hours and power consumption (2.7)

Tolerance: ± 2 %
This display shows the number of operating hours and the power consumption. The value of operating hours is an accumulated value and cannot be reset. The value of power consumption is an accumulated value calculated from the unit’s birth, and it cannot be reset.

11.6.8 Firmware Version (2.11)

This display shows the version of the software.

Note For reference only, actual software version number will differ.

11.6.9 Configuration file

This display shows the configuration file.
11.7 Menu INSTALLATION

11.7.1 Sensor 1 (3.1)

Setting of sensor 1 connected to terminal 54. This is the feedback sensor.

Select among the following values:

- Sensor output signal:
  0-20 mA
  4-20 mA.
- Unit of measurement of sensor:
  psi
- Sensor measuring range:
  0-120 psi

11.7.2 Motor speed high limit (3.2)

This parameter allows the user to limit the maximum speed that the motor can operate.

Setting range is 1800 rpm to 3450 rpm.

11.7.3 Dry pump function (3.3)

This display shows the setting for how the Dry-Run indication should be handled by the drive. This parameter can be set to these values:

- OFF
- Warning
- Alarm

The default setting is “Alarm” which will stop the motor to protect the pump. When “Warning” is selected the drive will provide a Dry-Run warning on the display screen only and the pump will continue to run. When “OFF” is selected the Dry-Run function is disabled. Neither a warning nor alarm will be issued.

*If the Dry Pump Function setting is changed to “Warning” or “OFF” the drive will not stop motor operation and there is a risk of damage to the pump. This is not recommended by Grundfos.*

11.7.4 Power correction factor (3.4)

Power Correction Factor is used to adjust the sensitivity of the Dry-Run function. Contact Grundfos for assistance if it is necessary to adjust this parameter.

*Changing this parameter may cause the Dry-Run function to stop working and therefore put the pump at risk for damage. Use caution when making adjustments to this parameter.*

11.7.5 Protocol (3.5)

This display shows the protocol selection for the RS-485 port of the CU331SP. The protocol can be set to these values:

- GENIbus
- FC
- FC MC.

If GENIbus is selected, the communication is set according to the Grundfos GENIbus standard. FC and FC MC is for service purpose only.

12. Low flow and stop functions

1. Low-flow detection function

The pump will check the flow regularly by reducing the speed for a short time. If there is no or only a small change in pressure, this means that there is low flow.

The speed will be increased until the stop pressure (actual setpoint + 0.5 x ΔH) is reached and the pump will stop after a few seconds. The pump will restart at the latest when the pressure has fallen to the start pressure (actual setpoint - 0.5 x ΔH).

If the flow in the off period is higher than the low-flow limit, the pump will restart before the pressure has fallen to the start pressure.

When restarting, the pump will react in the following way:

1. If the flow is higher than the low-flow limit, the pump will return to continuous operation at constant pressure.
2. If the flow is lower than the low-flow limit, the pump will continue in start/stop operation. It will continue in start/stop operation until the flow is higher than the low-flow limit. When the flow is higher than the low-flow limit, the pump will return to continuous operation.

**Operating conditions for the stop function**

It is only possible to use the stop function if the system incorporates a pressure sensor, a non-return valve and a diaphragm tank.

*The non-return valve must always be installed before the pressure sensor.*
Diaphragm tank
The stop function requires a diaphragm tank of a certain minimum size. The tank must be installed as close as possible after the pump and the precharge pressure must be 0.7 x actual setpoint. Recommended diaphragm tank size:

<table>
<thead>
<tr>
<th>Rated flow rate of pump [gpm (m³/h)]</th>
<th>Typical diaphragm tank size [gallon (L)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-26 (0-6)</td>
<td>2 (7.5)</td>
</tr>
<tr>
<td>27-105 (7-24)</td>
<td>4.4 (16.7)</td>
</tr>
</tbody>
</table>

If a diaphragm tank of the above size is installed in the system, the factory setting of ΔH is the correct setting. If the tank installed is too small, the pump will start and stop too often.

13. Maintenance and service

13.1 Cleaning the CU331SP
Keep the cooling fins and fan blades clean to ensure sufficient cooling of the CU331SP.

13.2 Service parts and service kits
For further information on service parts and service kits, visit www.grundfos.us > website > WebCAPS.

14. Fault finding

14.1 Warning and alarm list

<table>
<thead>
<tr>
<th>Code and display text</th>
<th>Status</th>
<th>Operating mode</th>
<th>Resetting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Too high leakage current</td>
<td>-</td>
<td>Stop</td>
<td>Man.</td>
</tr>
<tr>
<td>2  Mains phase failure</td>
<td>-</td>
<td>Stop</td>
<td>Aut.</td>
</tr>
<tr>
<td>3  External fault</td>
<td>-</td>
<td>Stop</td>
<td>Man.</td>
</tr>
<tr>
<td>16 Other fault</td>
<td>-</td>
<td>Stop</td>
<td>Aut.</td>
</tr>
<tr>
<td>32 Overvoltage</td>
<td>-</td>
<td>Stop</td>
<td>Aut.</td>
</tr>
<tr>
<td>40 Undervoltage</td>
<td>-</td>
<td>Stop</td>
<td>Aut.</td>
</tr>
<tr>
<td>55 Overload</td>
<td>-</td>
<td>Stop</td>
<td>Aut.</td>
</tr>
<tr>
<td>64 Too high CU331SP temperature</td>
<td>-</td>
<td>Stop</td>
<td>Aut.</td>
</tr>
<tr>
<td>89 Sensor 1 outside range</td>
<td>-</td>
<td>Stop</td>
<td>Aut.</td>
</tr>
<tr>
<td>96 Setpoint signal outside range</td>
<td>-</td>
<td>Stop</td>
<td>Aut.</td>
</tr>
<tr>
<td>155 Inrush fault</td>
<td>-</td>
<td>Stop</td>
<td>Aut.</td>
</tr>
<tr>
<td>241 Motor phase failure</td>
<td>-</td>
<td>Stop</td>
<td>Aut.</td>
</tr>
</tbody>
</table>

1) In case of an alarm, the CU331SP will change the operating mode depending on the pump type.

2) Warning is reset in display 3.20.

14.2 Resetting of alarms
In case of fault or malfunction of the CU331SP, check the alarm list in menu OPERATION. The latest five alarms and latest five warnings can be found in the log menus.

Contact a Grundfos technician if an alarm occurs repeatedly.

14.2.1 Warning
The CU331SP will continue the operation as long as the warning is active. The warning remains active until the cause no longer exists. Some warnings may switch to alarm condition.

14.2.2 Alarm
In case of an alarm, the CU331SP will stop the pump or change the operating mode depending on the alarm type and pump type. See 14.1 Warning and alarm list.
Pump operation will be resumed when the cause of the alarm has been remedied and the alarm has been reset.
The CU331SP has an automatic reset function for all alarms (except "Locked Alarm" as listed above.) The automatic reset time is 10 seconds for all alarms except Dry-Run. The Dry-run alarm will reset after 30 minutes.
Resetting an alarm manually
- Press OK in the alarm display.
- Press On/Off twice.
- Activate a digital input DI 1 (Start/stop).

If it is not possible to reset an alarm, the reason may be that the fault has not been remedied, or that the alarm has been locked.

14.2.3 Locked alarm
In case of a locked alarm, the CU331SP will stop the pump and become locked. Pump operation cannot be resumed until the cause of the locked alarm has been remedied and the alarm has been reset.

Resetting a locked alarm
- Switch off the power supply to the CU331SP for approx.
  30 seconds. Switch on the power supply, and press OK in the
  alarm display to reset the alarm.

14.3 Indicator lights
The table shows the function of the indicator lights.

<table>
<thead>
<tr>
<th>Indicator light</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>On (green)</td>
<td>The pump is running or has been stopped by a stop function. If flashing, the pump has been stopped by the user (CU331SP menu), external start/stop or bus.</td>
</tr>
<tr>
<td>Off (orange)</td>
<td>The pump has been stopped with the On/Off button.</td>
</tr>
<tr>
<td>Alarm (red)</td>
<td>Indicates an alarm or a warning.</td>
</tr>
</tbody>
</table>

14.4 Signal relays
The table shows the function of the signal relays.

<table>
<thead>
<tr>
<th>Type</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relay 1</td>
<td>Pump running</td>
</tr>
<tr>
<td>Relay 2</td>
<td>Alarm</td>
</tr>
</tbody>
</table>

15. Technical data

15.1 Enclosure
All CU331SP enclosures are size B1. The enclosure rating can be either IP 55 / TYPE 12 or IP 66 / TYPE 4X

15.2 Main dimensions and weight

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>a</td>
<td>B</td>
<td>b</td>
</tr>
<tr>
<td>B1</td>
<td>18.9</td>
<td>17.9</td>
<td>9.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Screw holes [in]</th>
<th>Weight [lbs]</th>
</tr>
</thead>
<tbody>
<tr>
<td>c</td>
<td>d</td>
</tr>
<tr>
<td>0.47</td>
<td>0.75</td>
</tr>
</tbody>
</table>

15.3 Surroundings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative humidity</td>
<td>5-95 % RH</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>Max. 122 °F</td>
</tr>
<tr>
<td>(50 °C)</td>
<td></td>
</tr>
<tr>
<td>Average ambient temperature</td>
<td>Max. 113 °F</td>
</tr>
<tr>
<td>over 24 hours</td>
<td>(45 °C)</td>
</tr>
<tr>
<td>Minimum ambient temperature</td>
<td>32 °F (0 °C)</td>
</tr>
<tr>
<td>at full operation</td>
<td></td>
</tr>
<tr>
<td>Minimum ambient temperature</td>
<td>14 °F (-10 °C)</td>
</tr>
<tr>
<td>at reduced operation</td>
<td></td>
</tr>
<tr>
<td>Temperature during storage</td>
<td>-13 to 150 °F</td>
</tr>
<tr>
<td>and transportation</td>
<td>(-25 to 65 °C)</td>
</tr>
<tr>
<td>Storage duration</td>
<td>Max. 6 months</td>
</tr>
<tr>
<td>Maximum altitude above sea</td>
<td>3280 ft (1000 m)</td>
</tr>
<tr>
<td>level without performance</td>
<td></td>
</tr>
<tr>
<td>reduction</td>
<td></td>
</tr>
<tr>
<td>Maximum altitude above sea</td>
<td>9840 ft (3000 m)</td>
</tr>
<tr>
<td>level with performance</td>
<td></td>
</tr>
<tr>
<td>reduction</td>
<td></td>
</tr>
</tbody>
</table>

Note: The CU331SP comes in a packaging which is not suitable for outdoor storage.

15.4 Terminal tightening torques

<table>
<thead>
<tr>
<th>Enclosure</th>
<th>Mains</th>
<th>Motor</th>
<th>Earth</th>
<th>Relay</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>1.3</td>
<td>1.3</td>
<td>2.2</td>
<td>0.4</td>
</tr>
</tbody>
</table>
15.5 Cable length

<table>
<thead>
<tr>
<th>Maximum length, screened motor cable</th>
<th>500 ft (152 m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum length, unscreened motor cable</td>
<td>1000 ft (305 m)</td>
</tr>
<tr>
<td>Maximum length, signal cable</td>
<td>1000 ft (305 m)</td>
</tr>
</tbody>
</table>

15.6 Fuses and cable cross-section

**Warning**
Always comply with national and local regulations as to cable cross-sections.

### 15.6.1 Cable cross-section to signal terminals

| Maximum cable cross-section to signal terminals, rigid conductor | AWG 14 |
| Maximum cable cross-section to signal terminals, flexible conductor | AWG 18 |
| Minimum cable cross-section to signal terminals | AWG 20 |

### 15.6.2 Non-UL fuses and conductor cross-section to mains and motor

<table>
<thead>
<tr>
<th>Typical shaft power P2 [Hp]</th>
<th>Maximum fuse size [A]</th>
<th>Fuse type</th>
<th>Maximum conductor cross section [mm²]</th>
<th>AWG</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>40</td>
<td>gG</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>40</td>
<td>gG</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>80</td>
<td>gG</td>
<td>7</td>
<td>10</td>
</tr>
</tbody>
</table>

1) Screened motor cable, unscreened supply cable.

### 15.6.3 UL fuses and conductor cross-section to mains and motor

<table>
<thead>
<tr>
<th>Typical shaft power P2 [Hp]</th>
<th>Maximum fuse size [A]</th>
<th>Bussmann RK1</th>
<th>Maximum conductor cross section [AWG]</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>40</td>
<td>KTN-R40</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>40</td>
<td>KTN-R40</td>
<td>7</td>
</tr>
<tr>
<td>5</td>
<td>80</td>
<td>KTN-R80</td>
<td>7</td>
</tr>
</tbody>
</table>

1) Screened motor cable, unscreened supply cable.

15.7 Inputs and outputs

#### 15.7.1 Mains supply (L1, L2)

- **Supply voltage**: 200-240 V ± 10%
- **Supply frequency**: 60 Hz
- **Maximum temporary imbalance between phases**: 3% of rated value
- **Leakage current to earth**: > 3.5 mA
- **Number of cut-ins**: Max. 1 time/min.

**Note**
Do not use the power supply for switching the CU331SP on and off.

#### 15.7.2 Motor output (U, V, W)

- **Output voltage**: 0-100% 1)  
- **Output frequency**: 0-60 Hz
- **Switching on output**: Not recommended

1) Output voltage in % of supply voltage.

#### 15.7.3 RS-485 GENIbus connection

- **Terminal number**: 68 (A), 69 (B), 61 GND (Y)

The RS-485 circuit is functionally separated from other central circuits and galvanically separated from the supply voltage (PELV).

#### 15.7.4 Digital inputs

- **Terminal number**: 18
- **Voltage level**: 0-24 VDC
- **Voltage level, open contact**: > 19 VDC
- **Voltage level, closed contact**: < 14 VDC
- **Maximum voltage on input**: 28 VDC
- **Input resistance, Rᵢ**: Approx. 4 kΩ

All digital inputs are galvanically separated from the supply voltage (PELV) and other high-voltage terminals.

#### 15.7.5 Signal relays

<table>
<thead>
<tr>
<th>Relay 01, terminal number</th>
<th>1 (C), 2 (NO), 3 (NC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relay 02, terminal number</td>
<td>4 (C), 5 (NO), 6 (NC)</td>
</tr>
<tr>
<td>Maximum terminal load (AC-1) 1)</td>
<td>240 VAC, 2 A</td>
</tr>
<tr>
<td>Maximum terminal load (AC-15) 1)</td>
<td>240 VAC, 0.2 A</td>
</tr>
<tr>
<td>Maximum terminal load (DC-1) 1)</td>
<td>50 VDC, 1 A</td>
</tr>
<tr>
<td>Minimum terminal load</td>
<td>24 V DC 10 mA</td>
</tr>
<tr>
<td></td>
<td>24 V AC 20 mA</td>
</tr>
</tbody>
</table>

1) IEC 60947, parts 4 and 5.

C Common
NO Normally open
NC Normally closed

The relay contacts are galvanically separated from other circuits by reinforced insulation (PELV).
15.7.6 Analog input

<table>
<thead>
<tr>
<th>Terminal number</th>
<th>54</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current signal</td>
<td>A54 = &quot;I&quot; 1)</td>
</tr>
<tr>
<td>Current range</td>
<td>0-20, 4-20 mA</td>
</tr>
<tr>
<td>Input resistance, $R_i$</td>
<td>Approx. 200 $\Omega$</td>
</tr>
<tr>
<td>Maximum current</td>
<td>30 mA</td>
</tr>
<tr>
<td>Maximum fault, terminals 53, 54</td>
<td>0.5 % of full scale</td>
</tr>
</tbody>
</table>

1) The factory setting is voltage signal "U".

All analog inputs are galvanically separated from the supply voltage (PELV) and other high-voltage terminals.

15.8 Sound pressure level

The sound pressure of the CU331SP is maximum 70 dB(A).

The sound pressure level of a motor controlled by a Variable frequency drive may be higher than that of a corresponding motor which is not controlled by a variable frequency drive.

16. Disposal

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

1. Use the public or private waste collection service.

If this is not possible, contact the nearest Grundfos company or service workshop.

Subject to alterations.