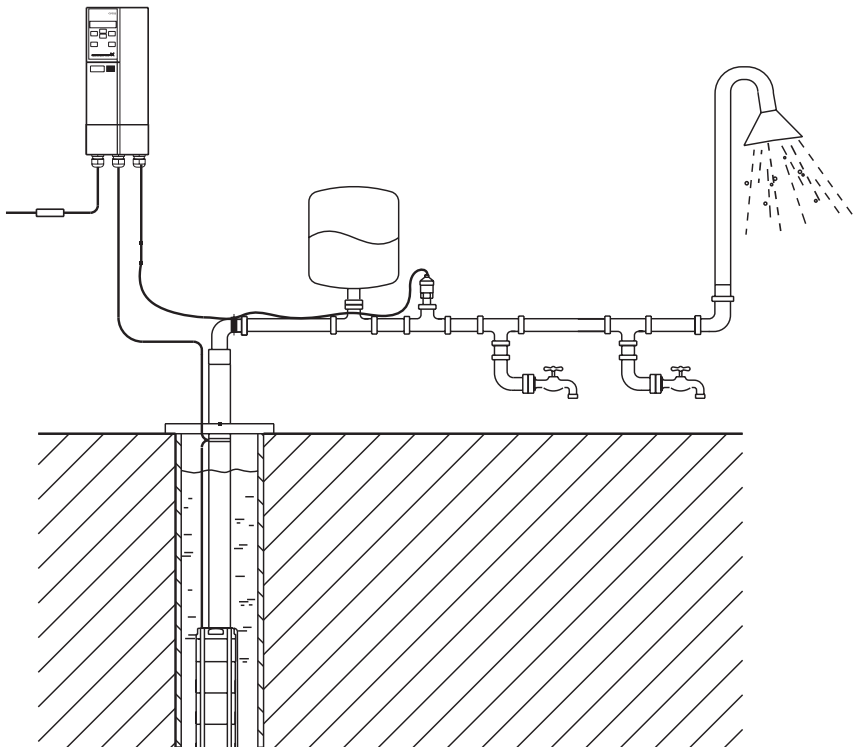


CU 321

US Installation and operating instructions



LIMITED WARRANTY

Products manufactured by GRUNDFOS PUMPS CORPORATION (Grundfos) are warranted to the original user only to be free of defects in material and workmanship for a period of 24 months from date of installation, but not more than 30 months from date of manufacture. Grundfos' liability under this warranty shall be limited to repairing or replacing at Grundfos' option, without charge, F.O.B. Grundfos' factory or authorized service station, any product of Grundfos' manufacture. Grundfos will not be liable for any costs of removal, installation, transportation, or any other charges which may arise in connection with a warranty claim. Products which are sold but not manufactured by Grundfos are subject to the warranty provided by the manufacturer of said products and not by Grundfos' warranty. Grundfos will not be liable for damage or wear to products caused by abnormal operating conditions, accident, abuse, misuse, unauthorized alteration or repair, or if the product was not installed in accordance with Grundfos' printed installation and operating instructions.

To obtain service under this warranty, the defective product must be returned to the distributor or dealer of Grundfos' products from which it was purchased together with proof of purchase and installation date, failure date, and supporting installation data. Unless otherwise provided, the distributor or dealer will contact Grundfos or an authorized service station for instructions. Any defective product to be returned to Grundfos or a service station must be sent freight prepaid; documentation supporting the warranty claim and/or a Return Material Authorization must be included if so instructed.

GRUNDFOS WILL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSSES, OR EXPENSES ARISING FROM INSTALLATION, USE, OR ANY OTHER CAUSES. THERE ARE NO EXPRESS OR IMPLIED WARRANTIES, INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WHICH EXTEND BEYOND THOSE WARRANTIES DESCRIBED OR REFERRED TO ABOVE.

Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages and some jurisdictions do not allow limit actions on how long implied warranties may last. Therefore, the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from jurisdiction to jurisdiction.

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

High voltage warning



The voltage of the adjustable frequency drive is dangerous whenever the drive is connected to electrical current. Incorrect fitting of the motor or adjustable frequency drive may cause damage to the equipment, serious injury or death. Consequently, it is essential to comply with the instructions in this manual as well as local and national rules and safety regulations.

These rules concern your safety:

1. Disconnect the adjustable frequency drive from the AC line if repair work is to be carried out. Wait 4 minutes to allow for electrical discharge before removing motor and AC line connectors.
2. The [STOP/RESET] key on the control panel of the adjustable frequency drive does not disconnect the equipment from the AC line. Do not use it as a safety switch.
3. The unit must be grounded correctly. The user must be protected against supply voltage and the motor protected against overload in accordance with applicable national and local regulations.
4. The ground leakage currents are higher than 3.5 mA.
5. Do not remove the terminal plugs for the motor and AC line supply while the adjustable frequency drive is connected to the AC line. Ensure that the AC line supply has been disconnected and that 4 minutes has passed before removing motor and AC line plugs.

Warnings against unintended start:

1. The motor can be started by means of digital commands, bus commands, references or a local start command whenever the drive is connected to the AC line. Therefore, an unintended start may occur anytime power is applied. Never service the drive or equipment when power is applied to the drive.
2. A motor that has been stopped may start if faults occur in the electronics of the drive, or if a temporary overload or fault clears in the AC line or motor connection.

WARNING!

It can be extremely dangerous to touch the electrical parts even when the mains supply has been disconnected.



Also ensure that other voltage inputs are disconnected from load sharing through the DC bus.

Wait at least 4 minutes after the input power has been removed before servicing the drive.

1. Constant-pressure control system

1.1 CU 321 control unit

The CU 321 control unit is designed for use only with certain Grundfos SP submersible pumps and motors. Configuration and operation parameters are optimized for the Grundfos pump and motor sets in the table below.

3 hp	5 hp
16S30-24	16S50-38
25S30-15	25S50-26
40S30-9	40S50-15
75S30-5	75S50-8

For more information, see section 6. *Technical data.*

1.2 Description of a constant-pressure system

The system maintains a constant pressure within the maximum pump performance in spite of a varying water consumption.

The CU 321 is designed for wall mounting only.

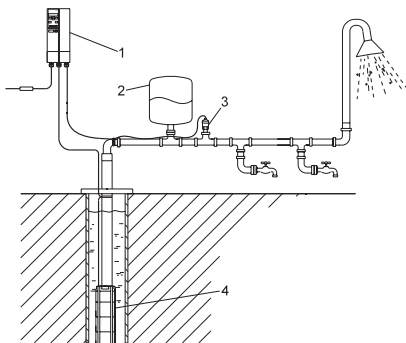


Fig. 1 Example of a system using the CU 321

Pos.	Description
1	CU 321 control unit
2	Diaphragm tank (4 gal.)
3	Pressure sensor
4	SP pump

1.3 Function

The pressure is registered by the pressure sensor, which transmits a 4-20 mA signal to the CU 321. To maintain a constant pressure, the CU 321 adjusts the pump performance accordingly by changing the pump speed.

When does the pump start?

The pump starts as a consequence of a low pressure. To ensure that the pump is started when water is consumed, a flow detection is required. The flow is detected via pressure changes in the system. When water is consumed, the pressure will drop accordingly depending on the size of the diaphragm tank and the water flow:

- at a low flow, the pressure will drop slowly.
- at a high flow, the pressure will drop quickly.

See fig. 2.

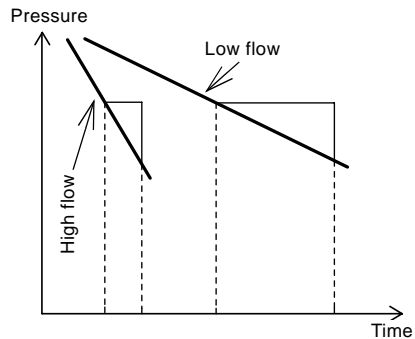


Fig. 2 Pressure in relation to a high and a low flow

The pump will start when the pressure has dropped below the pressure setting.

The pressure is boosted to 7 psi above the pressure setpoint before the pump is stopped, thus precharging the tank in preparation for the next start cycle.

Flow detection

During pump operation, i.e. when water is consumed, the CU 321 will adjust the pump speed to maintain a constant pressure. The CU 321 performs flow detection continuously in order to stop the pump when no water is consumed.

The flow detection is based on the actual power consumption compared to a no flow power for the actual pump.

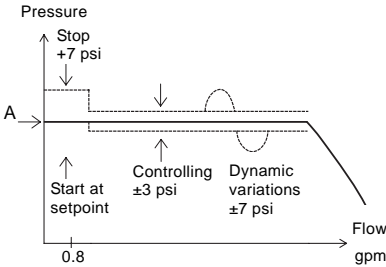
The system will operate in pressure switch mode ± 7 psi around the setpoint when the flow is less than 10% of the pump's max. rated flow.

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TM01 8545 0400

System limits

Even though the CU 321 is controlling the pressure within ± 3 psi, larger pressure variations may occur in the system. If the consumption is suddenly changed, e.g. if a tap is opened, the water must start flowing before the pressure can be made constant again. Such dynamic variations depend on the pipework, but, typically ± 7 psi. If the desired consumption is higher than the quantity the pump is able to deliver at the desired pressure, the pressure follows the pump curve as illustrated in the far right of fig. 3.



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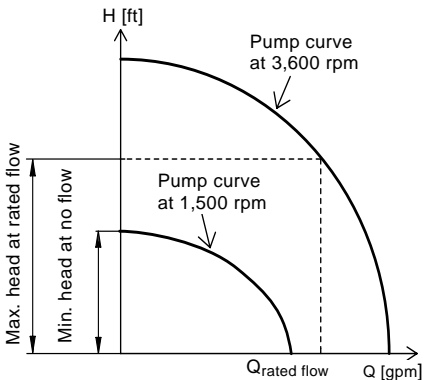
Fig. 3 Pressure as a function of the flow

Note: The pressure may fluctuate up to 20 psi below the setpoint when the pump is started in a high-demand situation. A larger diaphragm tank will minimize this effect.

1.4 System sizing

To ensure the correct function of the system, it is important that the pump is of the right type.

During operation, the CU 321 controls the pump speed within the range from 1,500 to 3,600 rpm, see fig. 4.



TM01 8547 0400

Fig. 4 Pump curve (sizing)

Recommended guidelines for system sizing:

The following must be fulfilled:

1. Min. head at no flow < static head + system pressure.

Comment: If this is not fulfilled, the pressure may exceed the pressure set on the CU 321.

2. Max. head at rated flow > dynamic head + system pressure.

Comment: If this is not fulfilled, the pressure may fall below the pressure set on the CU 321.

Max. head at rated flow and min. head at no flow can be found in the table below:

3 hp:

Pump type	Min. head at no flow, 1500 rpm	Max. head at rated flow, 3600 rpm
	[feet]	[feet]
16S30-24	128	490
25S30-15	80	305
40S30-9	45	185
75S30-5	30	105

5 hp:

Pump type	Min. head at no flow, 1500 rpm	Max. head at rated flow, 3600 rpm
	[feet]	[feet]
16S50-38	200	825
25S50-26	105	530
40S50-15	75	310
75S50-8	45	175

1.5 Positioning the pressure sensor

Pressure losses often cause inconvenience to the user.

The CU 321 keeps the pressure constant in the place where the pressure sensor is positioned, see fig. 5.

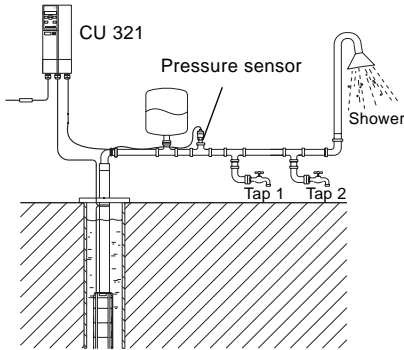


Fig. 5 Pressure sensor position

In fig. 5, tap 1 is placed close to the pressure sensor. Therefore, the pressure will be kept nearly constant at tap 1, as the friction loss is small. At the shower and tap 2, the friction loss is greater. This depends on the piping.

It is recommended that the pressure sensor be positioned as close to the places of consumption as possible.

1.6 Precharge pressure setting

The CU 321 is designed to work with a 4 gal. (minimum) diaphragm tank.

The precharge pressure of the diaphragm tank must be set to 70% of the pressure setting in order to use the tank to the limit of its capacity. This is especially important when the tank volume is limited to 4 gal.

Use the values in the following table. Precharge pressure is measured with 0 psi in the pipeline:

Setting [psi]	Precharge pressure [psi]
40	28
45	31
50	35
55	38
60	42
65	45
70	49
75	52
80	56
85	59
90	63
95	66
100	70

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2. Mechanical and electrical installation

It can be extremely dangerous to touch the electrical parts even when the mains supply has been disconnected.

Wait at least 4 minutes after the input power has been removed before servicing the CU 321.



Note: For outdoor installation, the CU 321 must be installed in a minimum NEMA 3R enclosure with provisions for heating and ventilating designed to keep the CU 321 within its operating temperature limits.

2.1 Mechanical installation

All dimensions are in inches.

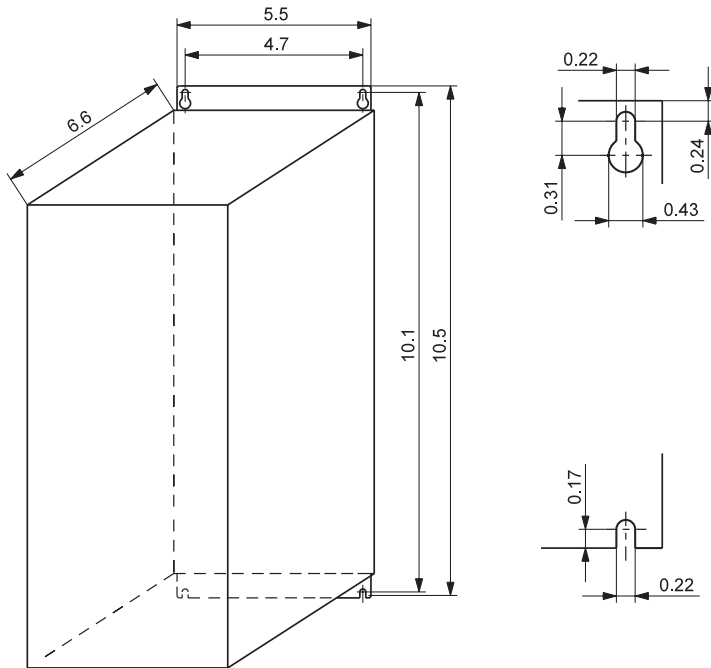


Fig. 6 Dimensional sketch of CU 321 (without the NEMA 1 kit)

Spacing

If more than one CU 321 is installed, the following must be observed during mechanical installation.

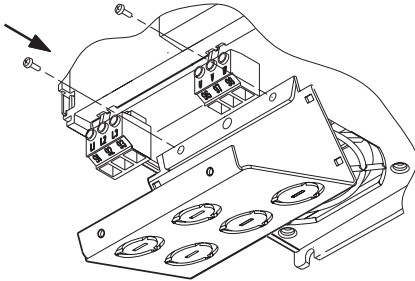
IMPORTANT

The CU 321 is cooled by air circulation. For proper cooling, allow a minimum of 4 inches (100 mm) of open space above, below and beside the CU 321 to protect the unit from overheating.

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2.1.1 Mounting the NEMA 1 terminal cover kit

Mount the terminal cover for cable lead as shown in fig. 7.



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Fig. 7 Mounting the metal part

Mount cables to mains supply, motor, pressure sensor and relay via conduits.

Mount the terminal cover as shown in fig. 8.

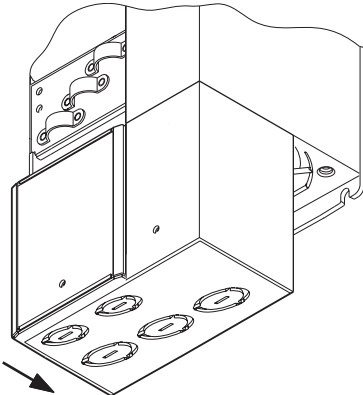


Fig. 8 Mounting the terminal cover

TM03 2630 4605

2.1.2 Access to control terminals (pressure sensor or relay)

All control terminals are located underneath the protective plate on the front of the CU 321. Dismantle the terminal cover to make it possible to remove the protective plate. Remove the protective plate by sliding it downwards, see fig. 9.

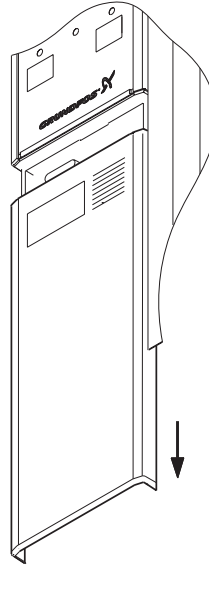


Fig. 9 Accessing the control terminals

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2.2 Electrical installation

It is the responsibility of the installer to ensure correct grounding and protection in accordance with national and local standards.

The voltage of the CU 321 is dangerous whenever the drive is connected to the AC line. Incorrect installation of the motor or drive may cause damage to the equipment, serious injury or death.



Comply with the safety instructions in this manual as well as local and national rules and safety regulations.

Touching electrical parts may be fatal - even after the equipment has been disconnected from the AC line.

Wait at least 4 minutes for current to dissipate.

IMPORTANT:

To eliminate the possibility of electrical interference, do not route power cables near any other electrical cables. Maintain a physical separation of at least 10-12 inches.

If this is impossible or extra precautions are desired, use a shielded cable and tie the drain wire to the CU321 ground lug.

2.2.1 Grounding

Comply with the following at installation:

- **Safety grounding:** The drive has a high leakage current and must be grounded properly for safety. Follow all local safety regulations.
- **High frequency grounding:** Keep grounding cables as short as possible.

Since the leakage currents to ground may be higher than 3.5 mA, the CU 321 must always be connected to ground in accordance with applicable national and local regulations.

Do not use GFCI together with the CU 321 due to high leakage currents which can trip these devices.

2.2.2 Mains supply

See section 6. *Technical data* for correct sizing of cable cross-section.

Connect the mains supply to terminals according to the following table. The reinforced protective earth must be connected to terminal ⊕.

Mains supply voltages:

- CU 321, 3Hp: Single or 3 phase 208-240V
- CU 321, 5Hp: 3 phase 208-240V.

Mains supply	CU 321 terminals		
	3 hp		5 hp
	2-wire	3-phase	
L1	L1	L1	L1
L2	L2	L2	L2
L3		L3	L3
Ground ⊕		Ground ⊕	

2.2.3 Motor connection

See section 6. *Technical data* in this manual for correct sizing of cable cross-section.

Connect the motor leads to terminals according to the table below. The reinforced protective earth must be connected to terminal ⊕.

Motor	CU 321 terminals
Yellow (U)	U
Red (V)	V
Black (W)	W
Green (ground ⊕)	Ground ⊕

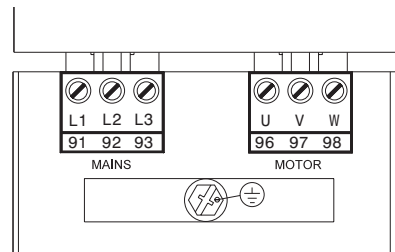


Fig. 10 Mains and motor terminal connections

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Maximum motor cable length [feet]

Mains supply	Motor rating	Power [hp]	Copper wire size (AWG)					
			14	12	10	8	6	4
3 x 208	3	180	290	470	740	1160	1810	–
	5	–	170	280	440	690	1080	1300
3 x 240	3	210	340	540	860	1340	2080	–
	5	–	200	320	510	800	1240	1300

2.2.4 Direction of motor rotation

To change the direction of motor rotation, switch any two phases at the drive output.



Remember to turn off mains and wait at least 4 minutes for current to dissipate before switching phases.

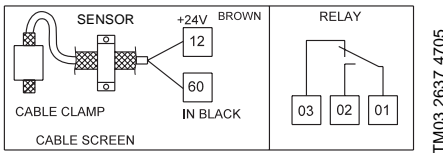
2.2.5 Connection of the pressure sensor

The CU 321 is factory-set for this pressure sensor:

Product	Data		Product number
	Signal	Range	
Pressure sensor	4-20 mA	0-120 psi	96437852

Connect the pressure sensor to the control terminals as follows:

CU 321 terminals	Sensor wire color
12	Brown
60	Black



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Fig. 11 Sensor connection label in CU 321

Note: Expose enough cable screen to make electrical contact to the cable clamp.

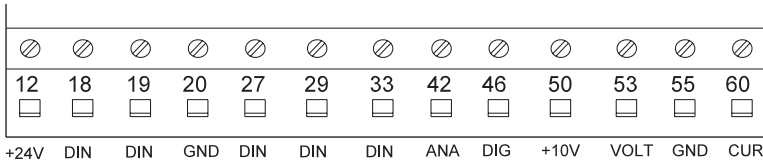


Fig. 12 Control terminals in CU 321

2.2.6 Relay connection

Note: The cable jacket for the relay must cover the first row of control card terminals. Maximum cable diameter: 0-0.160 in (4 mm). See fig. 13.

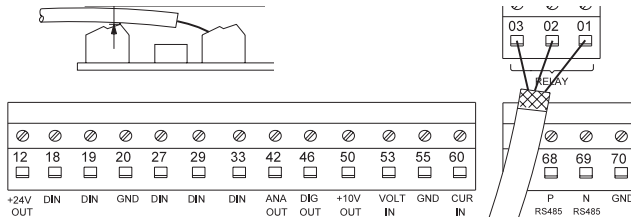


Fig. 13 Relay connection terminals

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3. Operating functions

3.1 Operating buttons and indicator lights

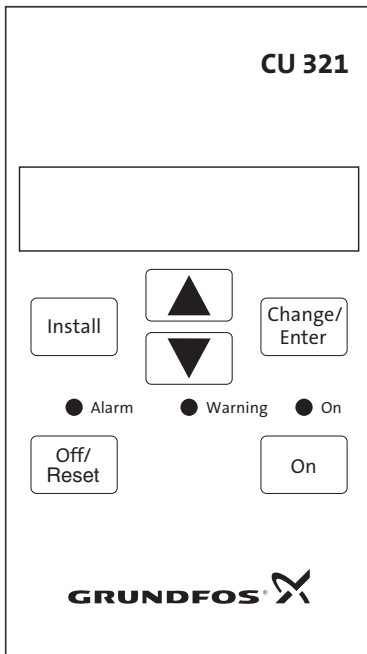


Fig. 14 Front view of the CU 321 control unit

Operating buttons

Button	Function
	Enables the pump
	Stops the pump and resets warnings and alarms
	Increases pump performance
	Decreases pump performance
	Installation menu
	Changes or enters data

Indicator lights

LED	Function
Alarm (red)	Indicates an alarm
Warning (yellow)	Indicates that a warning level has been reached
On (green)	Indicates that the mains supply has been switched on

4. Installation and setup menu

The installation menu is used to set up the system. The actual pump size must be selected and some other system parameters can be set in this menu. Only predefined setup can be made. The installation menu is described in the following sections.

4.1 Installation mode and alarm information

Press the button to enter into installation mode. This mode also includes a list of the three latest alarms in the CU 321. The complete installation menu and alarm information are shown in fig. 15.

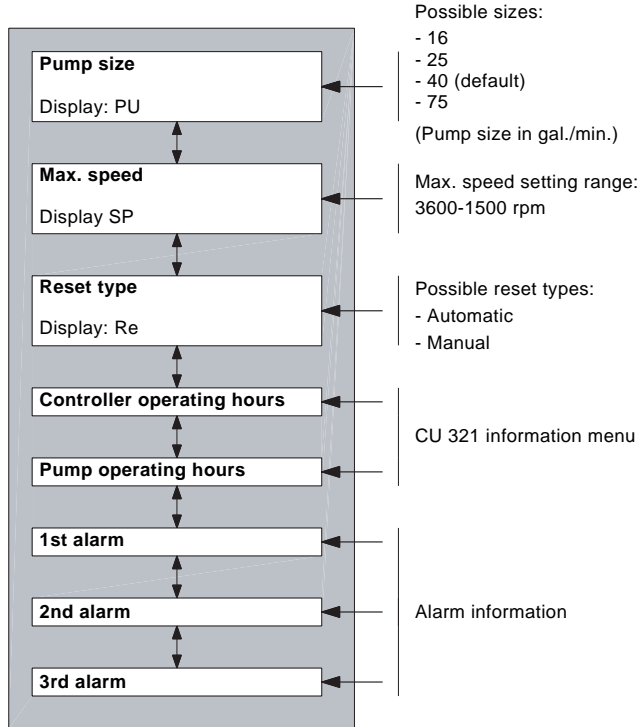






Fig. 15 Installation menu and alarm information

Press the button to return to normal operation.

Pump size


The Pump size is selected from a list of possible sizes. The default size is 40.

To change the pump size, press  and use the  or  button to go to the desired setting.

The display starts flashing when the  button is pressed and it will display the pump size using:

PU XX (XX = actual pump size).

For possible pump sizes, see the table below.

Press the  button to select the pump size. The display stops flashing.


Possible pump sizes:

3 hp

CU 321 data	Pump
75	75S30-5
40 (default)	40S30-9
25	25S30-15
16	16S30-24




5 hp


CU 321 data	Pump
75	75S50-8
40 (default)	40S50-15
25	25S50-26
16	16S50-38

Press  to go to the next menu: Max. speed.


Max. speed

The Max. speed menu makes it possible to reduce the max. speed of the pump.

To change the max. speed, press  and use the  or  button to go to the desired setting.


The display starts flashing when the  button is pressed and it will display the max. speed using:

SP XXX (XXX = actual max. speed)
(360 = 3600 rpm and 150 = 1500 rpm).

Press the  button to select the speed. The display stops flashing.

Range of max. speed settings:


Max.	3600 rpm (default)
Min.	1500 rpm




Press  to go to the next menu: Reset type.


Reset type

The Reset type menu makes it possible to choose between two types of reset: Automatic or manual.

If automatic reset is selected, the CU 321 automatically resets in case of a fault.


If manual reset is selected, press the  button to reset the alarm.

To change the reset type, press  and use the  or  button to go to the desired setting.

The display starts flashing when the  button is pressed and it will display the reset type using:


Re X (X = Reset type).

Automatic resetting time: 10 seconds.
(Resetting time for dry run: 30 minutes.)

Press the  button to select the reset type. The display stops flashing.

Possible reset types:

0	Manual
1	Automatic (default)


Press  to go to the next menu: Controller operating hours.

Controller operating hours

The Controller operating hours menu displays the number of hours that the CU 321 has been connected to the mains.

The display shows: hD XXX (XXX = the hours the CU 321 has been connected to mains). The scale is x100 hours.

The value is not reset at power-off.


Press  to go to the next menu: Pump operating hours.

Pump operating hours

The Pump operating hours menu displays the number of hours that the pump has been running.

The display shows: hP XXX (XXX = the operating hours of the pump). The scale is x100 hours.

The value is not reset at power-off.


Press  to go to the next menu: 1st alarm.

1st alarm

The 1st alarm menu displays the alarm code of the latest alarm.

The display shows: AL1 XX (XX = alarm code).

For more information about alarm codes, see section 5.4.


Press  to go to the next menu: 2nd alarm.

2nd alarm

The 2nd alarm menu displays the alarm code of the 2nd alarm.

The display shows: AL2 XX (XX = alarm code).

For more information about alarm codes, see section 5.4.

Press  to go to the next menu: 3rd alarm.


3rd alarm

The 3rd alarm menu displays the alarm code of the 3rd alarm.


The display shows: AL3 XX (XX = alarm code).

For more information about alarm codes, see section 5.4.


Older alarms are lost!


Press  button to return from the installation menu.

4.2 Normal operation

Press the  button to enable the pump.

The pressure setpoint can be changed during normal operation.


Press the  button to increase the pressure setpoint.

Press the  button to decrease the setpoint.

Press the  button to stop the pump.

Remember to change the pressure in the tank when the setpoint is changed.

The pressure setpoint (in psi) will appear in the display during normal operation. The display shows "PSI" followed by a number between 40 and 100.

The pump will automatically stop when the flow is low. The  button should only be used when a permanent stop is required or when an alarm is reset.

The display shows: OFF followed by a number. The number indicates the pressure setpoint in psi.

4.2.1 Operating relay

The CU 321 incorporates an operating relay, terminals 1, 2 and 3, for a potential-free operating signal. The output, terminals 1, 2 and 3, is electrically separated from the rest of the control unit.

The terminals of the relay are connected as follows according to the pump status:

Pump status	Connected terminals
Running	1 and 2
Off due to low flow	1 and 3
Off	1 and 3
Alarm	1 and 3

4.2.2 Display

The display indicates the status of the installation as follows:

Status	Display indication
Running	"PSI", followed by the setpoint in psi, permanently on
Automatic stop due to low flow	"PSI", followed by the setpoint in psi, flashing
Off (stop)	"OFF", followed by the setpoint in psi, flashing

5. Troubleshooting and alarm messages

This section includes information regarding troubleshooting and alarm messages.



The troubleshooting section includes application-related issues. It should help you to find and identify faults and errors in the application.

The warning/alarm messages section is useful in understanding the CU 321. In case of a failure, see section 5.2 *Warning and alarm messages from the CU 321*.

5.1 Troubleshooting



Before working on the input or output of the CU 321, make sure that the electricity supply has been switched off and that it cannot be accidentally switched on.

Fault	Cause	Remedy
No light in the display.	One fuse in the installation is blown/tripped out.	Replace/cut in the fuse. Check that the electricity supply falls within the specified range.
	Faulty electricity supply.	Check that the electricity supply corresponds to the specified voltage range.
	The current-operated or voltage-operated circuit breaker has tripped out.	Cut in the circuit breaker. Check that the electricity supply falls within the specified range.
	The CU 321 may be defective.	Replace the CU 321 or call GRUNDFOS SERVICE for assistance.
The pump is not running.	If the display is flashing, the pump is stopped, either due to a stop command from the  button (flashing OFF XXX) or due to the fact that no water is required (flashing PSI XXX). XXX indicates the pressure setting in psi.	Check that the pressure is below the pressure setpoint.
	No connection between the CU 321 and the pump.	Check the connection between the CU 321 and the pump. Restore the connection.
	The sensor is defective.	Check the sensor, see the table in section 7. <i>Pressure sensor voltage chart</i> .
The pressure is not constant.	Incorrect pressure in diaphragm tank.	Restore the correct pressure in the diaphragm tank.
	The pump is not of the correct type.	If the pump is running and the pressure is dropping, the pump may be undersized. Or if the pump is oversized, cycling may occur. See section 1.4 <i>System sizing</i> . Replace the pump, if necessary.
	The pressure sensor is positioned too far away from the tap.	Reposition the pressure sensor, see section 1.4 <i>Positioning the pressure sensor</i> .
	The max. speed has been set too low.	Review max. speed setting.
	The flow is below 10% of max. rated flow of the pump and the CU 321 operates in pressure switch mode.	
The pump is running continuously.	The pump may be defective.	Check the pump.
	The pump cannot deliver the set pressure.	Lower the pressure setting; note that it takes about 15 to 25 seconds before the pump stops.
	The pressure sensor is defective.	Check that the pressure port of the sensor is not blocked. If so, remove the blockage.
	The CU 321 is defective.	Try to stop the pump by pressing the  button. If that is not possible, the CU 321 is defective.

5.2 Warning and alarm messages from the CU 321

The CU 321 display gives information about warnings/alarms by writing "Err" and a specific code.

Warning and alarm messages:

- Sensor defective
- Overload
- Overtemperature
- Voltage alarm
- Phase error (3-phase only)
- Ground fault
- Short-circuit
- Dry run
- Internal fault

The last three warning/alarm messages can be accessed by pressing the button.

The table in section 5.4 *Warning and alarm codes* lists the CU 321 warnings and alarms and indicates how severe a certain alarm is. The most severe fault cause is an alarm lock.

In case of an alarm lock, the input power must be cut out, the cause of the fault corrected, and the input power restored to reset the CU 321.

5.3 Pressing the Off/Reset button

An alarm can be overruled by pressing the button, but if the cause of the alarm has not been removed, the alarm will reappear. Remember to press the button to enable the pump after a manual reset.

In addition, an automatic reset may be selected in the installation menu, which will reset all non-locking alarms.

Wherever an "X" is placed under both warning and alarm in the table, see section 5.4 *Warning and alarm codes*, this means that a warning precedes the alarm.

After an alarm lock, the motor will be coasting and the CU 321 alarm and warning indications will flash. If the fault is corrected, only the alarm will flash. The alarm indication stops flashing when the CU 321 is reset.

After a reset, the CU 321 will be ready to start up.

In the following detailed descriptions of warning and alarm messages, corrective actions to resolve the condition are recommended.


5.4 Warning and alarm codes

Code	Description	Status of the alarm		
		Warning	Alarm with reset	Alarm locked
2	Sensor fault (sensor input below 4 mA)	x		
4	AC line phase fault (only on 5 hp drive!)	x	x	x
5	Voltage warning high	x		
6	Voltage warning low	x		
7	Overvoltage		x	
8	Undervoltage		x	
9	Overload			x
12	Current limit	x		
13	Overcurrent			x
14	Ground fault			x
15	Internal fault			x
16	Short-circuit			x
35	Inrush fault		x	
36	Overtemperature	x	x	
37-45	Internal fault		x	x
79	Dry run		x	

Warning

The CU 321 will continue to operate for some time depending on the alarm. The yellow warning indicator light on the CU 321 flashes, and the specific code appears in the display. See the specific codes about the performance during warning.

Alarm with reset

The CU 321 will stop operating. The red indicator light on the CU 321 lights up and the CU 321 will not start until it is reset. The CU 321 will try to start if automatic reset has been selected. Otherwise the  button must be pressed to reset the alarm. The specific code will appear in the display.

Alarm locked

The CU 321 will stop running and the AC power must be cycled to reset the alarm. Alarm locked is the most severe type of alarm indicating that there is something wrong in the installation.

The yellow and red indicator lights on the CU 321 will light up during an alarm-locked situation. The specific code will appear in the display.

Indicator lights on display

Warning/alarm	LED indications
Warning	Yellow
Alarm with reset	Red
Alarm locked	Yellow and red

5.5 Description of warning and alarm codes

Code	LED	Description
2	Yellow	<p>Sensor output out of range</p> <p>The current signal on terminal 60 is below 4 mA. The pump will stop in case of warning 2.</p>
4		<p>AC line phase fault</p> <p>Missing mains phase on AC line supply side. Check the supply voltage to the CU 321. (This fault is only active in 3-phase 5 hp CU 321).</p>
5	Yellow	<p>Voltage warning high</p> <p>If the voltage is higher than the <i>Voltage warning high</i> limit, the CU 321 will give a warning and the motor will continue to operate unchanged. The <i>Voltage warning high</i> limit is: 285 V_{AC}. Check whether the supply voltage matches the rating of the CU 321, see section 6. <i>Technical data</i>.</p> <p>Note: An alarm code 7 (overvoltage) will occur if the voltage remains above the <i>Voltage warning high</i> limit for a fixed period of more than 5 seconds.</p>
6	Yellow	<p>Voltage warning low</p> <p>If the voltage is lower than the <i>Voltage warning low</i> limit, the CU 321 will give a warning and the motor will continue to operate unchanged. The <i>Voltage warning low</i> limit is: 170 V_{AC}. Check whether the supply voltage matches the rating of the CU 321, see section 6. <i>Technical data</i>.</p> <p>Note: An alarm code 8 (undervoltage) will occur if the voltage remains below the <i>Voltage warning low</i> limit for a fixed period of more than 5 seconds. When the CU 321 is switched off, warnings 6 and 8 are displayed briefly.</p>
7	Red	<p>Overvoltage</p> <p>If the voltage is higher than the <i>Overvoltage</i> limit, the CU 321 will cut out until the voltage falls below the <i>Overvoltage</i> limit. Note: An alarm code 7 (overvoltage) will occur if the voltage remains above the <i>Overvoltage</i> limit for a fixed period of more than 5 seconds. The time depends on the unit and is factory-set to 5 seconds. <i>Voltage warning high</i> (warning 5) will be able to generate an alarm 7.</p>
8	Red	<p>Undervoltage</p> <p>If the voltage is lower than the <i>Undervoltage</i> limit, the CU 321 will cut out until the voltage once more rises above the <i>Undervoltage</i> limit. Check the supply voltage to the CU 321, see section 6. <i>Technical data</i>.</p> <p>Note: An alarm code 8 (undervoltage) will occur if the voltage remains below the <i>Undervoltage</i> limit for a fixed period of more than 5 seconds. The time depends on the unit and is factory-set to 5 seconds. When the CU 321 is switched off, an alarm 8 and warning 6 are displayed briefly and a alarm reset is generated. Note: <i>Voltage warning low</i> (warning 6) will be able to generate an alarm 8.</p>
9	Red	<p>Overload</p> <p>If the CU 321 is loaded beyond the current limit and if a reduction of the output frequency does not reduce the load, the CU 321 will give an alarm 9. The CU 321 is alarm-locked.</p>
12	Yellow	<p>Current limit</p> <p>The output current is greater than the max. value allowed by the CU 321.</p>

Code	LED	Description
13	Red and yellow	<p>Overcurrent</p> <p>The CU 321 peak current limit (approx. 200% of rated output current) has been exceeded. The warning will last for approx. 1-2 seconds before the CU 321 is alarm-locked.</p> <p>Check that the correct pump has been installed and that the CU 321 is programmed accordingly.</p> <p>If OK, switch off the CU 321 power, disconnect motor leads and measure winding resistance, looking for short-circuits between windings or ground.</p> <p>If motor windings are OK, inspect pump and motor ensuring that both spin freely.</p>
14	Red and yellow	<p>Ground fault</p> <p>There is a discharge from the output phases to ground, either in the cable between the CU 321 and the pump motor, or in the pump motor.</p> <p>Switch off the CU 321 power, disconnect motor leads and measure winding resistance, looking for short-circuits between windings or ground.</p>
15	Red and yellow	<p>Internal fault</p> <p>Internal fault in the CU 321 (internal supply). Contact your Grundfos supplier.</p>
16	Red and yellow	<p>Short-circuit</p> <p>There is a short-circuit on the motor terminals of the CU 321 or in the pump motor.</p> <p>Switch off the CU 321 power, disconnect motor leads and measure winding resistance, looking for short-circuits between windings or ground.</p> <p>The CU 321 is not destroyed by a short-circuit.</p>
35	Red and yellow	<p>Inrush fault</p> <p>This alarm appears when line voltage has been applied to the CU 321 more than twice in one minute.</p>
36	Yellow during warning, red during alarm	<p>Overtemperature (internal temperature measurement)</p> <p>The CU 321 gives a warning if the temperature inside the box goes too high. The motor continues to operate unchanged. The CU 321 will stop operating if the temperature continues to rise.</p> <p>The temperature fault cannot be reset until the temperature inside the CU 321 has dropped below 158°F (70°C). The tolerance is ±9°F (±5°C).</p> <p>The following can cause the temperature to rise:</p> <ul style="list-style-type: none"> • Ambient temperature too high. • Motor cable too long. • AC line voltage too high. • Dust covering the fan in the CU 321. <p>The CU 321 performance can be limited by reducing the max. speed in the installation menu. The CU 321 will be able to operate with a slightly reduced performance at high ambient temperature when the max. speed is reduced.</p>
37-45	Red and yellow	<p>Internal fault</p> <p>Internal fault in the CU 321. Contact your Grundfos supplier.</p>
79	Red	<p>Dry run</p> <p>The dry-run alarm shows that the well is dry or that the pump is too large for the well. If the pump is too large for the well, it will be able to empty the well and a dry-run alarm will be generated.</p> <p>The dry-run alarm will reset in 30 minutes if automatic reset is selected.</p> <p>If the power consumption is low and the pump speed is at maximum speed, a dry-run alarm is generated.</p>

6. Technical data

General electrical data

Supply voltage CU 321 (3 hp 1- or 3-phase mains supply, 5 hp 3-phase mains supply)	208-240 V \pm 10%
Supply frequency	50/60 Hz \pm 3 Hz
Max. imbalance on supply voltage	\pm 2.0% of rated supply voltage
Power factor	0.90 / at rated load
Number of mains on/off	Max. 2 times/min.
Output frequency	25-60 Hz
Rated motor voltage	3 x 230 V

Pressure sensor input

Terminal number	60
Current level	4-20 mA

Supply for pressure sensor 24 VDC

Terminal number	12
Max. load	130 mA

Relay output

Terminal number	1-3 (NC), 1-2 (NO)
Max. terminal load (AC) on 1-3, 1-2	240 VAC, 1 A
Min. terminal load on 1-3, 1-2	<ul style="list-style-type: none"> • 24 VDC 10 mA • 24 VAC 100 mA

CU 321	3 hp	5 hp
Output current continuous [A]	10.0	16.0
Output current max. (60 seconds) [A]*	12.0	19.2
Max. cable cross-section, motor [mm ² /AWG]	4/10	4/10
Max. cable length, motor [ft/m]	1300/400	1300/400
Input current 1 x 200-240 V [A]	23.0	–
Input current 3 x 200-240 V [A]	9.2	14.7
Max. cable cross-section, mains [mm ² /AWG]	4/10	4/10
Weight excl. IP 21/NEMA 1 options [lbs/kg]	13.3/6.0	13.3/6.0

* End of curve protection. The output is reduced after 60 seconds indicating that the pump is running at the end of the curve. The output will resume to normal operation when the load is reduced or after a period of further 60 seconds.

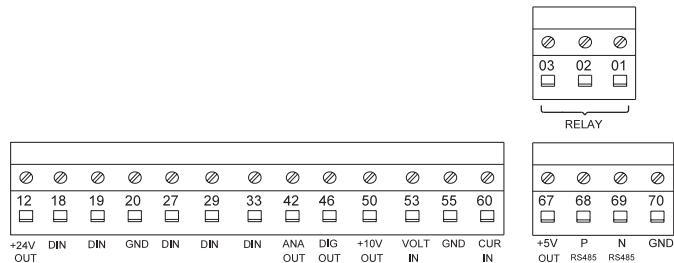


Fig. 16 Control terminals in CU 321

TM03 2628 4605

Surroundings

Enclosure (CU 321 unit)	NEMA 0
Enclosure with fitted NEMA 1 kit	NEMA 1
Max. relative air humidity	93%
Ambient temperature	Max. 113°F
Min. ambient temperature during full-scale operation	32°F
Temperature during storage/transport	Min. -13°F Max. 160°F

Note: For outdoor installation, the CU 321 must be installed in a minimum NEMA 3R enclosure with provisions for heating and ventilating designed to keep the CU 321 within its operating temperature limits.

7. Pressure sensor voltage chart

Voltage to pressure chart for the CU 321 pressure sensor. Measure DC voltage between "terminal 12" and "terminal 60", see fig. 12. "Err 2" will appear in the CU 321 display if the signal is outside the range or if the signal is reversed.

DC voltage	psi	DC voltage	psi	DC voltage	psi
22.5	0.0 to 1.3	20.9	40.4 to 41.7	19.3	80.8 to 82.1
22.4	2.5 to 3.8	20.8	42.9 to 44.2	19.2	83.4 to 84.6
22.3	5.1 to 6.3	20.7	45.5 to 46.7	19.1	85.9 to 87.2
22.2	7.6 to 8.8	20.6	48.0 to 49.3	19.0	88.4 to 89.7
22.1	10.1 to 11.4	20.5	50.5 to 51.8	18.9	90.9 to 92.2
22.0	12.6 to 13.9	20.4	53.1 to 54.3	18.8	93.5 to 94.7
21.9	15.2 to 16.4	20.3	55.6 to 56.8	18.7	96.0 to 97.3
21.8	17.7 to 18.9	20.2	58.1 to 59.4	18.6	98.5 to 99.8
21.7	20.2 to 21.5	20.1	60.6 to 61.9	18.5	101.1 to 102.3
21.6	22.7 to 24.0	20.0	63.2 to 64.4	18.4	103.6 to 104.8
21.5	25.3 to 26.5	19.9	65.7 to 66.9	18.3	106.1 to 107.4
21.4	27.8 to 29.1	19.8	68.2 to 69.5	18.2	108.6 to 109.9
21.3	30.3 to 31.6	19.7	70.7 to 72.0	18.1	111.2 to 112.4
21.2	32.8 to 34.1	19.6	73.3 to 74.5	18.0	113.7 to 114.9
21.1	35.4 to 36.6	19.5	75.8 to 77.1	17.9	116.2 to 117.5
21.0	37.9 to 39.2	19.4	78.3 to 79.6	17.8	118.7 to 120.0

8. 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.
2. If this is not possible, contact the nearest Grundfos company or service workshop.

Safeguards

- The CU 321 is protected against short-circuits on motor terminals U, V, W.
- Monitoring of the intermediate circuit voltage ensures that the CU 321 cuts out if the intermediate circuit voltage is too low or too high.
- The CU 321 is protected against ground fault on motor terminals U, V, W.

Subject to alterations.

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