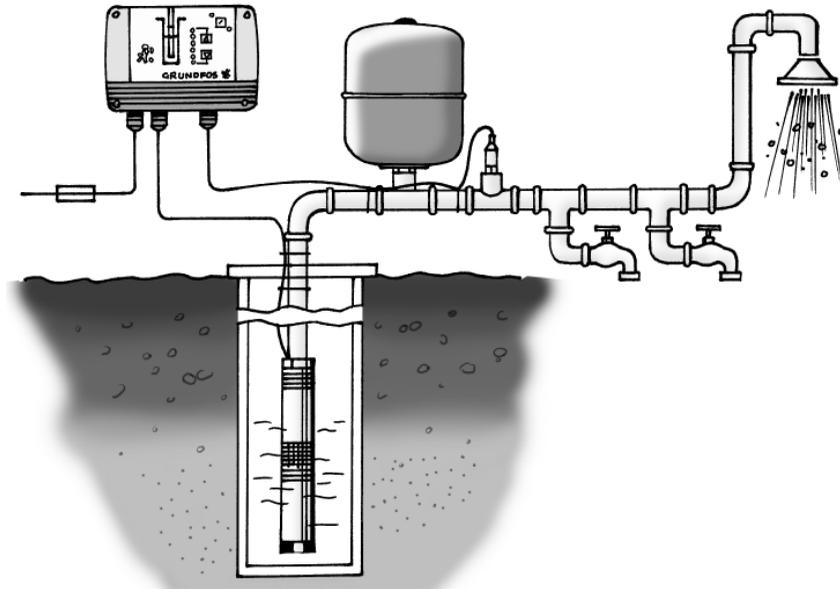


CU 301

GB Installer's manual



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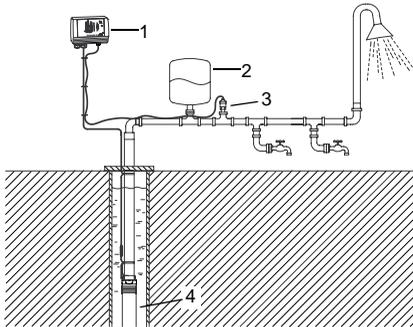
1. Constant-pressure control

1.1 Description

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

Fig. 1 shows an example of an installation with constant-pressure control.

Fig. 1



TM01 7862 4999

Pos.	Description
1	CU 301
2	Diaphragm tank
3	Pressure sensor
4	SQE pump

1.2 Function

The pressure is registered by means of the pressure sensor, which transmits a signal to the CU 301. The CU 301 adjusts the pump performance accordingly by changing the pump speed.

Mains borne signalling:

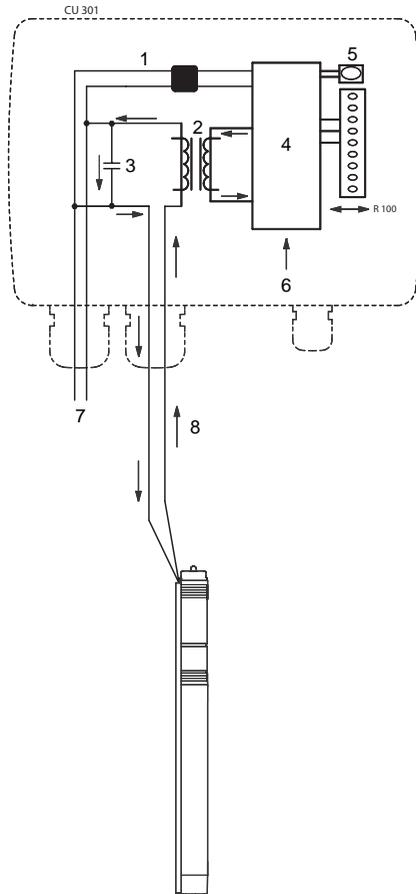
The communication between the CU 301 and the pump is effected via the power supply cable.

This communication principle is called mains borne signalling (or power line communication). Using this principle means that no additional cables to the pump are required.

The communication of data is effected by means of a high-frequency signal transmitted to the power supply cable and led into the electronics unit by means of signal coils incorporated in the motor and the CU 301 respectively.

Fig. 2 shows the principle of mains borne signalling between the CU 301 and the pump.

Fig. 2



TM01 8495 1703

Pos.	Description
1	Supply to the electronics
2	Signal coils
3	Capacitor
4	Electronics for the control of the communication
5	On/off button
6	Sensor signal
7	Electricity supply
8	Communication signals

When does the pump start?

The pump starts as a consequence of...

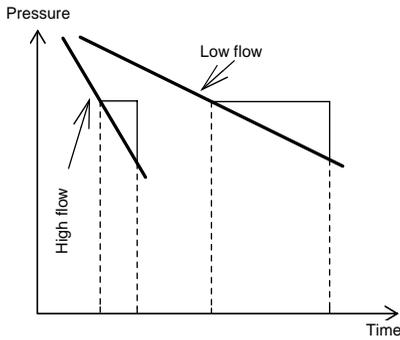
- a high flow or
- a low pressure or
- a combination of both.

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. 3.

Fig. 3



TM01 8545 0400

Note: When the pressure is dropping 0.1 bar/s or faster, the pump will start immediately.

If a diaphragm tank of 8 litres is used, the pump will start at a flow rate of approx. 0.18 m³/h.

Note: If a larger tank is used, the flow must be higher before the pump starts.

Consumption up to 0.18 m³/h:

The pump will start when the pressure has dropped to 0.5 bar below the pressure setting.

The pump will run until the pressure is 0.5 bar above the pressure set.

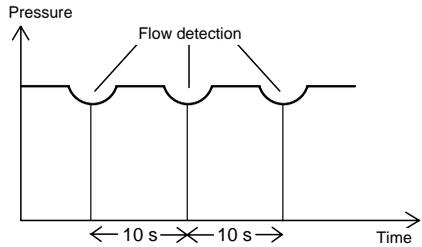
Flow detection:

During pump operation, i.e. when water is consumed, the CU 301 will adjust the pump speed to maintain a constant pressure. In order to stop the pump when no water is consumed, the CU 301 performs flow detection every 10 seconds.

The pump speed is reduced until a small pressure drop is registered. This pressure drop indicates that water is consumed and the pump speed is resumed, see fig. 4.

If the pump speed can be reduced without any pressure drop being registered, this indicates that no water is consumed. The diaphragm tank will be filled with water and the pump will be stopped.

Fig. 4



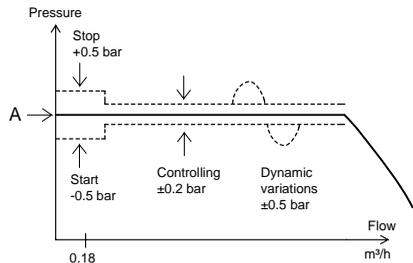
TM01 8546 0400

System limits:

Even though the CU 301 is controlling the pressure within ± 0.2 bar, bigger 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 pipe-work, but, typically, they will lie between 0.5 and 1 bar.

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 fig. 5.

Fig. 5



TM01 8634 0500

A = Pressure set

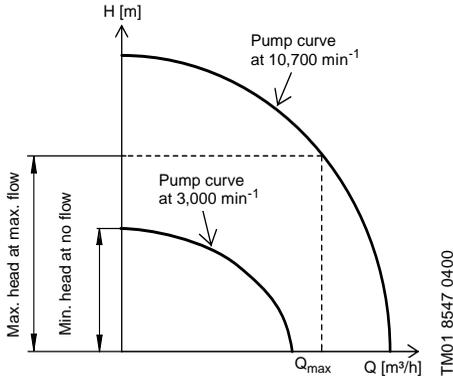
1.3 System sizing

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

During operation, the CU 301 controls the pump speed within the range from 3,000 min⁻¹ to 10,700 min⁻¹, see fig. 6.

It is recommended to follow the guidelines below:

Fig. 6



The following must be fulfilled:

1. Min. head at no flow < static head + system pressure.
2. Max. head at max. flow > dynamic head + system pressure.

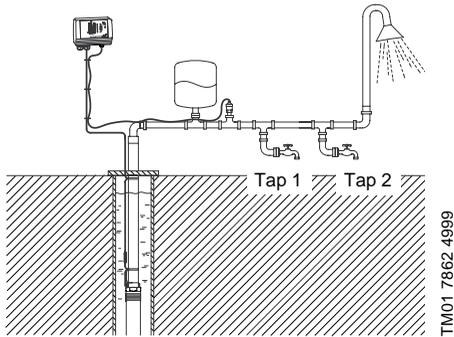
Max. head at max. flow and min. head at no flow can be found in the following table:

Pump type	Min. head at $Q = 0 \text{ m}^3/\text{h}$, 3,000 min ⁻¹	Max. head at $Q = Q_{\text{max}}$, 10,700 min ⁻¹
	[m] / [feet]	[m] / [feet]
SQE 1 - 35	18 / 59	29 / 86
SQE 1 - 50	28 / 91	44 / 131
SQE 1 - 65	37 / 121	59 / 177
SQE 1 - 80	46 / 151	75 / 222
SQE 1 - 95	56 / 184	90 / 270
SQE 1 - 110	65 / 213	105 / 315
SQE 1 - 125	74 / 243	120 / 360
SQE 1 - 140	81 / 266	136 / 405
SQE 1 - 155	92 / 302	151 / 450
SQE 2 - 35	19 / 62	35 / 105
SQE 2 - 55	29 / 95	54 / 164
SQE 2 - 70	38 / 125	71 / 215
SQE 2 - 85	47 / 154	88 / 267
SQE 2 - 100	56 / 184	108 / 328
SQE 2 - 115	66 / 217	128 / 390
SQE 3 - 30	15 / 49	26 / 75
SQE 3 - 40	24 / 79	42 / 123
SQE 3 - 55	31 / 102	56 / 164
SQE 3 - 65	39 / 128	70 / 205
SQE 3 - 80	47 / 154	84 / 246
SQE 3 - 95	55 / 180	98 / 287
SQE 3 - 105	62 / 203	113 / 328
SQE 5 - 15	7.7 / 25	11 / 36
SQE 5 - 25	15 / 49	23 / 77
SQE 5 - 35	23 / 75	36 / 117
SQE 5 - 50	30 / 98	48 / 159
SQE 5 - 60	38 / 125	61 / 200
SQE 5 - 70	45 / 148	73 / 240
SQE 7 - 15	8.6 / 28	9 / 33
SQE 7 - 30	18 / 59	23 / 82
SQE 7 - 40	27 / 89	37 / 126

1.4 Positioning the pressure sensor

Pressure losses often cause inconvenience to the user. The CU 301 keeps the pressure constant in the place where the pressure sensor is positioned, see fig. 7.

Fig. 7



In fig. 7, 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 bigger. This, of course, depends on the piping. However, old and furred-up piping may cause inconvenience due to friction loss.

Example: A person is in the shower. Tap 2 is opened. The increased flow will cause pressure loss in the pipe, and even though the CU 301 is keeping the pressure constant at the pressure sensor, the person in the shower will feel the pressure loss. If the pressure sensor is placed closer to the shower tap, the CU 301 will increase the pressure when the flow is increased. Then the pressure at the shower and tap 2 will be kept constant, but the pressure at tap 1 will be increased.

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

1.5 Precharge pressure setting

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 of course especially important when the tank volume is limited to 8 litres.

Use the values in the following table:

Setting [bar]	Precharge pressure [bar]
2	1.4
2.5	1.8
3	2.1
3.5	2.5
4	2.8
4.5	3.2
5	3.5

Note: If the precharge pressure is higher than the pressure setting, the system will not be able to control the pressure.

If the user wants to adjust the pressure without changing the precharge pressure of the diaphragm tank, the precharge pressure must be equal to the lowest pressure setting used. This means that the control will work but that the pressure fluctuations might increase. In such cases, it is recommended to use a larger diaphragm tank, e.g. a tank of double size.

1.6 Pressure relief valve

In order to provide protection against the possibility of an overpressurization, a pressure relieve valve should be installed down stream of the well head. The setpoint of the pressure relief valve should be at least 30 psi above the pressure setting, see section 2.3.

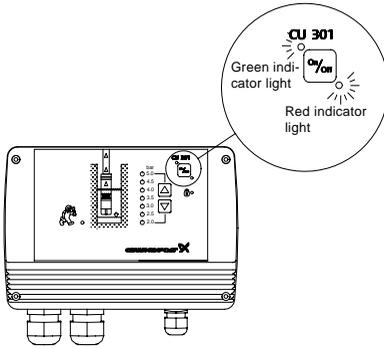
If a relief valve is installed, it is recommended that its discharge be plumbed into an appropriate drainage point.

2. Operating functions

2.1 On/off button

Fig. 8 shows the on/off button of the CU 301.

Fig. 8



TM01 7860 4701

The green and red indicator lights in the on/off button indicate pump operating condition as follows:

Indication	Description
Green indicator light permanently on.	The system is operational.
Green indicator light off.	The system is not operational.
Red indicator light permanently on.	Pump has been stopped by means of the on/off button.*
Red indicator light flashing.	The CU 301 is communicating with the R100.

* If the on/off button has been used to stop the pump, this button must also be used for restarting.

Any alarm indication can be reset by pressing the on/off button.

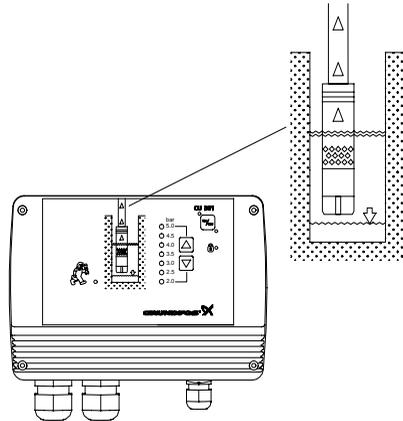
If the on/off button is pressed for more than 5 seconds, the pump is started, irrespective of any active fault/alarm indications and sensor signals.

When the on/off button is released, the pump will stop, if the alarm still exists.

2.2 Indication of pump operation

On the graphical illustration on the CU 301 front, the riser pipe shows running light when the pump is operating. When the pump is not operating, none of the indicator lights are on, see fig. 9.

Fig. 9



TM01 8328 4701

The indication of pump operation can be changed by means of the R100.

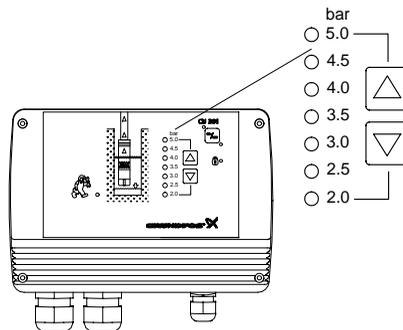
Possible settings:

- “Running light” during pump operation (factory setting).
- “Constant light” during pump operation.

2.3 Pressure setting

The two arrow buttons on the CU 301 front are used for the pressure setting, see fig. 10.

Fig. 10



TM01 8329 4701

Indication of pressure setting:

The system pressure set is indicated by a yellow indicator light, which is permanently on. Setting range: 2, 2.5 ... 5.0 bar.

Arrow-up button:

When this button is pressed, the system pressure setting is increased in steps of 0.5 bar.

Arrow-down button:

When this button is pressed, the system pressure setting is decreased in steps of 0.5 bar.

2.4 Button locking

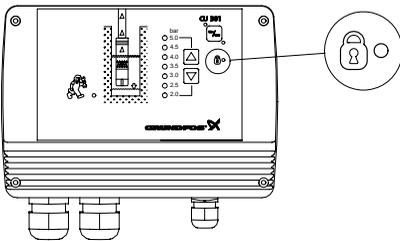
The buttons on the CU 301 can be locked/unlocked by pressing the two arrow buttons simultaneously for 5 seconds or via the R100 remote control.

Note: When the arrow buttons are used for locking, the pressure setting may change.

Use the following procedure:

1. Set the pressure one step up.
2. Press the arrow-down button as the first one when pressing the two buttons.

Fig. 11



TM01 8330 4701

When the buttons are locked, the indicator light is permanently on, see fig. 11.

For further information, see section 5.3.7 *Buttons on CU 301*.

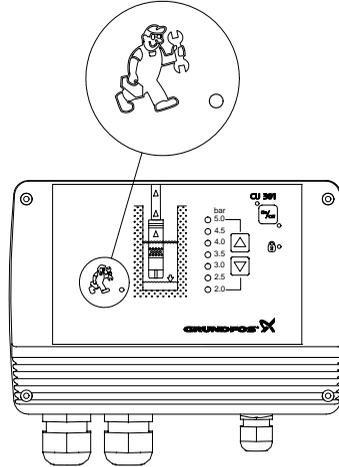
3. Alarm functions

The CU 301 continuously receives operating data from the pump. The alarm functions indicated on the CU 301 front are described in the following sections.

3.1 Service alarm

If one or more factory-set alarm values are exceeded, the indicator light for service alarm is permanently on, see fig. 12.

Fig. 12



TM01 8327 4701

Possible alarms:

- Sensor defective.
- Overload.
- Overtemperature.
- Speed reduction.
- Voltage alarm.
- No contact to pump.

The possible alarms and how to identify them and make the relevant corrections are described in section 6.1 *Service*.

3.2 Dry-running protection

The purpose of the dry-running protection is to protect the pump in case of insufficient water flow.

The dry-running protection makes the conventional dry-running protection unnecessary.

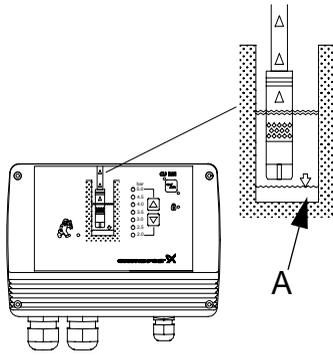
No additional cables to the motor are required.

The dry-running protection will be active after 30 seconds' operation.

The dry-running alarm is activated when the load has been below the minimum power limit for an accumulated time of 5 seconds.

The motor is stopped and the dry-running indicator light is permanently on, see fig. 13, pos. A.

Fig. 13



TIM01 8329 4701

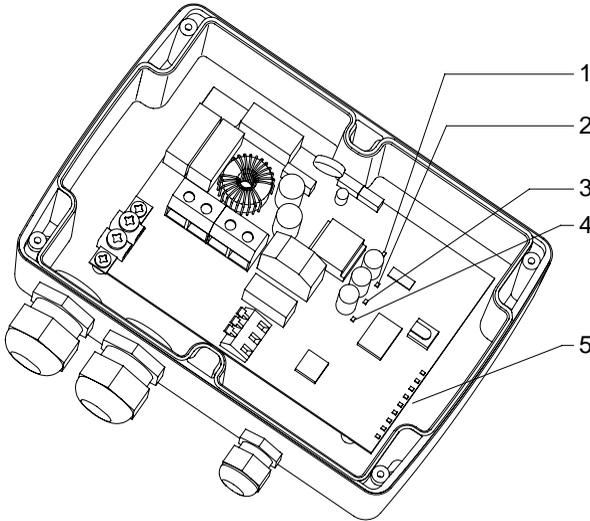
Possible cause	Remedy
The pump performance is too high compared to the borehole yield.	Replace the pump with a smaller one.
	Reduce pump performance using the R100 display 5.3.6 <i>Maximum speed</i> .
Borehole filter is blocked.	Borehole service is required.

Restarting:

After 5 minutes (factory setting), or the period set by means of the R100 display 5.3.4 *Automatic restart*, the motor will restart automatically.

4. Position of LEDs and fuse

Fig. 14



TM01 8537 1703

Pos.	Indication	Description
1	+24 V overload	Permanent red light when the internal 24 VDC supply is overloaded.
2	+24 V	Permanent green light when the internal 24 VDC supply is OK.
3	+10 V	Permanent green light when the internal 10 VDC supply is OK.
4	+5 V	Permanent green light when the internal 5 VDC supply is OK.
5	9 indicator lights:	
	• Control indicator	• Flashing green light when the pump control is working correctly.
	• Min. speed	• Permanent yellow light when the pump is running at minimum speed, 3,000 min ⁻¹ .
	• Max. speed	• Permanent yellow light when the pump is running at maximum speed, 10,700 min ⁻¹ .
	• Sensor defective *)	• Permanent red light when the sensor signal is out of signal range.
	• Overload *)	• Permanent red light when the motor load exceeds the stop limit, see section 7. <i>Technical data</i> .
	• Overtemperature *)	• Permanent red light when the motor temperature exceeds the stop limit, see section 7. <i>Technical data</i> .
	• Speed reduction *)	• Permanent red light when the pump speed is reduced, see section 7. <i>Technical data</i> .
	• Voltage alarm *)	• Permanent red light when the supply voltage is out of range, see section 7. <i>Technical data</i> .
	• No contact to pump *)	• Permanent red light when communication between the CU 301 and the pump is impossible.

*) Press the on/off button to reset the alarm indication.

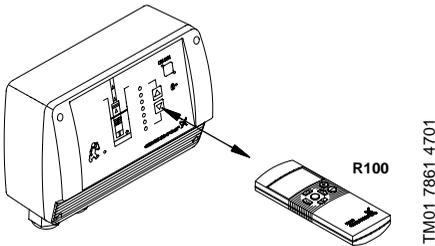
5. CU 301 with R100

The remote control R100 can be used as a supplement for the installer. The R100 is used for wireless communication with the CU 301.

Note: It is not necessary to use the R100 to operate the system. The R100 offers additional features.

The R100 communicates via infra-red light. During communication, there must be visual contact between the CU 301 and the R100. The best visual contact between the two units is obtained by pointing the R100 at the lower arrow button or by removing the front cover and pointing the R100 at the right side of the CU 301, see fig. 15.

Fig. 15



The R100 offers possibilities of setting and status displays for the CU 301.

When the communication between the R100 and CU 301 has been established, the red indicator light in the on/off button will flash.

For general use of the R100, see the operating instructions for this unit.

The menu structure for the R100 and CU 301 is divided into four parallel menus, each including a number of displays.

0. GENERAL, see operating instructions for the R100.

1. OPERATION

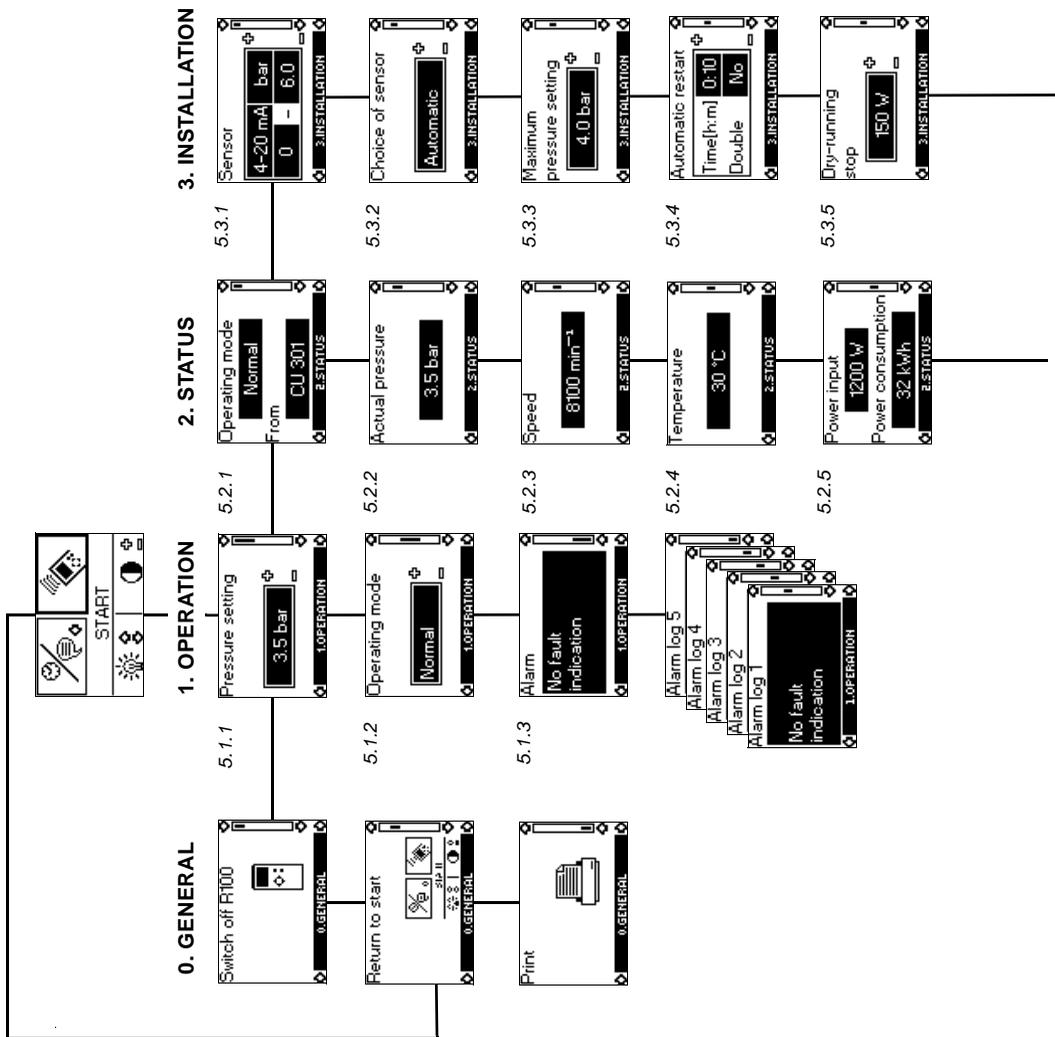
2. STATUS

3. INSTALLATION

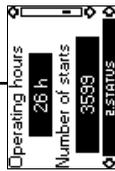
Menu overview, see fig. 16, page 12.

Note: The number stated at each individual display in fig. 16 refers to the section in which the display is described.

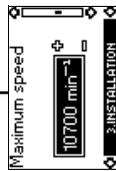
Fig. 16



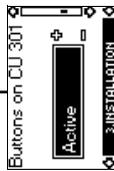
5.2.6



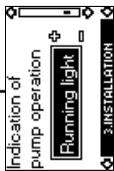
5.3.6



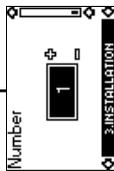
5.3.7



5.3.8



5.3.9



5.1 Menu OPERATION

The OPERATION menu for the CU 301 offers the possibility of setting and reading operating parameters.

Factory settings are marked in **bold-faced type** under each individual display.

5.1.1 Pressure setting



TM CU301_1_01 GB

Set the required pressure.

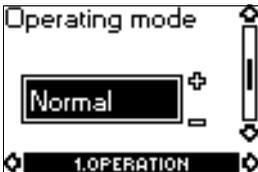
Setting range:

- 2.0-5.0 bar (0.5 bar intervals), **3.0 bar**.
- 40-100 psi (10 psi intervals), **50 psi**.

Relation to other displays:

The setting in display 5.1.1 *Pressure setting* is overridden by the "Max." and "Min." settings in the displays 5.1.2 *Operating mode* and 5.3.3 *Maximum pressure setting*.

5.1.2 Operating mode



TM CU301_1_02 GB

Select one of the following operating modes:

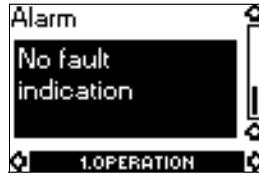
- **Max.**
Pump operation is set to maximum speed, irrespective of the pressure setting. The maximum speed is set in display 5.3.6 *Maximum speed* (factory setting: 10,700 min⁻¹).
- **Normal.**
Normal operating mode, i.e. pump operation is based on the pressure set in display 5.1.1 *Pressure setting*.
- **Min.**
Pump operation is set to minimum speed, 3,000 min⁻¹, irrespective of the pressure setting.
- **Stop.**
The pump is stopped.

If the on/off button has been used to stop the pump, this button must also be used for restarting.

Relation to other displays:

The "Max." and "Min." settings override the pressure setting in display 5.1.1 *Pressure setting*.

5.1.3 Alarm



TM CU301_1_03 GB

This display shows the types of alarm that may occur.

Possible alarms are described in the following table:

Alarm indication	Description
<i>No fault indication</i>	No alarms are registered by the CU 301.
<i>No contact to pump</i>	No communication between the CU 301 and the pump.
<i>Overvoltage</i>	The supply voltage exceeds the limit value.
<i>Undervoltage</i>	The supply voltage is below the limit value.
<i>Dry running</i>	The dry-running protection of the pump has been activated.
<i>Overtemperature</i>	The motor temperature exceeds the limit value.
<i>Overload</i>	The current consumption of the motor exceeds the limit value.
<i>Sensor defective</i>	The sensor signal has fallen outside the measuring range set. The sensor signal of a 4-20 mA or 2-10 V sensor is below 2 mA or 1 V respectively.

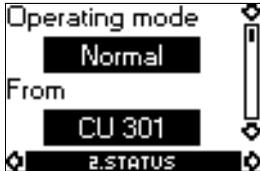
5.2 Menu STATUS

The STATUS menu for the CU 301 provides operating data about pump/motor and sensor. It is not possible to change or set values in this menu.

When [OK] is pressed continuously in this display, the displayed value is being updated.

The measuring accuracy is stated in section 7. *Technical data*.

5.2.1 Operating mode



TM CU301_2_01 GB

Possible operating modes:

- **Max.**
Pump operation has been set to maximum speed, e.g. 10,700 min⁻¹.
- **Normal.**
Normal operating mode, i.e. pump operation is based on the pressure setting made in display 5.1.1 *Pressure setting*.
- **Min.**
Pump operation has been set to minimum speed, 3,000 min⁻¹.
- **Stop.**
The pump has stopped.

The operating mode was selected from one of the following:

- *CU 301* (on/off button on the CU 301).
- *R100*.
- *Sensor* (signals received via the sensor input).

5.2.2 Actual pressure



TM CU301_2_02 GB

The actual system pressure measured by the pressure sensor.

Tolerance: ±1%.

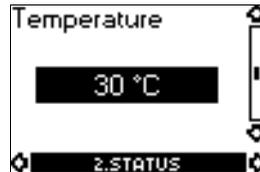
5.2.3 Speed



TM CU301_2_03 GB

The actual speed stated in min⁻¹ (rpm).
Tolerance: ±1%.

5.2.4 Temperature



TM CU301_2_04 GB

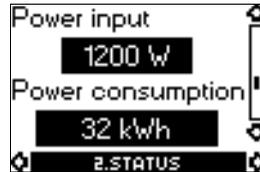
The actual temperature of the motor electronics stated in "°C" or "°F".

Tolerance: ±5%.

Relation to other displays:

To select "F", choose the language "US English".

5.2.5 Power input and power consumption



TM CU301_2_05 GB

Power input:

The actual motor power from the electricity supply. The power input is displayed in W (watt).

Note: This value is used for the calculation of minimum power limit (dry-running stop).

Power consumption:

The accumulated motor power consumption in kWh.

The value of power consumption is accumulated from the pump's birth and it cannot be reset.

The value

- is stored in the motor electronics, and it is kept even if the CU 301 is replaced.
- is updated in the software every 2 minutes of continuous operation. The displayed value is updated every two hours.

Tolerance: ±5%.

5.2.6 Operating hours and number of starts



TM CU301_2_06_GB

Operating hours:

The value of operating hours is accumulated from the pump's birth and it cannot be reset.

The value

- is stored in the motor electronics, and it is kept even if the CU 301 is replaced.
- is updated in the software every 2 minutes of continuous operation. The displayed value is updated every two hours.

Number of starts:

The value of number of starts is accumulated from the pump's birth and it cannot be reset.

The value is stored in the motor electronics, and it is kept even if the CU 301 is replaced.

5.3 Menu INSTALLATION

The INSTALLATION menu for the CU 301 offers the possibility of configuring the CU 301, pump/motor and sensor.

Factory settings are marked in **bold**-faced type under each individual display.

5.3.1 Sensor



TM CU301_3_01_GB

Make the following settings according to sensor type:

- Sensor output signal: "-" (not active), *0-20 mA*, **4-20 mA**, 0-10 V, 2-10 V.

- Setting range unit: **bar**, *psi*.

Setting range, bar:

- Minimum value: **0**.
- Maximum value: 2-6 (2, 2.5, 3, 3.5 ... **6.0**).

Setting range, psi:

- Minimum value: **0**.
- Maximum value: 40-120 (40, 50, 60, 70 ... **120**).

Two CU 301 front covers are available, one for "bar" and another for "psi", i.e. a "bar" front cover can be replaced by a "psi" front cover.

Note: The pressure sensor must be replaced by a sensor measuring the pressure in the actual measuring unit.

When the front cover is replaced, the display 5.3.1 *Sensor* automatically changes from bar to psi or vice versa.

Relation to other displays:

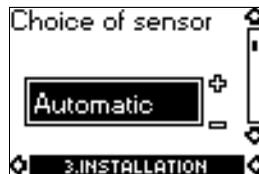
The measuring unit appearing in display 5.2.2 *Actual pressure* will be identical to the measuring unit in the front cover.

Exception: If "Manual" is selected in display 5.3.2 *Choice of sensor*, the sensor can be set, irrespective of the front cover.

If changes are made in display 5.3.1 *Sensor*, the setting in display 5.3.2 *Choice of sensor* is changed to "Manual".

If the original setting is resumed, it is necessary to change the setting in display 5.3.2 *Choice of sensor* from "Manual" to "Automatic".

5.3.2 Choice of sensor



TM CU301_3_02_GB

The following settings are available:

- **Automatic**.
- *Manual*.

Relation to other displays:

If, for some reason, the setting in this display has changed to "Manual" and this is changed to "Automatic", the setting of the displays 5.3.1 *Sensor* and 5.3.3 *Maximum pressure setting* will change to the factory setting.

5.3.3 Maximum pressure setting



TM CU301_3_03_GB

The setting of this display overrules the possibility of using the arrow button on the CU 301 front to increase the pressure to a setting above the "Maximum pressure setting".

The following settings are available:

- 2, 2.5 ... **5.0 bar**.

Relation to other displays:

The setting of this display overrules the possibility of using the display 5.1.1 *Pressure setting* to increase the pressure to a setting above the "Maximum pressure setting".

If the setting is changed from 5.0 bar, the setting in display 5.3.2 *Choice of sensor* changes from "Automatic" to "Manual".

5.3.4 Automatic restart



TM CU301_3_04 GB

Set the automatic restart time from stop, caused by an alarm, to restart attempt.

The following settings are available:

Time:

- **0:05.**
- “–” (not active).
- 1, 2, ... 30 m (1 min. intervals),
30, 45, 1 h, ... 2 h (15 min. intervals),
2 h 30 m, 3 h, ... 4 h (30 min. intervals).

Double:

- Yes.
- **No.**

When “Yes” is selected, the restart time set will be doubled automatically for every 10 motor stops caused by an alarm. The time is doubled up to a stop time of 4 hours. After 10 hours of operation without an alarm, the restart time is automatically set to:

- the time set in the “Time” field or
- 5 min. (factory setting) if no setting was made in the “Time” field.

5.3.5 Dry-running stop



TM CU301_3_05 GB

The dry-running stop value is factory-set.

The value depends on the actual motor.

The factory setting depends on the power rating of the motor.

The following settings are possible:

- Motor type 0.1 to 0.63 kW, dry-running stop = **300 W.**
- Motor type 0.7 to 1.05 kW, dry-running stop = **680 W.**
- Motor type 1.1 to 1.73 kW, dry-running stop = **800 W.**

When the dry-running protection is to be active, the minimum value of the pump power input must be set in this display.

Setting range: 0-2500 W (10 W intervals).

Relation to other displays:

The actual pump power input can be read in display 5.2.5 *Power input and power consumption.*

If the maximum pump speed has been reduced in display 5.3.6 *Maximum speed*, the dry-running stop value must be changed.

5.3.6 Maximum speed



TM CU301_3_06 GB

Set the maximum speed.

Setting range: 3,000-10,700 min⁻¹ (100 min⁻¹ intervals).

Dry-running stop at reduced maximum pump speed:

If the maximum pump speed has been reduced, the dry-running stop value in display 5.3.5 *Dry-running stop* must be changed.

Calculating the minimum power limit:

Note: The calculated value is used in display 5.3.5 *Dry-running stop.*

Note: If the pump is worn, a renewed calculation of the minimum power limit may be required.

Step	Action
1	Start the pump against closed discharge valve.
2	Read the power input (P_1) in display 5.2.5 <i>Power input and power consumption.</i>
3	Calculate the minimum power limit as follows: Power limit [W] = $P_1 \cdot 0.9$.

5.3.7 Buttons on CU 301



TM CU301_3_07 GB

The buttons on the CU 301 can be set to:

- **Active.**
- *Not active.*

5.3.8 Indication of pump operation



TM CU301_3_08 GB

The following settings are available:

- **Running light.**
- *Constant light.*

5.3.9 Number



TM CU301_3_09 GB

Allocate a number to the CU 301 and the pump connected. The CU 301 and the pump must have the same number.

Setting range: "–" (not active), 1, 2, ... 64.

Once a number setting has been made, the factory setting (not active) is no longer available.

If the CU 301 and the pump do not have the same number, the alarm "No contact to pump" will be indicated.

6. Fault finding

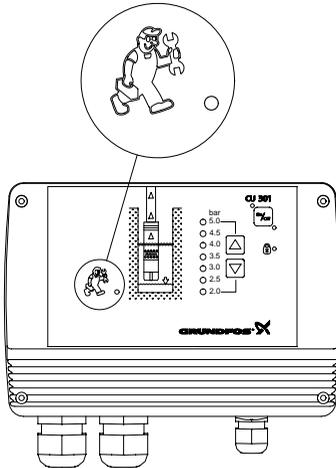


Before starting any work on the CU 301, make sure that the electricity supply has been switched off and that it cannot be accidentally switched on.

6.1 Service

The CU 301 continuously receives operating data from the pump. In case of an alarm, the service indicator light is permanently on, see fig. 17.

Fig. 17



The service indicator light will be permanently on if one of the following alarm situations occurs:

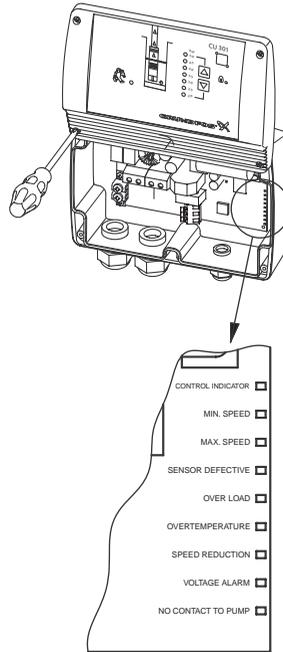
- Sensor defective.
- Overload.
- Overtemperature.
- Speed reduction.
- Voltage alarm.
- No contact to pump.

To identify the cause of the service alarm, it is necessary to remove the front cover from the CU 301. Fit the front cover as shown in fig. 18 to avoid disconnecting the multi-core cable.

A number of LEDs are mounted on the supply board inside the CU 301, see section 4. *Position of LEDs and fuse.*

Fig. 18 shows the LEDs and the alarm texts on the supply board.

Fig. 18



TM01 8327 4701

TM01 8435 1703

Fault	Possible cause	Remedy
1. No light in the front cover.	a) The multi-core connection is misplaced or defective.	<ul style="list-style-type: none"> • Is the control indicator LED flashing? If not, the CU 301 is defective. • Check that the multi-core cable connection is OK. If so, the CU 301 is defective.
2. The pump does not start. The green indicator light in the on/off button is on. No alarm is indicated.	a) The CU 301 or the pump is defective.	<p>Check</p> <ul style="list-style-type: none"> • that the control indicator LED is flashing. If not, the CU 301 is defective. • that the system pressure is 0.5 bar below the pressure setting. If so, the pump is supposed to start. Open a tap to be sure. If the pump starts, the system is probably OK. The system pressure can be read on the pressure gauge. • See point 13. to check the pressure sensor. <p>If the pump has not started yet, proceed as follows:</p> <ul style="list-style-type: none"> • Press the on/off button for 5 seconds. If the pump starts, the CU 301 or the sensor may be defective. Note: The pressure is not controlled and may rise to a high level.
3. The pressure is not constant.	a) The pump is not of the correct type or the precharge pressure of the diaphragm tank is incorrect.	<p>Check</p> <ul style="list-style-type: none"> • that the LED for Max. speed or Min. speed is on. If so, this indicates that the pump has reached a limit. See section <i>1.3 System sizing</i>. Replace the pump, if necessary. • the precharge pressure of the diaphragm tank. Note: Remember to stop and drain the system before the pressure is checked. • whether the sensor is positioned far away from the tap. If so, the pressure variations may be caused by friction losses, see section <i>1.4 Positioning the pressure sensor</i>.
4. The pump is running continuously.	a) The pump cannot deliver the pressure set. The CU 301 or the sensor is defective.	<ul style="list-style-type: none"> • Try to lower the pressure set, see section <i>1.3 System sizing</i>. Note that the pump may run for about 15 to 20 seconds before it stops. • Check that the control indicator LED is flashing. • Check that the pipe end of the sensor is not blocked. If so, remove the blockage. • Try to stop the pump by means of the on/off button. If this is not possible, the CU 301 is defective. Replace the CU 301. • See point 13. to check the pressure sensor.

(continued on the following pages)

5. The CU 301 indicates "No contact to pump".	a) The motor is not an MSE 3.	If the pump has already worked satisfactorily with a CU 301 or a CU 300, the motor can be expected to be an MSE 3. There is no technical way of determining the motor type. The only way is to read the nameplate engraved in the motor sleeve.
	b) The pump cable is longer than 200 metres.	Reduce the length of the pump cable.
	c) Cable breakage.	Switch off the mains supply to the CU 301. Switch on the mains supply again. The pump is now connected direct to the mains supply without interference from the CU 301. Does the motor start? Yes: The cable is OK. Go to point d). No: Switch off the mains supply again. Remove cable and cable plug from the motor and carry out megging of cable complete including plug. Is the cable OK? Yes: The motor is defective. Replace the motor. No: Replace the cable.
	d) Cross communication with adjacent CU 301.	If another CU 301 is installed: <ul style="list-style-type: none"> • Insure each unit has a unique number assigned. See section 5.3.9 <i>Number</i>. • If pump cables run parallel to each other, physically separate them by 12-14 inches or rewire using shielded cable.
	e) The CU 301 communication part is defective.	Are the three CU 301 supply board LEDs in pos. 2, 3 and 4 on and is the control indicator LED flashing? See section 4. <i>Position of LEDs and fuse</i> . Yes: <ul style="list-style-type: none"> • The mains supply is OK. • Give the system a new number. If this does not work, the CU 301 or the motor communication part is defective. Replace the CU 301 and give the new system a number between 1 and 64 in order to obtain correspondence between the numbering of the SQE pump and the CU 301. Note: Two systems on the same mains supply must not have the same number! Is the LED "No contact to pump" of the new CU 301 also on? Yes: The CU 301 is OK. Go to point e). No: The CU 301 which was removed is defective.
	f) The MSE 3 motor communication part is defective.	As a consequence of the above-mentioned checks, replace the MSE 3 motor.
6. Even AFTER replacement, the CU 301 indicates "No contact to pump".	a) Numbering of SQE pump and CU 301 is different.	If an SQE/CU 301 system has been given a number, this number is stored in both the SQE and CU 301. A new CU 301 will probably not have a number corresponding to the number stored in the SQE. Therefore, "No contact to pump" is indicated even if there is no fault. Give the new system a number between 1 and 64 in order to obtain correspondence between the numbering of the SQE pump and the CU 301. Note: Two systems on the same mains supply must not have the same number!

7. The CU 301 indicates "Over-voltage" or "Undervoltage".	a) The supply voltage is unstable or outside the voltage range specified for the installed motor type.	Check - possibly over a period of time - that the supply voltage is according to the values below. A. Motor type 0.1 to 0.63 kW / 0.3 to 0.5 hp = 190 - 320 V. B. Motor type 0.7 to 1.05 kW / 0.5 to 0.7 hp = 190 - 320 V. C. Motor type 1.1 to 1.73 kW / 1.0 to 1.5 hp = 210 - 320 V. Note: As the voltage is detected at the motor, allow for the voltage drop in the pump cable.
8. The CU 301 indicates "Dry running".	If the power consumption is lower than the dry-running stop setting for an accumulated period of 5 seconds, the pump will be stopped.	
	a) The pump performance is too high for the bore-hole yield.	Replace the pump with a smaller pump or reduce the pump performance.
	b) The well screen is blocked.	Check the well capacity and restore water supply to the well.
	c) The dry-running stop setting is incorrect.	Check and correct the setting, see section 5.3.5 <i>Dry-running stop</i> .
9. The CU 301 indicates "Speed reduction" and "Undervoltage".	Speed reduction is activated so as to maintain a reduced performance. When the supply voltage falls so low that it can no longer supply the necessary current to maintain 3,000 min ⁻¹ , the pump will be stopped.	
	a) The supply voltage is unstable or lower than the voltage range specified for the installed motor type.	Restore correct supply voltage.
	b) The pump is not of the correct type.	Install correct pump type.
	c) The voltage drop in the pump cable is too big.	Replace the pump cable.
10. The CU 301 indicates "Speed reduction" and "Overload".	Speed reduction is activated so as to maintain a reduced performance.	
	a) The pump is worn or blocked.	The pump must be serviced.
	b) The pump is too large for the installed motor.	Replace pump or motor.
11. The CU 301 indicates "Over-temperature".	The temperature sensor in the motor is sensing a temperature above the values below: A. Motor type 0.1 to 0.63 kW / 0.3 to 0.5 hp = 65°C. B. Motor type 0.7 to 1.05 kW / 0.5 to 0.7 hp = 75°C. C. Motor type 1.1 to 1.73 kW / 1.0 to 1.5 hp = 85°C.	
	a) Insufficient cooling of the motor.	Restore correct cooling of the motor. The flow velocity past the motor should be at least 0.15 m/s.
12. The CU 301 indicates "Overload".	a) The pump is worn or blocked.	The pump must be serviced.
	b) The pump is too large for the installed motor.	Replace pump or motor.

13. The CU 301 indicates "Sensor defective".	a) The pressure sensor is defective.	<p>Check that the sensor is installed correctly.</p> <p>Check that the R100 setting of the sensor is correct, see section 5.3.1.</p> <p>Check that the R100 setting of the sensor is correct.</p> <p>If the sensor type is 4-20 mA, measure the signal current. If the current is above 2 mA, the sensor and wiring are OK. If the current is below 2 mA, the sensor or wiring is defective.</p> <p>Replace defective parts.</p> <p>Are the LED "Sensor defective" and the LED, pos. 1, on? See section 4. <i>Position of LEDs and fuse.</i></p> <p>Yes: The total load of 24 VDC from terminal 5 is above 100 mA. Disconnect the sensor in order to determine if it is defective. Replace defective sensor.</p> <p>No: The load is OK, but the CU 301 sensor input may be defective.</p>
14. The pump is operating on/off.	a) No communication.	<p>Check that the LED "No contact to pump" is on.</p> <p>If so, the control unit CU 301 starts and stops the pump, based on the sensor signal only. The CU 301 has to be reset every 250 stops.</p> <p>Refer to fault no. 5 for remedy.</p>

7. Technical data

Supply voltage

1 x 100-240 V -10%/+6%, 50/60 Hz, PE.

Power consumption

5 W.

Back-up fuse

Maximum 16 A.

Current consumption

Maximum 130 mA.

Mains borne signalling

Frequency shift keying (FSK).

(132.45 kHz, ±0.6 kHz).

Enclosure class

IP 55.

Maximum length between CU 301 and pump

200 metres.

Ambient temperature

- During operation: -30 to +50°C (must not be exposed to direct sunlight).
- During storage: -30 to +60°C.

Weight

2.0 kg.

Relative air humidity

Maximum 95%.

Materials

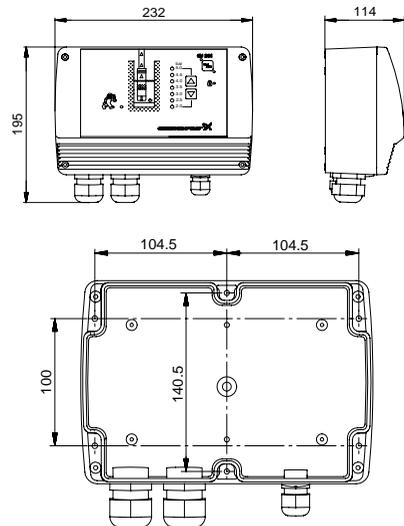
The CU 301 box is made of black PPO.

EMC (electromagnetic compatibility)

According to EN 55 014 and EN 55 014-2.

Dimensional sketch

Fig. 19



Sensor input

External sensor

Voltage signal:

0-10 VDC/2-10 VDC, $R_i = 11 \text{ k}\Omega$.

Tolerance: ±3% at maximum voltage signal.

Screened cable is recommended.

Maximum cable length: 500 m.

Current signal:

DC 0-20 mA/4-20 mA, $R_i = 500 \Omega$.

Tolerance: ±3% at maximum current signal.

Screened cable is recommended.

Maximum cable length: 500 m.

TM01 7842 4999 / TM01 7864 4999

Factory settings

Alarm	200-240 V motors			100-115 V motors
	0.1 - 0.63 kW	0.7 - 1.05 kW	1.1 - 1.73 kW	0.1 - 0.63 kW
Sensor defective	4-20 mA (the value is stored in the CU 301)			
Overload	5 A	8 A	11 A	11 A
Overtemperature	Stop limit: 65°C	Stop limit: 75°C	Stop limit: 85°C	Stop limit: 85°C
	Restart: 55°C	Restart: 65°C	Restart: 75°C	Restart: 75°C
Speed reduction	In connection with undervoltage or overload			
Overvoltage *)	320 VAC	320 VAC	320 VAC	185 VAC
Undervoltage	Speed reduction: 190 V	Speed reduction: 190 V	Speed reduction: 210 V	Speed reduction: 90 V
	Stop limit: 150 V	Stop limit: 150 V	Stop limit: 150 V	Stop limit: 75 V
Dry running	300 W	680 W	800 W	300 W

*) 200-240 V motors: Operation is guaranteed up to 280 VAC.

100-115 V motors: Operation is guaranteed up to 150 VAC.

In order to avoid unnecessary stops, the overvoltage stop limit is as stated.

Accuracy of R100 readings

Operation

Display	Accuracy
5.2.2 Actual pressure	±0.1 bar
5.2.3 Speed	±1%
5.2.4 Temperature	±5%
5.2.5 Power input and power consumption	±5%

Sensor

The sensor signal accuracy depends on the sensor type. See the sensor specifications in question.

7.1 Electrical connection

The supply voltage and frequency are marked on the nameplate. Make sure that the CU 301 is suitable for the electricity supply on which it will be used.

The CU 301 has two terminal blocks:

- Screw terminals 1 to 4.
- Spring terminals 5 to 7.

Furthermore, the CU 301 is equipped with two screw terminals for the protective earth leads (PE).

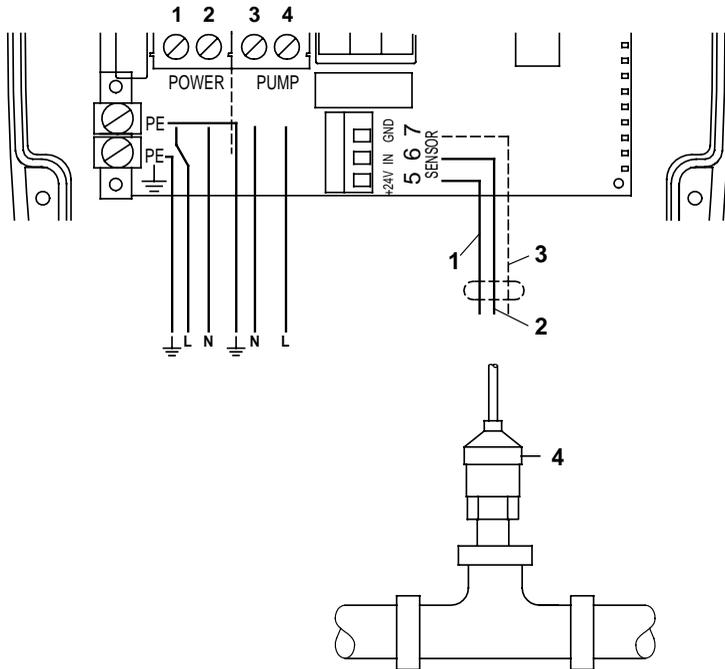
The CU 301 is supplied with special gaskets for the Pg cable entries. The special gaskets are suitable for flat cables and single-core cables.

Never make any connections on the CU 301 terminal block unless the electricity supply has been switched off. The CU 301 must be connected in accordance with the local rules and standards in force for the application in question.



The on/off button on the CU 301 must not be used as a safety switch when installing and servicing the pump.

Fig. 20



Legend:

Pos.	Description
1	Standard pressure sensor. + 24 VDC, brown lead, terminal 5.
2	Standard pressure sensor. Input signal, black lead, terminal 6.
3	Standard pressure sensor. Screen, terminal 7.
4	Standard pressure sensor.

7.1.1 Mains supply

POWER, terminals 1, 2 and PE:

Connect terminals 1 and 2 to the phase and neutral leads of the mains supply. Each terminal can be connected to any of the two leads.

Connect the PE terminal to the green/yellow earth lead. Each PE terminal must be connected to an earth lead of its own.

Maximum cross-section of the leads to be connected is 6 mm².

Back-up fuse: Maximum 16 A.

Note: The leads of the mains supply must not be connected to terminals 3 and 4 (PUMP).

7.1.2 Pump supply

PUMP, terminals 3, 4 and PE:

Connect terminals 3 and 4 to the phase and neutral leads of the pump. Each terminal can be connected to any of the two leads.

Connect the PE terminal to the green/yellow earth lead. Each PE terminal must be connected to an earth lead of its own.

Maximum cross-section of the leads to be connected is 6 mm².

7.1.3 Pressure sensor

SENSOR, terminals 5, 6 and 7:

Terminals 5, 6 and 7 (SENSOR) are used for the pressure sensor.

Sensor signals:

The sensor to be connected must give signals within one of the following ranges:

- 0-10 V.
- 2-10 V.
- 0-20 mA.
- 4-20 mA.

Changeover between current and voltage signals is carried out by means of the R100.

Important!

The total load of terminal 5 (+24 VDC) must not exceed 100 mA.

TM01 7720 4999

Subject to alterations.

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