SMART PUMP

MULTIZONE INSTALLATION & START UP MANUAL



COMMERCIAL FLOW CENTER

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ALL THE PUMP YOU NEED AND MORE

System Introduction-

For the applications that require a little more than it's Multizone cousin can provide, the all new Smart Pump Multizone utilizes the latest in Variable Speed Technology. Designed for the high end residential or commercial applications, the Smart Pump Multizone can be used with single phase power to keep things simple. With no added controls to complicate your system the Smart Pump Multizone is very user friendly and is easily adjustable and customized for your source side geothermal systems.

Efficient Operation-

When you look at pump motor efficiency you will notice the smaller motor the less efficient its operation. The Smart Pump Multizone utilizes efficient motor technology with its one single motor. In fact less horse power will be used with a single pump/ motor combination verses several small circulators for your Multizone heat pump system.

Installation Simplicity-

With only one pump and motor to install contractor installation time is reduced. All the work consists of setting the GT canister, mounting the pump to the provided flange, mount the motor to the pump, mount the variable speed drive unit on the adjacent wall and the electrical power. Its that simple your system will be ready to run.

Competitive Installed Costs-

When you look at the cost of purchasing and installing several pumps switching to the Smart Pump Multizone will save more than just energy.

Maintenance Simplicity-

The Smart Pump Multizone utilizes one of the industries most popular in-line circulators. This bullet proof pump is very reliable however in the event of a pump failure parts and qualified technicians are readily available.

Sealable Lid –

Provides for a closed sealed system while allowing for ease of access to sample fluid and measure flow rate.

Inlet Connection -

Stainless Steel MPT connection provided as standard, with various transitions available upon request. Size based on canister size (see chart).

Check Valve -

A check valve is provided before the pump assuring proper flow and reliable pump operation.

Canister –

Provides a standing column of water on the suction side of the pump to insure a flooded volute and reliable pump operation. Size required is based on max load design flow rate (see chart).

Optional Isolation Valve –

An isolation valve is available on the pump discharge for ease of maintenance(not shown).

Variable Speed Pump Control -

The Smart Pump Drive is robust and designed to operate in some of the harshest conditions.

Insulation -

3/8" Armaflex insulation factory provided to prevent condensation.

Dimensions-



Smart Pump Multizone Dimensions (in.)					
Size	MAX FLOW (gpm*)	Н	D	P (IPT)	Volume (gal)
С	130	70	12	3	20.8
D	180	70	14	4	29.5



PRODUCT DATA

Performance Curve-



Pump Information-

Pump Model	Nominal Flow Rate	Max Efficiency %	Flow Range (GPM)
CR 10	55	70	5-70
CR 15	95	72	9-125
CR 20	115	72	11-155
CR 32	140	76	14-180
CR 45*	180	78	22-180

*Performance curve not shown on chart above.



INSTALLATION

Installation Guidelines & Procedures for B & D MFG, INC Smart Pump Multizone Flowcenter

SAFETY INSTRUCTIONS

This safety alert symbol will be used in this manual to draw attention to safety related instructions. When used, the safety alert symbol means: ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED! FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN A SAFETY HAZARD.

WARNING: Electrical Shock and potential circuit damage. Disconnect power supply before begining installation. Failure to follow these instructions could result in serious personal injury or death and property

WARNING: Improper wiring and wire can cause electrical shock and fires. Wiring connections must be made in accordance with all applicable electrical codes and ordinances. Use copper wire only. Failure to

Electrical Service & Connections- 🦺

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The Smart Pump Multizone Flow Center requires a dedicated, 240 volt single or three phase circuit. Wire and fuse sizes shall be accordance with Local Codes and that of the National Electric Code. Low voltage wiring must be isolated from primary voltage lines and connections

Flowcenter Canister Placement Requirements-

A level location with 36" of clearance around the canister is <u>required</u>. This allows enough room to hook-up the CR series pump and associated piping. An allowance for 36" of clearance on the top of the canister (between lid and ceiling) for insertion of an optional flow meter tool and system fluid access.



CU 321 Variable Speed Drive Placement-

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.



ALL THE PUMP YOU NEED AND MORE

Installation Recommendations-

- It is recommended that an isolation valve be installed on the discharge side of the pump. This will allow for more ease of service and can also aid in the start up procedures.
- All Pipe, valves and fittings should be at least the same diameter as the discharge pipe or sized in accordance with good piping practices to reduce excessive fluid velocities and pipe friction losses.
- Before the pump is installed it is recommended that the discharge piping be pressure checked to at least 40 psi or as required by codes or local regulations.
- Whenever possible, avoid high pressure loss fittings, such as elbows or branch tees.
- It is recommended that the discharge pipe is 10 pipe diameters in length before the nearest fitting.
- The piping should be adequately supported to reduce thermal and mechanical stresses on the pum
- Good installation practice recommends the system be thoroughly cleaned and flushed of all foreign materials and sediment prior to pump installation.

Warning: Be sure to anchor piping properly as two-way control valves may cause water hammer resulting in excessive pipe movement. Possible pump and pipe damage may occur of the system is not properly anchored.

Motor/Pump Assembly-

- 1. Remove key from motor shaft, if present, and discard.
- 2. Thoroughly clean the surfaces of the motor and pump end mounting flange. The motor and shaft must be clean of all oil/grease and other contaminants where the coupling attaches. Set the motor on the pump end.
- 3. Place the terminal box in the desired position by rotat ing the motor.
- 4. Insert the mounting bolts, then diagonally and evenly tighten. For 3/8" bolts (2 HP), torque to 17 ft.-lbs., for 1/2" bolts (3 to 5 HP) torque to 30 ft.-lbs.

The following instructions are specific for the pump noted. Please take note of the pump being installed. Pump model is designated as CR #-# (i.e. CR10-2)

CR 5-

- 1. Insert shaft pin into shaft hole. Reinstall the coupling halves onto shaft and shaft pin.
- 2. Reinstall the coupling screws and leave loose. Check that the gaps on either side of the coupling are even, and that the motor shaft keyway is centered in the coupling half, as shown in Figure 6a.
- 3. Tighten the screws to the correct torque (62 ft.-lbs.).

CR 10, 15 & 20-

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- 1. Insert shaft pin into shaft hole. Insert plastic shaft seal spacer beneath shaft seal collar. Reinstall the coupling halves onto shaft and shaft pin.
- 2. Reinstall the coupling screws and leave loose. Check that the gaps on either side of the coupling are even and that the motor shaft key way is centered in the coupling half, as shown in Figure 6a.





CR 10, 15 & 20-(Continued)

- 3. Tighten the screws to the correct torque.
- 4. Remove plastic shaft seal spacer and hang it on inside of the coupling guard.

CR 32 & 45-

- 1. Place the plastic adjustment fork under the cartridge seal collar (see Figure 7).
- 2. Fit the coupling on the shaft so that the top of the pump shaft is flush with the bottom of the clearance chamber in the coupling (see Figure 8).
- 3. Lubricate the coupling screws with an anti-seize and lubricating compound. Tighten the coupling screws (finger tight) while keeping the coupling separation equal on both sides and the motor shaft keyway centered in the coupling half as shown in Figure 6a.
- 4. When the screws are tight enough to keep the couplings in place, then torque the screws evenly in a crisscross pattern. Torque coupling screws to 62 ft.-lbs.
- 5. Remove the adjustment fork from under the cartridge seal collar and replace it to the storage location (see Figure 9).
- 6. Check to see that the gaps between the coupling halves are equal. Loosen and readjust, if necessary.
- 7. Be certain the pump shaft can be rotated by hand. If the shaft cannot be rotated or it binds, disassemble and check for misalignment.









Warning: CFC Multizones are a nonpressurized unit and should never be pressurized for any reason

ELECTRICAL WIRING INFORMATION

Electrical Installation

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

WARNING: THE VOLTAGE OF THE CU A

321 IS DANGEROUS WHENEVER THE DRIVE IS CONNECTED TO AC POWER. **INCORRECT INSTALLATION OF THE** MOTOR OR DRIVE MAY CAUSE DAMAGE TO THE EQUIPMENT, SERIOUS INJURY OR DEATH. COMPLY WITH SAFETY INSTRUCTIONS IN THIS MANUAL AS WELL AS LOCAL AND NATIONAL SAFETY REGULATIONS. TOUCHING ELECTRICAL PARTS MAY **BE FATAL EVEN AFTER EQUIPMENT** HAS BEEN DISCONNECTED FROM THE AC POWER. WAIT AT LEAST 4 MINUTES FOR CURRENT TO DISSIPATE.

CU 321 Mains Wiring

The Smart Pump Variable Speed drive is capable of taking standard single phase 230 volt power and converting it to 3 phase power to run the Grundfos ML motor. Single phase 230 volt power shall be connected to terminals L1 and L2 as shown in figure 1a.

The drive has a high leakage current and must be grounded properly for safety. Keep all grounding cables as short as possible. Follow all local and national safety regulations.

Motor Wiring

All Grundfos ML motors are 3 phase motors capable of running on either 208-230 voltage or 460 voltage. B&D's Smart Pump Multizone must be wired for low voltage 208-230 volt power. Remove wire box cover and follow the wiring schematic for LOW VOLTAGE as the CU 321 variable speed drive will provide 3 phase 208 voltage to the motor. Take extra precaution as all the wires are color coded and are labeled with appropriate numbers. Wire connections L1, L2 and L3 are to be connected to the CU 321 variable speed wires. The "L" connections shall be connected to the drive as follows L1-U, L2-V, L3-W figures (1a & 1b) Follow the wiring diagram on the motor label for the correct motor wiring combination which matches 230 supply voltage. Once this has been confirmed, reconnect the power supply wiring to the motor. Check the direction of rotation, by bump-starting the motor. Rotation must be left to right (counter-clockwise) when looking directly at the coupling. Shut off the power, then re-install the coupling guards. After the coupling guards have been installed the power can be turned back on.

Pressure Transducer Wiring

The pump mounted pressure transducer shall be wired on the control terminal block on posisions 12 and 60. (See figure 1c.) Sensor wire color Brown = 12 Black = 60.











Figure 1c



SYSTEM START UP PROCEDURE

Pump & Valve Positions-

- 1. Close the isolation valve on discharge side of the pump and the isolation valves on the outlet of each heat pump.
- 2. Manually open all 2-way control valves at each heat pump. (Valves to remain open temporarily until a later time.)
- 3. Fill the Multizone canister with water up to the elbow of the dip tube. An adequate supply of water will be needed to add to the system as necessary on start up.
- 4. Open the priming plug on the pump head (See Figures 1a) until a steady stream of airless water runs out the priming port. Close the plug and securely tighten.
- 5. Remove the coupling guard and rotate the pump shaft by hand to be certain it turns freely. Replace coupling guard once proper shaft movement has been established.







CU321 Control Panel



Figure 1a

Power Supply & Smart Pump Drive-

- 1. Turn power supply "ON" to the wall mounted CU321 (Variable Frequency Drive).
- 2. Press the "on" switch located on the CU321, this will activate the drive system. Be sure the setting is at '5'.
- 3. Allow the pump to dead head against the closed discharge valve for at least one minute to ensure water is forced against the seal face.
- 4. Slowly open discharge side valve to the QUARTER OPEN POSITION.
- 5. Slowly open a heat pump outlet valve. It is recommended the furthest heat pump in the system be opened first.
- 6. Run the pump until there is a steady stream of water returning back to the Multizone Canister.
- 7. Once steady return water has been established, open pump discharge side valve to FULL OPEN POSITION.

Warning: BE SURE THE MULTIZONE CANISTER DOES NOT RUN OUT OF WATER

Warning: BE SURE THE CU321 STARTS UP AT "5" OR IT MAY LOCK OUT ON ERROR

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System Start Up Procedure

Proper Smart Pump Drive Setting-

- 1. Continue to open heat pump outlet side valves ONE AT A TIME to purge each line separately.
- 2. Once all the heat pump outlet valves are open, the pump shall be run long enough to properly purge the entire system of air and debris. Any remaining trapped air or debris will allow false system settings to occur.
- 3. Start at "5" on the CU321 display, press the up arrow till the number displayed is"15".
- 4. Note the sound of the motor as the indicated number was increased to 15. The audible sound of the motor should have changed as the drive increased the speed. It is important to note how the motor sounds when the speed is increased as this will help indicate the system setting.
- 5. Increase the CU321 display to indicate "20" by pressing the up arrow. Again note the audible sound of the motor as the drive increases the speed.
- 6. Continue to increase the indicated number on the CU321 by pressing the up arrow as the drive setting will be adjusted in increments of "5". Once it is noted that the audible sound of the pump no longer INCREASES, the system setting has been found. (Example: If the CU321 is increased from 30 to 35 and there is no audible sound difference in the motor from 30 to 35; 30 will be the system setting.)
- 7. Balance the flow rate of each heat pump allowing pressure drop for all circuits to be equal.
- 8. Once heat pumps are adjusted with proper flow repeat steps 3-6 to ensure the proper setting is found.

Manual Valve Manipulation/Stop Function-

- Once the system setting has been found on the CU321, close the heat pump outlet side valves ONE AT A TIME. A difference in speed should be noticed by the audible sound of the pump motor as valves are closed. NOTE: On a larger system such as 3 horse power and bigger. A few heat pump outlet valves may need to be closed before a noticeable change in motor speed occurs.
- 2. After all heat pump outlet valves have been closed the CU321 will sense the system "dead head" occurrence and shut the pump motor off. The "Power Down" function shall happen almost immediately after all heat pump outlet valves have been closed. If the CU321 does not power down one of the following could be the cause.
 - -The system setting could be wrong
 - -Trapped air in the system
 - -Valve and/or fitting leakage

Note: It may take 24-48 hours for all the air to be purged from a piping system to allow effective pump operation.

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System Checks

- 1. Once the system setting has been established and the CU321 adjusts/reacts to heat pump outlet valves opening and closing the system is ready to operate on its own.
- 2. Return each heat pump 2-way control valve to its normal operating setting so it is allowed to open and close based on heat pump status.
- 3. Monitor the system as it reacts to the heat pump 2-way control valves. It is recommended that each heat pump shall manually meet its set point to allow the 2-way control valve to close ensuring they provide a 100% off position allowing the CU321 to Power Down
- 4. Once all the set up procedures and test have been performed, the Smart Pump Multizone can now operate as a self contained system.

Note: Use good quality 2-way control valves that will provide a 100% closed seal with no leakage.





Note: Be sure the system is purged of air before adjusting Smart Pump Drive Speed.



4.2 Normal operation

Press n to enable the pump.

The pressure setpoint can be changed during normal operation.

Press () to increase the pressure setpoint.

Press 👿 to decrease the setpoint.

Press off/ Reset 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 <u>refer</u> 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 1 and 2			
Running				
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 applicationrelated 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.





WARNING!

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		
	One fuse in the installation is blown/ tripped out.	Replace/cut in the fuse. Check that the electricity supply falls within the specified range.		
No light in the	Faulty electricity supply.	Check that the electricity supply corresponds to the specified voltage range.		
display.	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	If the display is flashing, the pump is stopped, either due to a stop command from the from 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.		
running.	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. Pressure sensor voltage chart.		
	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 System sizing. Replace the pump, if necessary.		
The pressure is not constant.	The pressure sensor is positioned too far away from the tap.	Reposition the pressure sensor, see section 1.5 Positioning the pressure sensor.		
	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 may be defective.	Check the pump.		
	The pump cannot deliver the set pres- sure.	Lower the pressure setting; note that it takes about 15 to 25 seconds before the pump stops.		
The pump is running continu-	The pressure sensor is defective.	Check that the pressure port of the sensor is not blocked. If so, remove the blockage.		
ously.	The CU 321 is defective.	Try to stop the pump by pressing the mean but- ton. If that is not possible, the CU 321 is defec-		



5.4 Warning and alarm codes

		Status of the alarm			
Code	Description	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	х	
5	Voltage warning high	x			
6	Voltage warning low	×			
7	Overvoltage		х		
8	Undervoltage		x		
9	Overload			x	
12	Current limit	х			
13	Overcurrent			х	
14	Ground fault			x	
15	Internal fault			х	
16	Short-circuit			х	
35	Inrush fault		x	2010	
36	Overtemperature	x	x		
37-45	Internal fault		x	х	
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, press

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	



5.5 Description of warning and alarm codes

Code	LED	Description	
	2	Sensor output out of range	
2	9	The current signal on terminal 60 is below 4 mA.	
	×	The pump will stop in case of warning 2.	
		AC line phase fault	
		Missing mains phase on AC line supply side.	
4		Check the supply voltage to the CU 321.	
		(This fault is only active in 3-phase 5 hp CU 321).	
		Voltage warning high	
		If the voltage is higher than the Voltage warning high limit, the CU 321 will give a warning and the motor will continue to operate unchanged.	
5	low	The Voltage warning high limit is: 285 VAC.	
5	Yel	Check whether the supply voltage matches the rating of the CU 321, see section 6. Technical data.	
		Note: An alarm code 7 (overvoltage) will occur if the voltage remains above the Voltage warn ing high limit for a fixed period of more than 5 seconds.	
		Voltage warning low	
		If the voltage is lower than the Voltage warning low limit, the CU 321 will give a warning and the motor will continue to operate unchanged.	
	9 Yellow	The Voltage warning low limit is: 170 VAC.	
9 Yello		Check whether the supply voltage matches the rating of the CU 321, see section 6. Technica data.	
		Note: An alarm code 8 (undervoltage) will occur if the voltage remains below the Voltage warning low limit for a fixed period of more than 5 seconds.	
		When the CU 321 is switched off, warnings 6 and 8 are displayed briefly.	
		Overvoltage	
			If the voltage is higher than the Overvoltage limit, the CU 321 will cut out until the voltage falls below the Overvoltage limit.
7	Re	Note: An alarm code 7 (overvoltage) will occur if the voltage remains above the Overvoltage limit for a fixed period of more than 5 seconds. The time depends on the unit and is factory-set to 5 seconds.	
		Voltage warning high (warning 5) will be able to generate an alarm 7.	
		Undervoltage	
		If the voltage is lower than the Undervoltage limit, the CU 321 will cut out until the voltage once more rises above the Undervoltage limit.	
		Check the supply voltage to the CU 321, see section 6. Technical data.	
8	Red	Note: An alarm code 8 (undervoltage) will occur if the voltage remains below the Under- voltage 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: Voltage warning low (warning 6) will be able to generate an alarm 8.	
		Overload	
9	Red	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.	
12	rellow	Current limit The output current is greater than the max. value allowed by the CU 321.	



Code	LED	Description
		Overcurrent
	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.
13	ed an yellow	Check that the correct pump has been installed and that the CU 321 is programmed accordingly.
	£ ,	If OK, switch off the CU 321 power, disconnect motor leads and measure winding resistance, looking for short-circuits between windings or ground.
		If motor windings are OK, inspect pump and motor ensuring that both spin freely.
	-	Ground fault
14	ellow	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.
	Я. Ж	Switch off the CU 321 power, disconnect motor leads and measure winding resistance, look- ing for short-circuits between windings or ground.
	pu »	Internal fault
15	Red a yellor	Internal fault in the CU 321 (internal supply). Contact your Grundfos supplier.
		Short-circuit
	pu »	There is a short-circuit on the motor terminals of the CU 321 or in the pump motor.
16	Red a yello	Switch off the CU 321 power, disconnect motor leads and measure winding resistance, look- ing for short-circuits between windings or ground.
		The CU 321 is not destroyed by a short-circuit.
35 Sed and Vellow	pu »	Inrush fault
	Red a yello	This alarm appears when line voltage has been applied to the CU 321 more than twice in one minute.
	F	Overtemperature
	Tielan	(internal temperature measurement)
	uring a	The CU 321 gives a warning if the temperature inside the box goes too high. The motor con- tinues to operate unchanged. The CU 321 will stop operating if the temperature continues to rise.
	red d	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).
36	bu	The following can cause the temperature to rise:
35.76	arn	Ambient temperature too high.
	N D	Motor cable too long.
	-ULI	 AC line voltage too high.
	p v	Dust covering the fan in the CU 321.
	Yellow	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 tem- perature when the max. speed is reduced.
	P.a	Internal fault
37-45	Red ar yellov	Internal fault in the CU 321. Contact your Grundfos supplier.
		Dry run
79	ted	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 gen erated.
1343	Ω.	The dry-run alarm will reset in 30 minutes if automatic reset is selected.
		If the power consumption is low and the pump speed is at maximum speed, a dry-run alarm is generated.



Surroundings

CU 321	3 hp, 1- and 3-phase 5 hp, 3-phase	5 hp, 1-phase
Enclosure (CU 321 unit)	NEMA 0	NEMA 1
Enclosure with fitted NEMA 1 kit	NEMA 1	-
Max. relative air humidity	939	%
Ambient temperature	Max. 1	13°F
Min. ambient temperature during full-scale operation	32°	F
Temperature during storage/transport	Min. – Max. 1	13°F 60°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.

Safe guards

- 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.

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. 18. "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.

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

Subject to alterations.



MEASUREMENT AND TESTING

Motor Winding Resistance (lead to lead)

To check the electrical condition of the motor windings, a winding resistance check with an ohmmeter is required.

Instructions

- 1. Turn the POWER OFF.
- 2. Disconnect all electrical leads to motor.
- 3. Set the scale selector in the ohmmeter to R x 1 (if you expect ohm values under 10) or R x 10 (for ohm values over 10).
- 4. Touch the leads to the ohmmeter to two motor leads. Touching the leads of the ohmmeter to any hot two leads will measure that winding's resistance. Repeat for all three possible lead combinations (L1 and L2; L2 and L3; L1 and L2)
- 5. Watch the ohmmeter scale and compare this figure with the appropriate chart.

Evaluation

If all ohm values are normal, the motor windings are neither shorted nor open. If any one ohm value is less than normal, that motor winding may be starting to short. If any one ohm value is greater than normal, the winding may be starting to open. If some ohm values are greater than normal (more than 25%), the leads may be connected incorrectly.



Insulation Resistance (lead to ground)

- 1. Turn POWER OFF.
- 2. Disconnect all electrical leads to motor.
- 3. Set the scale selector on the megohimmeter to R x 100, touch its leads together and adjust the indicator to zero.
- 4. Touch the leads of the megohimmeter to each of the motor leads and to ground (i.e L1 to ground; L2 to ground, ect)
- 5. Watch the megohimmeter scale and compare this figure with appropriate chart.

Evaluation

The resistance values fo new motors must exceed 1,000,000 ohms. If they do not, replace the motor.





