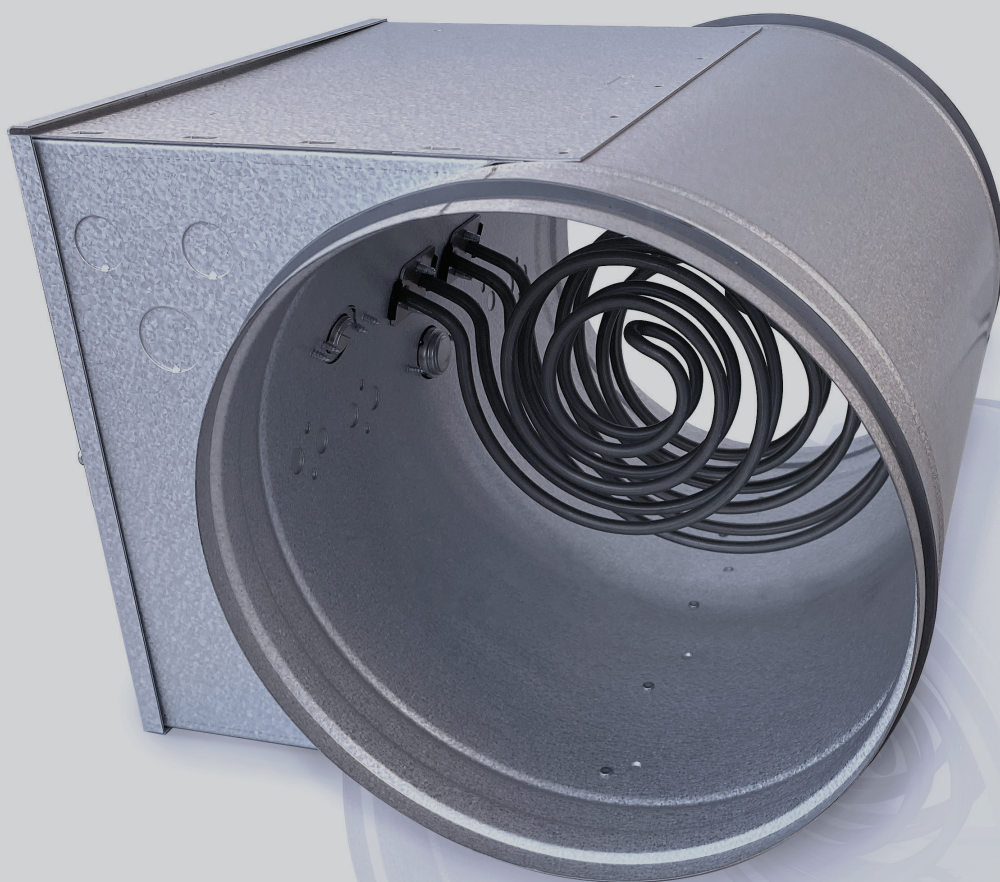


User's Manual

CBMF Circular Electric Duct Heater



NTC
Pt100
Pt1000



0 ... 10 VDC
2 ... 10 VDC
4 ... 20 mA
MODBUS

PWM (<0,02 Hz)

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IMPORTANT:

Please read this manual before installation, connection and putting the product into use.
Save the manual for future use.

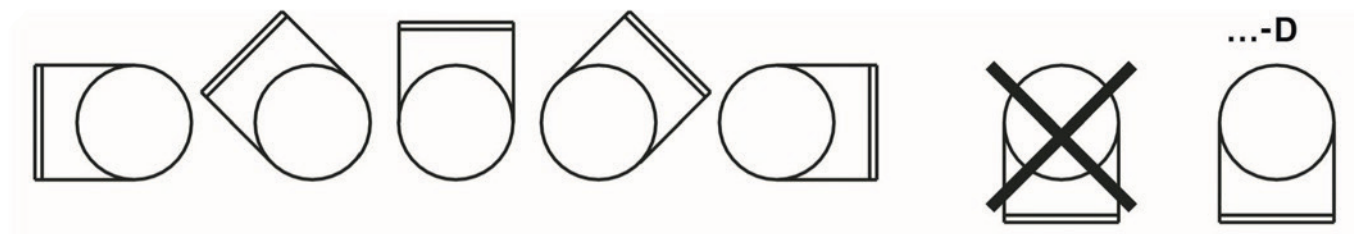
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any time without notice.

SAFETY INFORMATION

1. This appliance may be used by children aged 8 years or above, people with physical and mental disabilities as well as those who lack any experience, provided that they have received detailed instructions about the functionality of the appliance and any risks. Children must not play with the appliance. Cleaning and maintenance must not be performed by children without proper supervision.
Children under 3 years of age should not be near the appliance without constant supervision. Children between 3 and 8 years old may only turn on/shut off the appliance if it is located in a suitable position and they have received instructions about the proper course of action, or are being supervised. They shall also be informed about possible dangers. Children between 3 and 8 years old may not connect the device, change its settings or perform care/maintenance.
2. The installation must be carried out by qualified and authorized personnel.
3. The heater supply voltage and loading specifications appears on the circuit diagram on the inside of the lid and on the ratings plate on the outside of the lid.
The circuit diagram also contains information about the thermal cut-outs.
4. The allowed ambient temperature is -20°C ... +30°C.
The heater is made for a highest outgoing air temperature of 50°C.
5. The heater must be connected to the mains using permanently installed cables. The fixed installation must include an all-pole switch. The cable glands must be selected such that the IP class of the heater is maintained. The protection class of the heater is stated on the ratings plate.
6. The air velocity through heaters of type CBMF must be at least 1 m/s. CBMF Heater automatically reduce the power, if the air velocity falls below 1 m/s and automatically shuts off the heating if the air velocity falls below 0 m/s. Inlet air to heaters of **CBMF** heater must be filtered to avoid contamination of the airflow measuring sensor. Some fan run-on time is recommended, to avoid tripping of the thermal cut-outs due to the remaining heat.
7. The heater is CE marked and made in accordance with these standards:
EN 60335-1 / EN 60335-20 / EN 61000-6-2 / EN 61000-6-3 / EN 62233.

INSTALLATION

1. The heater is designed for insertion into standard spiral ducting. It is fixed to the ducting with screws.
2. The air must flow through the heater in the direction of the arrow, placed on the side of the connection box.
3. The heater can be fitted in either horizontal or vertical ducting. The heater may only be fitted in ducts that are made of incombustible and temperature-resistant materials. The connection box may freely be positioned upwards or sideways to a maximum angle of 90°. The connection box facing downwards is normally NOT allowed, but heaters with the type code suffix ...-D may have the connection box facing downwards.



4. If the heater not will be installed and used within three months, it must be stored dry (max 40% RH).
5. The air outlet into a room must be equipped with a fixed mesh or an intake air device, to prevent touching the heating coils.
6. In the immediate vicinity of the air outlet, a warning sign must be placed, stating that the air outlet must not be covered.
7. The distance from, or to, a duct bend, a butterfly valve, a filter, etc. should correspond to at least twice the duct diameter, otherwise there is a risk that the airflow through the heater will be uneven, which may cause tripping of the overheating cut-out. Example: CV 16 result in a distance of at least 320mm, etc.
8. The heater may be insulated in accordance with valid regulations for ventilation ducting. The insulation material must be incombustible. The insulation must not cover the lid, since the ratings plate must be visible, and the lid must be removable.
9. The ducting section, where the heater is placed, must be accessible for replacement and maintenance.
10. The distance from the metal casing of the heater, to any wood or other combustible materials, must NOT be less than 30mm.

11. The maximum ambient temperature allowed is 30°C.

12. The maximum outgoing air temperature allowed is 50°C.

MAINTENANCE

1. Normally, no maintenance is needed. A periodic function check, and re-tightening of the power terminals, must be carried out at least once a year.
2. To maintain the insulation characteristics of the heating coils, they must be activated for 24h, at least every 3 months.

OVERHEATING

If the manually reset cut-out has tripped, the following must be considered:

1. Switch the power supply off.
2. The lid of the heater may only be opened by qualified and authorized personnel.
3. Carefully investigate the cause of the tripping of the cut-out.
4. When the fault has been rectified, the overheating cut-out may be reset.

TROUBLESHOOTING

- Check that the airflow through the heater is sufficient.
The airflow is insufficient in heaters of **CBMF** if the red LED next to the flow sensor is lit up constantly.
Alternatively, the LED may be flashing, indicating that the controller is limiting the allowed output power.

TEMPERATURE CONTROL

- Check that the sensor is of the correct type and that it is terminated correctly.
- Check the resistance of the sensor and the set value potentiometer.
Disconnect them from the terminals before any measurements are taken.
NTC sensors for 0...30°C should have a resistance of 10kΩ @ 30°C, 11.7kΩ @ 20°C and 15kΩ @ 0°C.
The external set value potentiometer should have a resistance of 0...5kΩ.

Full heating power but no regulation

- Disconnect the sensor/sensors.

If this results in the heating now being turned off, then the fault is in the external sensor circuitry.

If this doesn't turn the heating off and no LED is lit up on the PCB, then there may be a short in a triac.

No heating

- Check that there is mains voltage at the heater supply terminals, and that the manual reset overheating cut-out, has not tripped.
- Check the interlocking devices, fuses, breakers, etc.
- Disconnect the sensor/sensors from the terminals.

If the heater starts now, then the fault is in the external sensor circuitry. Otherwise, the fault is in the controller.

CAPACITY CONTROL

- Make sure that the control signal has the correct polarity.

Full heating power but no regulation

- Disconnect the control signal wiring and strap/short-circuit the control signal input terminals.

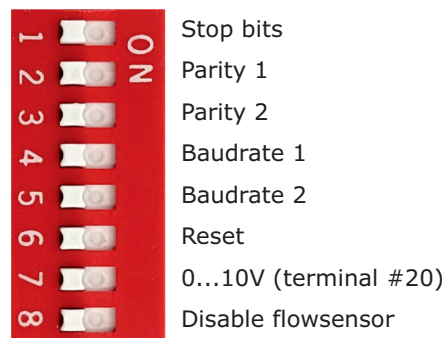
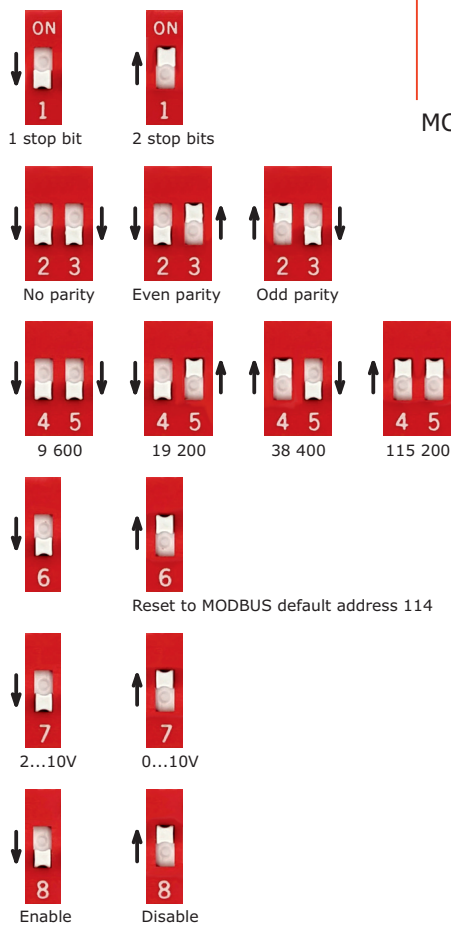
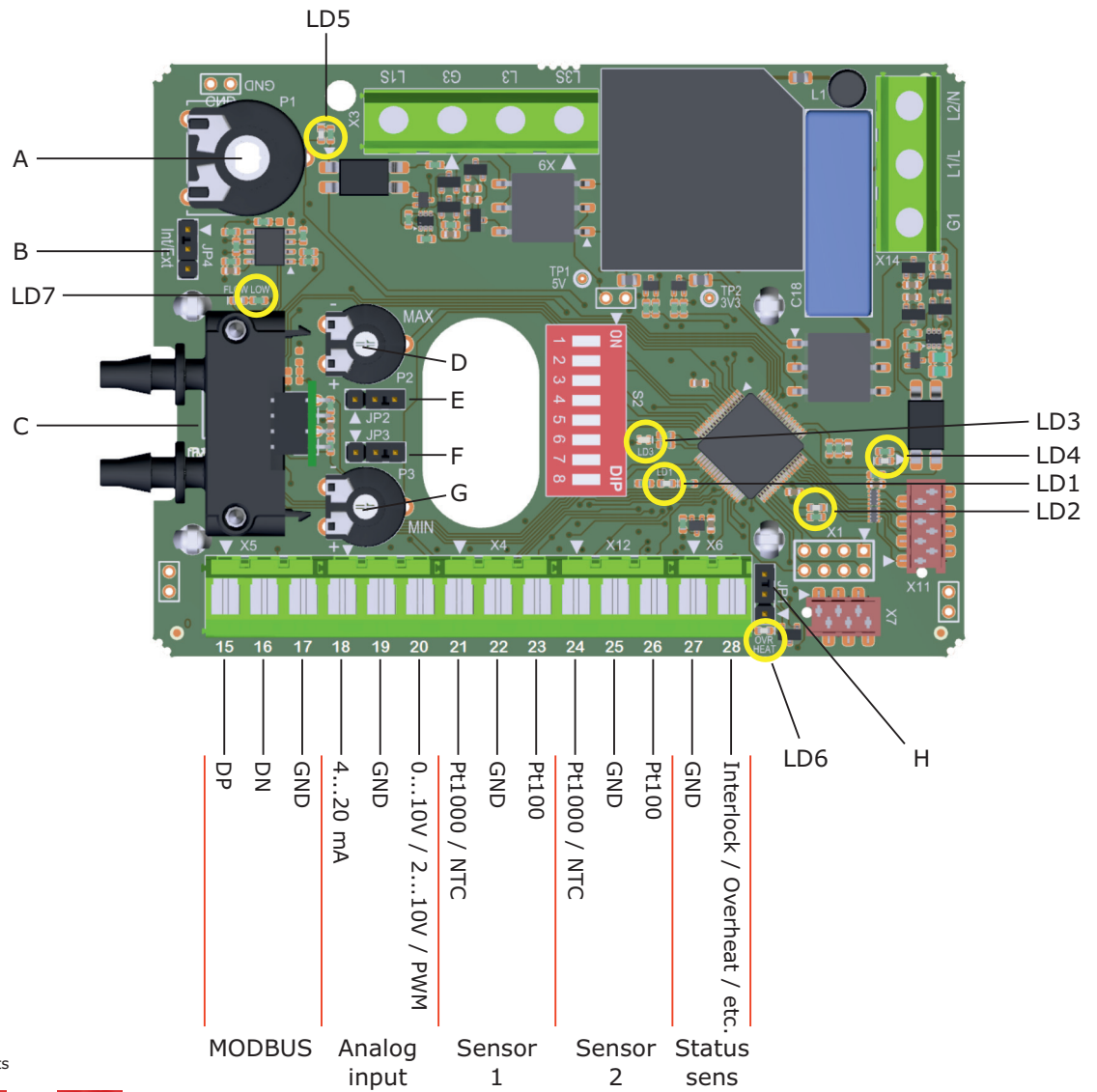
If this results in the heating now being turned off, then the fault is in the excitation signal.

If this doesn't turn the heating off and no LED is lit up on the PCB, then there may be a short in a triac.

No heating

- Check that there is mains supply voltage, and that the manual reset overheating cut-out has not tripped.
- Check the interlocking devices, fuses, breakers, etc.
- Disconnect the control signal wiring and connect a 9V battery-cell or another suitable voltage source as an excitation signal.

If the heater doesn't start now, then the fault is in the controller.



A = Internal setpoint potentiometer.

B = Jumper JP1 (Int/Ext) to activate and deactivate the internal setpoint potentiometer.



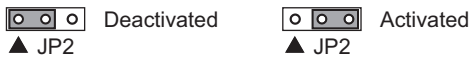
The internal setpoint potentiometer works in conjunction with the Sensor 1 (terminals #21, #22 and #23) and works regardless of sensor type NTC, Pt1000 or Pt100. External setpoint potentiometer works only with sensor type NTC.

C = Flow sensor. Appears in heaters type **ViCi-QOL** and **ViCi-QAL**.

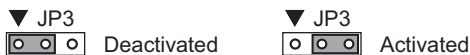
Heaters without the flow sensor, instead has the terminals #29 and #30 on the PCB, to connect a pressure switch or other interlocking device.

D = Setpoint potentiometer for MAX limitation.

E = Jumper JP2 to activate and deactivate the setpoint potentiometer for the MAX limitation.



F = Jumper JP3 to activate and deactivate the setpoint potentiometer for the MIN limitation.



G = Setpoint potentiometer for MIN limitation.

Sensor 2 is the limitation sensor (terminals #24, #25 and #26).

If there is no sensor connected to the terminals, then an activation has no effect.

H = Jumper JP4 to activate and deactivate Status Alarm.



Typical use of Status Alarm is to indicate Overheating (see further LD6) but may be used to indicate other status of choice.

LD1 = LED. Flashes green  when the heater is running normally.

Flashes red  once and then 2 seconds intermission, to indicate a fault in Sensor 1.

Flashes red  twice and then 2 seconds intermission, to indicate a fault in Sensor 2.

LD2 = Not used.

LD3 = LED with green light  when SW6 is activated, and that resets the MODBUS ID address to 114.

LD4 = LED with green light  when the triac for L1 is turned on.

LD5 = LED with green light  when the triac for L3 is turned on. Only in 3 phase heaters.

LD6 = LED with red light  to indicate Status (for example, overheating), if H (jumper JP4) is activated and the connection between terminals #27 and #28 is broken. Then, heating is precluded.

LD7 = Red LED.

If a flowsensor is present, the LED is off if the air velocity is ≥ 1.5 m/s.

If a flowsensor is present, the LED is flashing  if the air velocity is < 1.5 m/s but ≥ 0.7 m/s.

Then, the power is reduced.

If a flowsensor is present, the LED is lit up continuously  if the air velocity is < 0.7 m/s.

Then, heating is precluded.

PCB without flowsensor, has the terminals #29 and #30 instead, to connect a pressure switch or other interlocking device.

Then the LED is off, when there is a connection between terminals #29 and #30.

The LED is lit up continuously  if the connection between terminals #29 and #30 is broken, and then heating is precluded.

NOTE that this is true, as long as SW8 is "OFF" 

If SW8 is "ON"  the interlocking ability for both the flowsensor and the pressure switch is superseded,

hence interlocking must be done otherwise.

The controller auto detects which terminals are used, but it cannot determine if it is 0...10V or 2...10V that is applied to terminals #19 and #20. är 0...10V eller 2...10V. Hence SW7 must be set to "ON"  when 0...10V is used.

In all other cases, let SW7 be "OFF" 

MODBUS INPUT REGISTERS

Register No.	sw variable	read datatype	write	Description	Range
1	SENSOR1_DEG_NTC1	int16	NA	Temperature measured from sensor1 NTC, NTC type 1	
2	SENSOR1_DEG_NTC2	int16	NA	Temperature measured from sensor1 NTC, NTC type 2	
3	SENSOR1_DEG_NTC3	int16	NA	Temperature measured from sensor1 NTC, NTC type 3	
4	SENSOR1_DEG_NTC4	int16	NA	Temperature measured from sensor1 NTC, NTC type 4	
5	SENSOR1_DEG_NTC5	int16	NA	Temperature measured from sensor1 NTC, NTC type 5	
6	SENSOR1_DEG_NTC6	int16	NA	Temperature measured from sensor1 NTC, NTC type 6	
7	SENSOR1_DEG_PT1000	int16	NA	Temperature measured from sensor1 PT1000	
8	SENSOR1_DEG_PT100	int16	NA	Temperature measured from sensor1 PT100	
9	SENSOR1_RES_NTC	int16	NA	Resistance measured from sensor1 NTC	
10	SENSOR1_ERROR_STATE	uint8	NA	Sensor1 Error state. NTC=1,PT1000=2,PT100=3,SHORT NTC/PT1000=4,SHORT PT100=5	
21	SENSOR2_DEG_NTC1	int16	NA	Temperature measured from sensor2 NTC, NTC type 1	
22	SENSOR2_DEG_NTC2	int16	NA	Temperature measured from sensor2 NTC, NTC type 2	
23	SENSOR2_DEG_NTC3	int16	NA	Temperature measured from sensor2 NTC, NTC type 3	
24	SENSOR2_DEG_NTC4	int16	NA	Temperature measured from sensor2 NTC, NTC type 4	
25	SENSOR2_DEG_NTC5	int16	NA	Temperature measured from sensor2 NTC, NTC type 5	
26	SENSOR2_DEG_NTC6	int16	NA	Temperature measured from sensor2 NTC, NTC type 6	
27	SENSOR2_DEG_PT1000	int16	NA	Temperature measured from sensor2 PT1000	
28	SENSOR2_DEG_PT100	int16	NA	Temperature measured from sensor2 PT100	
29	SENSOR2_RES_NTC	int16	NA	Resistance measured from sensor2 NTC	
30	SENSOR2_ERROR_STATE	uint8	NA	Sensor2 Error state. NTC=1,PT1000=2,PT100=3,SHORT NTC/PT1000=4,SHORT PT100=5	
50	Main_FsPdiff	int32	NA	Momentaryairflow value	
51	Main_FlowSensMedian	int32	NA	Median airflow value	
52	Main_FlowSensAvg	int32	NA	Average airflow value, affected byfilter "Main_FlowSensFltr.time"	
53	Main_FsDisabled	uint8	NA	State of dipswitch 8. 0=Flowsensor active, 1=Flowsensor deactivated	
61	PS_state	uint8	NA	State of external pressure switch (terminal 29&30)	0/1
90	ePSENT_4-20mA_IN			Value of 4-20mAinput (terminal 18)	0-1000
91	ePSENT_0-10V_IN			Value of 0-10Vinput (terminal 20)	0-1000
92	ePSENT_2-10V_IN			Value of 2-10Vinput (terminal 20)	0-1000
100	OUTPUT_CTRL_TRIAC_STATE	uint8	NA	TRIAC_STATES(bit0=triac1,bit1=triac3)	
101	OUTPUT_CTRL_RLY1_STATE	uint8	NA	Relay1 OFF = 0, Relay1 ON = 1	
102	OUTPUT_CTRL_RLY2_STATE	uint8	NA	Relay2 OFF = 0, Relay2 ON = 1	
103	OUTPUT_CTRL_RLY3_STATE	uint8	NA	Relay3 OFF = 0, Relay3 ON = 1	
104	OUTPUT_CTRL_RLY4_STATE	uint8	NA	Relay4 OFF = 0, Relay4 ON = 1	
105	OUTPUT_CTRL_RLY5_STATE	uint8	NA	Relay5 OFF = 0, Relay5 ON = 1	
106	OUTPUT_CTRL_RLY6_STATE	uint8	NA	Relay6 OFF = 0, Relay6 ON = 1	
110	OUTPUT_CTRL_REQ	uint16	NA	Inputtedsetpoint	range 0-1000 == (0-100%)
111	OUTPUT_CTRL_FINAL	uint16	NA	OutputafterlimitationbyairflowandMIN/MAXpotentiometers	range 0-1000 == (0-100%)
112	CtrlMux_PowerLevel			Power level requestes from Ain/temp/modbus	range 0-1000 == (0-100%)
115	OUTPUT_CTRL_TRIAC	uint16	NA		range 0-1000 == (0-100%)
120	OUTPUT_CTRL_MODE	uint8	NA	SEQ=0,BIN=1 setfromrelayboarddipswitch	
121	OUTPUT_CTRL_STEP_COUNT	uint8	NA	0-6 setfromrelayboarddipswitch	
200	TempReg_Setpoint	int16	NA		
201	TempReg_InpValue	int16	NA	Temp from sensor 1	Value in °C*10
202	TempLim_InpValue	int16	NA	Temp from sensor 2	Value in °C*10
203	TempLim_InpSetpointLo	int16	NA	Value from "MIN" potentiometer if enabled byjumper.	
204	TempLim_InpSetpointHi	int16	NA	Value from "MAX" potentiometer if enabled byjumper.	
205	TempLim_status	int8	NA	NotSet=0,Running=1,Running_Lo_act=2,Running_Hi_act=3,Error1_Timeout=-1,ModuleError=-2	
206	TempReg_status	int8	NA	?	

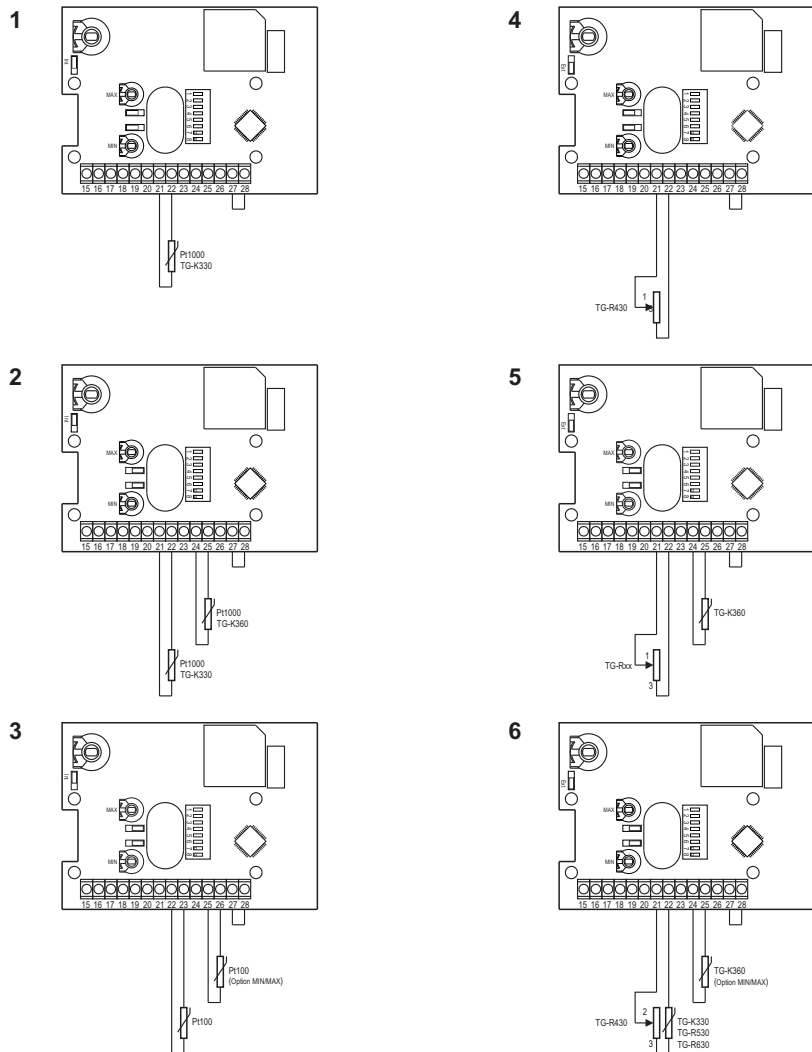
MODBUS INPUT REGISTERS

220	Sensor1ActType			(0=NONE, 1=NTC, 2=PT1000, 3=PT100)	
221	Sensor1Error			(0=no errors, 1=NTC, 2=PT1000, 3=PT100, 4=shortNTC/PT1000, 5=short PT100)	
222	Sensor2ActType			(0=NONE, 1=NTC, 2=PT1000, 3=PT100)	
223	Sensor2Error			(0=no errors, 1=NTC, 2=PT1000, 3=PT100, 4=shortNTC/PT1000, 5=short PT100)	
331	&nv.FlowUpperLimit	int16	NA		
332	&nv.FlowLowLimit	int16	NA		
333	&Main_FlowPowerLimit	uint16	NA	Maximum output due to flow reduction	range 0-1000 == (0-100%)
700	OVRH_state	uint8	NA	OVRH state (0=normal,1=overheat)	0/1
800	CtrlMux_PowerLevel	uint8	NA	Same as reg "112" but scaled 0-255	range 0-255
801	CtrlMux_Timeout	uint8	NA	Watchdog timeout in seconds	10
803	CtrlMux_status	int8	NA		
804	AinHdlr_ActInp	int8	NA		
805	AinHdlrOutput_0_255	uint16	NA		range 0-1000 == 10x(0-100%)
806	AinHdlr_Timeout	uint8	NA		
807	AinHdlrOutput_0_255	uint8	NA		range 0-255
808	TempLim_InpTimeout	uint8	NA		
809	TempLim_power_inp	uint8	NA		
810	TempLim_power_lo	uint8	NA		
811	TempLim_power_hi	uint8	NA		
812	TempLim_power_output	uint8	NA	Same as reg "3009" but scaled 0-255	range 0-255
813	TempReg_power	uint8	NA	Same as reg "5005" but scaled 0-255	range 0-255
900	Fw version A-x-xxx		NA	Fw version Major	
901	Fw version x-A-xxx		NA	Fw version Minor	
902	Fw version x-x-AAA		NA	Fw version Build	

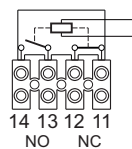
MODBUS HOLDING REGISTERS

Register No.	sw variable	read datatype	write	Description	Range	Default value
1001	CtrlMux_ActChannel	int8	uint8	Not set=-1, No Source=0, TempReg=1, Ain=2, Modbus=3		
1002	CtrlMux_PowerLevel	uint16	uint16	range 0-1000 == 10x(0-100%)	0-1000	0
1003	Main_FlowSensFltr.time	int32	int16	Filter that affects input register"FlowSens Avg"		0
1004	MB_AIN_CONF	uint8	uint8	Ain_CONF (0=AUTO, 1=PWM)		0
1005	MB_Slave_Address	uint8	uint8	MB_Slave_Address	1-255	114
1012	MB_SENSOR1_CONF	uint8	uint8	MB_SENSOR1_CONF (0=AUTO, 1=NTC, 2=PT1000, 3=PT100)		0
1013	MB_SENSOR2_CONF	uint8	uint8	MB_SENSOR2_CONF (0=AUTO, 1=NTC, 2=PT1000, 3=PT100)		0

TEMPERATURE CONTROL

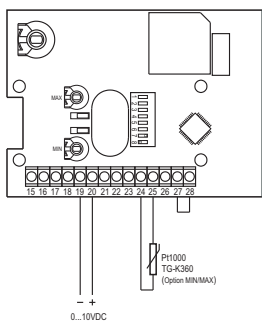


ALARM RELAY (OPTIONAL)

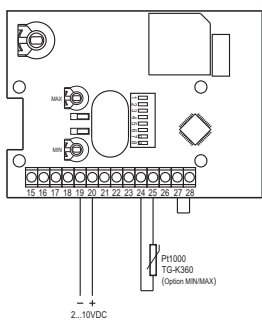


CAPACITY CONTROL

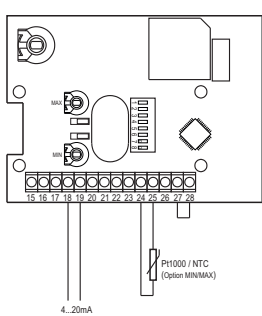
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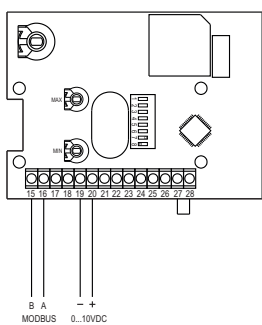
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