Intelligent Solution Managing Automation

iSMA-B-FCU

User Manual

FCU Hardware

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1 Introduction

This document presents ISMA-B-FCU device hardware information.

1.1 Document change log

V1.1 – iSMA-B-FCU-LL hardware description added

1.2 Safety rules

- Please note: incorrect wiring of this product can cause its' damage and may result in other hazards. Make sure the product has been correctly wired before turning the power ON.
- Before wiring, or removing / mounting the product, be sure to turn the power OFF. Failure to do so might cause electric shock.
- Do not touch electrically charged parts such as the power terminals. Doing so might cause electric shock.
- Do not disassemble the product. Doing so might cause electric shock or faulty operation.
- Use the product within the operating ranges recommended in the specification (temperature, humidity, voltage, shock, mounting direction, atmosphere etc.). Failure to do so might cause fire or faulty operation.
- Tighten the wires firmly to the terminal. Insufficient tightening of the wires to the terminal might cause fire.

1.3 Technical specifications

<table>
<tr><th></th><th></th><th>iSMA-B-FCU-HH</th><th>iSMA-B-FCU-HL</th><th>iSMA-B-FCU-LL</th></tr>
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<tr><td>Power consumption</td><td colspan="3">Max 12VA (Including 7 VA for Triac outputs)</td></tr>
<tr><td rowspan="5">Special Inputs</td><td>Temperature input</td><td colspan="3">Measurement with attached RTDs
resolution ±0.1°C
accuracy ±0.2°C at 25°C</td></tr>
<tr><td>Voltage input</td><td colspan="3">Voltage measurement from 0 to 10 VDC
(Input impedance 120 KΩ)
resolution ±6 mV
accuracy ±50 mV</td></tr>
<tr><td>Resistance input</td><td colspan="3">Resistance measurement from 0 to 700 kΩ
Measurement resolution ±20 Ω for 20 kΩ load</td></tr>
<tr><td>Dry contact input</td><td colspan="3">Output current ~0.2 mA</td></tr>
<tr><td>Measurement resolution</td><td colspan="3">12 bits</td></tr>
<tr><td rowspan="2">Digital Inputs</td><td>Type</td><td colspan="3">Dry contact</td></tr>
<tr><td>Max input frequency</td><td colspan="3">100Hz</td></tr>
<tr><td rowspan="8">Analog Outputs

Digital Outputs (relays)</td><td>Voltage range</td><td colspan="3">0 to 10 V DC</td></tr>
<tr><td>Max. load current</td><td colspan="3">5 mA</td></tr>
<tr><td>Resolution</td><td colspan="3">12 bits</td></tr>
<tr><td>Accuracy</td><td colspan="3">±1%</td></tr>
<tr><td>Resistive load (FAN, CTG)</td><td colspan="3">6A at 230V AC or 6A at 30V DC</td></tr>
<tr><td>Inductive load AC3 (FAN, CTG)</td><td colspan="3">75VA at 230 V AC or 10 W at 30 V DC</td></tr>
<tr><td>Resistive load (HTG)</td><td colspan="3">10A at 230V AC or 10 A at 30 V DC</td></tr>
<tr><td>Inductive load AC3 (HTG)</td><td colspan="3">1/2 HP at 230 V AC</td></tr>
<tr><td rowspan="5">Triac Outputs</td><td>Load</td><td>Min: 20 mA
Max: 0.5 A at 230 V AC</td><td>Min: 20 mA
Max: 0.3 A at 24 V AC
I_{max} = 0.3 A = I_{TO1} + I_{TO2} + I_{24VOut}</td><td>Min: 20 mA
Max: 0.5 A at 24 V AC</td></tr>
<tr><td>Peak load per channel</td><td colspan="3">1.5 A (30 s)</td></tr>
<tr><td>Gate Control</td><td colspan="3">Zero crossing turn ON</td></tr>
<tr><td>Frequency Range</td><td colspan="3">47 to 63 Hz</td></tr>
<tr><td>Snubber</td><td colspan="3">Snubberless Triac</td></tr>
<tr><td>Power Supply output</td><td>Power Supply output</td><td>24 V AC ± 20%,
7 VA</td><td colspan="2">24 V AC ± 20%, 7 VA*
* In HL this Power Supply is also used for Triac Outputs</td></tr>
<tr><td>RS485</td><td>RS485</td><td colspan="3">Up to 128 devices</td></tr>
</table>

Interface		Failsafe Receiver (Bus Open, Bus Shorted, Bus Idle)
RJ12 Interface	Communication protocols	Modbus RTU, Modbus ASCII or BACnet MSTP set by switch
	Baud rate	From 2400 to 115200 set by switch
	Address	0 to 255 set by DIP switch
	RS485	Up to 128 devices
	Communication protocol	Modbus RTU
	Baud rate	From 2400 to 115200
	Power supply	34 V DC ± 15%, 2.5 W
USB	USB	Mini USB 2.0
Ingress protection	IP	IP40
Temperature	Storage	– 40°C to +85°C
	Operating	0°C to +50°C
Humidity	Relative	5 to 95%
Connectors	Inputs / Outputs, Power Supply and Communication	Removable
	HTG Relay	Constant
	Maximum cable size	1.5 mm^2
Dimensions	Width	123 mm
	Length	137 mm
	Height	55 mm

Table 1 Technical specification

1.4 Dimensions

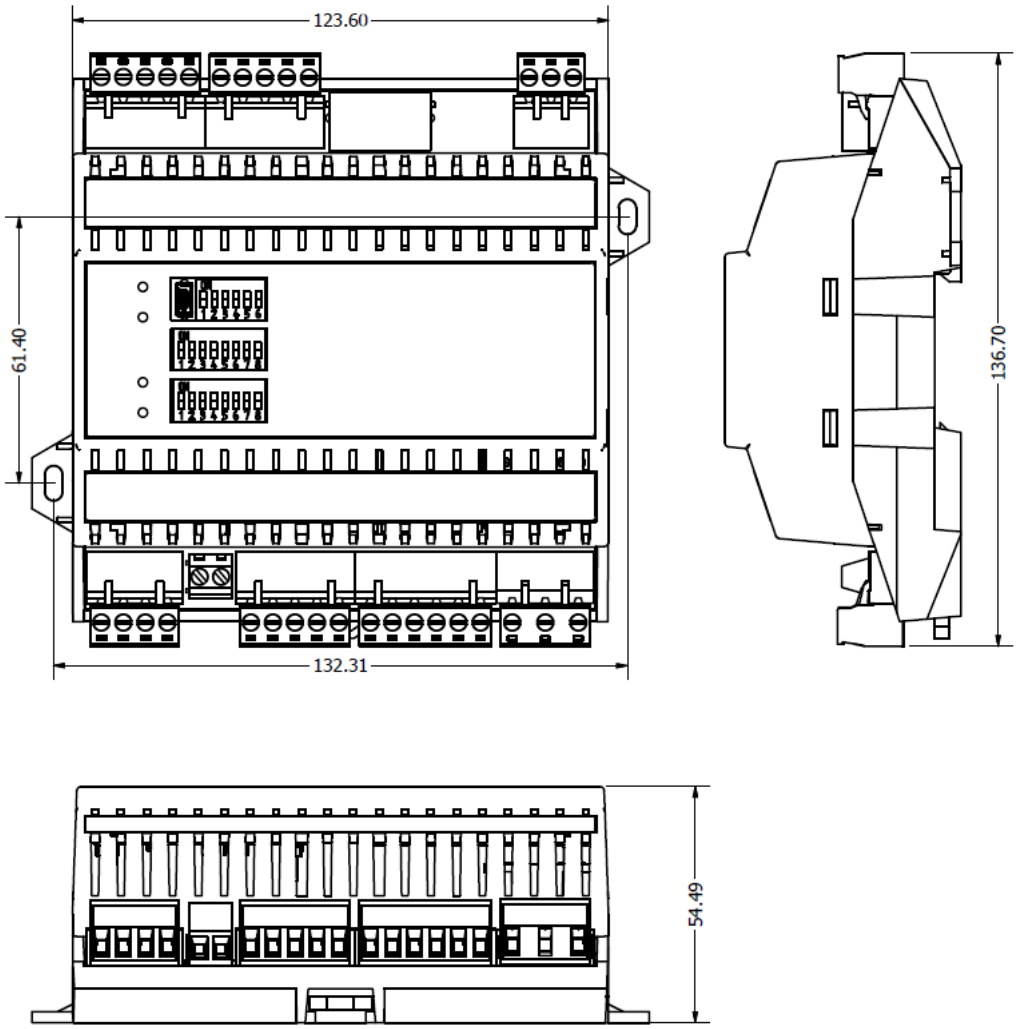

Figure 1 iSMA-B-FCU dimensions (all versions)

2 Hardware specification

2.1 Terminals and internal connection diagram

There are 3 types of hardware available:

- iSMA-B-FCU-HH with 230 V AC power supply and Triac Outputs,
- iSMA-B-FCU-HL with 230 V AC power supply and 24 V AC Triac Outputs,
- iSMA-B-FCU-LL with 24 V AC power supply and Triac Outputs.

2.1.1 iSMA-B-FCU-HH

iSMA-B-FCU-HH has a high voltage power supply (230 V AC) and high voltage Triac Outputs (230 V AC). The Triac Outputs are connected directly to the main controller power supply as presented in diagram below. The maximum current for each Triac Output is 0.5 A. The maximum power consumed by external equipment connected to the 24 V terminals (L2, N2) cannot exceed 7VA in total.

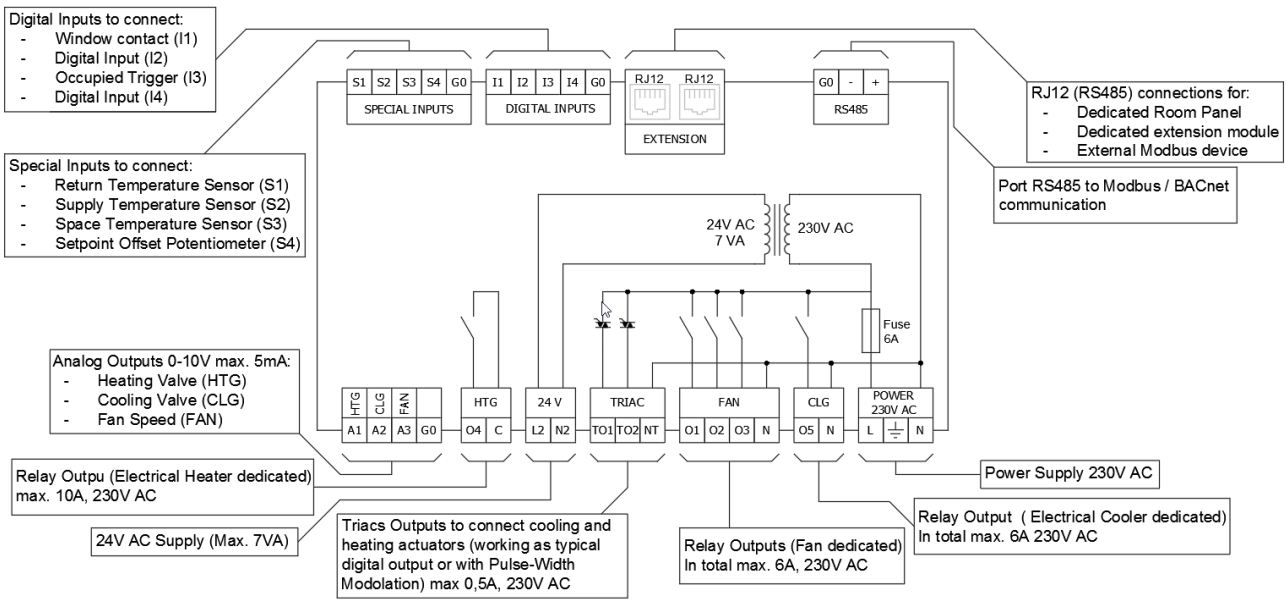

Figure 2 iSMA-B-FCU-HH diagram of terminals and internal connections

2.1.2 iSMA-B-FCU-HL

iSMA-B-FCU-HL has a high voltage power supply (230 V AC) and low voltage Triac Outputs (24 V AC). The Triac Outputs are connected to a built-in 24 V AC transformer as shown in the below diagram. The maximum power consumed by the external equipment connected to the Triac Outputs and to 24 V terminals (L2, N2) cannot exceed 7 VA in total.

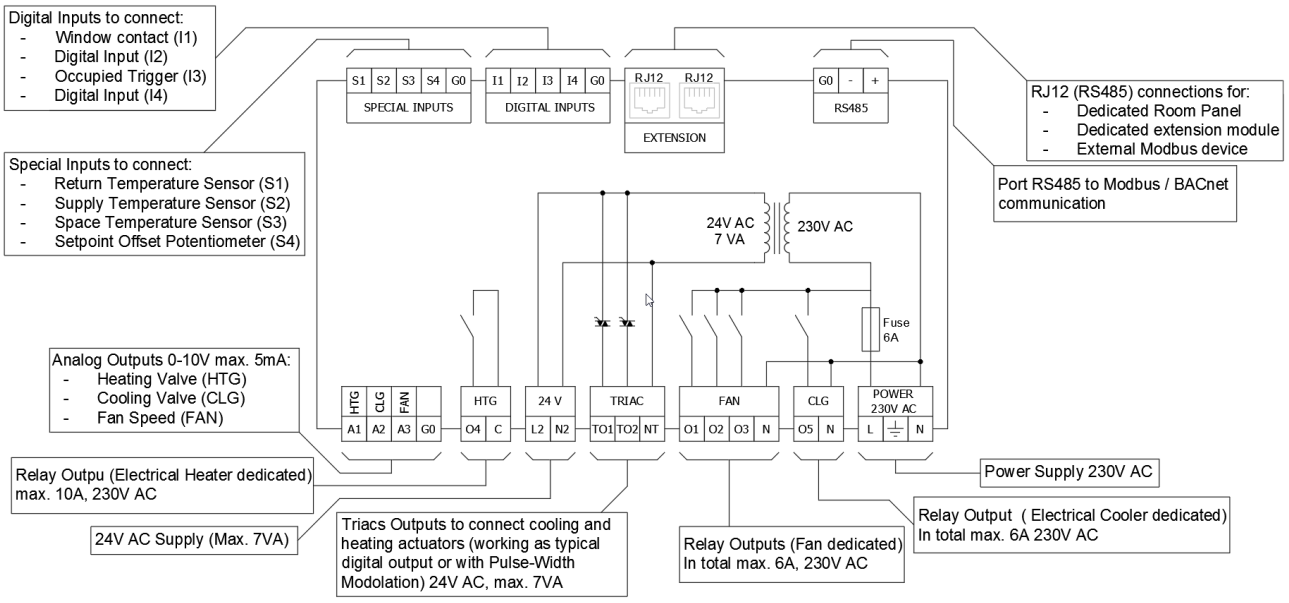

Figure 3 iSMA-B-FCU-HL diagram of terminals and internal connections

2.1.3 iSMA-B-FCU-LL

iSMA-B-FCU-LL has a low voltage power supply and Triac Outputs (24 V AC). The Triac Outputs are connected to power supply terminals. The maximum current for each of the Triac Outputs is 0.5 A. The maximum power used by external equipment connected to the 24 V terminals (L2, N2) cannot exceed 7 VA in total.

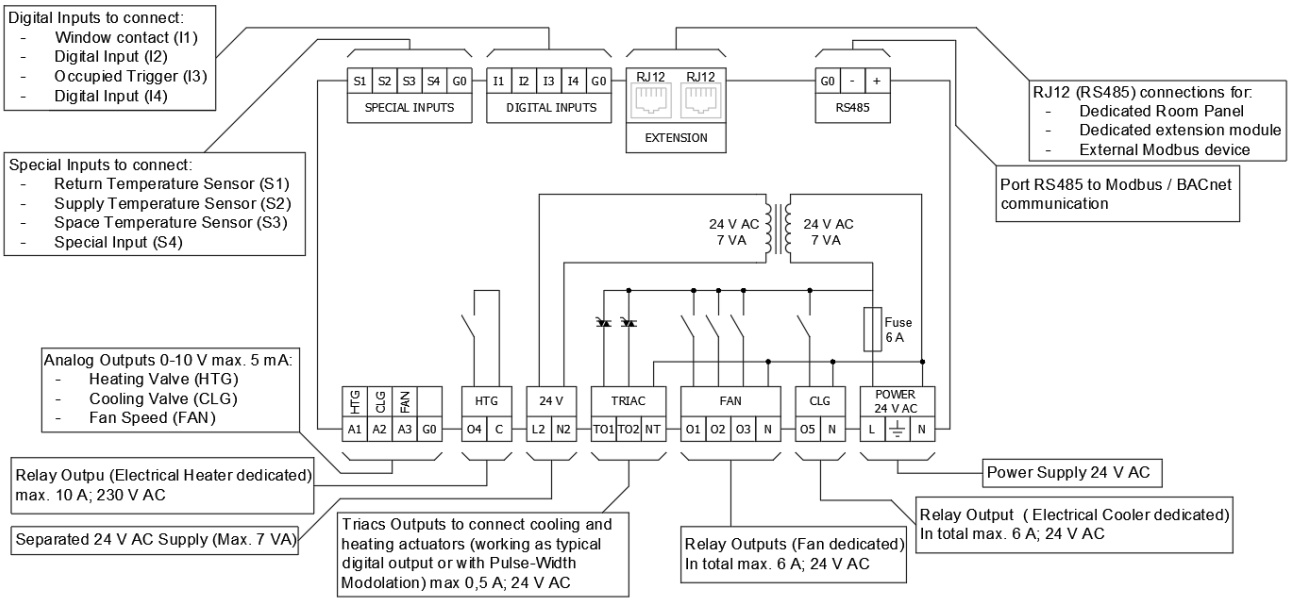

Figure 4 iSAM-B-FCU-LL diagram of terminals and internal connections

2.2 Power supply connection

iSMA-B-FCU-HH and iSMA-B-FCU-HL are designed to work with 230 V AC power supply. Each ISMA-B-FCU device is equipped with a built-in 6 A fuse protecting the controller and connected 230 V AC equipment.

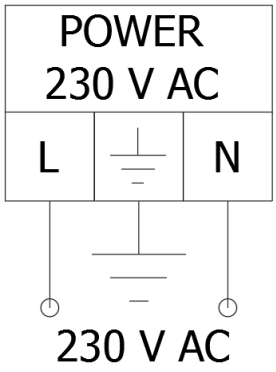

Figure 5 230 V AC Power supply connection

iSMA-B-FCU-LL is designed to work with 24 V AC power supply. The device is equipped with a built-in 6 A fuse protecting the controller and connected 24 V AC equipment.

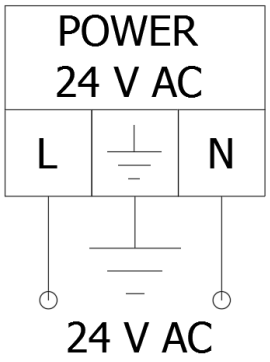

Figure 6 24 V AC Power supply connection

Note: Total current for digital relay outputs O1-O4 cannot exceed 6A.

Note: It is forbidden to use a fuse with current exceeding 6 A! Higher current may permanently damage the device and cause danger to the user and to the equipment!

2.2.1. 24 V AC power supply for external equipment

iSMA-B-FCU-HH is equipped with a 24 V AC, 7 VA power supply output to supply an external equipment like sensors and actuators. This power supply uses a separate coil in the transformer. 24 V AC power supply terminal connection is labeled L2, N2.

iSMA-B-FCU-HL is equipped with a 24 V AC power supply output for thermal valves controlled by Triac Outputs and external devices like sensors and actuators. This power supply uses a separate coil in the transformer. 24 V AC power supply terminal connection is labeled L2, N2. The total power

consumption with thermal valves and external devices cannot exceed 7 VA (~0.3 A).

iSMA-B-FCU-LL is equipped with a 24 V AC, 7 VA power supply output to supply the external equipment like sensors and actuators. This power supply uses a separate 24 V AC transformer. The external separate power supply terminal connection is labeled L2, N2.

2.3 Connecting the communication bus (RS485)

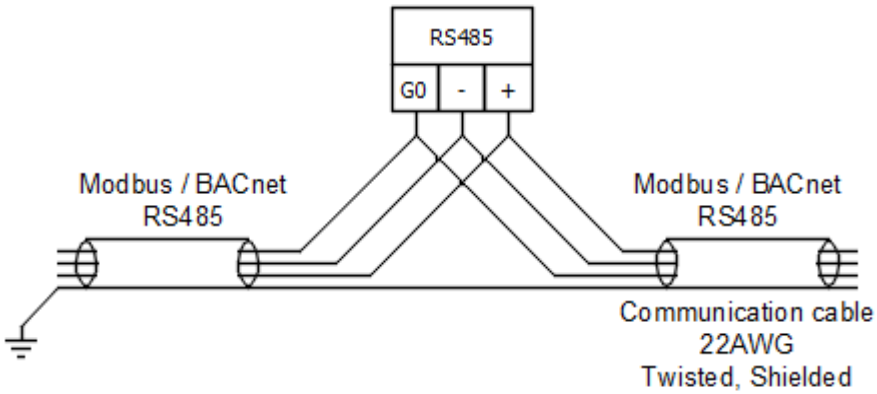

Figure 7 RS485 connection

2.3.1 RS485 grounding and shielding

This device can be exposed to electromagnetic field. Electromagnetic radiation can induce electrical noise into both power and signal lines, as well as direct radiation into the FCU device with negative results for the system. Appropriate grounding, shielding and other protective steps should be taken at the stage of installation to prevent these effects. These protective steps include grounding the control cabinet and the cable shield, installing protective elements for electromagnetic switching devices, correct wiring, as well as proper choice of cable types and their cross sections.

2.3.2 RS 485 network termination

Transmission line effects often present a problem for data communication networks. These problems include reflections and signal attenuation.

To eliminate the presence of reflections of signal from the end of the cable, the cable must be terminated at both ends with a resistor across the line adequate to its characteristic impedance. Both ends must be terminated since propagation is bidirectional. In case of an RS485 twisted pair cable this termination is typically 120 Ω.

2.4 RJ12 Panel connection

RJ12 socket is designed for connecting external modules and LCD panel. The ISMA-B-FCU device has two parallel sockets with the same pin configuration. Those sockets provide communication in Modbus RTU protocol.

RJ12 socket provides also power supply dedicated for external LCD panels with maximum load up to 2.5 W. Before connecting devices powered from RJ12 please calculate the power supply load. Power consumption of the dedicated wall panel iSMA-B-LP with temperature sensor is 0.5 W, so the maximum number of panels on the bus is 5.

RJ12 pins are shown in the figure below.

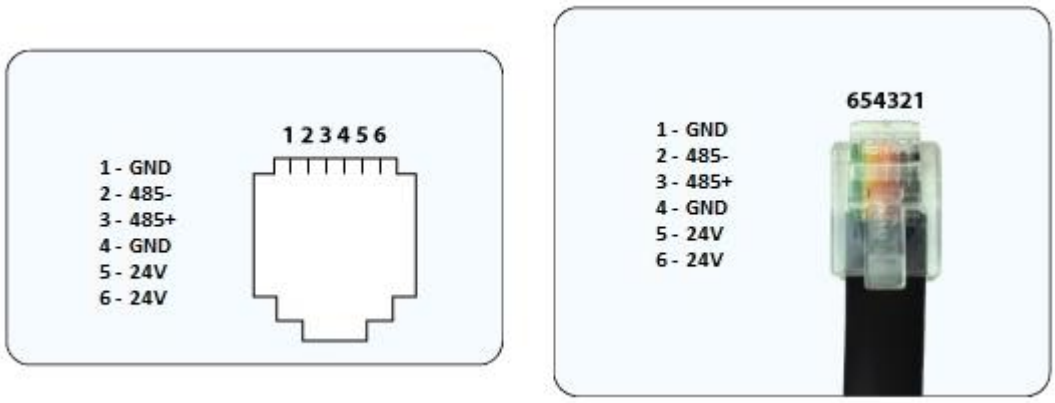

Figure 8 RJ12 pin description

For short distance, up to 100 m, it is recommended to use the following cables for connection: standard category 3, 4 wire or 6 wire telephone cable straight without crossing (for example YTLYP 6x0.12). For longer distance, it is recommended to use twisted shielded Modbus standard cable.

2.5 Mini USB Port

The iSMA-B-FCU device has a built-in mini USB port designed to manage controller firmware and application, as well as for diagnostics.

This USB port also provides controller power supply for commissioning processes and for application diagnostics. When the controller is powered up by a USB, all inputs and outputs are operational (except for Triac Outputs which require external power supply).

2.6 Front panel LED functions

The ISMA-B-FCU device is equipped with 4 LED diodes for quick status check and diagnostics:

- Power LED lights up (green) after turning the power on.
- Communication LED lights up (orange) for 20 ms after sending each package through the main RS485 port. As long as module receives/sends packages, the Communication LED blinks continuously.

- Extension Communication LED lights up (orange) for 20 ms after sending each package through the extension ports. As long as the module receives / sends packages, the Extension Communication LED blinks continuously.
- User LED is OFF as default, the function is programmable through LED_ALARM component; it blinks very softly when there is a fault during the start-up of Sedona virtual machine.
- During device reset, when Switch 6 in DIP switch PROTOCOL is in ON position (default settings restoration mode), Power LED blinks in 300 ms time intervals. After Switch 6 is switched OFF, Power LED is lit permanently and the default settings are restored.
- When the device remains in bootloader status, the Power LED and the Communication LED blink alternatively. The communication LED keeps its functionality and blinks also after sending/receiving data packages.

2.7 Setting Controller Address

The Controller Address is a setting made with a Dip switch MAC. The procedure of setting the address in presented in the figure and table below. The addressing table is shown at the end of this document.

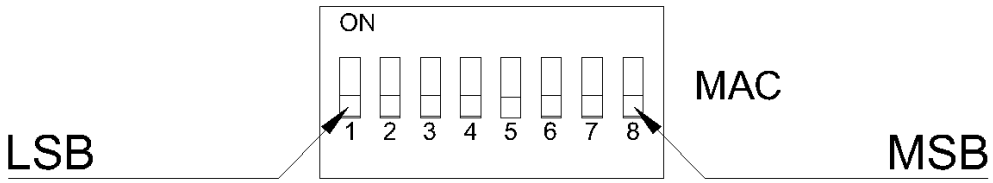

Figure 9 MAC Dip Switch

Number of Dip Switch MAC	Position	Function
1	On	Add 1 to MAC Address
	Off	Add 0 to MAC Address
2	On	Add 2 to MAC Address
	Off	Add 0 to MAC Address
3	On	Add 4 to MAC Address
	Off	Add 0 to MAC Address
4	On	Add 8 to MAC Address
	Off	Add 0 to MAC Address
5	On	Add 16 to MAC Address
	Off	Add 0 to MAC Address
6	On	Add 32 to MAC Address
	Off	Add 0 to MAC Address
7	On	Add 64 to MAC Address

	Off	Add 0 to MAC Address
8	On	Add 128 to MAC Address
	Off	Add 0 to MAC Address

Table 1 Setting MAC address with a Dip Switch

Example: Configuration setting of the ISMA-B-FCU device address 83.

Address 83 contains following multiplicity of number 2: 83 = 1 + 2 + 16 + 64. Address DIP switch settings are presented in the table below. All addresses of DIP switch configuration are presented in the table at the end of this document.

Address	S1	S2	S3	S4	S5	S6	S7	S8
83	On	On			On		On	

Table 2 Address 83 DIP switch configuration

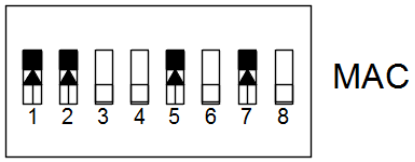

Figure 10 MAC DIP switch address 83 settings

WARNING! In BACnet network setting, the address above 128 automatically switches BACnet to Slave mode. In this mode, the device cannot be discovered in device searching process.

WARNING! Do not set address 255 (all switches in ON position). This address setting is reserved for system operation.

2.8 Baud rate selection

Transmission baud rate is determined by S3 switch (sections 1, 2, and 3) in accordance with the following table:

1	2	3	Baud rate
OFF (0)	OFF (0)	OFF (0)	Defined by the user
OFF (0)	OFF (0)	ON (1)	76800
OFF (0)	ON (1)	OFF (0)	4800
OFF (0)	ON (1)	ON (1)	9600
ON (1)	OFF (0)	OFF (0)	19200
ON (1)	OFF (0)	ON (1)	38400
ON (1)	ON (1)	OFF (0)	57600
ON (1)	ON (1)	ON (1)	115200

Table 2 Baud rate selection

2.9 Protocol selection

Protocol selection is made with sections 4 and 5 of the S3 switch according to the table:

4	5	Protocol
OFF (0)	OFF (0)	Modbus RTU
OFF (0)	ON (1)	Modbus ASCII
ON (1)	OFF (0)	BACnet Master
ON (1)	ON (1)	BACnet Slave

Table 3 Protocol selection

WARNING! In BACnet mode switch number 4 must be on ON(1) position and switch number 5 decides if BACnet works in Master or Slave mode (please check on the above table).

2.10 Restoring the default settings

To restore the default ISMA-B-FCU device settings, follow the steps below:

1. Turn power supply off
2. Set section 6 of Protocol switch to ON
3. Turn on power supply, power LED blinking
4. Switch section 6 of Protocol switch to OFF to restore the default settings. To cancel the reset, turn off the power and switch section 6 of Protocol switch to the OFF position.

2.11 Default Settings

Out of the box device as well as after restoring default values procedure, has got the following default settings:

Name	Default Value
USER BAUD RATE	76800
STOP BITS	1
DATA BITS	8
PARITY BITS	0
RESPONSE DELAY	0
I1 – I4 DIGITAL INPUT COUNTERS	0

Table 4 Default values

2.12 CFG DIP switch

The ISMA-B-FCU device has, on the top panel, 8 position DIP switch which can be used in client application. Each of 8 positions can have true or false state. This DIP switch is dedicated for setting configuration in client application.

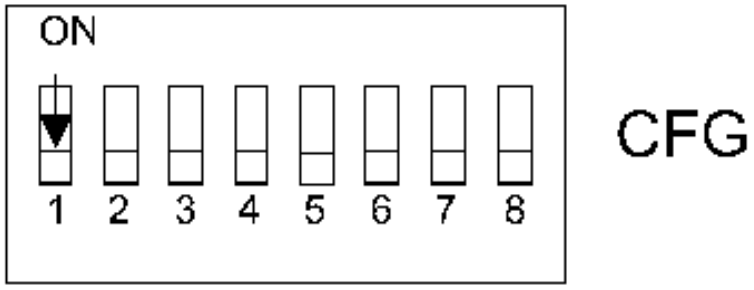

Figure 11 DIP switch CFG

3 ISMA-B-FCU device inputs

ISMA-B-FCU device has two types of inputs: 4 Digital Inputs – for Boolean values, and 4 Special Inputs – for resistance and voltage measurement.

3.1 Special Inputs

ISMA-B-FCU device has 4 built-in special inputs which can work in the following modes:

- Digital Input – dry contact,
- Analog Input - 0-10 V DC,
- Resistance Input- 0 – 1000 kΩ (1 MΩ),
- Temperature Input - working with NTC sensors.

3.1.1 Special Inputs working as digital input

In this mode, Special Input works as a digital input dry contact and reactive Boolean value, false for open circuit and true for close circuit. Circuit status is measured with 1 mA current.

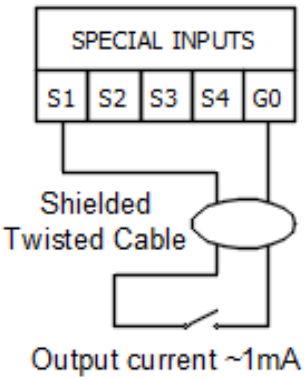

Figure 12 Connection of Special Inputs Dry Contact

3.1.2 Special Inputs working as analog input 0-10 V DC

In this mode, Special Input measures voltage in the range from 0 to 10 V DC (10 000 mV) with 6 mV resolution.

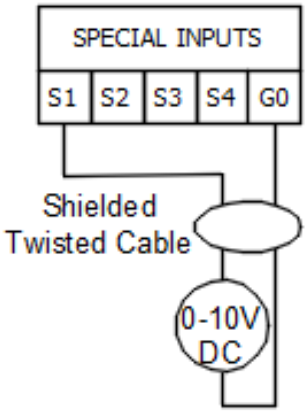

Figure 13 Connection of the Special Inputs voltage sensor

3.1.3 Special Inputs operating as resistance inputs

In this mode, Special Input measures resistance value with voltage driver. The input works in range from 0 to 1000 kΩ (1 MΩ), with resolution ±20 Ω for 20 kΩ load.

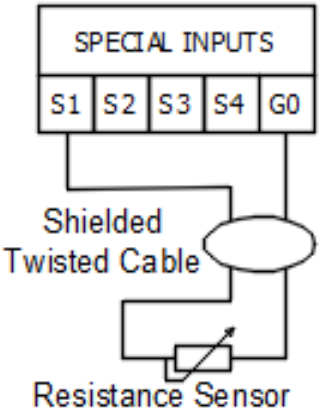

Figure 14 Connection of Special Inputs resistance sensor

3.1.4 Special Inputs working as temperature inputs

In this mode, Special Input measures NTC sensor resistance with voltage driver and converts to temperature value. Special Input is equipped with a built-in conversion table for the following NTC sensors:

- 10K3A1 NTC B=3975K temperature sensor
- 10K4A1 NTC B=3695K temperature sensor
- 10K NTC B=3435K Carel temperature sensor
- 20K6A1 NTC B=4262K temperature sensor
- 2.2K3A1 NTC B=3975K temperature sensor
- 3K3A1 NTC B=3975K temperature sensor
- 30K6A1 NTC B=4262K temperature sensor
- SIE1 temperature sensor
- TAC1 temperature sensor
- SAT1 temperature sensor

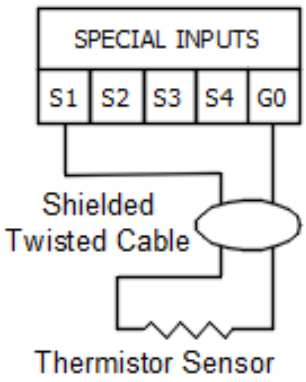

Figure 15 Connection of Special Inputs NTC sensor

3.2 Digital Inputs

ISMA-B-FCU device is equipped with 4 Digital Inputs. The figure below presents the way they are connected.

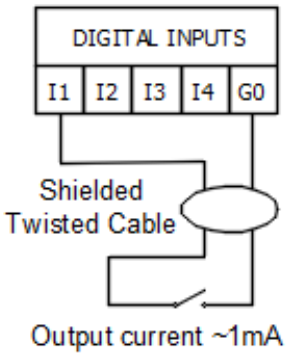

Figure 16 Connection of Digital Inputs Dry Contact

3.2.1 Digital Input fast counter

Digital Input can work as a counter of dry contact impulses up to 100 Hz. Counter value is saved in non-volatile EEPROM memory.

WARNING! During Restore to Default process, the value of the counter is set to 0.

4 ISMA-B-FCU device outputs

ISMA-B-FCU device is equipped with three types of outputs: 2 Triac Outputs, 5 Digital Outputs, and 4 Analog Outputs.

4.1 Triac Outputs

ISMA-B-FCU device is equipped with two Triac Outputs designed for heating and cooling thermal valve actuators. Depending on controller model, Triac Outputs can be connected to actuators with 230 V AC supply (for iSMA-B-FCU-HH) or to actuators with 24 V AC supply (for iSMA-B-FCU-HL and iSMA-B-FCU-LL). In iSMA-B-FCU-HL, Triac Outputs are supplied with 24 V AC from a build-in transformer, whereas in iSMA-B-FCU-LL and iSMA-B-FCU-HH Triac Outputs are connected directly to Power Supply terminals.

Triac Outputs can work as typical binary outputs (for Binary Temperature Control) or with PWM modulation. PWM mode has two parameters:

- Duration time in seconds (this value depends on valve parameters)
- Fill out (percentage value of signal fill out).

The figure below presents the way actuators are connected to Triac Outputs (for 4 pipes mode).

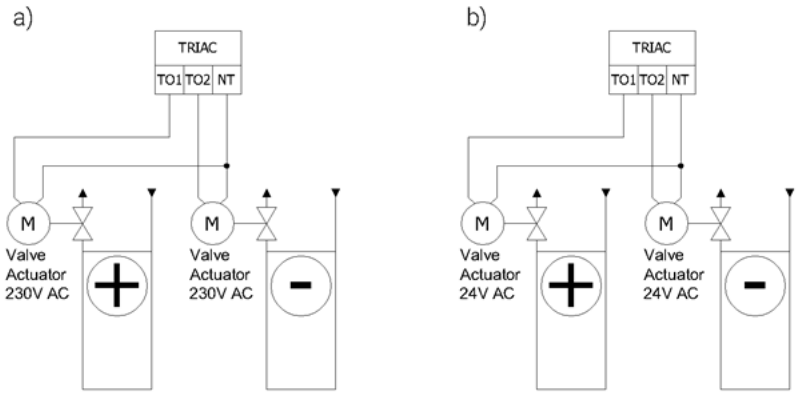

Figure 17 Connection between Thermal Valves and Triac Outputs: a) iSMA-B-FCU-HH; b) iSMA-B-FCU-HL, and iSMA-B-FCU-LL

WARNING!

In case of iSMA-B-FCU-HH or iSMA-B-FCU-LL controller, the actuators connected to each Triac Output may consume up to 0.5 A under constant load. In some cases the current can be higher for a limited time, 1.5 A up to 30 seconds.

In case of iSMA-B-FCU-HL controller, the sum of power consumption of both Triac Outputs and 24 V AC output cannot exceed 0.3 A (7 VA):

$$I_{max} = 0{,}3\ A = I_{TO1} + I_{TO2} + I_{24VOut}.$$

4.2 Digital Outputs

All Digital Outputs are based on relays which can operate with 230 V AC voltage (in iSMA-B-FCU-LL, Digital Outputs are working with 24 V AC). ISMA-B-FCU device has 2 types of digital outputs:

- O1-03 and 05 – relay outputs connected directly to power supply terminal,
- O4 – a relay separated from ISMA-B-FCU device circuits.

4.2.1 O1 – O3 relays "Fan"

ISMA-B-FCU device is equipped with three relay outputs, designed for connecting up to 3 speed Fans. The way the Fans are connected (depending on the number of speeds) is presented in the figure below. The common terminal for those outputs is connected directly to Power Supply "L" terminal.

WARNING! Outputs O1-O3 and output O5 are protected by a built-in 6 A fuse. Total current for digital relays outputs O1-03 and O5 cannot exceed 6 A.

WARNING! It is forbidden to use a fuse with current exceeding 6 A! Higher current may permanently damage device and cause danger to the user and to the equipment!

WARNING! In iSMA-B-FCU-LL, 24 V AC Fan motor is required.

An exemplary fan connection is presented in the figure below.

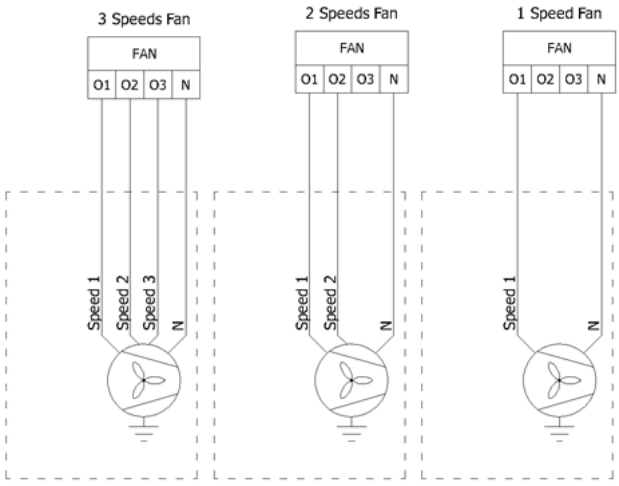

Figure 18 Digital Outputs O1-O3, example of fan connections

4.2.2 O4 – HTG relay "Electrical Heater"

iSMA-B-FCU device is equipped with relay outputs for connecting for example an Electrical Heater. This relay is separated from the rest of the control circuit. Current consumption cannot exceed 10 A with 250 V AC power supply. The figure below presents the way of connecting.

WARNING! HTG relay voltage is always limited to 250 V AC, irrespectively of the power supply version of the FCU controller.

WARNING! This digital output is equipped with a separate circuit with 10 A relay. This circuit requires using external fuse protection up to 10 A. The current higher than 10 A may permanently damage device and cause danger to the user and to the equipment!

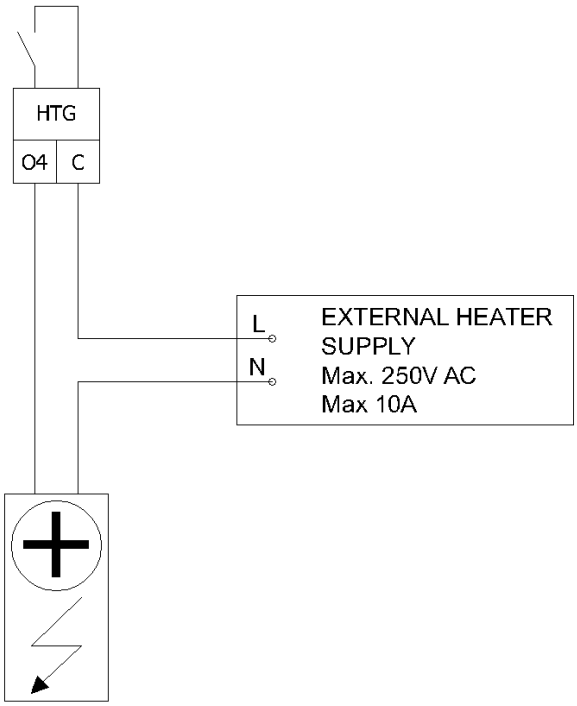

Figure 19 Digital Output O4, exemplary Electrical Heater connection

4.2.3 O5 – CLG relay "Electrical Cooler"

ISMA-B-FCU device is equipped with a relay output, which in FCU application is dedicated to an external Cooler. This relay output is internally connected to the power supply, therefore there is no need to connect external supply. In iSMA-B-FCU-HH and iSMA-B-FCU-HL the output voltage in high state is 230 V AC, and in iSMA-B-FCU-LL version the high state voltage is 24 V AC. Current consumption cannot exceed 6 A. An exemplary way of connecting is presented in the figure below.

WARNING! Output O4 and outputs O1-O3 are protected by a 6 A fuse. Total current for digital relay outputs cannot exceed 6A.

WARNING! It is forbidden to use a fuse with current exceeding 6A! Higher current may permanently damage the device and cause a danger to the user and to the equipment!

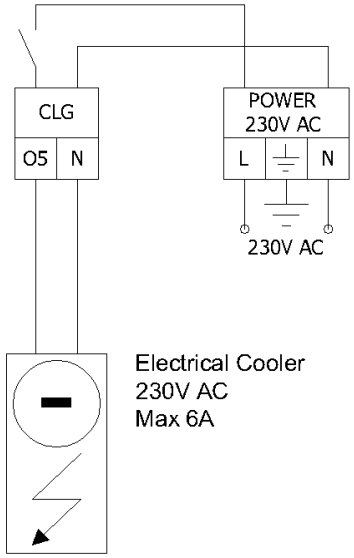

Figure 20 Digital Output O5, an example of 230 V AC Electrical Cooler connection (iSMA-B-FCU-HH and iSMA-B-FCU-HL version)

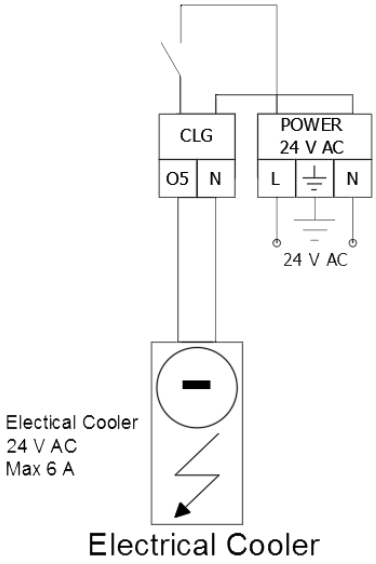

Figure 21 Digital Output O5, an example of 24 V AC Electrical Cooler connection (iSMA-B-FCU-LL version)

4.3 Analog Outputs

ISMA-B-FCU device is equipped with 3 Analog Outputs 0-10 V DC. Those outputs are designed for controlling the following actuators:

- A1 (HTG) – analog heating valve actuator,
- A2 (CTG) – analog cooling valve actuator,
- A3 (FAN) – analog fan speed control.

The recommended way of connecting the Analog Outputs is presented in the figures below.

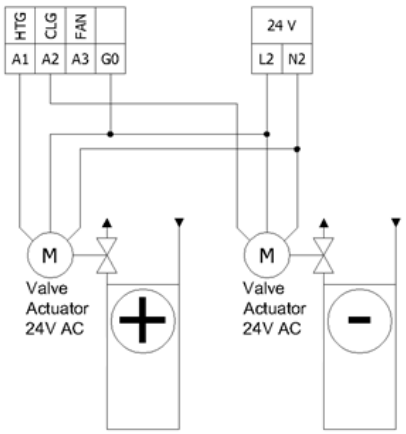

Figure 22 Analog Outputs, an exemplary connection of analog 0-10 V valve actuators

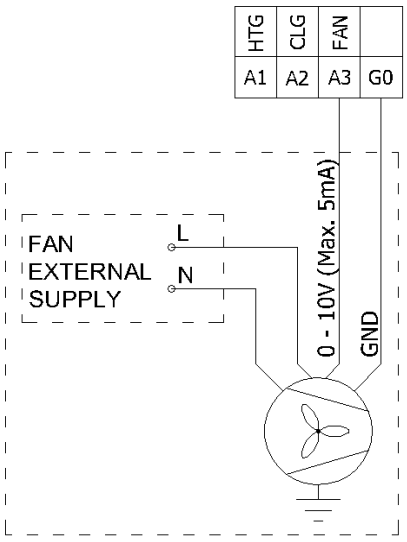

Figure 23 Analog Outputs, an exemplary connection of analog 0-10 V fan control

5 MAC DIP SWITCH addressing table

Address	S1	S2	S3	S4	S5	S6	S7	S8
1	On							
2		On						
3	On	On						
4			On					
5	On		On					
6		On	On					
7	On	On	On					
8				On				
9	On			On				
10		On		On				
11	On	On		On				
12			On	On				
13	On		On	On				
14		On	On	On				
15	On	On	On	On				
16					On			
17	On				On			
18		On			On			
19	On	On			On			
20			On		On			
21	On		On		On			
22		On	On		On			
23	On	On	On		On			
24				On	On			
25	On			On	On			
26		On		On	On			
27	On	On		On	On			
28			On	On	On			
29	On		On	On	On			
30		On	On	On	On			
31	On	On	On	On	On			
32						On		
33	On					On		
34		On				On		
35	On	On				On		
36			On			On		
37	On		On			On		
38		On	On			On		
39	On	On	On			On		
40				On		On		
41	On			On		On		
42		On		On		On		

Address	S1	S2	S3	S4	S5	S6	S7	S8
43	On	On		On		On		
44			On	On		On		
45	On		On	On		On		
46		On	On	On		On		
47	On	On	On	On		On		
48					On	On		
49	On				On	On		
50		On			On	On		
51	On	On			On	On		
52			On		On	On		
53	On		On		On	On		
54		On	On		On	On		
55	On	On	On		On	On		
56				On	On	On		
57	On			On	On	On		
58		On		On	On	On		
59	On	On		On	On	On		
60			On	On	On	On		
61	On		On	On	On	On		
62		On	On	On	On	On		
63	On	On	On	On	On	On		
64							On	
65	On						On	
66		On					On	
67	On	On					On	
68			On				On	
69	On		On				On	
70		On	On				On	
71	On	On	On				On	
72				On			On	
73	On			On			On	
74		On		On			On	
75	On	On		On			On	
76			On	On			On	
77	On		On	On			On	
78		On	On	On			On	
79	On	On	On	On			On	
80					On		On	
81	On				On		On	
82		On			On		On	
83	On	On			On		On	
84			On		On		On	
85	On		On		On		On	

Address	S1	S2	S3	S4	S5	S6	S7	S8
86		On	On		On		On	
87	On	On	On		On		On	
88				On	On		On	
89	On			On	On		On	
90		On		On	On		On	
91	On	On		On	On		On	
92			On	On	On		On	
93	On		On	On	On		On	
94		On	On	On	On		On	
95	On	On	On	On	On		On	
96						On	On	
97	On					On	On	
98		On				On	On	
99	On	On				On	On	
100			On			On	On	
101	On		On			On	On	
102		On	On			On	On	
103	On	On	On			On	On	
104				On		On	On	
105	On			On		On	On	
106		On		On		On	On	
107	On	On		On		On	On	
108			On	On		On	On	
109	On		On	On		On	On	
110		On	On	On		On	On	
111	On	On	On	On		On	On	
112					On	On	On	
113	On				On	On	On	
114		On			On	On	On	
115	On	On			On	On	On	
116			On		On	On	On	
117	On		On		On	On	On	
118		On	On		On	On	On	
119	On	On	On		On	On	On	
120				On	On	On	On	
121	On			On	On	On	On	
122		On		On	On	On	On	
123	On	On		On	On	On	On	
124			On	On	On	On	On	
125	On		On	On	On	On	On	
126		On	On	On	On	On	On	
127	On	On	On	On	On	On	On	
BACnet WARNING! Addressing in the range below will run devices in BACnet Slave mode								

Address	S1	S2	S3	S4	S5	S6	S7	S8
128								On
129	On							On
130		On						On
131	On	On						On
132			On					On
133	On		On					On
134		On	On					On
135	On	On	On					On
136				On				On
137	On			On				On
138		On		On				On
139	On	On		On				On
140			On	On				On
141	On		On	On				On
142		On	On	On				On
143	On	On	On	On				On
144					On			On
145	On				On			On
146		On			On			On
147	On	On			On			On
148			On		On			On
149	On		On		On			On
150		On	On		On			On
151	On	On	On		On			On
152				On	On			On
153	On			On	On			On
154		On		On	On			On
155	On	On		On	On			On
156			On	On	On			On
157	On		On	On	On			On
158		On	On	On	On			On
159	On	On	On	On	On			On
160						On		On
161	On					On		On
162		On				On		On
163	On	On				On		On
164			On			On		On
165	On		On			On		On
166		On	On			On		On
167	On	On	On			On		On
168				On		On		On
169	On			On		On		On
170		On		On		On		On

Address	S1	S2	S3	S4	S5	S6	S7	S8
171	On	On		On		On		On
172			On	On		On		On
173	On		On	On		On		On
174		On	On	On		On		On
175	On	On	On	On		On		On
176					On	On		On
177	On				On	On		On
178		On			On	On		On
179	On	On			On	On		On
180			On		On	On		On
181	On		On		On	On		On
182		On	On		On	On		On
183	On	On	On		On	On		On
184				On	On	On		On
185	On			On	On	On		On
186		On		On	On	On		On
187	On	On		On	On	On		On
188			On	On	On	On		On
189	On		On	On	On	On		On
190		On	On	On	On	On		On
191	On	On	On	On	On	On		On
192							On	On
193	On						On	On
194		On					On	On
195	On	On					On	On
196			On				On	On
197	On		On				On	On
198		On	On				On	On
199	On	On	On				On	On
200				On			On	On
201	On			On			On	On
202		On		On			On	On
203	On	On		On			On	On
204			On	On			On	On
205	On		On	On			On	On
206		On	On	On			On	On
207	On	On	On	On			On	On
208					On		On	On
209	On				On		On	On
210		On			On		On	On
211	On	On			On		On	On
212			On		On		On	On
213	On		On		On		On	On

Address	S1	S2	S3	S4	S5	S6	S7	S8
214		On	On		On		On	On
215	On	On	On		On		On	On
216				On	On		On	On
217	On			On	On		On	On
218		On		On	On		On	On
219	On	On		On	On		On	On
220			On	On	On		On	On
221	On		On	On	On		On	On
222		On	On	On	On		On	On
223	On	On	On	On	On		On	On
224						On	On	On
225	On					On	On	On
226		On				On	On	On
227	On	On				On	On	On
228			On			On	On	On
229	On		On			On	On	On
230		On	On			On	On	On
231	On	On	On			On	On	On
232				On		On	On	On
233	On			On		On	On	On
234		On		On		On	On	On
235	On	On		On		On	On	On
236			On	On		On	On	On
237	On		On	On		On	On	On
238		On	On	On		On	On	On
239	On	On	On	On		On	On	On
240					On	On	On	On
241	On				On	On	On	On
242		On			On	On	On	On
243	On	On			On	On	On	On
244			On		On	On	On	On
245	On		On		On	On	On	On
246		On	On		On	On	On	On
247	On	On	On		On	On	On	On
248				On	On	On	On	On
249	On			On	On	On	On	On
250		On		On	On	On	On	On
251	On	On		On	On	On	On	On
252			On	On	On	On	On	On
253	On		On	On	On	On	On	On
254		On	On	On	On	On	On	On
255	On	On	On	On	On	On	On	On

6 List of supported temperature sensors

No	1	No	2
Sensor	10K3A1	Sensor	10K4A1
β coefficient	3975K	β coefficient	3695K
Manufacturers	Cylon, Honeywell, Johnson, Satchwell, Seachange	Manufacturers	Andover, Delta Controls, Siebe, York
°C	Ω	°C	Ω
-45	491749	-45	330749
–40	335671	-40	239831
-35	241840	-35	181532
–30	176683	-30	135233
-25	131251	-25	105081
–20	96974	-20	78930
–15	72895	-15	61030
–10	55298	-10	47549
–5	42314	-5	37316
0	32650	0	29490
5	25396	5	23462
10	19904	10	18787
15	15714	15	15136
20	12494	20	12268
25	10000	25	10000
30	8056	30	8197
35	6530	35	6754
40	5325	40	5594
45	4367	45	4656
50	3601	50	3893
55	2985	55	3271
60	2487	60	2760
65	2082	65	2339
70	1751	70	1990
75	1480	75	1700
80	1256	80	1458
85	1070	85	1255
90	916	90	1084
95	787	95	939
100	678	100	817
105	587	105	713
110	510	110	624
115	444	115	547

No	1	No	2
120	388	120	482
125	340	125	426

No	3	No	4
Sensor	10K	Sensor	20K6A1
β coefficient	3435K	β coefficient	4262K
Manufacturers	Carel	Manufacturers	Honeywell
°C	Ω	°C	Ω
−40	188500	−40	806800
-35	144100	-35	574400
−30	111300	−30	413400
-25	86430	-25	300400
−20	67770	−20	220600
−15	53410	−15	163480
−10	42470	−10	122260
−5	33900	−5	92220
0	27280	0	70140
5	22050	5	53780
10	17960	10	41540
15	14690	15	32340
20	12090	20	25340
25	10000	25	20000
30	8313	30	15886
35	6940	35	12698
40	5827	40	10212
45	4912	45	8260
50	4161	50	6718
55	3536	55	5494
60	3020	60	4518
65	2588	65	3732
70	2228	70	3098
75	1924	75	2586
80	1668	80	2166
85	1451	85	1823
90	1266	90	1541
95	1108	95	1308
100	973	100	1114

No	3	No	4
105	857	105	953
110	758	110	818
115	672	115	704
120	597	120	609
125	531	125	528

No	5	No	6
Sensor	2.2K3A1	Sensor	3K3A1
β coefficient	3975K	β coefficient	3975K
Manufacturers	Ambiflex, Johnson	Manufacturers	Alerton
°C	Ω	°C	Ω
−50	154464	−50	200348
-45		-45	150524
−40	77081	−40	100701
-35		-35	76853
−30	40330	−30	53005
-25		-25	41048
−20	22032	−20	29092
−15		−15	21868
−10	12519	−10	16589
−5	9529	−5	12694
0	7373	0	9795
5	5719	5	7619
10	4487	10	5971
15	3539	15	4714
20	2814	20	3748
25	2252	25	3000
30	1814	30	2417
35	1471	35	1959
40	1199	40	1598
45	983	45	1310
50	812	50	1080
55	672	55	896
60	561	60	746
65	469	65	625
70	395	70	526
75	333	75	444
80	284	80	377
85	241	85	321

No	5	No	6
90	207	90	275
95	177	95	236
100	154	100	204
105	132	105	176
110	116	110	153
115		115	133
120	88	120	117
125		125	102

No	7	No	8
Sensor	30K6A1	Sensor	SIE1
β coefficient	4262K	Manufacturers	Barber Colman, Siebe
Manufacturers	Drayton	°C	Ω
°C	Ω	−50	10732
−30	622911	-45	10624
-25	477393	−40	10517
−20	331876	-35	10344
−15	245785	−30	10172
−10	183697	-25	9913
−5	138502	−20	9654
0	105305	−15	9320
5	60713	−10	8933
10	62347	−5	8496
15	48511	0	8044
20	38019	5	7489
25	30000	10	6938
30	23828	15	6370
35	19046	20	5798
40	15317	25	5238
45	12390	30	4696
50	10079	35	4185
55	8243	40	3707
60	6777	45	3271
65	5600	50	2875
70	4650	55	2521
75	3879	60	2206
80	3251	65	1929
85	2737	70	1685

No	7	No	8
90	2313	75	1472
95	1963	80	1287
100	1672	85	1127
105	1430	90	986
110	1228	95	866
115	1058	100	760
120	915	105	670
125	793	110	590
		115	522
		120	462
		125	410

No	9	No	10
Sensor	TAC1	Sensor	SAT1
β coefficient	3500K	Manufacturers	Satchwell
Manufacturers	TAC	°C	Ω
°C	Ω	-45	9652
–40	39024	–40	9584
-35	29358	-35	9467
–30	22284	–30	9349
-25	17073	-25	9159
–20	13192	–20	8968
–15	10276	–15	8708
–10	8068	–10	8396
–5	6382	–5	8031
0	5085	0	7614
5	4078	5	7150
10	3294	10	6649
15	2676	15	6121
20	2188	20	5580
25	1800	25	5039
30	1488	30	4513
35	1237	35	4012
40	1034	40	3545
45	869	45	3117
50	733	50	2730
55	622	55	2386
60	529	60	2082

65	453	65	1816
70	389	70	1585
75	335	75	1385
80	290	80	1213
85	252	85	1064
90	220	90	937
95	192	95	828
100	169	100	734
105	149	105	654
110	131	110	585
115	116	115	525
120	103	120	474
125	92	125	429