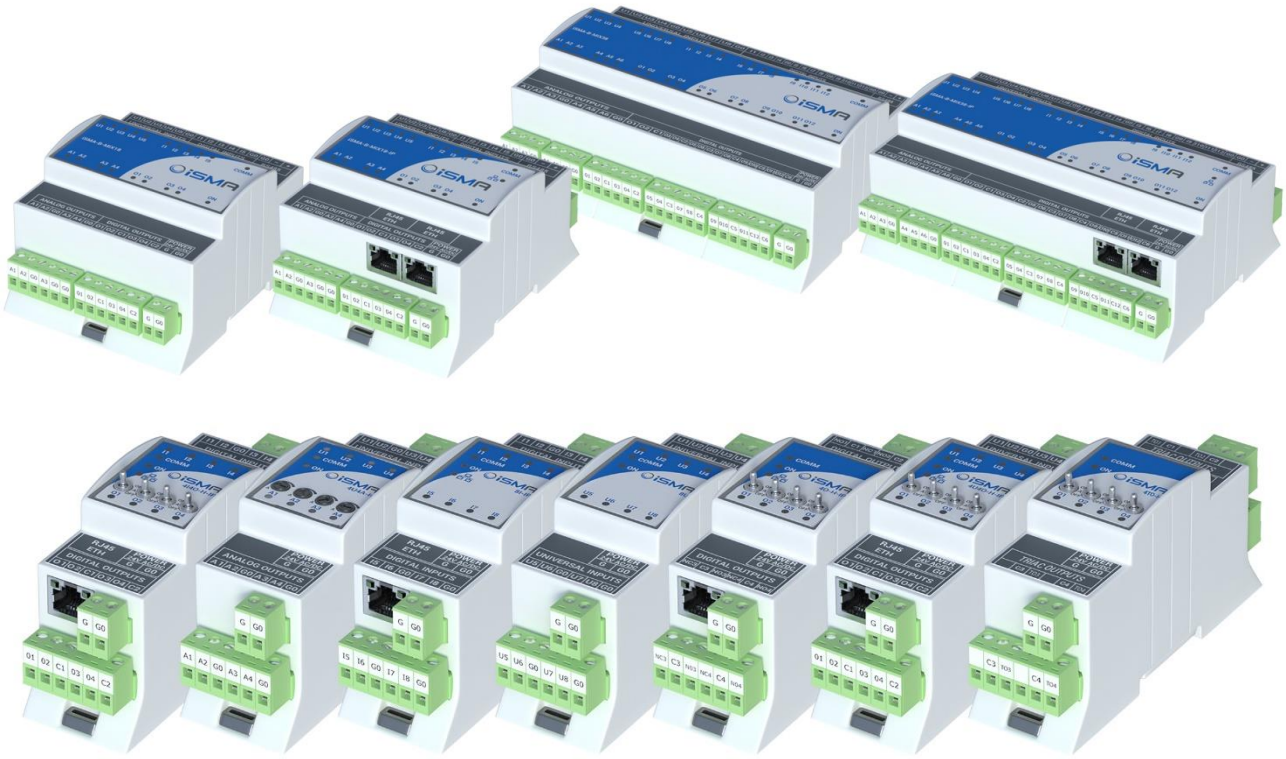
Intelligent Solution Managing Automation

MINI and MIX Series

I/O modules

User Manual

BACnet



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1 Introduction

1.1 Revision history

Rev	Date	Description
1.0	2015.08.28	First edition
1.1	2016.02.01	The reason for the creation of a new version of the document: At 12.2015 GC5 released a new hardware version for MIX module with more powerful processor and USB port. For this hardware and for all MINI series devices were released firmware 4.0 which contains bug fix, firmware improvement and also rebuilt BACnet protocol (new object, COV). All modules purchased as of 2016 have improved versions of the relays, which allow to increase the capacitive load. Details of the technical specifications. Note: This document was created for devices with firmware version 4.0 and above. For previous firmware version please read BACnet Manual version 1.0. Changes in Document: • Added to the technical specifications information about the capacitive load relay. • Added to the technical specifications information about load Triac Outputs. • Added information about COV. • New BACnet objects UP_TIME and WATCHDOG. • Universal Inputs: added COV support and new feature of flag OUT_OF_SERVICE. • Universal Inputs: added new objects UI_CONFIGRATION, UI_RESOLUTION, UI_FILTER and UI_DRY CONTACT. • Digital Inputs: added COV support and new feature of flag OUT_OF_SERVICE. • Digital Inputs: added new objects BIA_COUNTER, BI_COUNTER. • Analog Outputs: added COV support and new feature of flag OUT_OF_SERVICE and STATUS_FLAG. • Analog Outputs: added new objects AO_CONFIGURATION, AO_HAND_STATUS, AO_HAND_VALUE. • Digital Outputs: added COV support and new feature of flag OUT_OF_SERVICE and STATUS_FLAG. • Digital Outputs: added new objects HAND_STATUS. • Added description of the new MINI module 4x Triac Outputs: 4TO-H and 4TO-H-IP. • MINI - 4I40-H and 4I40-H-IP Module built in application: Change of logic in the Time relay mode. Now, timer counts from falling edge (before from rising edge). • MINI - 4I40-H and 4I40-H-IP Module built-in application: added new objects MODE_TIME, COMMAND, BLOCKING. • Added short list of BACnet Object. • Changed tables with PT1000 and NI1000 for more accurate, because new FW measures temperature of these sensors with accuracy 0,1°C.
1.2	2017.01.04	The reason for the creation of new version of the document: New functions: • New HVAC functions Heating and Cooling in 4U4O based on output thermostatic control with a setpoint and differential value setting; • Added new input mode for 4I4O: Time Relay NC [ms], Time Relay NO and NC in

		seconds, Input Forwarding; • Added new input mode for 4U4O: Ordinary IO, Monostable Relay, Bistable Relay, Time Relay NO and NC [ms], Time Relay NO and NC in seconds, Input Forwarding, Heating, Cooling with corresponding BACnet objects and Modbus registers; • Added reset output to default after input mode change in 4U4O and 4I4O; Improvements: • Improved BACnet COV Increment can now have values with resolution 0.1; • Added BACnet COV Increment access (read/write) through USB; • Added power Led flashing after IO watchdog triggered; • Changed IO watchdog reset after read/write registers through USB; • Added immediately detecting sensors short circuit and disconnection regardless of filter settings on universal inputs; Fixed bugs: Fixed bug with Stop bits, was always 1;
1.3	2017.05.16	The reason for the creation of new version of the document: New functions: • added Hardware Version info on main tab in web page and Modbus register • new action in the Modbus register no 0 – enter bootloader • added RS485 biasing control for MINI modules with hardware version >= 2.0 (option unavailable in MIX modules) • added new Device Object properties : Version type, Baud rate, User Baud rate, IP address, Subnet mask, Default Gateway, HTTP port, UDP port • www page: RS485 Biasing Resistors activation option (shows only in MINI modules with a hardware >= 2.0) Improvements: • fixed www page: COV increment always in format with one decimal place • fixed modules names on web page (added -H for all modules with hand operation switches)

Table 1 Revision history

1.2 Safety rules

- Note: Incorrect wiring of this product can damage it and lead to 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 an electric shock.
- Do not touch electrically charged parts such as the power terminals. Doing so might cause an electric shock.
- Do not disassemble the product. Doing so might cause an 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 a fire or faulty operation
- Firmly tighten the wires to the terminal. Insufficient tightening of the wires to the terminal might cause a fire.

1.3 Technical specifications

Power supply	Voltage	24 V AC/DC ± 20%	
	Power consumption		
	Module type	@ 24 V DC	@ 24 V AC
	8I	0.4 W	0.6 VA
	8I-IP	1.4 W	2.1 VA
	8U	0.5 W	0.8 VA
	8U-IP	1.5 W	2.3 VA
	4I4O-H	1.2 W	1.8 VA
	4I4O-H-IP	2.2 W	3.3 VA
	4U4O-H	1.2 W	1.8 VA
	4U4O-H-IP	2.2 W	3.3 VA
	4U4A-H	2.2 W	3.3 VA
	4U4A-H-IP	3.2 W	4.8 VA
	4O-H	1.6 W	2.4 VA
	4O-H-IP	2.6 W	3.9 VA
	4TO-H	1.0 W	1.5 VA
	4TO-H-IP	2.0 W	3.0 VA
	MIX18	3.0 W	4.5 VA
	MIX18-IP	4.4 W	6.6 VA
	MIX38	5.0 W	7.5 VA
	MIX38-IP	7.4 W	11.1 VA
Universal Inputs	Temperature input	• Measurement with attached RTDs • accuracy ± 0,1˚C • For sensor PT1000 and NI1000 use 16-bit resolution	
	Voltage input	• Voltage measurement from 0-10 V DC • Input impedance 100 kΩ • Measurement accuracy ±0,1% • Measurement resolution 3 mV @ 12-bit and 1 mV @ 16-bit	
	Current input	• Current measurement 0 - 20 mA • Required external resistor 200 Ω • Measurement accuracy ±1,1% • Measurement resolution 15 µA @ 12-bit and 5 µA @ 16-bit	
	Resistive input	• Measurement of resistance from 0 to 1000 kΩ • Measurement resolution for 20 kΩ load 20 Ω @ 12-bit and 1 Ω @ 16-bit • Measurement resolution for PT1000 and NI1000 0,1 Ω @ 16-bit	

	Resistance measurement method	The voltage divider
	Dry contact input	Output current ~1 mA
	Measurement resolution	12-bits (default) or 16-bits
	Processing time	• 10 ms/channel at 12-bits • 140 ms/channel at 16-bits
Digital Inputs	Type	Dry contact
	Max input frequency	100 Hz save in EEPROM memory
Analog Outputs	Voltage range	0-10 V DC
	Max. load current	20 mA
	Resolution	12-bits
	Accuracy	± 0.5%
Digital Outputs (relays)	Contact material	$AgSnO_2$
	Resistive load AC1	3 A @ 230 V AC or 3A @ 30 V DC
	Inductive load AC3	75 VA @ 230 V AC or 30W @ 30 V DC
	Capacitive load	• 50 W @ LED + PS 230 VAC • 100 W @ fluorescent lamps with electronic ballast • 75 W @ CFL Compact fluorescent lamp
Digital Outputs (relays) 4O-H and 4O-H-IP	Contact material	AgSnO2
	Resistive load AC1	8A @ 230 V AC or 8 A @ 30 V DC
	Inductive load AC3	360 VA@ 230 V AC or 90 W @ 30 V DC
	Capacitive load	• 120 W @ LED + PS 230 V AC • 240 W @ fluorescent lamps with electronic ballast • 180 W @ CFL Compact fluorescent lamp
Triac Outputs	Continuous load per channel	0,5 A @ 20 V AC up to max. 250 V AC
	Peak load per channel	1,5 A @ 20 V AC up to max. 250 V AC (30s)
	Gate Control	Zero crossing turn ON
	Frequency Range	47 to 63 Hz
	Snubber	Snubberless Triac
RS485 Interface	RS485	Up to 128 devices
	Communication protocols	Modbus RTU, Modbus ASCII or BACnet set by switch
	Baud rate	From 2400 to 115200 set by switch
	Address	0 to 99 set by switch
Ethernet	MIX18-IP, MIX38-IP	
	2x Fast Ethernet	Switch mode
	Baud rate	10/100 Mb/s
	8I-IP, 8U-IP, 4I4O-H-IP, 4U4O-H-IP, 4U4A-H-IP, 4O-H-IP, TO-H-IP	

	1x Fast Ethernet	IP Interface
	Baud rate	10/100 Mb/s
USB	USB	Mini USB 2.0
Ingress protection	IP	IP40
Temperature	Storage	-40˚C to +85˚C
	Operating	-10˚C to +50˚C
Humidity	Relative	5% to 95%
Connectors	Type	Removable
	Maximum cable size	2.5 mm2
Dimension	MIX18, MIX18-IP	
	Width	110 mm
	Length	88 mm
	Height	62 mm
	MIX38, MIX38-IP	
	Width	110 mm
	Length	160 mm
	Height	62 mm
	MINI Series	
	Width	110 mm
	Length	37 mm
	Height	62 mm

Table 2 Technical specification

1.4 Summary table for all modules

Module type	UI	DI	AO	DO	TO	Modbus RS485	Modbus TCP/IP	BACnet MSTP	BACnet IP
4I4O-H		4		4		✓		✓	
4I4O-H-IP		4		4			✓		✓
4O-H				4 (NC/NO-8A)		✓		✓	
4O-H-IP				4 (NC/NO-8A)			✓		✓
4U4A-H	4		4			✓		✓	
4U4A-H-IP	4		4				✓		✓
4U4O-H	4			4		✓		✓	
4U4O-H-IP	4			4			✓		✓
8I		8				✓		✓	
8I-IP		8					✓		✓
8U	8					✓		✓	
8U-IP	8						✓		✓
4TO-H					4	✓		✓	
4TO-H-IP					4		✓		✓
MIX18	5	5	4	4		✓		✓	
MIX18-IP	5	5	4	4			✓		✓

MIX38	8	12	6	12		✓		✓	
MIX38-IP	8	12	6	12			✓		✓
						RTU ASCII	Modbus Gateway IP/RS485	Master Slave	

Table 3 Summary table for all modules

1.5 Dimension

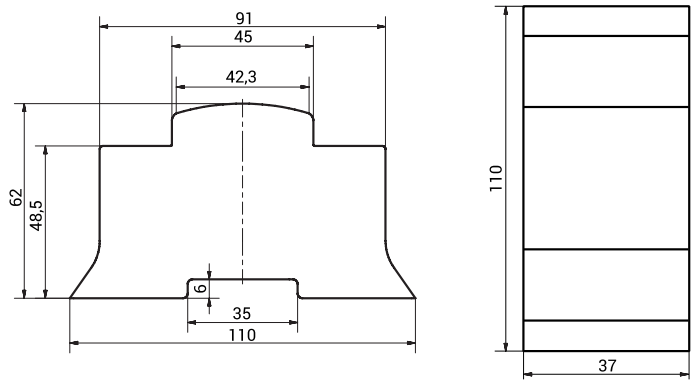

Figure 1 MINI series dimension

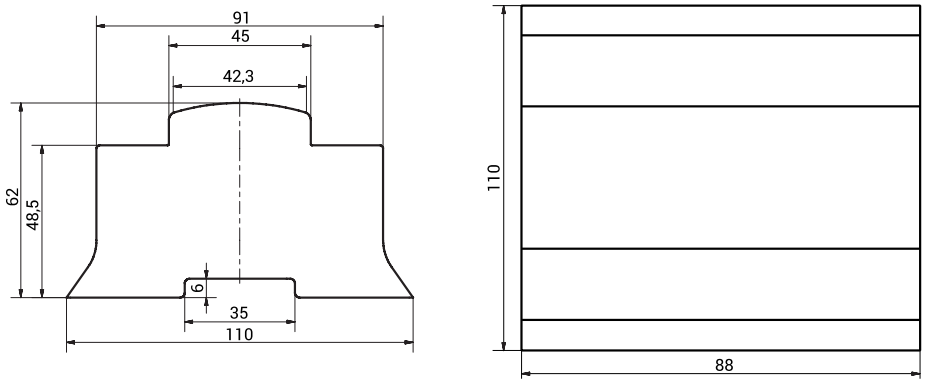

Figure 2 MIX18 and MIX18-IP dimension

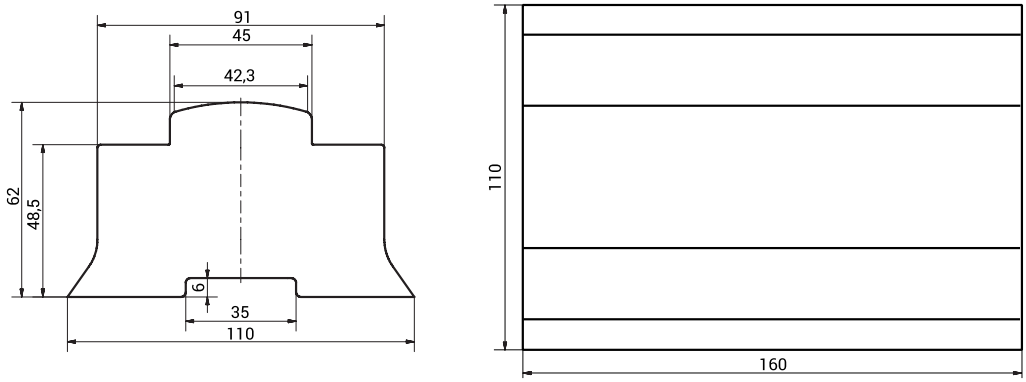

Figure 3 MIX38 and MIX38-IP dimension

1.6 Power supply connection

1.6.1 DC power connection

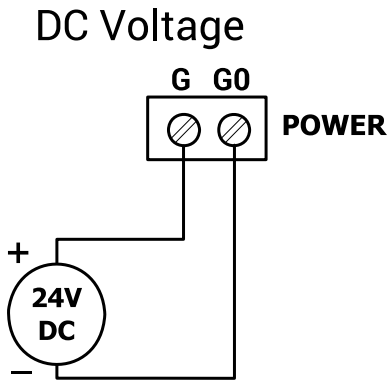

Figure 4 DC power supply connection

1.6.2 AC power connection

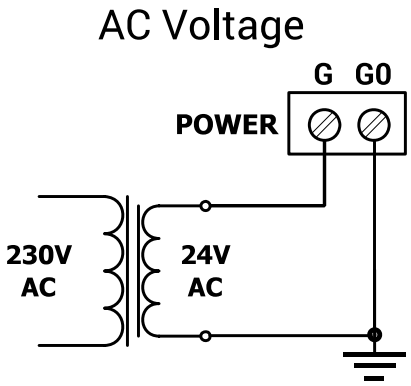

Figure 5 AC power supply connection

1.7 Connecting the communication bus (RS485)

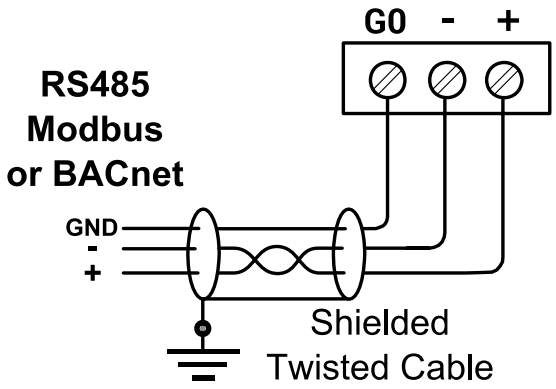

Figure 6 RS485 connection

1.8 LED Indicators

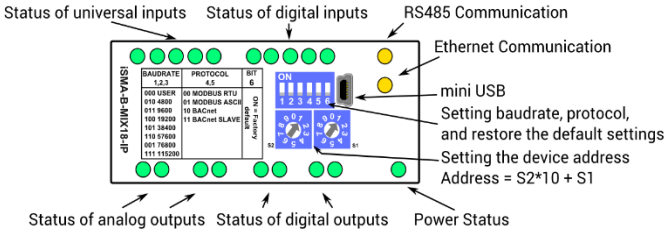

Figure 7 Top panel MIX 18 and MIX18-IP

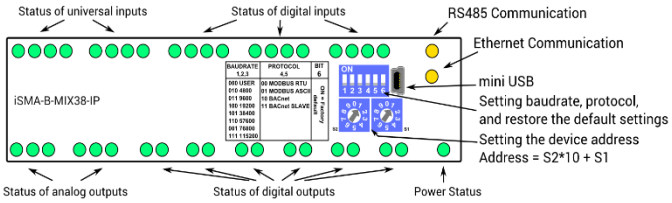

Figure 8 Top panel MIX38 and MIX38-IP

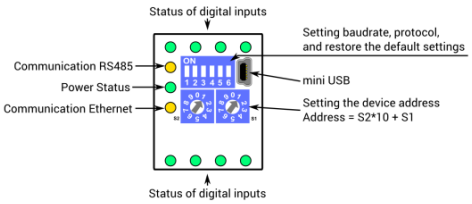

Figure 9 Top panel 8I and 8I-IP

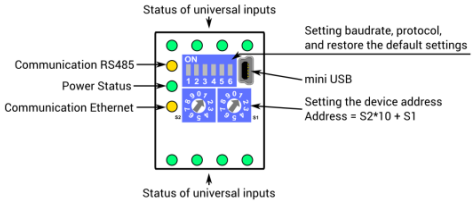

Figure 10 Top panel 8U and 8U-IP

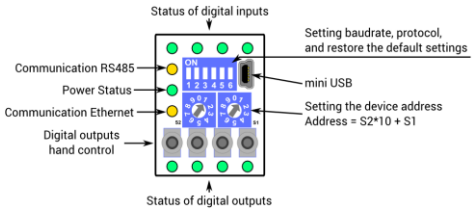

Figure 11 Top panel 4I4O-H and 4I4O-H-IP

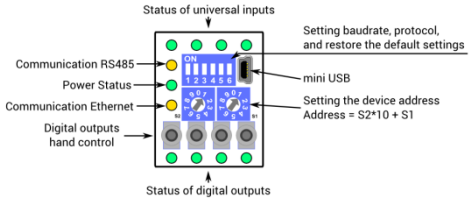

Figure 12 Top panel 4U4O-H and 4U4O-H-IP

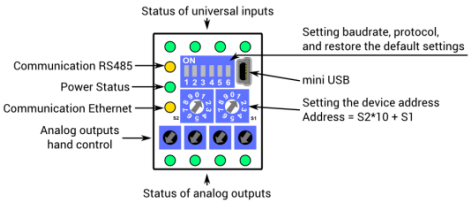

Figure 13 Top panel 4U4A-H and 4U4A-H-IP

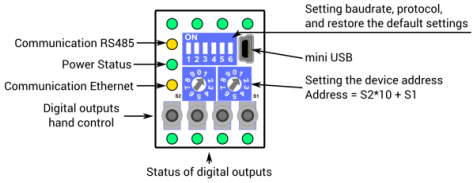

Figure 14 Top panel 4O-H and 4O-H-IP

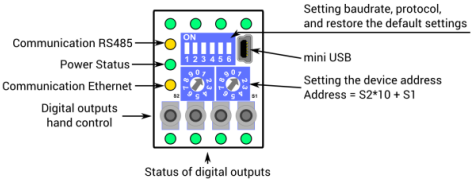

Figure 15 Top panel 4TO-H and 4TO-H-IP

- The power LED is ON (green) when the module runs properly.
- Communication LED is ON (orange) for 20 ms after sending each message. If the module receives/sends a lot of messages, LED can be lit continuously.
- LEDs indicate the status of the Universal Inputs are lit when resistance connected to the input is less than 5 kΩ (Dry Contact input is active).

WARNING! The LED also lights up when voltage connected to the input has a very low potential.

- LEDs indicate the status of the Digital Inputs are lit when the input is active.
- LEDs indicate the status of the Analog Outputs are lit when output voltage or PWM factor is different from 0.
- LEDs indicate the status of the Digital Outputs are lit when output is enabled.

1.9 Grounding and shielding RS485

In most cases, IO modules will be installed in an enclosure along with other devices which generate electromagnetic radiation. Relays, contactors, transformers, motor invertors etc. are the examples of these devices. This electromagnetic radiation can induce electrical noise into both power and signal lines, as well as direct radiation into the module causing negative effects on the system. Appropriate grounding, shielding and other protective steps should be taken at the installation stage to prevent these effects. These protective steps include control cabinet grounding, cable shield grounding, protective elements for electromagnetic switching devices, correct wiring as well as consideration of cable types and their cross sections.

1.10 RS485 network termination

Transmission line often causes the problems on data communication networks. These problems include reflections and signal attenuation.

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

1.11 Setting Module MAC

To determine the MAC of device, module provides two rotary switches S1 and S2 located on the top panel of the device.

It is possible to set the MAC from 0 to 99 in BACnet protocol mode or from 128 to 227 in BACnet SLAVE protocol mode (128 + switch value). The formula for setting the MAC:

$$MAC = S2 \cdot 10 + S1$$

Where S1 and S2 are values of switches.

The example for BACnet Master protocol mode:

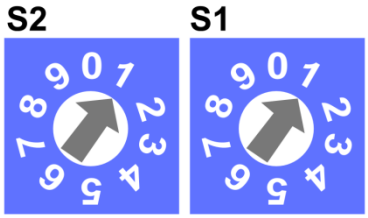

Figure 16 Sample of setting MAC in Master mode

Switches set as in figure above will set the module MAC to 11.

An example for BACnet Slave protocol mode (only RS485 modules, IP modules do not support BACnet Slave).

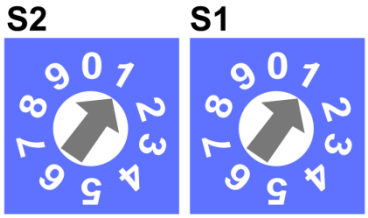

Figure 17 Sample of setting MAC in Slave mode

Switch sets as in the picture above will set the module MAC to 139 (128+11).

1.12 Setting Device ID

Formula for Device ID:

Device ID = Vendor ID * 1000 + MAC + 128 (Only in BACnet SLAVE)

Where GC5 Vendor ID = 826.

An example: If MAC is set to 41 and BACnet protocol then Device ID = 826041 or if in BACnet SLAVE than Device ID = 826169.

If user changes Device ID (by setting a new value of Device ID property in Device object) then change of MAC by rotary switches does not change Device ID. To allow change again Device ID by changing MAC the device needs to be restore to Default Settings.

1.13 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 in the registry
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 4 Baud rate selection

1.14 Protocol selection

Protocol selection is done by sections 4 and 5 of the S3 switch according to 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 5 Protocol selection

WARNING! BACnet SLAVE mode does not support discover function.

1.15 Restoring the default settings

To restore the default configuration of all registers, follow the steps below:

a) Turn off power supply

b) Set section 6 of S3 switch to ON

c) Turn on power supply, power LED blinking

d) Switch section 6 of S3 switch to OFF to restore the default settings. To cancel the reset, turn off the power and switch section 6 of S3 switch to the OFF position.

1.16 Default Settings

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

Register Name	Default Value
COUNTER 1 – 12	0
USER BAUD RATE	7680 (76800 bps)
STOP BITS	1
DATA BITS	8
PARITY BITS	0
RESPONSE DELAY	0
WATCHDOG TIME	0 (disabled)
DEFAULT STATE OF DIGITAL OUTPUTS (1-12)	0
DEFAULT STATE OF THE ANALOG OUTPUTS (DIGITAL 1-6)	0
DEFAULT STATE OF THE ANALOG OUTPUTS (1-6)	0
UNIVERSAL INPUT CONFIGURATION (1-8)	1
INPUT FILTER TIME CONSTANT (1-8)	2
UNIVERSAL INPUT RESOLUTION (1-8)	0
ANALOG OUTPUT CONFIGURATION (1-6)	0
COV INCREMENT (BACnet only)	1
Only for IP Modules	
USERNAME	admin
PASSWORD	1000
IP ADDRESS	192.168.1.123
MASK	255.255.255.0
GATEWAY	192.168.1.1
HTTP PORT	80
MODBUS TCP PORT	502
MODBUS TCP TIMEOUT	60s
RS485 TIMEOUT	1000 ms
SEND MODBUS ERRORS	DISABLE
BACNET ID	826001
BACNET UDP PORT	47808 (0xBAC0)

Table 6 Default values

2 Protocol implementation conformance statement

WARNING! Changing the parameters concerning the transmission configuration (except for registers which value is read from the switch) will only take effect after restarting the unit.

2.1 BACnet Protocol Implementation Conformance Statement

Date	2016-01-07
Vendor Name	Global Control 5 Sp. z o.o.
Product Name	iSMA-B-MIX iSMA-B-MINI
Product Model Number	iSMA-B-MIX18 iSMA-B-MIX38 iSMA-B-8I iSMA-B-8U iSMA-B-4O-H iSMA-B-4I4O-H iSMA-B-4U4O-H iSMA-B-4U4A-H iSMA-B-4TO-H iSMA-B-MIX18-IP iSMA-B-MIX38-IP iSMA-B-8I-IP iSMA-B-8U-IP iSMA-B-4O-H-IP iSMA-B-4I4O-H-IP iSMA-B-4U4O-H-IP iSMA-B-4U4A-H-IP iSMA-B-4TO-H-IP
Firmware Revision	4.0
BACnet Protocol Revision	1.12

Table 7 BACnet Protocol Implementation Conformance Statement

2.2 BACnet Standardized Device Profile

All I-O modules have been standardized as BACnet Smart Sensor (B-SS)

2.3 BACnet Interoperability Building Blocks Supported

Application Service (B-SS)	Designation
Data Sharing - Read Property - B	DS-RP-B
Data Sharing - Write Property - B	DS-WP-B
Data Sharing - COV - B	DS-COV-B
Device Management - Dynamic Device Binding - B	DM-DDB-B
Device Management - Dynamic Object Binding - B	DM-DOB-B
Data Sharing - Read Property Multiple - B	DS-RPM-B

Data Sharing - Write Property Multiple - B	DS-WPM-B

Table 8 Building Blocks Supported

2.4 BACnet Standard Object Types Supported

The following is a list of the standard object types as defined by ASHRAE.

Object Name	Object Numbers for different type of modules								
	8U, 8U-IP	8I, 8I-IP	4I4O-H, 4I4O-H-IP	4U4O-H, 4U4O-H-IP	4U4A-H, 4U4A-H-IP	4O-H, 4O-H-IP	4TO-H, 4TO-H-IP	MIX18, MIX18-IP	MIX38, MIX38-IP
Analog Input	8			4	4			5	8
Analog Output					4		4	4	6
Analog Value	9	9	10	6	10	2	2	12	22
Binary Input		8	4					5	12
Binary Output			4	4		4	4	4	12
Binary Value	8		8	4	4			5	8
Multistate Value	16		8	12	16	4	8	14	22
Accumulator		8	4					5	12
Device	1	1	1	1	1	1	1	1	1

Table 9 Objects types supported by modules

2.5 Data Link Layer Option

- Master-Slave/Token-Passing (MS/TP) master (Clause 9), baud rates: 2400, 4800, 9600, 19200, 38400, 57600, 76800, 115200
- MS/TP slave (Clause 9), baud rates: 2400, 4800, 9600, 19200, 38400, 57600, 76800, 115200
- BACnet Internet Protocol (IP) (Annex J)
- BACnet IP (Annex J), Foreign Device

2.6 Character Sets Supported

ANSI X3.4

2.7 Supported Application Services

Application Service	Initiates Requests	Executes Requests
I-Am	yes	
I-Have	yes	
ReadProperty		yes
ReadPropertyMultiple		yes
Who-Has		yes
Who-Is		yes
WriteProperty		yes
WritePropertyMultiple		yes

Table 10 Supported Application Services

2.8 About COV

All MIX and MINI modules support COV (change of value) policy. It means that the module can send a value every time when it is changed. COV only works with objects BI, BO, AI and AO. In Binary Input and Binary Output objects, the values are sent by every change. There is special property COV Increment which defines sending threshold in Analog Input and Analog Output objects.

2.9 Device BACnet Objects

2.9.1 Device BACnet Object description

Dynamically Creatable: No, Dynamically Deletable: No

Property Name	Required	Proprietary	Writeable	Property ID	Data Type	Description
OBJECT_IDENTIFIER	yes					
OBJECT_NAME	yes					
OBJECT_TYPE	yes					
SYSTEM_STATUS	yes					
VENDOR_NAME	yes					
VENDOR_IDENTIFIER	yes					
MODEL_NAME	yes					
FIRMWARE_REVISION	yes					
APPLICATION_SOFTWARE_VERSION	yes					
PROTOCOL_VERSION	yes					
PROTOCOL_REVISION	yes					
PROTOCOL_SERVICES_SUPPORTED	yes					
PROTOCOL_OBJECT_TYPES_SUPPORTED	yes					
OBJECT_LIST	yes					
MAX_APDU_LENGTH_ACCEPTED	yes					
SEGMENTATION_SUPPORTED	yes					
APDU_TIMEOUT	yes					
NUMBER_OF_APDU_RETRIES	yes					
MAX_MASTER	yes		yes			
MAX_INFO_FRAMES	yes					
DEVICE_ADDRESS_BINDING	yes					
DATABASE_REVISION	yes					
ACTIVE COV SUBSCRIPTION	yes					
HW_VERSION		yes		3020	Unsigned	
VERSION_TYPE		yes	yes	3030	Unsigned	
RS485_BIASING		yes	yes	3045	Unsigned	MINI modules only with HW_VERSION >=2.0
BAUD_RATE		yes		3084	Unsigned	

Property Name	Required	Proprietary	Writeable	Property ID	Data Type	Description
USER_BAUD_RATE		yes	yes	3085	Unsigned	
IP_ADDRESS		yes	yes	3101	Unsigned	
SUBNET_MASK		yes	yes	3102	Unsigned	
DEFAULT_GATEWAY		yes	yes	3103	Unsigned	
HTTP_PORT		yes	yes	3104	Unsigned	
UDP_PORT		yes	yes	3105	Unsigned	
WATCHDOG		yes	yes	5001	Unsigned	
VALID_FRAMES_FOR_US_CNT		yes		5101	Unsigned	
VALID_FRAMES_NOT_FOR_US_CNT		yes		5102	Unsigned	
ERROR_FRAMES_CNT		yes		5103	Unsigned	
TRANSMITTED_FRAMES_CNT		yes		5104	Unsigned	

Table 11 Device BACnet Object

2.9.2 VALID_FRAMES_FOR_US_CNT Property 5101

This property contains number of valid frames (on MS/TP layer) addressed to this module.

2.9.3 VALID_FRAMES_FOR_NOT_US_CNT Property 5102

This property contains number of valid frames (on MS/TP layer) but not addressed to this module.

2.9.4 ERROR_FRAMES_CNT Property 5103

This property contains number of invalid frames on MS/TP layer.

2.9.5 TRANSMITTED_FRAMES_CNT Property 5104

This property contains number of transmitted frames.

2.9.6 UP_TIME Object (Analog Value: 0)

This object shows module working time in seconds from last power up or module reset.

2.9.7 WATCHDOG Object (Analog Value: 1)

This object specifies the time in seconds to watchdog reset. If module does not receive any valid BACnet message within that time, all PRIORITY_ARRAYs will be set to null and PRESENT_VALUE for outputs will be set to RELINQUISH_DEFAULT value.

This feature is useful if for some reason there is an interruption in data transmission and for security reasons output states must be set to the appropriate state endanger the safety of persons or property.

The default value is 0 seconds which means the watchdog function is disabled. To save compatibility this object is also available as Device object property 5001.

When the watchdog is triggered the Power LED blinks with the specified sequence.(3 blinks with 20Hz frequency and 1 second pause).

2.9.8 FIRMWARE VERSION AND MODULE TYPE Property 3030

The property contains a type and a firmware version of a module.

The low byte contains information about a type of a module in accordance with the table below:

Value	Type
81_{10} ($0x51_{16}$)	8I
91_{10} ($0x5B_{16}$)	8I-IP
84_{10} ($0x54_{16}$)	8U
94_{10} ($0x5E_{16}$)	8U-IP
83_{10} ($0x53_{16}$)	4I4O-H
93_{10} ($0x5D_{16}$)	4I4O-H-IP
85_{10} ($0x55_{16}$)	4U4O-H
95_{10} ($0x5F_{16}$)	4U4O-H-IP
86_{10} ($0x56_{16}$)	4U4A-H
96_{10} ($0x60_{16}$)	4U4A-H-IP
82_{10} ($0x52_{16}$)	4O-H
92_{10} ($0x5C_{16}$)	4O-H-IP
87_{10} ($0x57_{16}$)	4TO-H
97_{10} ($0x61_{16}$)	4TO-H-IP
50_{10} ($0x32_{16}$)	MIX18
51_{10} ($0x33_{16}$)	MIX38
52_{10} ($0x34_{16}$)	MIX18-IP
53_{10} ($0x35_{16}$)	MIX38-IP

Table 12 Module type value assignment.

The high byte contains a module firmware version multiplied by 10.

The example:

In the property 3030 is a number 12810_{10} = $0x320A_{16}$. It means that it is a module MIX18 (0x32) with a firmware version 1.0 ($0x0A_{16}$ = 10_{10}).

Setting the property 3030 according to the table below will enable 1 of 4 available actions: reset module, reload settings, set to default and enter bootloader.

Value	Action
511	Reset
767	Reload settings
1023	Set to default
1279	Enter bootloader

Table 13 Device actions.

2.9.9 RS485_BIASING Property 3045

The property allows to activate RS485 biasing resistors in order to pull-up voltage on the RS485 bus. The function is only available in MINI modules with a hardware version >= 2.0 (option unavailable in MIX modules).

The biasing resistors are useful in case when iSMA modules are connected with a third part devices with the same RS485 bus and communication errors appears on the network.

WARNING! The only one single device in the network can have biasing resistors activated !

3 Local I/O

3.1 Universal Inputs connections

3.1.1 Connection of Universal Input to measure voltage 0 – 10 V

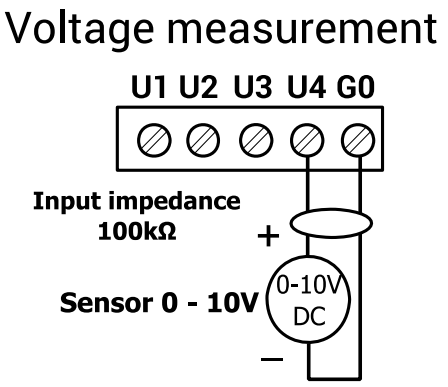

Figure 18 Connection of UI to measure 0-10 V DC for MIX38 and MIX38-IP

3.1.2 Connection of Universal Input to measure current 0 – 20 mA

Current measurement is realized by voltage measurement and 200 Ω resistance. According to the Ohm's law the current is directly proportional to the voltage and the resistance as the constant of proportionality.

$$I = \frac{U}{R}$$

According to the Ohm's low equation for 20 mA current with 200 Ω resistance the output voltage is 4 V. It means that the voltage 4 V on the Universal Input corresponds to 20 mA current.
The result is expressed in millivolts.

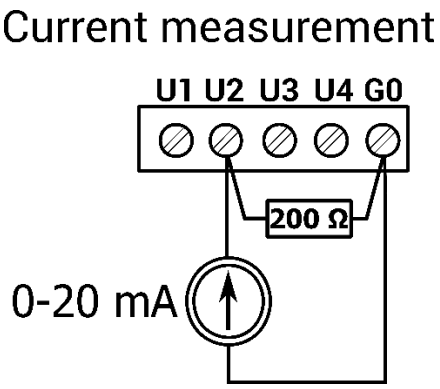

Figure 19 Connection of UI to measure 0-20 mA for MIX38 and MIX38-IP

3.1.3 Connection of Universal Input to measure temperature

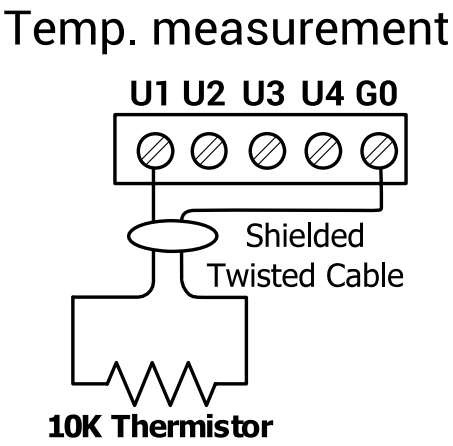

Figure 20 Connection of UI to measure temperature for MIX18 and MIX18-IP

3.1.4 Connection of Universal Input as a Digital Input (Dry Contact)

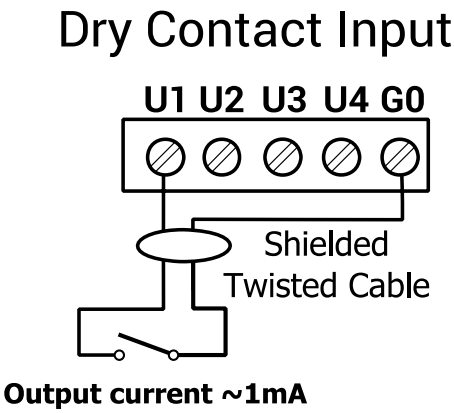

Figure 21 Connection of UI to work as DI for MIX38 and MIX38-IP

3.2 Universal Input BACnet objects

3.2.1 UI - Universal Input object description (Analog Input: 0 - 7)

Each Universal Input of all types of modules is represented on BACnet network as BACnet Analog Input Object which has got the following properties:

Dynamically Creatable: No, Dynamically Deletable: No

Property Name	Required	Proprietary	Writeable	Property ID	Data Type	Description
OBJECT_IDENTIFIER	yes					from AI:0 to AI-7
OBJECT_NAME	yes					UI-x
OBJECT_TYPE	yes					
PRESENT_VALUE	yes					PRESENT_VALUE and UNITS Property
STATUS_FLAGS	yes					
EVENT_STATE	yes					
OUT_OF_SERVICE	yes					OUT OF SERVICE Property
UNITS	yes					PRESENT_VALUE and UNITS Property
COV_INCREMENT						COV INCREMENT Property
INPUT_TYPE *		yes	yes	4001	Enumerated	UI CONFIGURATION Object (Multistate Value: 1 – 8)
RESOLUTION *		yes	yes	4002	Enumerated	
FILTER *		yes	yes	4003	Unsigned	
VOLTAGE *		yes		3010	Unsigned	
RESISTANCE *		yes		3012	Unsigned	
DRY_CONTACT *		yes		3013	Enumerated	

Table 124 Properties of BACnet Analog Input Object

* Object additional properties are saved to keep backword compatibility with older firmware version. In new firmware version each property has corresponding BACnet object.

3.2.1.1 PRESENT_VALUE and UNITS Property

This properties contain actual value and unit of universal input according to INPUT_TYPE property value. The units for Present Value is defined by UI_CONFIGURATION object.

3.2.1.2 COV INCREMENT Property

In firmware version above 4.0 MIX and MINI modules serve COV (change of value). It means that module will automatically send Analog Input value if it changes more than COV Increment property value. (In IP modules this value can be also changed from module web page)

3.2.1.3 OUT OF SERVICE Property

When Out Of Service is false then Present Value property represents actual value read from the input. Settings Out Of Service property to true value, will stop updating Present Value property from the physical input and will allow to write to Present Value property custom value.

WARNING! If you try to override Present value when Out Of Service is false, module will return error "Write Access Denied"

3.2.2 UI CONFIGURATION Object (Multistate Value: 1 – 8)

This object is used to set type of Universal Input. Changing Input type and Analog Input Units property (Voltage, Resistance or one of temperature) also influence on UI object Units.

Object value	Description	Unit Property
1	Voltage measuring 0-10 V	mV
2	Resistance input	Ω
3 (default)	The temperature sensor 10K3A1 NTC B=3975K	°C
4	The temperature sensor 10K4A1 NTC B=3695K	°C
5	The temperature sensor 10K NTC B=3435K Carel	°C
6	The temperature sensor 20K6A1 NTC B=4262K	°C
7	The temperature sensor 2,2K3A1 NTC B=3975K	°C
8	The temperature sensor 3K3A1 NTC B=3975K	°C
9	The temperature sensor 30K6A1 NTC B=4262K	°C
10	The temperature sensor SIE1	°C
11	The temperature sensor TAC1	°C
12	The temperature sensor SAT1	°C
13	The temperature sensor Pt1000	°C
14	The temperature sensor Ni1000	°C

Table 135 UI CONFIGURATION Object value list

This parameter is also available as BACnet UI Analog Input object property number 4001. For configuration parameters, please go to Modbus Manual register numbers 40151 – 40158.

3.2.3 UI RESOLUTION Object (Multistate Value: 9 – 16)

This object is used to determine the bit resolution for each Universal Input 12 or 16-bits.

Setting the value to 1 will set the resolution of converter to 12-bit. Setting the value to 2 sets the resolution of converter to 16-bit.

Object value	Description
1 (default)	12-bits
2	16-bits

Table 146 UI RESOLUTION Object value list

WARNING! Setting 16-bit resolution increases measurement time of one channel from 10 ms to 140 ms. Total time taken to measure all the channels increases from 80 ms to 1120 ms.

This parameter is also available as BACnet UI Analog Input object property number 4002.

3.2.4 UI FILTER Object (Analog Value: 14 – 21)

This object is used to determine time constant low pass filter. The value is expressed in seconds. Valid values must be between 0 and 60 seconds. The default filter value is 2 seconds. Setting value 0 will disable the filter.

This parameter is also available as BACnet UI Analog Input object property number 4003.

In the case of UI shortcut or open-loop the filter is reset and UI value filtering is stopped.

3.2.5 UI DRY_CONTACT Object (Binary Value: 0 – 7)

This object contains information about the status of Digital Inputs (dry contact). When the input is shortcut to the ground the value is set to 1. UI_DRY_CONTACT object works only if UI_CONFIGURATION object is set to resistance or temperature.

This status is also available as BACnet UI Analog Input object property number 3013.

3.3 Digital Inputs connections

3.3.1 Connection of Digital Input (Dry Contact)

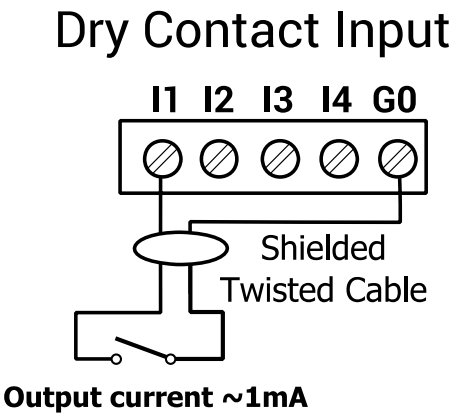

Figure 22 Connection of DI for MIX38 and MIX38-IP

3.4 Digital Input BACnet objects

3.4.1 BI - Digital Input object description (Binary Input: 0 -11)

Each Digital Input of all types of modules is represented on BACnet network as BACnet Binary Input Object which has got the following properties:

Dynamically Creatable: No, Dynamically Deletable: No

Property Name	Required	Proprietary	Writeable	Property ID	Data Type	Description
OBJECT_IDENTIFIER	yes					from BI:0 to BI:11
OBJECT_NAME	yes					BI-x
OBJECT_TYPE	yes					
PRESENT_VALUE	yes					PRESENT_VALUE Property
STATUS_FLAGS	yes					
EVENT_STATE	yes					
OUT_OF_SERVICE	yes					OUT OF SERVICE Property
POLARITY	yes					
UNITS	yes					
COUNTER *		yes	yes	3001	unsigned	

Table 157 Properties of BACnet Binary Input Object

* Object additional properties are saved to keep backword compatibility with older firmware version. In new firmware version each property has corresponding BACnet object.

3.4.1.1 PRESENT_VALUE Property

This property contains the status of the Digital Inputs. Short-circuiting the input to G0 sets the value to 1.

3.4.1.2 Binary Input COV

In firmware version above 4.0 MIX and MINI modules serve COV (change of value). It means that module will automatically send Digital Input value after every change.

3.4.1.3 OUT OF SERVICE Property

When Out Of Service is false then Present Value property represents actual value read from the input. Settings Out Of Service property to true value, will stop updating Present Value property from the physical input and will allow to write to Present Value property custom value.

WARNING! If you override Present Value when Out Of Service is false, module will return error "Write Access Denied"

3.4.2 BIA COUNTER Object (Accumulator: 0 – 12)

This object contains number of counted pulses represented by Accumulator Value BACnet object. This value is also save in non-volatile memory, so information are stored even after power cycle. There is a possibility reset the counter by writing 0 to Present Value property of this object.

This value is also available as BACnet BI Binary Input object property number 3001.

3.4.3 BI COUNTER Object (Analog Value: 2 – 13)

This object contains number of counted pulses identical as Accumulator BACnet object but as Analog Value object. Not every system supports the accumulator type objects that is why we have made additional objects to the counters. Analog Value has one drawback which is a floating number and for value above 16777216 cannot show precise value of the counter, because the number 16777216 + 1 will still be shown as 16777216, but 16777216 + 2 will be shown properly as 16777218.

3.5 Analog Outputs connections

3.5.1 Connection of Analog Output 0 – 10 V

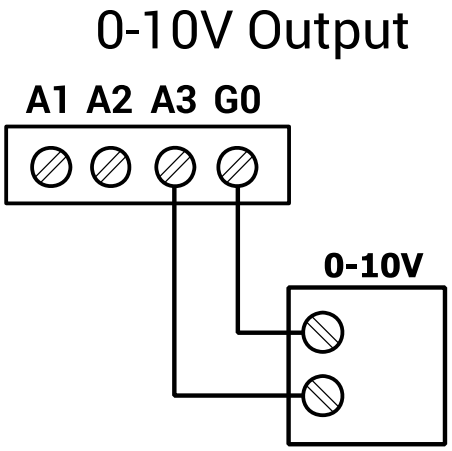

Figure 23 Connection of AO for MIX38 and MIX38-IP

3.5.2 Connecting relay to Analog Output

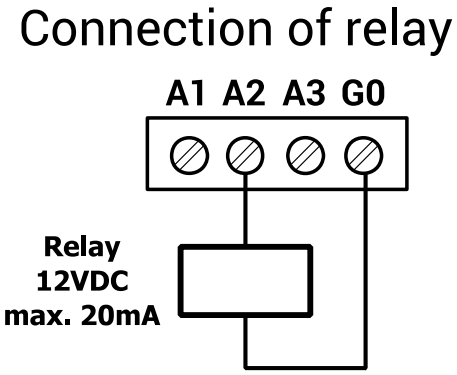

Figure 24 Connection of AO to the relay for MIX38 and MIX38-IP

3.5.3 Connection an actuator to Analog Output

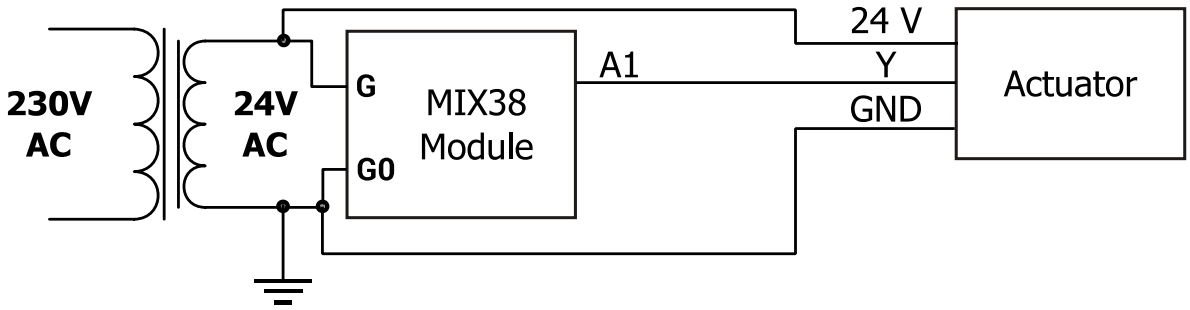

Figure 25 Connection an actuator to AO

Analog Output BACnet objects

3.5.4 AO - Analog Output object description (Analog Output: 0 - 5)

Each Analog Output of all types of modules is represented on BACnet network as BACnet Analog Output Object which has got the following properties:

Dynamically Creatable: No, Dynamically Deletable: No

Property Name	Required	Proprietary	Writeable	Property ID	Data Type	Description
OBJECT_IDENTIFIER	yes					from AO:0 to AO:5
OBJECT_NAME	yes					AO-x
OBJECT_TYPE	yes					
PRESENT_VALUE	yes		yes			PRESENT_VALUE Property
STATUS_FLAGS	yes					STATUS FLAG Property
EVENT_STATE	yes					
OUT_OF_SERVICE	yes		yes			OUT OF SERVICE Property
UNITS	yes					
PRIORITY_ARRAY	yes		yes			
RELINQUISH_DEFAULT	yes		yes			
COV_INCREMENT	no		yes			COV INCREMENT Property
OUTPUT_TYPE *		yes	yes	4001	enumerated	
HAND_STATUS*		yes		3014	Boolean	
HAND_VALUE*		yes		3015	enumerated	

Table 168 Properties of BACnet Analog Output Object

* Object additional properties are saved to keep backword compatibility with older firmware version. In new firmware version each property has corresponding BACnet object.

3.5.4.1 PRESENT_VALUE Property

In the property there is the voltage value stored in mV or percent's of duty that appears on the Analog Output or PWM duty cycle. Output working mode and Property Units are defined by AO_CONFIGURATION object.

3.5.4.2 COV INCREMENT Property

In firmware version above 4.0 MIX and MINI modules serve COV (change of value). It means that module will automatically send Analog Output value if it changes more than COV Increment property value. (In IP modules this value can be also changed for module web

page).

3.5.4.3 OUT OF SERVICE Property

For Analog Outputs object OUT OF SERVICE property is set to true value when output is overridden by USB connection or from module web page (only in IP version). In that case OUT OF SERVICE is set to false value when Present Value property is set by BACnet message.

3.5.4.4 STATUS FLAG Property

Status Flag property contains information about object status. This property consists of 4 binary flags. Each flag is described in the table below.

Module Inputs		Results		
AO Potentiometer	Priority Array	Present Value	Analog Output	Status flag property
Auto position	NULL	Default	Default	0000
	ANALOG VALUE	ANALOG VALUE	ANALOG VALUE	
Manual position	NULL	Manual Value	Manual Value	0010
	ANALOG VALUE	Manual Value		

Table 179 STATUS FLAG Property behaviour

3.5.5 AO CONFIGURATION Object (Multistate Value: 17 – 22)

This object contains information about the mode of the Analog Output according to the following table (Changing configuration also influences on Analog Output unit property):

Object value	Description	Unit Property
1 (default)	Voltage output 0–10 V	mV
2	PWM 1 Hz	%
3	PWM 10 Hz	%
4	PWM 100 Hz	%
5	PWM 0.1 HZ	%
6	PWM 0.01 Hz	%

Table 20 AO CONFIGURATION Object value list

This configuration is also available in AO Analog Output object as OUTPUT_TYPE Property 4001.

3.5.6 AO HAND_STATUS Object (Multistate Value: 23 – 26)

This object contains state of Hand Status Operation according to the table below:

Object Value	Description
1	AUTO
2	HAND_ON

Table 21 AO HAND_STATUS Object value list

This information is also available in AO Analog Output object as HAND_STATUS Property 3014.

WARNING! This object is only in MINI 4U4A-H and 4U4A-H-IP modules.

3.5.7 AO HAND_VALUE Object (Analog Value: 22 – 25)

This object contains value in percent's (0%-100%) of Hand. This information is also available in AO Analog Output object as HAND_VALUE Property 3015.

WARNING! This object is only in MINI 4U4A-H and 4U4A-H-IP modules.

3.6 Digital Outputs relays connections

3.6.1 Connecting the solenoid valve to the Digital Output

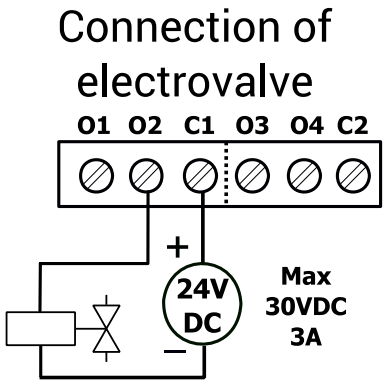

Figure 26 Connection of solenoid valve to DO for MIX38 and MIX38-IP

3.6.2 Connecting a resistive load to the Digital Output

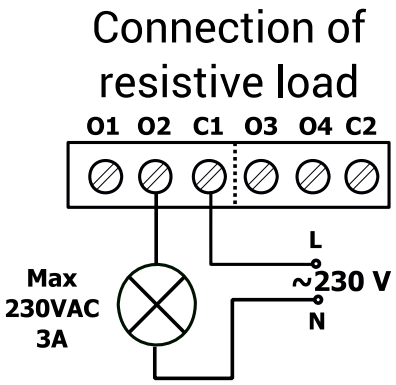

Figure 27 Connection of resistive load to DO for MIX38 and MIX38-IP

3.6.3 Connecting a inductive load to the Digital Output

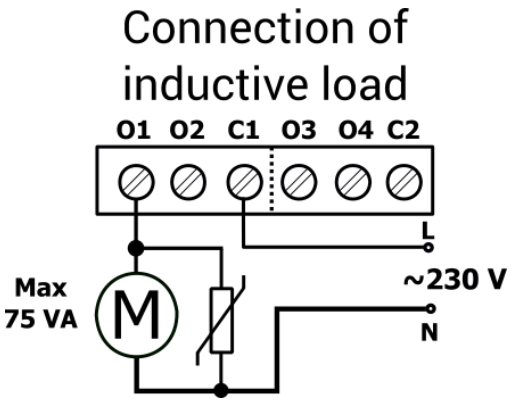

Figure 28 Connection of inductive load to DO for MIX38 and MIX38-IP

3.7 Digital Output BACnet objects

3.7.1 BO - Digital Output object description

Each Digital Output of all types of modules is represented on BACnet network as BACnet Binary Output Object which has got the following properties:

Dynamically Creatable: No, Dynamically Deletable: No

Property Name	Required	Proprietary	Writeable	Property ID	Data Type	Description
OBJECT_IDENTIFIER	yes					from BO:0 to BO:12
OBJECT_NAME	yes					BO-x
OBJECT_TYPE	yes					
PRESENT_VALUE	yes		yes			PRESENT_VALUE Property
STATUS_FLAGS	yes					STATUS FLAG Property
EVENT_STATE	yes					
OUT_OF_SERVICE	yes		yes			OUT OF SERVICE Property
POLARITY	yes					
PRIORITY_ARRAY	yes		yes			
RELINQUISH_DEFAULT	yes		yes			
HAND_STATUS *		yes		3014	enumerated	

Table 22 Properties of BACnet Digital Output Object

* Object additional properties are saved to keep backword compatibility with older firmware version. In new firmware version each property has corresponding BACnet object.

3.7.1.1 PRESENT_VALUE Property

In the property is stored actual value of Digital Output. If DO is in Hand Mode the actual value of DO is stored in both PRESENT VALUE property and HAND_STATUS object.

3.7.1.2 Digital Output COV

In firmware version above 4.0 MIX and MINI modules serve COV (change of value). It means that module will automatically send Digital Output value every change.

3.7.1.3 STATUS FLAG Property

Status Flag property contains information about object status. This property consists of 4 binary flags. Each flag is described in the table below.

Module Input		Results		
DO Switch	Priority Array	Present Value	Digital Output	Status flag property
Auto position	NULL	Default	Default	0000
	BINARY VALUE	BINARY VALUE	BINARY VALUE	
Manual position ON	NULL	TRUE	ON	0010
	BINARY VALUE			
Manual position OFF	NULL	FALSE	OFF	0010
	BINARY VALUE			

Table 23 STATUS FLAG Property behaviour

3.7.1.4 OUT OF SERVICE Property

For Digital Outputs object OUT OF SERVICE property is set to true value when output is overridden by USB connection or from module web page (only in IP version). In that case OUT OF SERVICE is set to false value when Present Value property is set by BACnet message.

3.7.2 HAND_STATUS Object (Multistate Value: 23 – 26)

In the property is stored status of Hand Operation Switch and as well the status of DO in Hand Mode, according to the table below:

Value of Hand status	Status Description
1	AUTO-OUT=OFF
2	AUTO-OUT=ON
3	HAND-OUT=OFF
4	HAND-OUT=ON

Table 24 DO HAND_STATUS Object value list

3.8 Triac Outputs (TO) connections

3.8.1 Connecting the solenoid valve to the Triac Output

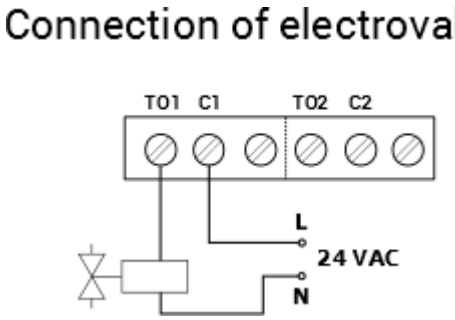

Figure 28 Connection of solenoid valve to TO for 4TO-H and 4TO-H-IP

3.8.2 Connecting a resistive load to the Triac Output

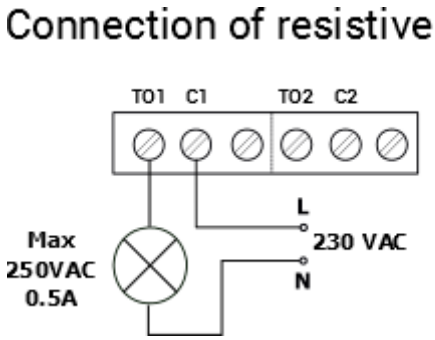

Figure 29 Connection of resistive load to TO for 4TO-H and 4TO-H-IP

3.9 Triac Outputs (TO) BACnet objects

3.9.1 TO - Triac Output object description (Binary Output: 0 – 3)

This object is designed to serve Triac Output in DIGITAL WORKING mode. BACnet Triac Output Object has got the following properties:

Dynamically Creatable: No, Dynamically Deletable: No

Property Name	Required	Proprietary	Writeable	Property ID	Data Type	Description
OBJECT_IDENTIFIER	yes					from BO:0 to BO:3
OBJECT_NAME	yes					TO-x
OBJECT_TYPE	yes					
PRESENT_VALUE	yes		yes			PRESENT_VALUE Property
STATUS_FLAGS	yes					STATUS FLAG Property
EVENT_STATE	yes					
OUT_OF_SERVICE	yes		yes			OUT OF SERVICE Property
POLARITY	yes					
PRIORITY_ARRAY	yes		yes			
RELINQUISH_DEFAULT	yes		yes			

Table 25 Properties of BACnet Triac TO Output Object

3.9.1.1 PRESENT_VALUE Property

Actual state of Triac Output is stored in the Present Value Property.

Note: If TO is in Hand Mode, the actual value of TO is stored in the HAND_STATUS object.

3.9.1.2 COV INCREMENT Property

In firmware version above 4.0 MIX and MINI modules serve COV (change of value).It means that module will automatically send Analog Output value if value changes more than COV Increment property value.

3.9.1.3 OUT OF SERVICE Property

For Triac Outputs object OUT OF SERVICE property is set to true value when output is overridden by USB connection or from module web page (only in IP version). In that case OUT OF SERVICE is set to false value when Present Value property is set by BACnet message.

OUT OF SERVICE property is also set when Triac Output configuration is set to PWM mode.

3.9.1.4 STATUS FLAG Property

Status Flag property contains information about object status. This property consists of 4 binary flags. Each flag is described in the table below.

Module Input		Results		
TO Switch	Priority Array	Present Value	Digital Output	Status flag property
Auto position	NULL	Default	Default	0000
	BINARY VALUE	BINARY VALUE	BINARY VALUE	
Manual position ON	null	TRUE	ON	0010
	ON			
Manual position OFF	null	FALSE	OFF	0010
	OFF			

Table 26 STATUS FLAG Property behaviour

3.9.2 TO PWM VALUE - Triac PWM object description (Analog Output: 0 - 3)

This object is designed to serve the Triac Output in PWM mode. BACnet PWM VALUE Object has got the following properties:

Dynamically Creatable: No, Dynamically Deletable: No

Property Name	Required	Proprietary	Writeable	Property ID	Data Type	Description
OBJECT_IDENTIFIER	yes					from AO:0 to AO:3
OBJECT_NAME	yes					TO-x PWM VALUE
OBJECT_TYPE	yes					
PRESENT_VALUE	yes		yes			PRESENT_VALUE Property
STATUS_FLAGS	yes					STATUS FLAG Property
EVENT_STATE	yes					
OUT_OF_SERVICE	yes		yes			OUT OF SERVICE Property
UNITS	yes					
PRIORITY_ARRAY	yes		yes			
RELINQUISH_DEFAULT	yes		yes			
COV INCREMENT	no		yes			COV INCREMENT Property
OUTPUT_TYPE *		yes	yes	4001	enumerated	
HAND_STATUS *		yes		3014	Boolean	
HAND_VALUE *		yes		3015	enumerated	

Table 27 Properties of BACnet PWM_VALUE Object

* Object additional properties are saved to keep backword compatibility with older firmware version. In a new firmware version each property has corresponding BACnet object.

3.9.2.1 PRESENT_VALUE Property

In the property is stored value in percent's of duty that appears at the PWM output. Output working mode is defined by TO_CONFIGURATION object.

3.9.2.2 COV INCREMENT Property

In firmware version above 4.0 MIX and MINI modules serve COV (change of value). It means that module will automatically send PWM_VALUE value if it changes more than COV Increment property value.

3.9.2.3 OUT OF SERVICE Property

For PWM Outputs object OUT OF SERVICE property is set to true value when output is overridden by USB connection or from module web page (only in IP version). In that case OUT OF SERVICE is set to false value when Present Value property is set by BACnet message. OUT OF SERVICE property is also set true when the Triac Output configuration is set to the Digital Output mode.

3.9.2.4 STATUS FLAG Property

Status Flag property contains information about object status. This property consists of 4 binary flags. Each flag is described in the table below.

Module Input		Results		
TO Switch	Priority Array	Present Value	Digital Output	Status flag property
Auto position	NULL	Default	Default	0000
	DUTY VALUE	DUTY VALUE	ON/OFF	
Manual position ON	NULL	100%	ON	0010
	DUTY VALUE			
Manual position OFF	NULL	0%	OFF	0010
	DUTY VALUE			

Table 28 STATUS FLAG Property behaviour

3.9.3 HAND_STATUS Object (Multistate Value: 23 – 26)

Hand Status Object stores the status of Hand Operation Switch and the status of TO in Hand Mode according to the table below:

Value of Hand status	Status Description
1	AUTO-OUT=OFF
2	AUTO-OUT=ON
3	HAND-OUT=OFF
4	HAND-OUT=ON

Table 29 TO HAND_STATUS Object value list

3.9.4 TO CONFIGURATION Object (Multistate Value: 17 – 22)

This object contains information about the mode of the Triac Output according to the following table:

Property value	Description
1 (default)	Digital Output
2	PWM 1 Hz
3	PWM 10 Hz
4	PWM 0.1 HZ
5	PWM 0.01Hz

Table 30 TO CONVIGURATION Object value list

This configuration is also available in PWM VALUE object as OUTPUT_TYPE Property 4001

3.10 Special application modes for 4I4O-H, 4I4O-H-IP, 4U4O-H and 4U4O-H-IP

In 4I4O-H, 4I4O-H-IP, 4U4O-H, 4U4O-H-IP modules simple applications have been built which can be used to control building devices. The applications make logic between signal from Digital Input and control Digital Output state. Relation between Inputs and Outputs is shown in the table below and it cannot be changed.

Digital Input	Digital Output
DI1	DO1
DI2	DO2
DI3	DO3
DI4	DO4

Table 31 Built in application relation between input and output

The Digital Inputs in modules type 4I4O-H, 4I4O-H-IP, 4U4O-H, 4U4O-H-IP can be set to work in different modes. There are dedicated objects for input mode (Multistate value 27-30), time parameters (Analog Value 26-29), setpoints for heating/cooling modes (Analog Value 30-33 ;4U4O-H and 4U4O-H-IP only) and for differential value in heating/cooling modes (Analog Value 34-37 ;4U4O-H and 4U4O-H-IP only).

3.10.1 INPUT MODE Object (Multistate Value: 27 – 30)

This object contains information about module working mode. Available modes and Multistate object value are shown in the table below:

Value	OPERATING MODE
0	Ordinary IO(def)
1	Monostable Relay
2	Bistable Relay
3	Time Relay NO [ms]
4	Time Relay NC [ms]
5	Time Relay NO [s]
6	Time Relay NC [s]
7	Input Forwarding
8	Heating (4U4O-H and 4U4O-H-IP only)
9	Cooling (4U4O-H and 4U4O-H-IP only)

Table 32 INPUT_MODE Object value list

Operating mode can be changed by writing right value in the Input Mode object.

Special modes are initialized after 3 seconds from power-up or restart of the module (the time value needed to stabilize the analog transmitter working). Each Input mode change sets assigned Output to the default state and reset the timer (used in Time-based modes). When the new selected operating mode is running output is controlled according to the new mode functioning.

3.10.1.1 Ordinary IO

Inputs and outputs work as standard IO; inputs and outputs are not related with each other.

3.10.1.2 Monostabile Relay

In this mode Digital Output reflects corresponding state of Digital Input. The action of monostabile relay can be executed remotely by changing the relevant COMMAND Object. Outputs can be also overwritten by DIGITAL OUTPUT Object, which allows remote control from BMS.

3.10.1.3 Bistabile relay

In this mode only rising edge on Digital Input changes output state. The action of bistable relay can be executed remotely by changing the relevant COMMAND Object. Outputs can be also overwritten by DIGITAL OUTPUT Object, which allows remote control from BMS.

3.10.1.4 Time Relay NO [ms]

In this mode when the output value is false, rising edge on Digital Input set output to true value. Every falling edge on Digital Input starts the counter from the beginning what means that the output will stay in true value for a time defined in MODE TIME Object (expressed in milliseconds), counting from the last falling edge of Digital Input. The action of time relay can be executed remotely by changing state from false to true in relevant COMMAND Object. Outputs can be also overwritten by module DIGITAL OUTPUT Object, which allows to remote control from BMS.

3.10.1.5 Time Relay NC [ms]

In this mode when the output value is false, falling edge on Digital Input set output to true value. Every rising edge on Digital Input starts the counter from the beginning what means that the output will stay in true value for a time defined in MODE TIME Object (expressed in milliseconds), counting from the last rising edge of Digital Input. The action of time relay can be executed remotely by changing state from false to true in relevant COMMAND Object. Outputs can be also overwritten by module DIGITAL OUTPUT Object, which allows to remote control from BMS.

3.10.1.6 Time Relay NO [s]

In this mode when the output value is false, rising edge on Digital Input set output to true value. Every falling edge on Digital Input starts the counter from the beginning what means that the output will stay in true value for a time defined in MODE TIME Object (expressed in seconds), counting from the last falling edge of Digital Input. The action of time relay can be executed remotely by changing state from false to true in relevant COMMAND Object. Outputs can be also overwritten by module DIGITAL OUTPUT Object, which allows to remote control from BMS.

3.10.1.7 Time Relay NC [s]

In this mode when the output value is false, falling edge on Digital Input set output to true value. Every rising edge on Digital Input starts the counter from the beginning what means that the output will stay in true value for a time defined in MODE TIME Object (expressed in seconds), counting from the last rising edge of Digital Input. The action of time relay can be executed remotely by changing state from false to true in relevant COMMAND Object. Outputs can be also overwritten by module DIGITAL OUTPUT Object, which allows to remote control from BMS.

3.10.1.8 Input Forwarding

In this mode, any signal from the input is transferred directly to the assigned output without any modifications. The input forwarding mode functioning can be stopped by Block Input function (see Blocking Object).

3.10.1.9 Heating mode (4U4O-H and 4U4O-H-IP only)

In this mode output is controlled as a typical thermostat, based on Setpoint Object and Control value (Input value) with differential parameter defined in Differential Object. The output signal works in 2 states low and high.
When Control value is lower or equal the difference of Setpoint Object and Differential Object the output is in low state.
When Control value is higher or equal the sum of Setpoint Object and Differential Object the output is in high state.

Output in low state:
Control value >= Setpoint + Differential

Output in high state:
Control value <= Setpoint – Differential

The heating mode algorithm is shown in chart below.

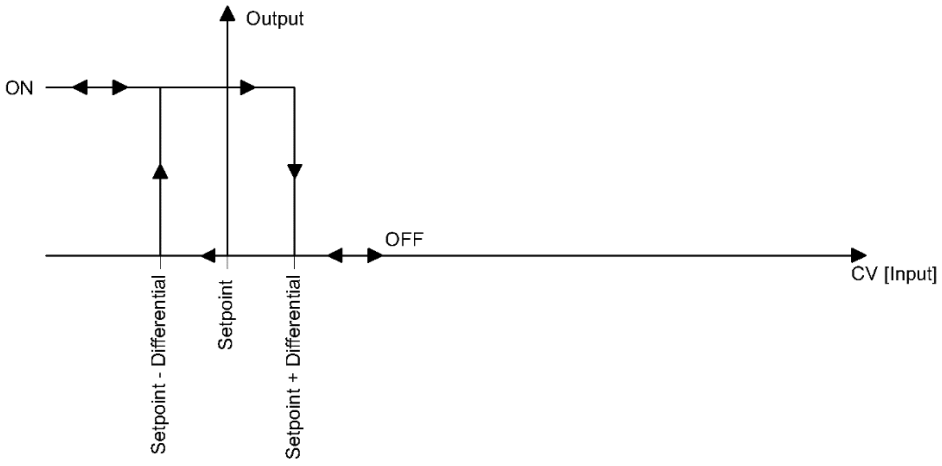

Figure 30 Heating mode algorithm functioning

WARNING! In the case when temperature sensor is failed (disconnected or shortcut) then heating mode does not work and output stays in the false state.

3.10.1.10 Cooling mode (4U4O-H and 4U4O-H-IP only)

In this mode output is controlled as a typical thermostat, based on Setpoint Object and Control value (Input signal) with differential parameter defined in Differential Object.
The output signal works in 2 states - low and high.

When Control value is lower or equal the difference of Setpoint Object and Differential Object the output is in low state.
When Control value is higher or equal the sum of Setpoint Object and Differential Object the output is in high state.

Output in low state:
Control value <= Setpoint – Differential

Output in high state:
Control value >= Setpoint + Differential

The cooling mode algorithm is shown in chart below.

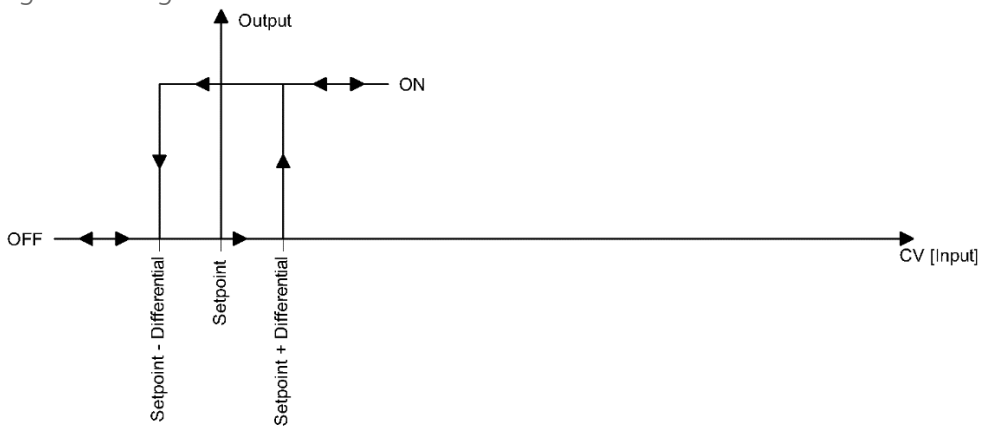

Figure 31 Cooling mode algorithm functioning

WARNING! In the case when temperature sensor is failed (disconnected or shortcut) then heating mode does not work and output stays in the false state.

3.10.2 MODE TIME Object (Analog Value: 26 – 29)

This object contains time value for TIME RELAY modes. The time unit depends on selected mode [milliseconds] or [seconds].

3.10.3 COMMAND Object (Binary Value: 12 – 15)

The module has special COMMAND Objects. The command objects are used for remotely execute action (simulate light switch/PIR). The action is executed by changing object state from false to true. All special application modes can be executed except Input Forwarding, Heating and Cooling modes.

3.10.4 BLOCKING Object (Binary Value: 8 – 11)

The BLOCKING objects are used to block physical input signals to take action in logic (all modes excluding heating/cooling mode). By setting true value on relevant object the module blocks input and no action will be executed. Setting false value restores normal operation. The block input function does not work when the heating/cooling input mode is set.

3.10.5 SETPOINT Object (Analog Value: 30 – 33)

The SETPOINT objects contain values which are used in heating/cooling modes (4U4O-H and 4U4O-H-IP only) as the setpoints for heating/cooling control algorithm
The default Setpoint value is 21. (read more in Heating mode, Cooling mode).

3.10.6 DIFFERENTIAL Object (Analog Value: 34 – 37)

The DIFFERENTIAL objects contain values which are used in heating/cooling modes (4U4O-H and 4U4O-H-IP only) as the differential for heating/cooling control algorithm. Setpoint Objects and Differential Objects create deadband of the Control values which has no influence on output.
Deadband = (Setpoint – Differential, Setpoint + Differential)
The default Differential value is 1. (read more in Heating mode, Cooling mode).

5 WEB Configuration- only IP version

5.1 Web server access

All IP version modules have built-in web server, which allows to show module status and to change configuration.

To access web server open browser and enter IP address of the module, default address for a new module (default IP address is 192.168.1.123). Please use the following credentials :

Username: admin

Password: 1000 (by default)

5.2 Device page

This page contains information and technical specification of the device. The Basic Information section includes information about module type, firmware version and uptime. In the Device Specification there are information about: Power Supply, Inputs/Outputs parameters, Interfaces and Mechanical.

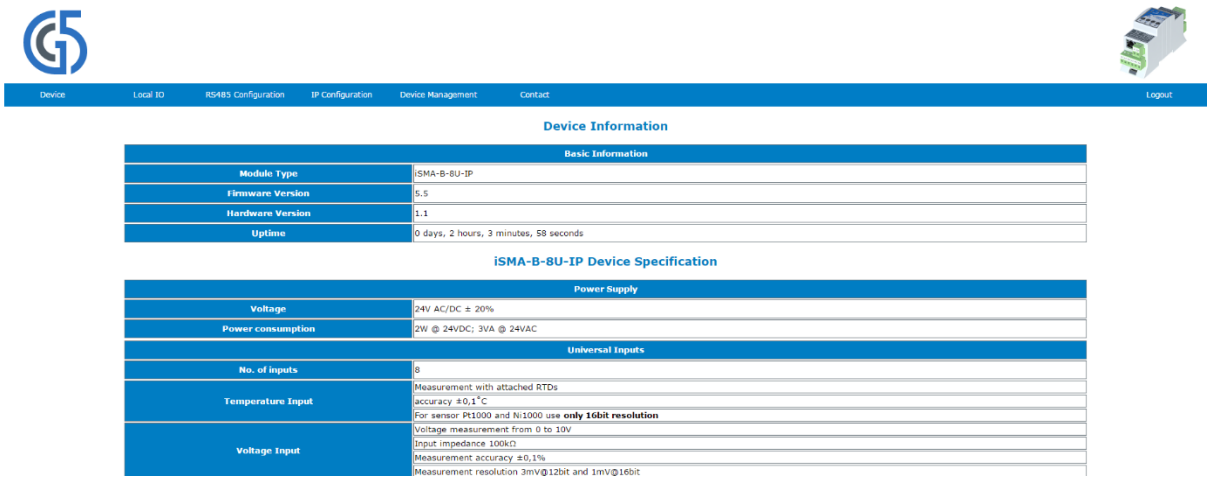

Figure 32 Device page of 8U-IP

5.3 Local I/O status and configuration

5.3.1 Universal Inputs

This page allows to enter configuration parameters and shows actual value of Universal Inputs. To open this page, please navigate to Local IO tab and choose Universal Inputs from submenu.

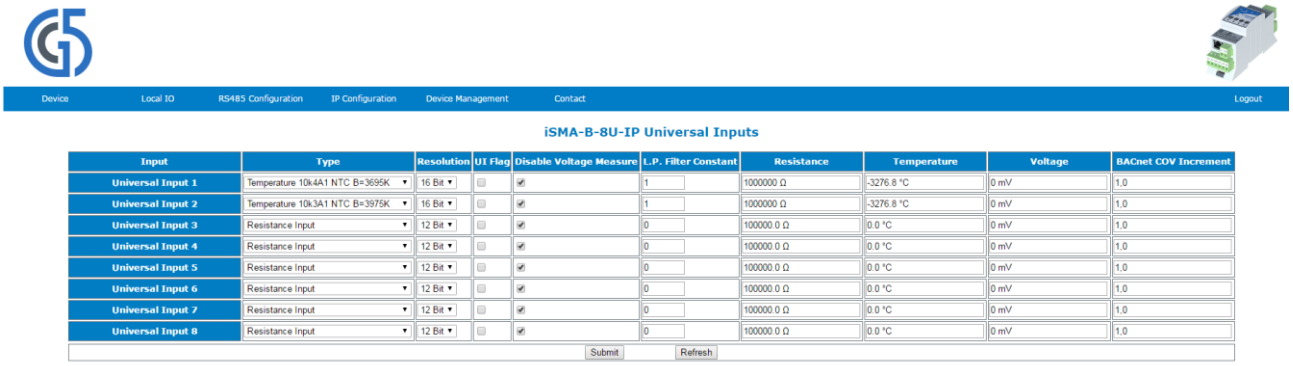

Figure 33 Universal Inputs page of 8U-IP

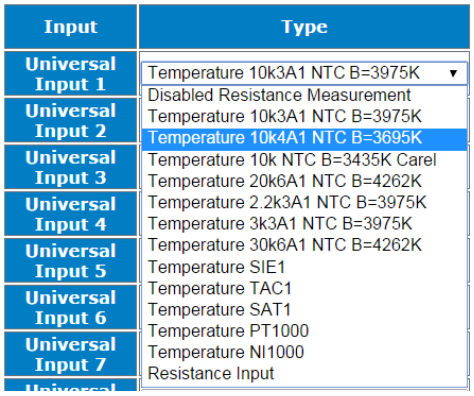

Figure 34 Types of sensors

Universal Input table has the following fields:

- Sensor type (Read&Write) allows to set the different type of sensor
- Resolution (Read&Write), resolution measurement 12-bits/16-bits (for PT1000 and NI1000 sensors please use 16-bits)
- UI Flag (Read Only), status of UI as DI
- Disable Voltage Measurement (Read&Write), disable voltage measuring for resistance measurement only
- L.P. Filter Constant (Read&Write), parameter time constant low pass filter in seconds. Valid values must be between 0 and 60 seconds (default 2s). Setting value 0 will disable the filter

- Resistance (Read Only), in ohms from 0 to 1000k [Ω]
- Temperature (Read Only), in Celsius with an accuracy of 1 decimal [°C]
- Voltage (Read Only) in millivolts [mV]
- BACnet COV Increment (Read&Write) change of state sending threshold value

WARNING! To save changes, please use "Submit" button.

5.3.2 Special application modes configuration

This page allows to enter configuration parameters and shows actual value of Special application modes. To open this page, please navigate to Local IO tab and choose Universal Inputs from submenu.

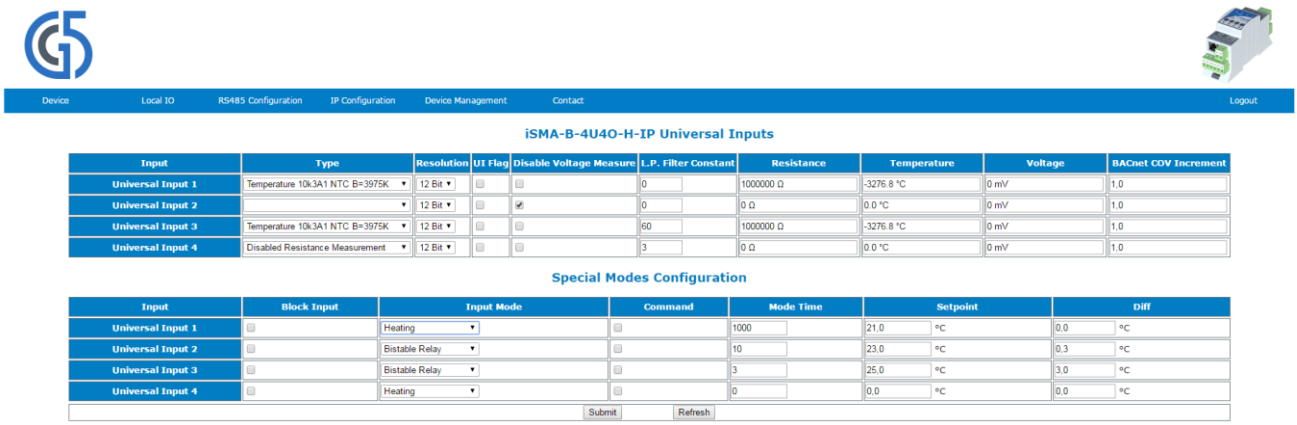

Figure 35 Universal Inputs page of 4U4O-IP

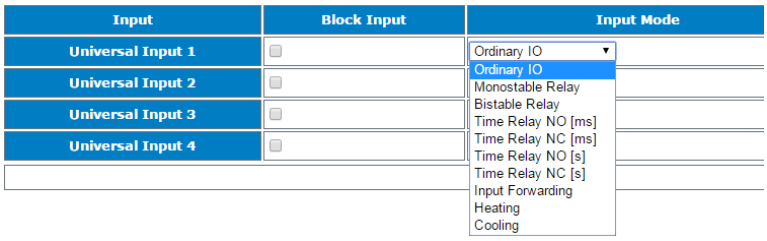

Figure 36 Special application modes

Special Modes Configuration table has the following fields:

- Block Input (Read&Write) allows to block particular input (except heating/cooling modes)
- Input Mode (Read&Write), allows to select the Special Application Mode for particular input (Ordinary IO in default)
- Command (Read & Write), execution of the Special Application Modes (except input forwarding, heating/cooling modes)
- Mode Time (Read & Write), Time base for time relay application modes (unit depends on selected mode [ms] or [s])

- Setpoint (Read&Write, 4U4O-H-IP only), setpoint value for heating/cooling modes
  In default 0
- Differential (Read&Write, 4U4O-H-IP only), differential value for heating/cooling modes.
  In default 0.

WARNING! To save changes, please use "Submit" button.

5.3.3 Digital Inputs

This page allows to enter configuration parameters and shows actual value of Digital Inputs. To open this page, please navigate to Local IO tab and choose Digital Inputs from submenu.

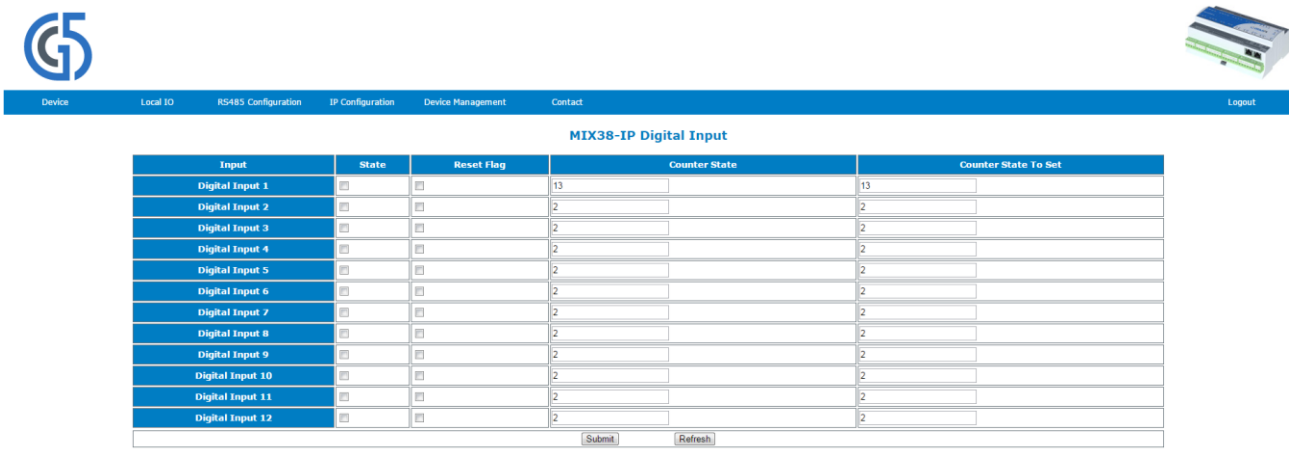

Figure 37 Digital Inputs page of MIX38-IP

Digital Input table has the following fields:

- State (Read Only), actual input state
- Reset Flag (Read&Write), reset of pulses value (leaving reset active will case resetting pulses value)
- Counter State (Read Only), actual value of pulses save in EEPROM
- Counter State To Set (Read & Write), allows to set value of counter

WARNING! To save changes, please use "Submit" button.

5.3.4 Digital Outputs

This page allows to enter configuration parameters and shows actual value of Digital Outputs. To open this page, please navigate to Local IO tab and choose Digital Outputs from submenu.

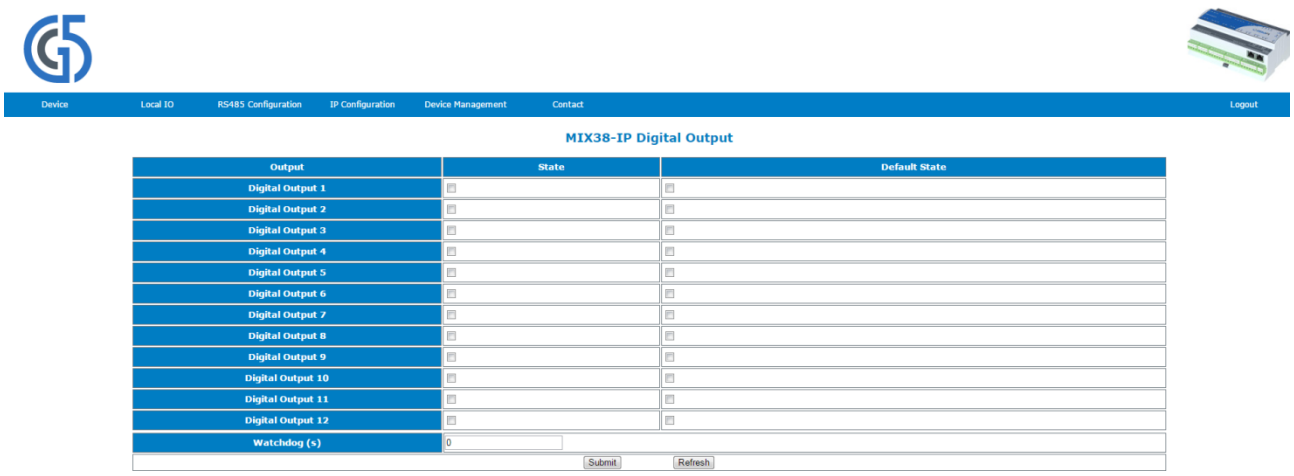

Figure 38 Digital Outputs page of MIX38-IP

Digital Outputs table has the following fields:

- State (Read&Write), actual state of Digital Output
- Default State (Read&Write), output state after power up and watchdog
- Hand State Output (Read Only, MINI series only) Manual overrides switch status
- Watchdog (Read & Write), device watchdog value in seconds

WARNING! To save changes, please use “Submit” button.

5.3.5 Analog Outputs

This page allows to enter configuration parameters and shows actual value of Analog Outputs. To open this page, please navigate to Local IO tab and choose Analog Outputs from submenu.

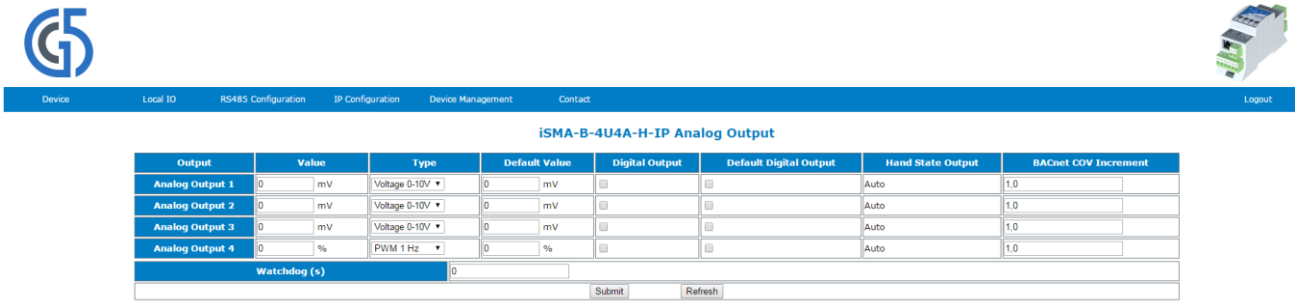

Figure 39 Analog Outputs page of 4U4A-H-IP

Analog Outputs table has the following fields:

- Value (Read&Write), actual value of Analog Output in millivolts [mV]
- Type (Read&Write), Analog Output working mode voltage/PWM
- Default Value (Read&Write), default output value after power up and watchdog
- Digital Output (Read&Write), output status flag for DO mode
- Default Digital Output (Read&Write), default output status for DO mode
- Watchdog (Read&Write), device watchdog value in seconds
- Hand State Output (Read Only, MINI series only), manual overrides potentiometer status
- BACnet COV Increment (Read&Write), change of state sending threshold value

WARNING! To save changes, please use “Submit” button.

5.4 RS485 Configuration

This page allows to enter configuration parameters and shows information of controllers RS485 port.

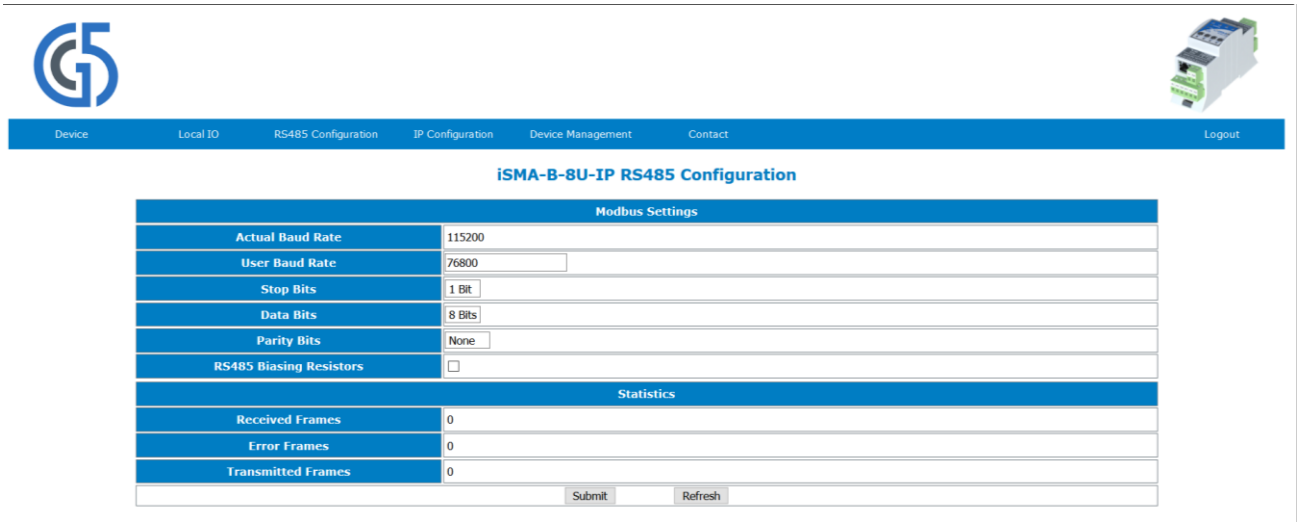

Figure 40 RS485 configuration page

This page allows to set parameters such as:

- Baud rate (Read Only), RS485 baud rate from 2400 up to 115200
- Modbus Config (Read Only), Modbus Protocol Type- RTU or ASCII
- Stop Bits (Read&Write), number of stop bits (1 or 2)
- Data Bits (Read&Write), number of data bits transmitted in a single byte (7 or 8)

- Parity Bits (Read&Write), transmission protection as a parity bit added before stop bit (bits)
- RS485 Biasing Resistors , the biasing resistors activation for MINI modules only with a hardware version >= 2.0 (option unavailable in MIX modules)
- Received Frames (Read Only), number of received frames
- Transmitted Frames (Read Only), number of transmitted frames
- Error Frames (Read Only), number of error frames

WARNING! To save changes, please use “Submit” button.

5.5 IP Configuration

This page allows to change parameters of Ethernet port, Modbus TCP and BACnet IP.

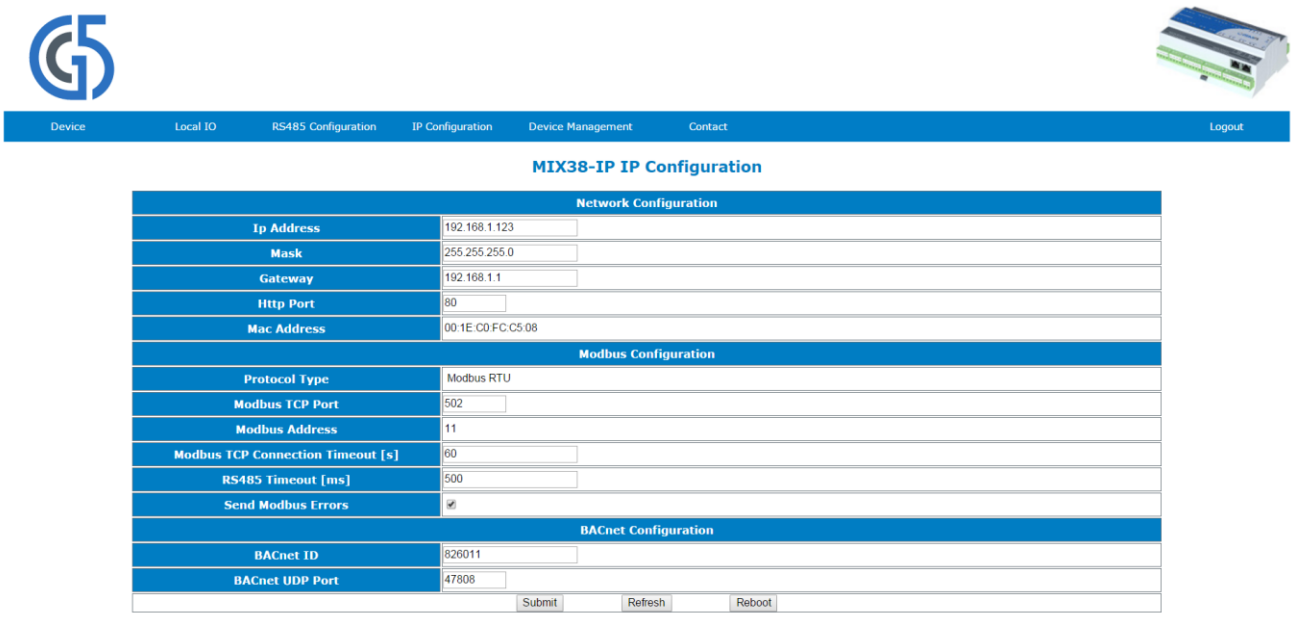

Figure 41 IP configuration page

This page allows to set parameters such as:

- IP Address (Read&Write), controller Ethernet interface IP address
- Mask (Read&Write), network mask
- Gateway (Read&Write), network default gateway
- Http Port (Read&Write), http port
- Mac Address (Read Only), Ethernet interface MAC address
- Protocol Type (Read Only), Dip Switch protocol selection
- Modbus TCP Port (Read&Write), Modbus TCP port number, default 502

- Modbus Address (Read Only), Modbus device address set by rotary switches
- Modbus TCP Communication Timeout (Read&Write), timeout for TCP/IP messages
- RS485 Timeout (Read&Write), timeout for Modbus RTU/ASCII messages
- Send Modbus Errors (Read Only), Enable/Disable sending Modbus error messages
- BACnet ID (Read&Write), BACnet ID set by rotary switches, this value can be overridden by the user, once overridden by user changing rotary switches will not affect BACnet ID
- BACnet UDP port (Read&Write), BACnet IP port

WARNING! To save changes, please first click “Submit” button and then “Reboot” button.

5.6 Device management

This page allows to change password and remote reboot device.

Figure 42 Device management page

Procedure of changing device password:

a) enter current device password in field - Current Device Password,

b) enter new device password in field - New Device Password,

c) enter again new device password in field - Confirm New Device Password,

d) to confirm password change, please click “Submit” button,

e) please Logout and Login again using new password.

WARNING! To reset password to default refer to “Restoring default settings”

5.7 Contact

This page displays information about Manufacture web address and email to technical support.

Figure 43 Contact page view

6 BACnet Object Table

BACnet Name	BACnet Type	ID	Access	COV	Description
UI-1	Analog Input	0	RO	Yes	Universal Input current value
UI-2	Analog Input	1	RO	Yes	
UI-3	Analog Input	2	RO	Yes	
UI-4	Analog Input	3	RO	Yes	
UI-5	Analog Input	4	RO	Yes	
UI-6	Analog Input	5	RO	Yes	
UI-7	Analog Input	6	RO	Yes	
UI-8	Analog Input	7	RO	Yes	
AO-1	Analog Output	0	RW	Yes	Analog Output current value
AO-2	Analog Output	1	RW	Yes	
AO-3	Analog Output	2	RW	Yes	
AO-4	Analog Output	3	RW	Yes	
AO-5	Analog Output	4	RW	Yes	
AO-6	Analog Output	5	RW	Yes	
BI-1	Binary Input	0	RO	Yes	Digital Input current value
BI-2	Binary Input	1	RO	Yes	
BI-3	Binary Input	2	RO	Yes	
BI-4	Binary Input	3	RO	Yes	
BI-5	Binary Input	4	RO	Yes	
BI-6	Binary Input	5	RO	Yes	
BI-7	Binary Input	6	RO	Yes	
BI-8	Binary Input	7	RO	Yes	
BI-9	Binary Input	8	RO	Yes	
BI-10	Binary Input	9	RO	Yes	
BI-11	Binary Input	10	RO	Yes	
BI-12	Binary Input	11	RO	Yes	
BO-1	Binary Output	0	RW	Yes	Digital Output current value
BO-2	Binary Output	1	RW	Yes	
BO-3	Binary Output	2	RW	Yes	
BO-4	Binary Output	3	RW	Yes	
BO-5	Binary Output	4	RW	Yes	
BO-6	Binary Output	5	RW	Yes	
BO-7	Binary Output	6	RW	Yes	
BO-8	Binary Output	7	RW	Yes	
BO-9	Binary Output	8	RW	Yes	
BO-10	Binary Output	9	RW	Yes	
BO-11	Binary Output	10	RW	Yes	
BO-12	Binary Output	11	RW	Yes	
UI-1_DRY_ CONTACT	Binary Value	0	RO	No	Universal Input Dry Contact Binary Value
UI-2_DRY_ CONTACT	Binary Value	1	RO	No	
UI-3_DRY_ CONTACT	Binary Value	2	RO	No	
UI-4_DRY_ CONTACT	Binary Value	3	RO	No	
UI-5_DRY_ CONTACT	Binary Value	4	RO	No	
UI-6_DRY_ CONTACT	Binary Value	5	RO	No	
UI-7_DRY_ CONTACT	Binary Value	6	RO	No	
UI-8_DRY_ CONTACT	Binary Value	7	RO	No	

BACnet Name	BACnet Type	ID	Access	COV	Description
UP_TIME	Analog Value	0	RO	No	Module working time [s]
WATCHDOG	Analog Value	1	RW	No	Watchdog time value [s] 0 - disable
BI-1_COUNTER	Analog Value	2	RW	No	Digital Input counter value Analog Value BACnet object (The same value is also available as Accumulator BACnet object)
BI-2_COUNTER	Analog Value	3	RW	No	
BI-3_COUNTER	Analog Value	4	RW	No	
BI-4_COUNTER	Analog Value	5	RW	No	
BI-5_COUNTER	Analog Value	6	RW	No	
BI-6_COUNTER	Analog Value	7	RW	No	
BI-7_COUNTER	Analog Value	8	RW	No	
BI-8_COUNTER	Analog Value	9	RW	No	
BI-9_COUNTER	Analog Value	10	RW	No	
BI-10_COUNTER	Analog Value	11	RW	No	
BI-11_COUNTER	Analog Value	12	RW	No	
BI-12_COUNTER	Analog Value	13	RW	No	
UI-1_FILTER	Analog Value	14	RW	No	Universal Input Low Pass filter time value (default value 2s)
UI-2_FILTER	Analog Value	15	RW	No	
UI-3_FILTER	Analog Value	16	RW	No	
UI-4_FILTER	Analog Value	17	RW	No	
UI-5_FILTER	Analog Value	18	RW	No	
UI-6_FILTER	Analog Value	19	RW	No	
UI-7_FILTER	Analog Value	20	RW	No	
UI-8_FILTER	Analog Value	21	RW	No	
AO-1_HAND_VALE	Analog Value	22	RO	No	Analog Output value in hand mode value
AO-2_HAND_VALE	Analog Value	23	RO	No	
AO-3_HAND_VALE	Analog Value	24	RO	No	
AO-4_HAND_VALE	Analog Value	25	RO	No	
UI-1_CONFIGURATION	Multistate Value	1	RW	No	Universal Input configuration: - Voltage - Resistance - Temperature with also sensor type
UI-2_CONFIGURATION	Multistate Value	2	RW	No	
UI-3_CONFIGURATION	Multistate Value	3	RW	No	
UI-4_CONFIGURATION	Multistate Value	4	RW	No	
UI-5_CONFIGURATION	Multistate Value	5	RW	No	
UI-6_CONFIGURATION	Multistate Value	6	RW	No	
UI-7_CONFIGURATION	Multistate Value	7	RW	No	
UI-8_CONFIGURATION	Multistate Value	8	RW	No	
UI-1_RESOLUTION	Multistate Value	9	RW	No	Universal Input resolution: - 12-bits (default) -16-bits
UI-2_RESOLUTION	Multistate Value	10	RW	No	
UI-3_RESOLUTION	Multistate	11	RW	No	

BACnet Name	BACnet Type	ID	Access	COV	Description
	Value				
UI-4_RESOLUTION	Multistate Value	12	RW	No	
UI-5_RESOLUTION	Multistate Value	13	RW	No	
UI-6_RESOLUTION	Multistate Value	14	RW	No	
UI-7_RESOLUTION	Multistate Value	15	RW	No	
UI-8_RESOLUTION	Multistate Value	16	RW	No	
AO-1_CONFIGURATION	Multistate Value	17	RW	No	Analog Output working mode (default mode 0-10 V)
AO-2_CONFIGURATION	Multistate Value	18	RW	No	
AO-3_CONFIGURATION	Multistate Value	19	RW	No	
AO-4_CONFIGURATION	Multistate Value	20	RW	No	
AO-5_CONFIGURATION	Multistate Value	21	RW	No	
AO-6_CONFIGURATION	Multistate Value	22	RW	No	
AO-1_HAND_STATUS	Multistate Value	23	RW	No	Analog Output value in hand mode status: HAND / AUTO
AO-2_HAND_STATUS	Multistate Value	24	RW	No	
AO-3_HAND_STATUS	Multistate Value	25	RW	No	
AO-4_HAND_STATUS	Multistate Value	26	RW	No	
BO-1_HAND_STATUS	Multistate Value	23	RW	No	Digital Output value in hand mode status: HAND / AUTO
BO-2_HAND_STATUS	Multistate Value	24	RW	No	
BO-3_HAND_STATUS	Multistate Value	25	RW	No	
BO-4_HAND_STATUS	Multistate Value	26	RW	No	
BIA-1_COUNTER	Accumulator	0	RW	No	Digital Input counter value Accumulator BACnet object (The same value is also available as Analog Value BACnet object)
BIA-2_COUNTER	Accumulator	1	RW	No	
BIA-3_COUNTER	Accumulator	2	RW	No	
BIA-4_COUNTER	Accumulator	3	RW	No	
BIA-5_COUNTER	Accumulator	4	RW	No	
BIA-6_COUNTER	Accumulator	5	RW	No	
BIA-7_COUNTER	Accumulator	6	RW	No	
BIA-8_COUNTER	Accumulator	7	RW	No	
BIA-9_COUNTER	Accumulator	8	RW	No	
BIA-10_COUNTER	Accumulator	9	RW	No	

BACnet Name	BACnet Type	ID	Access	COV	Description
BIA-11_COUNTER	Accumulator	10	RW	No	
BIA-12_COUNTER	Accumulator	11	RW	No	
For MINI 4TO-H and 4TO-H-IP only					
TO-1	Binary Output	0	RW	Yes	Triac Output current value (In Digital Output working mode)
TO-2	Binary Output	1	RW	Yes	
TO-3	Binary Output	2	RW	Yes	
TO-4	Binary Output	3	RW	Yes	
TO-1_PWM VALUE	Analog Output	0	RW	Yes	Triac Output current value (In PWM working mode)
TO-2_PWM VALUE	Analog Output	1	RW	Yes	
TO-3_PWM VALUE	Analog Output	2	RW	Yes	
TO-4_PWM VALUE	Analog Output	3	RW	Yes	
TO-1_CONFIGURATION	Multistate Value	17	RW	No	Triac Output working mode configuration, options: - Digital Output - PWM
TO-1_CONFIGURATION	Multistate Value	18	RW	No	
TO-1_CONFIGURATION	Multistate Value	19	RW	No	
TO-1_CONFIGURATION	Multistate Value	20	RW	No	
TO-1_ HAND_STATUS	Multistate Value	23	RW	No	Triac Output hand mode status
TO-1_ HAND_STATUS	Multistate Value	24	RW	No	
TO-1_ HAND_STATUS	Multistate Value	25	RW	No	
TO-1_ HAND_STATUS	Multistate Value	26	RW	No	
For MINI 4I4O-H and 4I4O-H-IP only					
BI-1_INPUT_MODE	Multistate Value	27	RW	No	Ordinary IO (def) Monostable Relay Bistable Relay Time Relay NO [ms] Time Relay NC [ms] Time Relay NO [s] Time Relay NC [s] Input Forwarding (4U4O-H, 4U4O-H-IP only) Heating Cooling
BI-2_INPUT_MODE	Multistate Value	28	RW	No	
BI-3_INPUT_MODE	Multistate Value	29	RW	No	
BI-4_INPUT_MODE	Multistate Value	30	RW	No	
BI-1_MODE_TIME	Analog Value	26	RW	No	Time Value object for Time Relay Mode
BI-2_MODE_TIME	Analog Value	27	RW	No	
BI-3_MODE_TIME	Analog Value	28	RW	No	
BI-4_MODE_TIME	Analog Value	29	RW	No	
BI-1_BLOCK_INPUT	Binary Value	8	RW	No	Digital Input blocking command,
BI-2_BLOCK_INPUT	Binary Value	9	RW	No	
BI-3_BLOCK_INPUT	Binary Value	10	RW	No	
BI-4_BLOCK_INPUT	Binary Value	11	RW	No	
BI-1_COMMAND	Binary Value	12	RW	No	Digital Input remote command,
BI-2_COMMAND	Binary Value	13	RW	No	

BACnet Name	BACnet Type	ID	Access	COV	Description
BI-3_COMMAND	Binary Value	14	RW	No	
BI-4_COMMAND	Binary Value	15	RW	No	
For MINI 4U4O-H and 4U4O-H-IP only					
BI-1_SETPOINT	Analog Value	30	RW	No	SETPOINT for Heating/Cooling modes Default = 0
BI-2_SETPOINT	Analog Value	31	RW	No	
BI-3_SETPOINT	Analog Value	32	RW	No	
BI-4_SETPOINT	Analog Value	33	RW	No	
BI-1_DIFFERENTIAL	Analog Value	34	RW	No	DIFFERENTIAL for Heating/Cooling modes Default = 0
BI-2_ DIFFERENTIAL	Analog Value	35	RW	No	
BI-3_ DIFFERENTIAL	Analog Value	36	RW	No	
BI-4_ DIFFERENTIAL	Analog Value	37	RW	No	

Table 18 BACNET Object table

7 List of supported temperature sensors

No	1	No	2
Sensor	10K3A1	Sensor	10K4A1
β coefficient	3975K	β coefficient	3695K
Manufacturers	Aquatrol, Cylon, Honeywell, Johnson, Satchwell, Seachange	Manufacturers	Andover, Delta Controls, Siebe, York
°C	Ω	°C	Ω
-50	667828	-50	441667
-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

No	1	No	2
90	916	90	1084
95	787	95	939
100	678	100	817
105	587	105	713
110	510	110	624
115	444	115	547
120	388	120	482
125	340	125	426

No	3	No	4
Sensor	10K Carel	Sensor	20K6A1
β coefficient	3435K	β coefficient	4262K
-50	329500	Manufacturers	
-45	247700	°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
105	857	105	953
110	758	110	818

No	3	No	4
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	329500	-50	200348
-45	247700	-45	150524
-40	188500	-40	100701
-35	144100	-35	76853
-30	111300	-30	53005
-25	86430	-25	41048
-20	67770	-20	29092
-15	53410	-15	21868
-10	42470	-10	16589
-5	33900	-5	12694
0	27280	0	9795
5	22050	5	7619
10	17960	10	5971
15	14690	15	4714
20	12090	20	3748
25	10000	25	3000
30	8313	30	2417
35	6940	35	1959
40	5827	40	1598
45	4912	45	1310
50	4161	50	1080
55	3536	55	896
60	3020	60	746
65	2588	65	625
70	2228	70	526
75	1924	75	444
80	1668	80	377
85	1451	85	321
90	1266	90	275
95	1108	95	236
100	973	100	204

No	5	No	6
105	857	105	176
110	758	110	153
115	672	115	133
120	597	120	117
125	531	125	102

No	7	No	8
Sensor	30K6A1	Sensor	SIE1
β coeffictient	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
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

No	7	No	8
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	-50	9719
-40	39024	-45	9652
-35	29358	-40	9584
-30	22284	-35	9467
-25	17073	-30	9349
-20	13192	-25	9159
-15	10276	-20	8968
-10	8068	-15	8708
-5	6382	-10	8396
0	5085	-5	8031
5	4078	0	7614
10	3294	5	7150
15	2676	10	6649
20	2188	15	6121
25	1800	20	5580
30	1488	25	5039
35	1237	30	4513
40	1034	35	4012
45	869	40	3545
50	733	45	3117
55	622	50	2730
60	529	55	2386
65	453	60	2082
70	389	65	1816
75	335	70	1585
80	290	75	1385
85	252	80	1213
90	220	85	1064
95	192	90	937
100	169	95	828
105	149	100	734
110	131	105	654

No	9	No	10
115	116	110	585
120	103	115	525
125	92	120	474
		125	429

No	16	No	16
Sensor	Pt1000	Sensor	Pt1000
Manufacturers	Honeywell, Sauter, Serck, Siebe, Cylon	Manufacturers	Honeywell, Sauter, Serck, Siebe, Cylon
°C	Ω	°C	Ω
-50	803,1	310	2156,1
-40	842,7	320	2191,5
-30	882,2	330	2226,8
-20	921,6	340	2262,1
-10	960,9	350	2297,2
0	1000,0	360	2332,1
10	1039,0	370	2367,0
20	1077,9	380	2401,8
30	1116,7	390	2436,4
40	1155,4	400	2470,9
50	1194,0		
60	1232,4	No	17
70	1270,8	Sensor	Ni1000
80	1309,0	Manufacturers	Sauter
90	1347,1	°C	Ω
100	1385,1	-50	742,6
110	1422,9	-40	791,3
120	1460,7	-30	841,5
130	1498,3	-20	893,0
140	1535,8	-10	945,8
150	1573,3	0	1000,0
160	1610,5	10	1055,5
170	1647,7	20	1112,4
180	1684,8	30	1170,6
190	1721,7	40	1230,1
200	1758,6	50	1291,1
210	1795,3	60	1353,4
220	1831,9	70	1417,2
230	1868,4	80	1482,5
240	1904,7	90	1549,4
250	1941,0	100	1617,8
260	1977,1	110	1687,9

No	16	No	16
270	2013,1	120	1759,8
280	2049,0	130	1833,4
290	2084,8	140	1909,0
300	2120,5	150	1986,6