Intelligent Solution Managing Automation

MINI and MIX Series

I/O modules

User Manual

Modbus

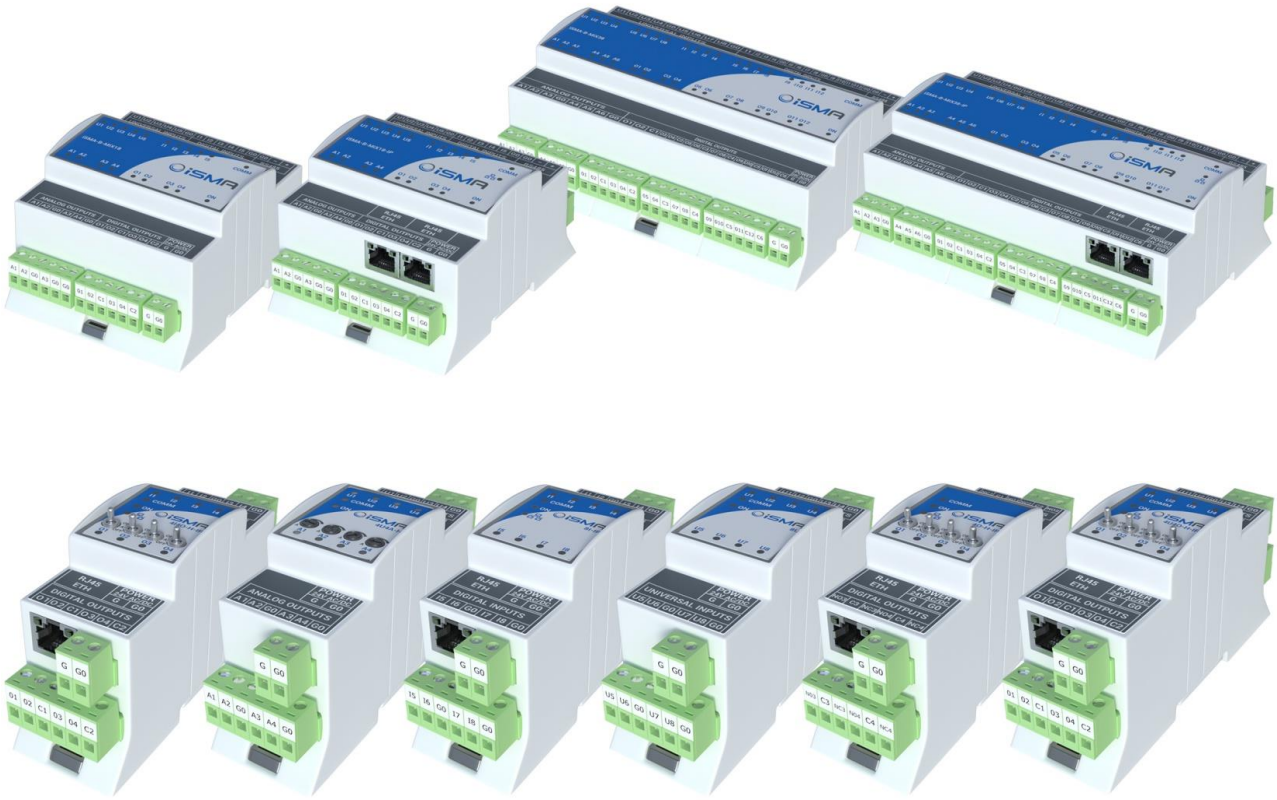

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Table of contents

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 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 we 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 Modbus 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 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). • New gateway functionality blocking Send Modbus Error. • Changed tables with PT1000 and NI1000 for more accurate, because new FW measure resistance for this sensors with accuracy 0,1 Ω.
1.2	2017.01.03	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 information 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 a hardware version >= 2.0 (option unavailable in MIX modules) • www page: RS485 Biasing Resistors activation option (shows only in MINI modules with a hardware >= 2.0) Improvements: • 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 VDC	@ 24 VAC
	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 • 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 0,1Ω@16bit	

	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
Analog Outputs	Voltage range	0 to 10 V
	Max. load current	20 mA
	Resolution	12-bits
	Accuracy	±0.5%
Digital Outputs (relays)	Contact material	AgSnO2
	Resistive load AC1	3 A @ 230 VAC or 3 A @ 30 VDC
	Inductive load AC3	75 VA @ 230 VAC or 30 W @ 30 VDC
	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	8 A @ 230 VAC or 8 A @ 30 VDC
	Inductive load AC3	360 VA@ 230 VAC or 90 W @ 30 VDC
	Capacitive load	• 120 W @ LED + PS 230 VAC • 240 W @ fluorescent lamps with electronic ballast • 180 W @ CFL Compact fluorescent lamp
Triac Outputs	Continuous load per channel	0,5 A @ 20 VAC up to max. 250 VAC
	Peak load per channel	1,5 A @ 20 VAC up to max. 250 VAC (30 s)
	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

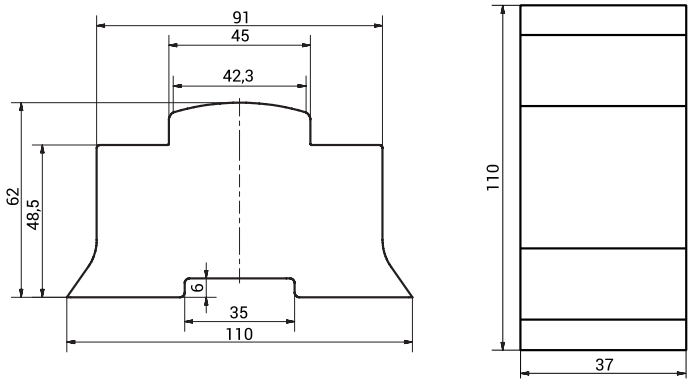

Figure 1 MINI series dimension

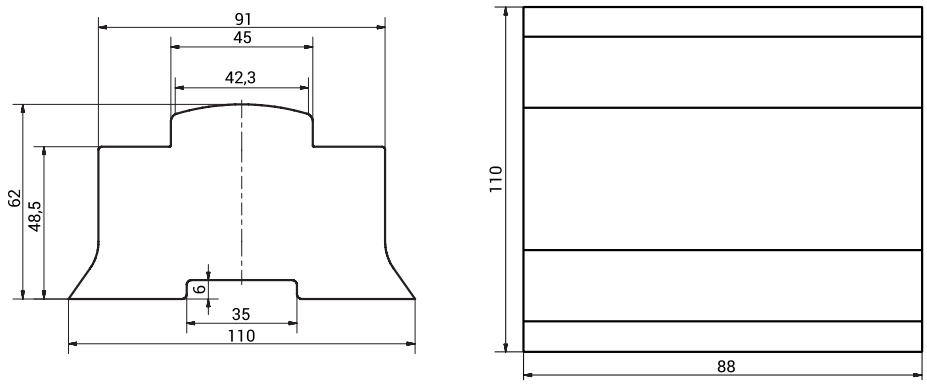

Figure 2 MIX18 and MIX18-IP dimension

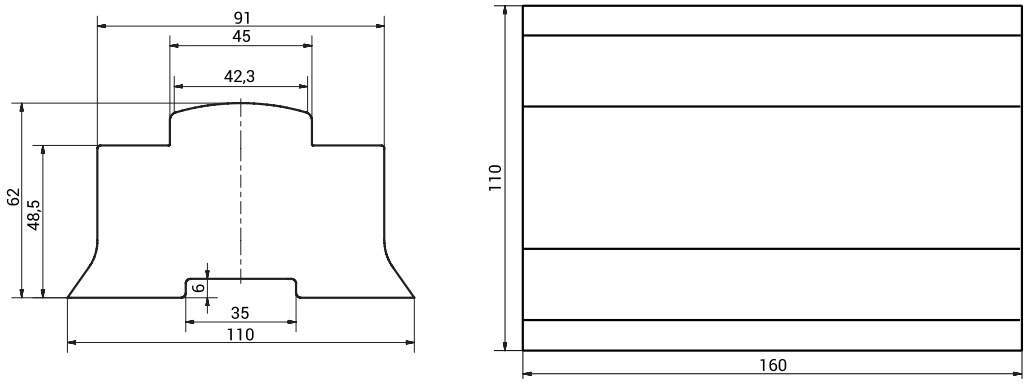

Figure 3 MIX38 and MIX38-IP dimension

1.6 Power supply connection

1.6.1 DC power connection

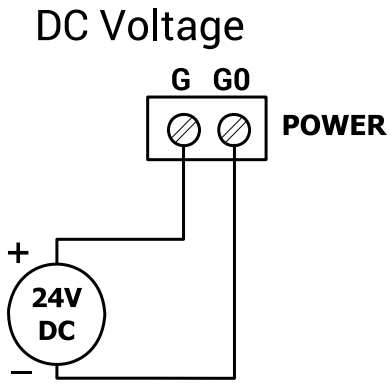

Figure 4 DC power supply connection

1.6.2 AC power connection

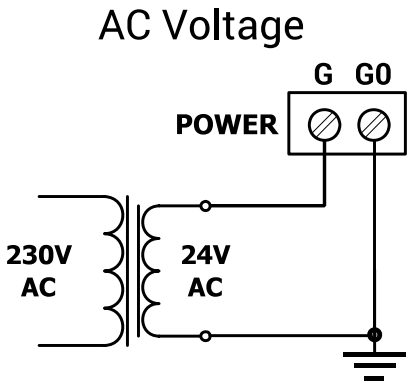

Figure 5 AC power supply connection

1.7 Connecting the communication bus (RS485)

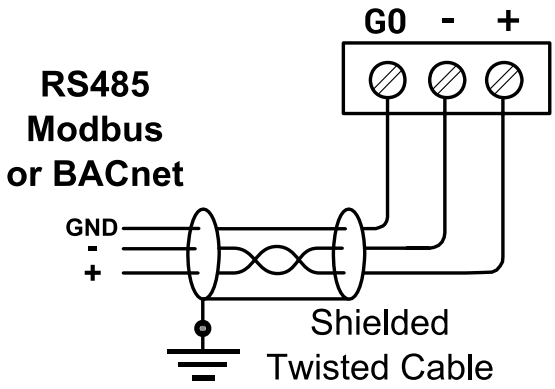

Figure 6 RS485 connection

1.8 LED Indicators

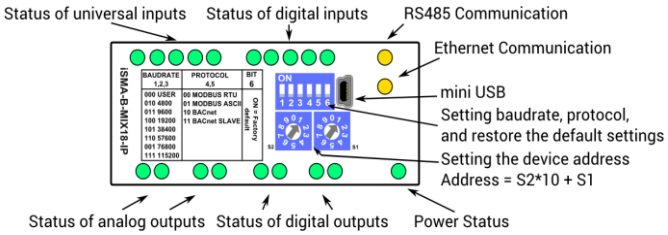

Figure 7 Top panel MIX18-IP

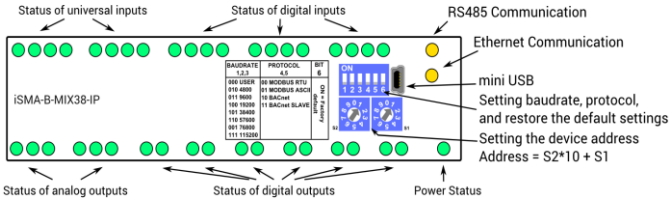

Figure 8 Top panel MIX38-IP

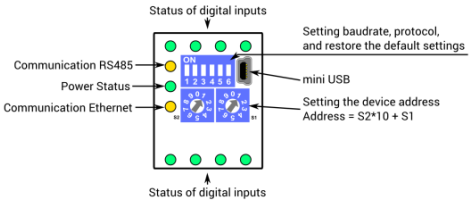

Figure 9 Top panel 8I and 8I-IP

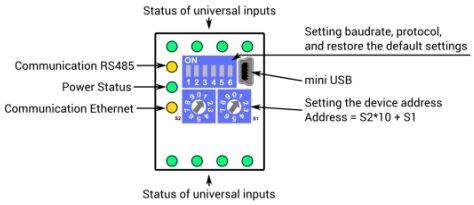

Figure 10 Top panel 8U and 8U-IP

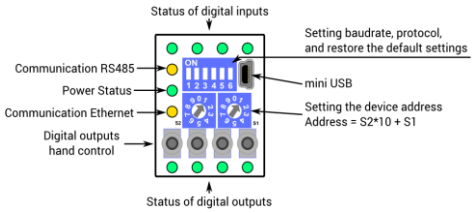

Figure 11 Top panel 4I4O-H and 4I4O-H-IP

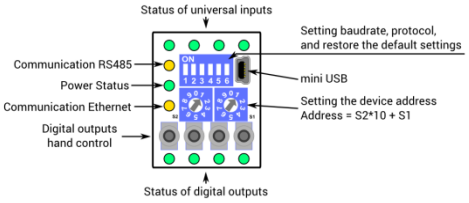

Figure 12 Top panel 4U4O-H and 4U4O-H-IP

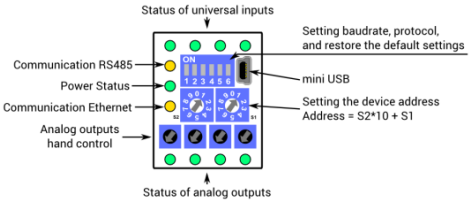

Figure 13 Top panel 4U4A-H and 4U4A-H-IP

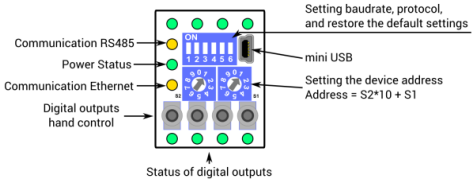

Figure 14 Top panel 4O-H and 4O-H-IP

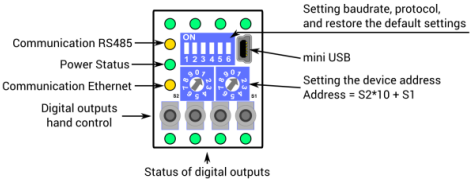

Figure 15 Top panel 4TO-H and 4TO-H-IP

- 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

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 effects often present a problem 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 an RS485 twisted pair cable this termination is typically 120 Ω.

1.11 Setting Module Address on Modbus Network

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

It is possible to set the device address from 0 to 99.

The formula for setting the address:

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

Where S1 and S2 are values of switches.

The example:

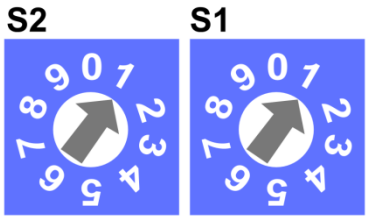

Figure 16 Sample of setting address

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

1.12 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 (factory set)*

Table 4 Baud rate selection

1.13 Protocol selection

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

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

1.14 Restoring the default settings

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

1. Turn off power supply
2. Set section 6 of S3 switch to ON
3. Turn on power supply, power LED blinking
4. 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.

1.15 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	*0*
BAUD RATE	*76800 (76800 bps)*
STOP BITS	*1*
DATA BITS	*8*
PARITY BITS	*0*
RESPONSE DELAY	*0*
WATCHDOG TIME	*0 (disabled)*
STATE OF THE DIGITAL OUTPUTS AFTER START	*0*
STATE OF THE ANALOG OUTPUTS (DIGITAL) AFTER START	*0*
STATE OF THE ANALOG OUTPUTS AFTER START	*0*
UNIVERSAL INPUT CONFIGURATION	*1*
INPUT FILTER TIME CONSTANT	*2*
UNIVERSAL INPUT RESOLUTION	*0*
ANALOG OUTPUT CONFIGURATION	*0*
Only for modules with IP	
USERNAME	*platform*
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	*1000ms*
SEND MODBUS ERRORS	*DISABLE*
BACNET ID	*826001*
BACNET UDP PORT	*47808 (0xBAC0)*

Table 6 Default values

2 Configuration registers

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

2.1 Firmware version and module type (30001)

In this register are encoded type and firmware version of module.

Low byte contains information about the type of module in accordance with 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 7 Firmware version and module type

High byte contains the module firmware version multiplied by 10.

The example:

In register 30001 is number 12810_{10} = $0x320A_{16}$. It means that it is a module MIX18 (0x32) with firmware in version 1.0 ($0x0A_{16}$ = 10_{10})

2.2 Module address (30002)

This register contains information about the address of the Modbus module. This address is set using switches S1 and S2 (see section Setting Module Address on Modbus Network).

2.3 Baud rate and protocol (30003)

The register contains information about the baud rate and type of protocol in accordance with the table below. This register reflects the state of the switch S3.

Baud rate				Protocol		
Bit 0	Bit 1	Bit 2	Baud rate	Bit 3	Bit 4	Protocol
0	*0*	*0*	*User defined*	*0*	*0*	*Modbus RTU*
0	*0*	*1*	*76800*	*0*	*1*	*Modbus ASCII*
0	*1*	*0*	*4800*	*1*	*0*	*BACnet Master*
0	*1*	*1*	*9600*	*1*	*1*	*BACnet Slave*
1	*0*	*0*	*19200*			
1	*0*	*1*	*38400*			
1	*1*	*0*	*57600*			
1	*1*	*1*	*115200*			

Table 8 Baud rate and protocol

2.4 Counter of received messages (30004)

32-bit register with the number of valid Modbus received messages by the module from last powered up. The value is reset after power cycle or after changing transmission parameters (speed, stop bits, parity, etc.).

2.5 Counter of error messages (30006)

32-bit register with the number of error Modbus received messages by the module from last powered up. The value is reset after power cycle or after changing transmission parameters (speed, stop bits, parity, etc.).

2.6 Counter of sent messages (30008)

32-bit register with the number of Modbus sent messages by the module from last powered up. The value is reset after power cycle or after changing transmission parameters (speed, stop bits, parity, etc.).

2.7 Up time (30012)

This 16-bits register contains module working time in seconds from last power up or module reset.

2.8 Hardware_version (30130)

This 16-bits register contains the module hardware version multiplied by 10.

2.9 MAC_address (30131)

This 32-bits register contains the module MAC address information.

2.10 Device actions (40001)

Setting register 40001 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 9 Device actions

2.11 Baud rate (40136)

When sections 1, 2 and 3 of S3 switch are in off position, baud rate is determined in accordance with this register. Baud rate is determined by the following formula:

Baud rate = Register value • 10

2.12 Stop bits (40137)

Number of stop bits is determined on the basis of this register in accordance with the following table:

Value	No of stop bits
1 (default)	*1*
2	*2*
256	*RS485 biasing**

Table 10 Stop bits

*Bit no 8 activates RS485 biasing resistors in order to pull-up voltage on the RS485 bus. When the bit no 8 is true (bit 8 = 1) then RS485 biasing resistors are activated. The function is only available in MINI modules with a hardware version >= 2.0

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 !

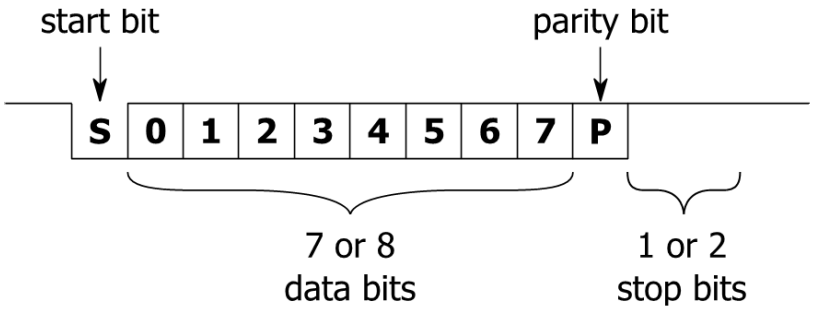

Figure 17 Modbus message frame

2.13 Data bits (40138)

Number of data bits transmitted in a single byte is determined according to the following table:

Value	No of data bits
7	*7*
8 (default)	*8*

Table 11 Data bits

2.14 Parity bit (40139)

Each byte of data being transferred may have additional protection as a parity bit added before stop bit (bits).

The method of calculating parity bit determines the table below:

Register value	Type of parity bit
0 (default)	*none*
1	*Odd (number of all ones in a byte is odd)*
2	*Even (number of all ones in a byte is even)*
3	*Always 1*
4	*Always 0*

Table 12 Parity bit

2.15 Response delay time (40140)

The value of this 16-bits register determines the number of milliseconds to wait before the unit answers the question. This time is used to extend the interval between question and answer. The default value of 0 means no delay (the answer is sent once during the 3.5 character required by the protocol Modbus RTU).

2.16 Watchdog time (40141)

This 16-bits register specifies the time in seconds to watchdog reset. If module does not receive any valid message within that time, all Digital and Analog Outputs will be set to

default state.

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.

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

3 Local I/O

3.1 Universal Inputs connections

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

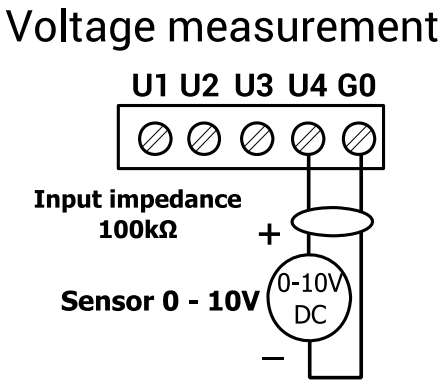

Figure 18 Connection of UI to measure 0-10 VDC for MIX38 and MIX38-IP

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.

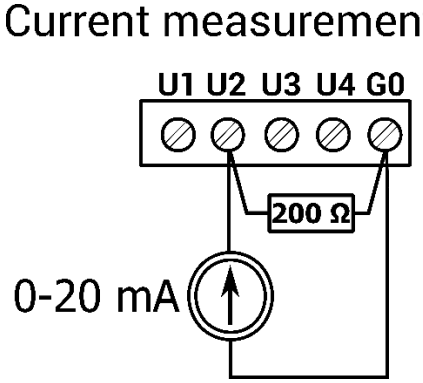

Figure 19 Connection of UI to measure 0-20 mA for MIX38 and MIX38-IP

3.1.3 Connection of Universal Input to measure temperature

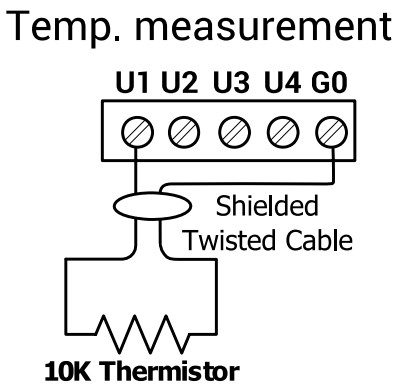

Figure 20 Connection of UI to measure temperature for MIX18 and MIX18-IP

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

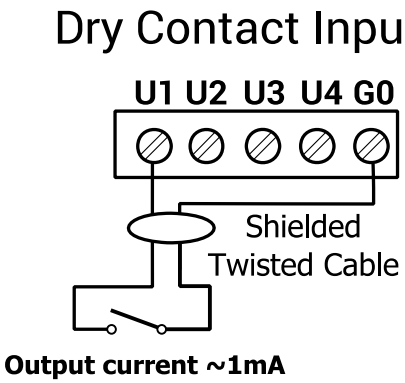

Figure 21 Connection of UI to work as DI for MIX38 and MIX38-IP

3.2 Universal Inputs MODBUS Registers

3.2.1 Status of Universal Inputs working as Digital Inputs (30017)

This 16-bits register contains information about the status of Digital Inputs (dry contact). When the input is shortcut to the ground the corresponding bit value is set to 1 in accordance with the following table:

No of bit in register	No of Universal Input
0	1
1	2
2	3
3	4
4	5
5	6
6	7
7	8

Table 13 UI register working as DI for MIX38 and MIX38-IP

3.2.2 Universal Input measure voltage (current) 1 - 8 (30071, 30073, 30075, 30077, 30079, 30087, 30089, 30091)

In these 16-bits registers are the results of measuring the voltage for each input. The result is expressed in millivolts.

Measuring the current for each input results are stored in the same registers. In that case the current value has to be calculated according to the equation:

$$I = \frac{register\ value}{200}\ [\text{mA}]$$

3.2.3 Universal Input measure temperature 1 - 8 (30072, 30074, 30076, 30078, 30080, 30095, 30097, 30099)

n these 16-bit registers. . The result is expressed in Celsius degrees • 10

3.2.4 Universal Input measure resistance 1 - 8 (30103, 30104 – 30117, 30118)

n these 32-bit registers. . The result is expressed in Ω or in 0,1 Ω for PT1000 and NI1000 configuration. In the register with lower number it is storage lower part of result and higher register storage higher part of result.

3.2.5 Universal Input configuration 1 - 8 (40151 – 40158)

These 16-bit registers are used to configure Universal Inputs in accordance with the following table:

Register value	Description
0	*Off resistance measurement (only measuring the voltage, dry contact off)*
1 (default)	*The temperature sensor 10K3A1 NTC B=3975K*
2	*The temperature sensor 10K4A1 NTC B=3695K*
3	*The temperature sensor 10K NTC B=3435K Carel*
4	*The temperature sensor 20K6A1 NTC B=4262K*
5	*The temperature sensor 2,2K3A1 NTC B=3975K*
6	*The temperature sensor 3K3A1 NTC B=3975K*
7	*The temperature sensor 30K6A1 NTC B=4262K*
8	*The temperature sensor SIE1*
9	*The temperature sensor TAC1*
10	*The temperature sensor SAT1*
16	*The temperature sensor Pt1000*
17	*The temperature sensor Ni1000*
+128 (set 7. bit of register)	*Off voltage measurement*

Table 14 Universal inputs configuration

3.2.6 Filter time constant of the Universal Input 1 - 8 (40159 – 40166)

These 16-bit registers consist a 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.

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

3.2.7 Resolution of the universal inputs (40167)

This register is used to determine the bit resolution for each Universal Input.

Setting the bit to 0 will set the resolution of converter to 12-bit. Setting the bit to 1 sets the resolution of converter to 16-bit.

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 50 ms to 700 ms.

Each input can be configured separately in accordance with the following table:

No of bit in register	No of Universal Input
0	*1*
1	*2*
2	*3*
3	*4*
4	*5*
5	*6*

6	7
7	8

Table 15 Universal inputs resolution for MIX38 and MIX38-IP

3.3 Digital Inputs Connections

3.3.1 Connection of Digital Input (Dry Contact)

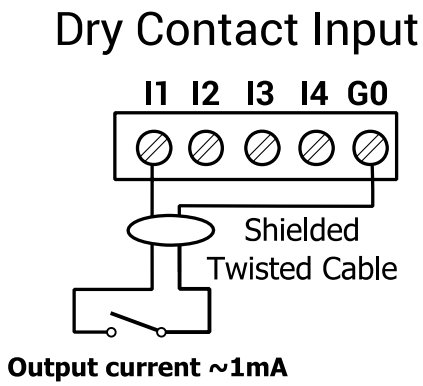

Figure 22 Connection of DI for MIX38 and MIX38-IP

3.4 Digital Inputs MODBUS Registers

3.4.1 State of Digital Inputs (30016)

This 16-bit register contains the status of the Digital Inputs. Short-circuit input to GND sets the corresponding bit in the register in accordance with the table below:

No of bit in register	No of Digital Input
0	1
1	2
...	...
10	11
11	12

Table 16 Status of DI for MIX38 and MIX38-IP

3.4.2 Counter 1 – 12 (40023, 40024 – 40045, 40046)

The modules have 32-bit counters, one for each Digital Input.

In the register with lower number is stored lower byte of the counter and in the register with higher number is stored higher byte of the counter.

In the case you would like to change the value of the register you can write any value (called preset) for pulse counting registers. In the particular case, you can reset the counter by entering 0. Reset counter is also possible via the registry 40022.

3.4.3 Resetting counters (40022)

Setting true value of particular bit of this 16-bit register causes reset (sets to 0) the corresponding counter in accordance with the following table:

No of bit in register	No of Digital Input
0	1
1	2
...	...
10	11
11	12

Table 17 Resetting counters for MIX38 and MIX38-IP

Setting true value of particular bit of the register causes continuously reset of the counter. Setting the bit to 0 restores normal operation.

3.5 Analog Outputs Connections

3.5.1 Connection of Analog Output 0 – 10 V

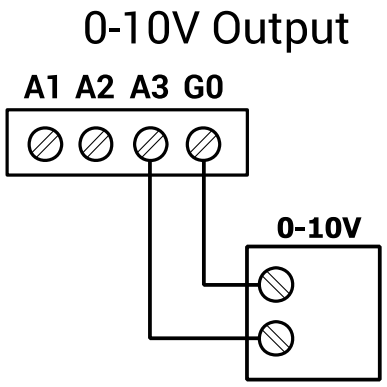

Figure 23 Connection of AO for MIX38 and MIX38-IP

3.5.2 Connecting relay to Analog Output

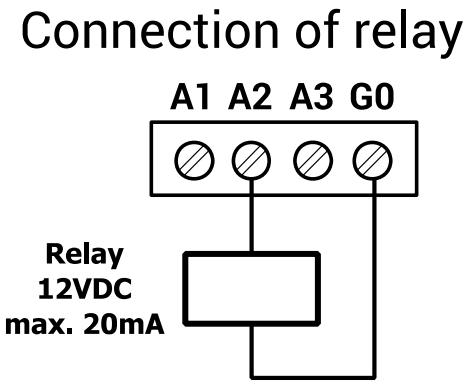

Figure 24 Connection of AO to the relay for MIX38 and MIX38-IP

3.5.3 Connection an actuator to Analog Output

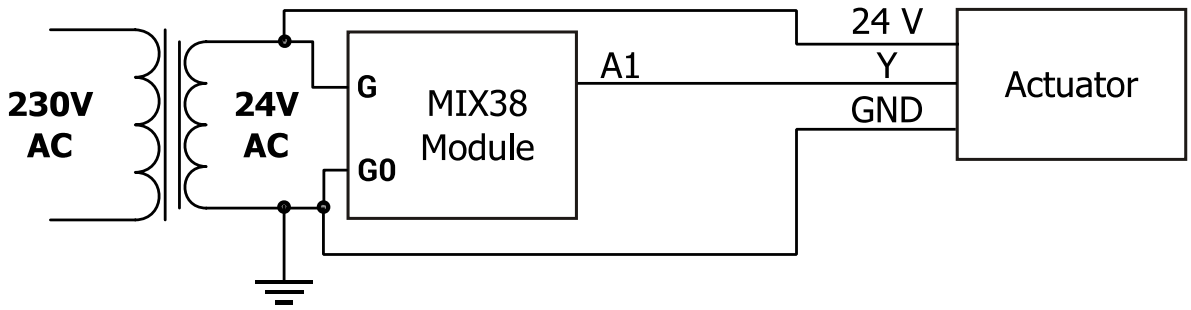

Figure 25 Connection an actuator to AO

3.6 Analog Outputs MODBUS Registers

3.6.1 State of Analog Outputs working as Digital Outputs (40019)

Set/setting true value of particular bit of this 16-bit register causes setting maximum output voltage (10 V) on corresponding output and setting to 0 corresponding register with Analog Output value (40121 – 40126).

Bits of register correspond to the following Analog Outputs.

No of bit in register	No of Analog Output
0	*1*
1	*2*
2	*3*
3	*4*
4	*5*
5	*6*

Table 18 AO working as DO for MIX38 and MIX38-IP

3.6.2 Value of the analog outputs 1 – 6 (40121 – 40126)

In these 16-bit registers are stored value in mV of voltage that appears at the Analog Output.

3.6.3 Default state of the analog outputs (digital) (40144)

Setting true value of particular bit of this 16-bits register sets the maximum voltage (10V) on the corresponding Analog Output after power on or watchdog reset.

Bits in register correspond to the following Analog Outputs:

No of bit in register	No of Analog Output
0	*1*
1	*2*
2	*3*
3	*4*
4	*5*
5	*6*

Table 19 Default state of AO working as DO for MIX38 and MIX38-IP

3.6.4 Default state of the Analog Output 1 – 6 (40145 – 40150)

In these 16-bits registers are stored values in mV of voltage which appear on the Analog Outputs after power on or watchdog reset.

3.6.5 Configuration mode of Analog Output 1 – 6 (40168 – 40173)

These 16-bit registers contain information about the mode of the Analog Outputs according to following table:

Register value	Description
0 (default)	*Voltage output 0 – 10V*
1	*PWM 1Hz*
2	*PWM 10Hz*
3	*PWM 100Hz*
4	*PWM 0.1Hz*
5	*PWM 0.01Hz*

Table 20 AO type settings

3.6.6 Hand control status of analog outputs (30015)

This register is available only for the modules with manual control of Analog Outputs.

No of bit in register	Description
0,1	*Hand status of outputs 1*
2,3	*Hand status of outputs 2*
4,5	*Hand status of outputs 3*

6,7	*Hand status of outputs 4*

Table 21 AO Hand status bits

Value of Hand status	Status Description
0	*AUTO*
1	*HAND CONTROL*

Table 22 AO Hand status value

The current value of output in the hand mode determines register 30125 to 30128.

3.6.7 Hand control value of Analog Outputs 1 – 4 (30125 - 20128)

The registers contain a percentage value of manual control for outputs from 1 to 4.

3.7 Digital Outputs (relays) Connections

3.7.1 Connecting the solenoid valve to the Digital Output

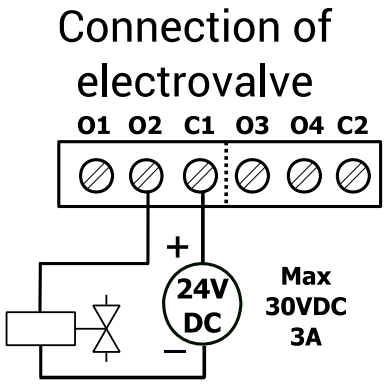

Figure 26 Connection of solenoid valve to DO for MIX38 and MIX38-IP

3.7.2 Connecting a resistive load to the Digital Output

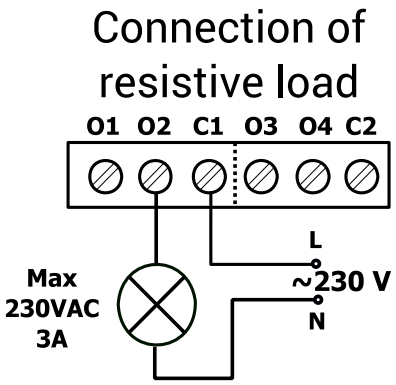

Figure 27Connection of resistive load to DO for MIX38 and MIX38-IP

3.7.3 Connecting a inductive load to the Digital Output

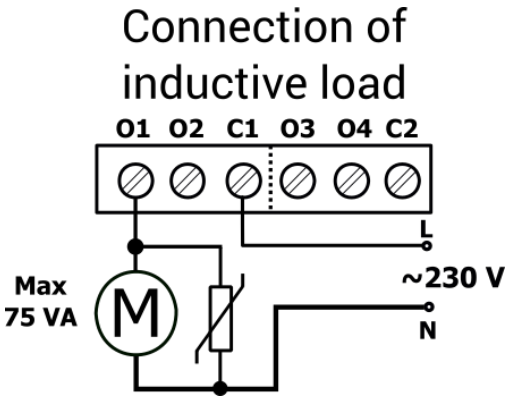

Figure 28 Connection of inductive load to DO for MIX38 and MIX38-IP

3.8 Digital Outputs (relays) MODBUS Registers

3.8.1 State of Digital Outputs (40018)

This 16-bit register contains the state of the Digital Outputs. Set/setting the particular bit in the register enables the corresponding Digital Output according to the following table:

No of bit in register	No of Digital Output
0	1
1	2
2	3
3	4
4	5
5	6

Table 23 State of DO for MIX38 and MIX38-IP

3.8.2 Default state of Digital Outputs (40143)

This 16-bit register contains the default state of the Digital Output device after the start or watchdog reset. Register bits correspond to the Digital Outputs according to the following table:

No of bit in register	No of Digital Output
0	1
1	2
2	3
3	4
4	5
5	6

Table 24 Default status of DO for MIX38 and MIX38-IP

3.8.3 Hand control status of Digital Outputs (30015)

This register is available only for the modules with manual control of outputs.

No of bit in register	Description
0,1	Hand status of output 1
2,3	Hand status of output 2
4,5	Hand status of output 3
6,7	Hand status of output 4

Table 25 DO Hand status bits

Value of Hand status	Status Description
0	*AUTO*
2	*HAND OUT = 0*
3	*HAND OUT = 1*

Table 26 DO Hand status value

3.9 Triac Outputs Connections

3.9.1 Connecting the solenoid valve to the Triac Output

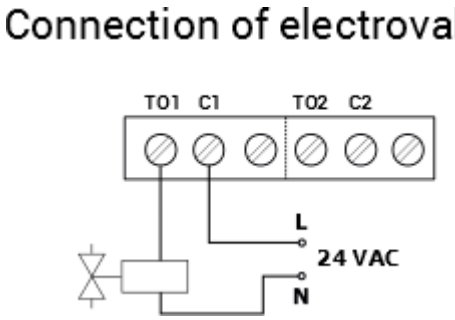

Figure 28 Connection of solenoid valve to TO for 4TO-H and 4TO-H-IP

3.9.2 Connecting a resistive load to the Triac Output

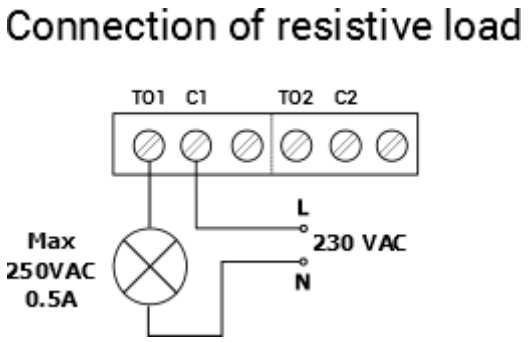

Figure 29 Connection of resistive load to TO for 4TO-H and 4TO-H-IP

3.10 Triac Outputs MODBUS Registers

3.10.1 State of Triac Outputs (40018)

This 16-bit register contains the state of the Triac Outputs in digital mode. /Setting particular bit in the register enables the corresponding Triac Output according to the following table:

No of bit in register	No of Triac Output
0	*1*
1	*2*
2	*3*
3	*4*

Table 27 State of TO for 4TO-H and 4TO-H-IP

3.10.2 Default state of triac outputs (40143)

This 16-bits register contains the default state of the Triac Output device after the start or watchdog reset.

The register bits correspond to the Triac Outputs according to the following table:

No of bit in register	No of Digital Output
0	*1*
1	*2*
2	*3*
3	*4*

Table 28 Default status of TO for 4TO-H and 4TO-H-IP

3.10.3 Value of the Triac PWM outputs 1 – 4 (40121 – 40124)

In these 16-bit registers are stored value in percent's of duty that appears on the PWM output. Output working mode is defined by CONFIGURATION mode of Triac Output.

3.10.4 Default state of the Triac PWM outputs 1 – 4 (40145 – 40148)

In these 16-bit registers are stored value in percent's of duty that appears on the Analog Output after power on or watchdog reset.

3.10.5 Configuration mode of Triac Output 1 – 4 (40168 – 40171)

These 16-bits registers contain information about the mode of the Triac Outputs according to the following table:

Register value	Description
1 (default)	*Digital Output*
2	*PWM 1Hz*
3	*PWM 10Hz*
4	*Not supported*
5	*PWM 0.1 HZ*
6	*PWM 0.01Hz*

Table 29 TO type settings

3.10.6 Hand control status of Triac Outputs (30015)

This register is available only for the modules with manual control of outputs.

No of bit in register	Description
0,1	*Hand status of outputs 1*
2,3	*Hand status of outputs 2*
4,5	*Hand status of outputs 3*
6,7	*Hand status of outputs 4*

Table 30 TO Hand status bits

Value of Hand status	Status Description
0	*AUTO*
2	*HAND OUT = 0*
3	*HAND OUT = 1*

Table 31 TO Hand status value

3.11 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 32 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 registers for operation mode (40176, 40180, 40184, 40188), time parameters (40177, 40181, 40185, 40189), setpoints for heating/cooling modes (40178, 40182, 40186, 40190 4U4O-H and 4U4O-H-IP only) and for differential value in heating/cooling modes (40179, 40183, 40187, 40191 4U4O-H and 4U4O-H-IP only).

Register	Description
40176	*DI1 OPERATION MODE*
40177	*DI1 TIME VALUE*
40178	*DI1 SETPOINT (4U4O-H and 4U4O-H-IP only)*
40179	*DI1 DIFFERENTIAL (4U4O-H and 4U4O-H-IP only)*
40180	*DI2 OPERATION MODE*
40181	*DI2 TIME VALUE*
40182	*DI2 SETPOINT (4U4O-H and 4U4O-H-IP only)*
40183	*DI2 DIFFERENTIAL (4U4O-H and 4U4O-H-IP only)*
40184	*DI3 OPERATION MODE*
40185	*DI3 TIME VALUE*
40186	*DI3 SETPOINT (4U4O-H and 4U4O-H-IP only)*
40187	*DI3 DIFFERENTIAL (4U4O-H and 4U4O-H-IP only)*
40188	*DI4 OPERATION MODE*
40189	*DI4 TIME VALUE*

40190	*DI4 SETPOINT (4U4O-H and 4U4O-H-IP only)*
40191	*DI4 DIFFERENTIAL (4U4O-H and 4U4O-H-IP only)*

Table 33 List of registers dedicated for special application mode

3.11.1 Operation Mode registers (40176,40180,40184,40188)

This register contains information about module working mode. Available modes and register values are shown in the table below:

Value	OPERATION MODE Register
0	*Ordinary IO(def)*
1	*Monostabile Relay*
2	*Bistabile 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 34 Special application modes

Operating mode can be changed by writing right value in the Operation Mode register.

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 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.

3.11.1.1 Ordinary IO

In this mode, module works as a standard IO; inputs and outputs are not related which each other.

3.11.1.2 Monostabile Relay

In this mode both rising and falling edge on digital input change output state. The action of monostable relay can by executed remotely by changing the state of bit from false to true in COMMAND register (40020). Outputs can by also overwritten by DIGITAL OUTPUT register (40018), which allows remote control from BMS.

3.11.1.3 Bistabile Relay

In this mode only rising edge on digital input change output state. The action of bistable relay can by executed remotely by changing the state of bit from false to true in COMMAND register (40020). Outputs can by also overwritten by DIGITAL OUTPUT register (40018), which allows remote control from BMS.

3.11.1.4 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 TIME VALUE register (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 register (40020). Outputs can be also overwritten by module DIGITAL OUTPUT register (40018), which allows to remote control from BMS.

3.11.1.5 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 TIME VALUE register (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 register (40020). Outputs can be also overwritten by module DIGITAL OUTPUT register (40018), which allows to remote control from BMS.

3.11.1.6 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 TIME VALUE register (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 register (40020). Outputs can be also overwritten by module DIGITAL OUTPUT register (40018), which allows to remote control from BMS.

3.11.1.7 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 TIME VALUE register (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 register (40020). Outputs can be also overwritten by module DIGITAL OUTPUT register (40018), which allows to remote control from BMS.

3.11.1.8 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 Block Inputs register).

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

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

When Control value is lower or equal the difference of Setpoint register and differential register the output is in low state.

When Control value is higher or equal the sum of Setpoint register and differential register 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.

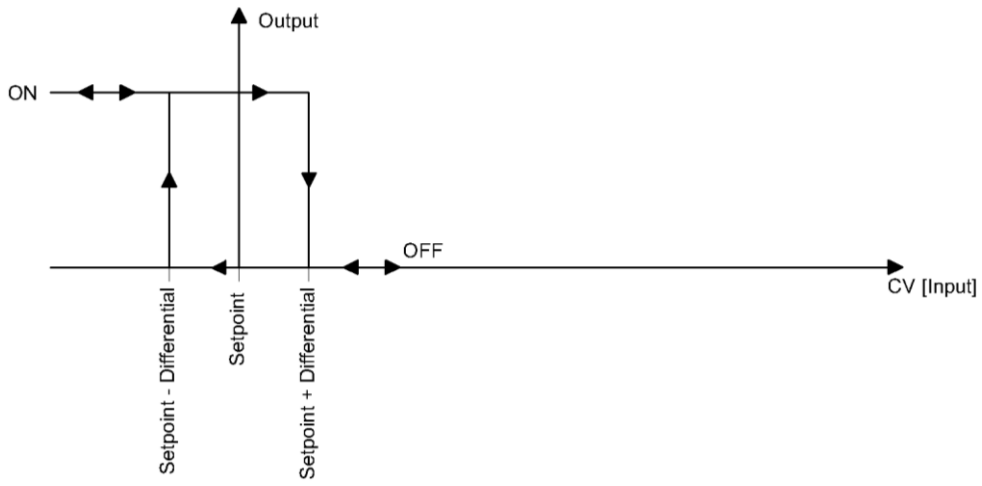

Figure 30 Heating mode algorithm functioning

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.

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

In this mode output is controlled as a typical thermostat, based on Setpoint register and Control value (Input signal) with differential parameter defined in Differential register.

The output signal works in 2 states - low and high.

When Control value is lower or equal the difference of Setpoint register and Differential register the output is in low state.

When Control value is higher or equal the sum of Setpoint register and Differential register 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.

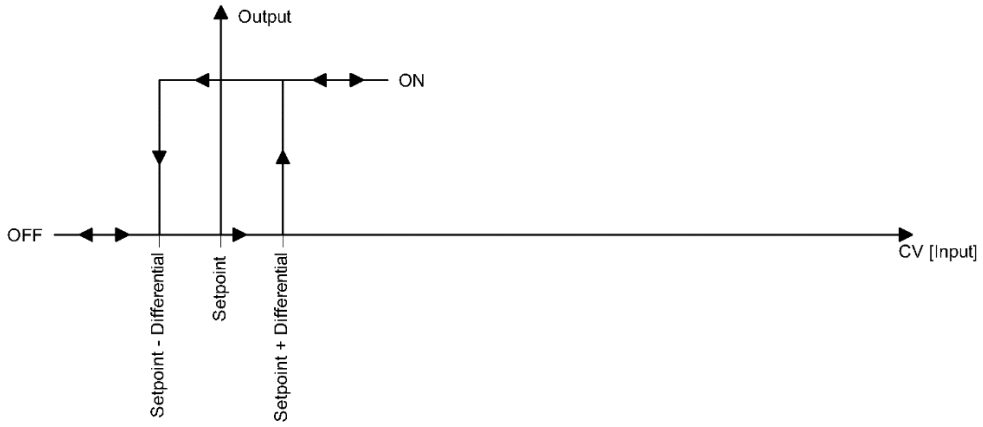

Figure 31 Cooling mode algorithm functioning

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.

3.11.2 Time Value registers (40177,40181,40185,40189)

The registers contain time values for TIME RELAY modes. The time unit depends on selected mode [milliseconds] or [seconds].

3.11.3 Command register (40020)

The module have special register COMMAND (40020). The command register is used for remotely execute action (simulate light switch/PIR). The action is executed by changing state of relevant bit (changing from false to true). All special application modes can be executed except Input Forwarding, Heating and Cooling modes.

No of bit in register (40020)	Command input number
0	*1*
1	*2*
2	*3*
3	*4*

Table 32 Command register for special application modes

3.11.4 Block Inputs register (40021)

The Block Inputs register is used to block physical input signals to take action in logic. By setting true value on relevant bit the module block 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.

No of bit in register (40021)	Block input number
0	*1*
1	*2*
2	*3*
3	*4*

Table 35 Block inputs register.

3.11.5 Setpoint registers (40178,40182,40186,40190)

The SETPOINT registers 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).

The register stores the setpoint multiplied by 10.

3.11.6 Differential registers (40179,40183,40187,40191)

The DIFFERENTIAL registers 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 registers and Differential registers 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).

The register stores the differential multiplied by 10.

4 WEB Configuration- only IP version

4.1 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 entre IP address of the module, default address for new module (default IP address is 192.168.1.123). Please use the following credentials :

Username: platform

Password: 1000 (by default)

4.2 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.

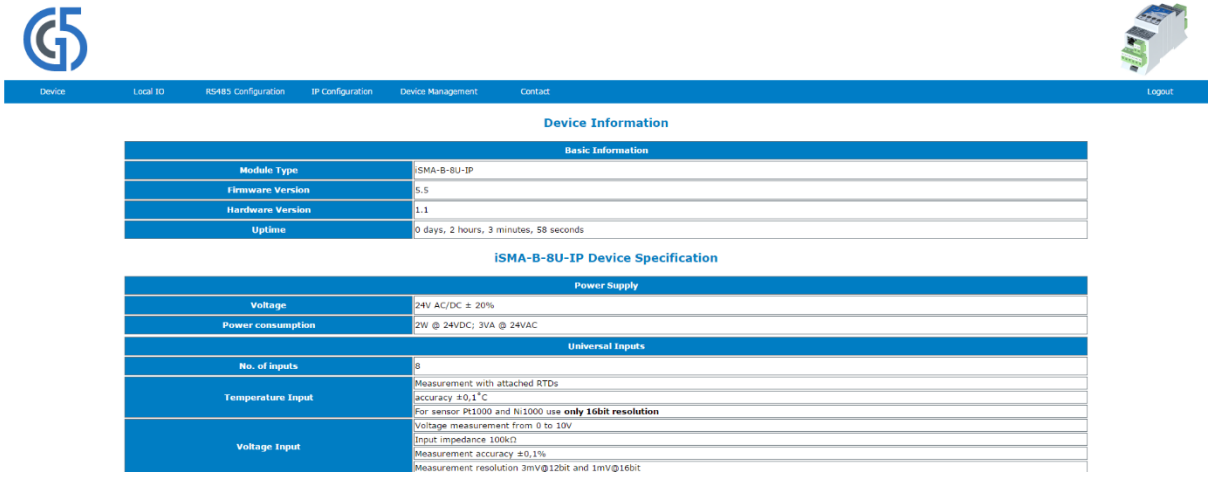

Figure 32 Device page of 8U-IP

4.3 Local I/O status and configuration

4.3.1 Universal Inputs

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

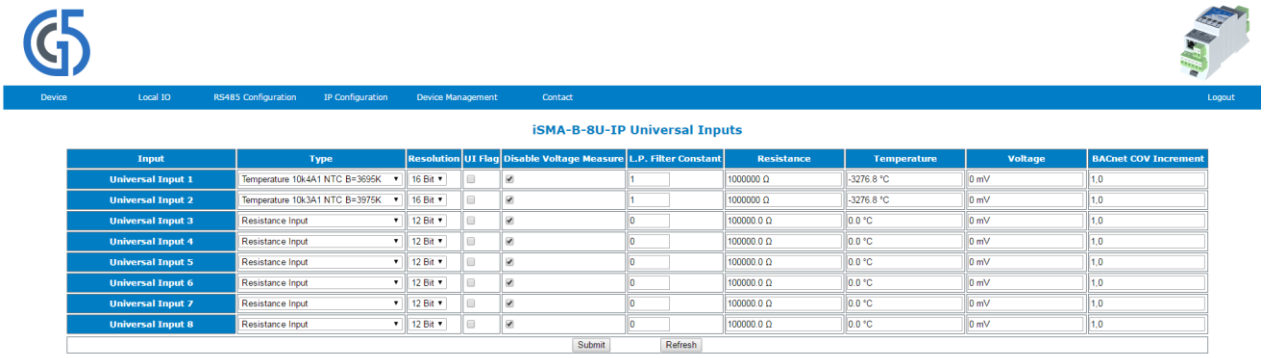

Figure 30 Universal Inputs page of 8U-IP

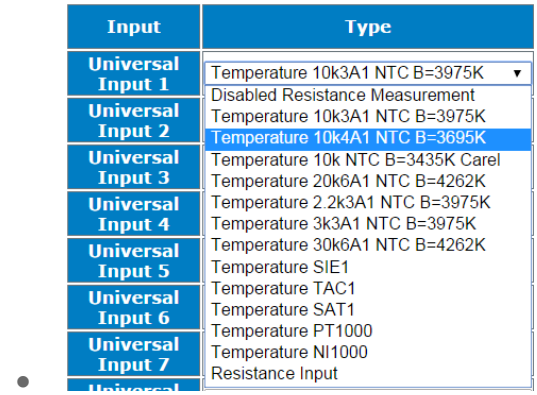

Figure 34 Types of sensors

Universal Input table has the following fields:

- Sensor type (Read & Write) allows to set different type of sensor.
- Resolution (Read & Write), resolution measurement 12bits / 16bits (for PT1000 and Ni1000 sensors please use 16bits).
- 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].

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

4.3.2 Special application modes configuration

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

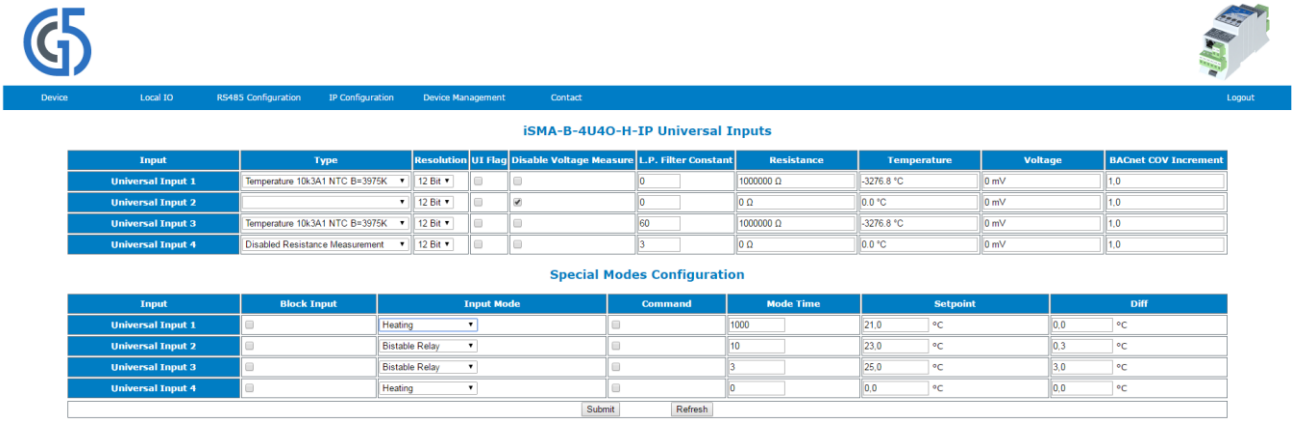

Figure 35 Universal Inputs page of 4U4O-IP

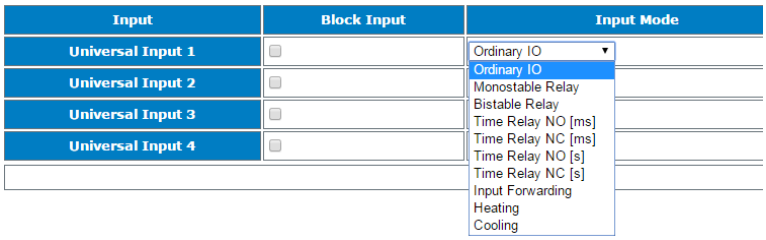

Figure 36 Special application modes

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.

4.3.3 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.

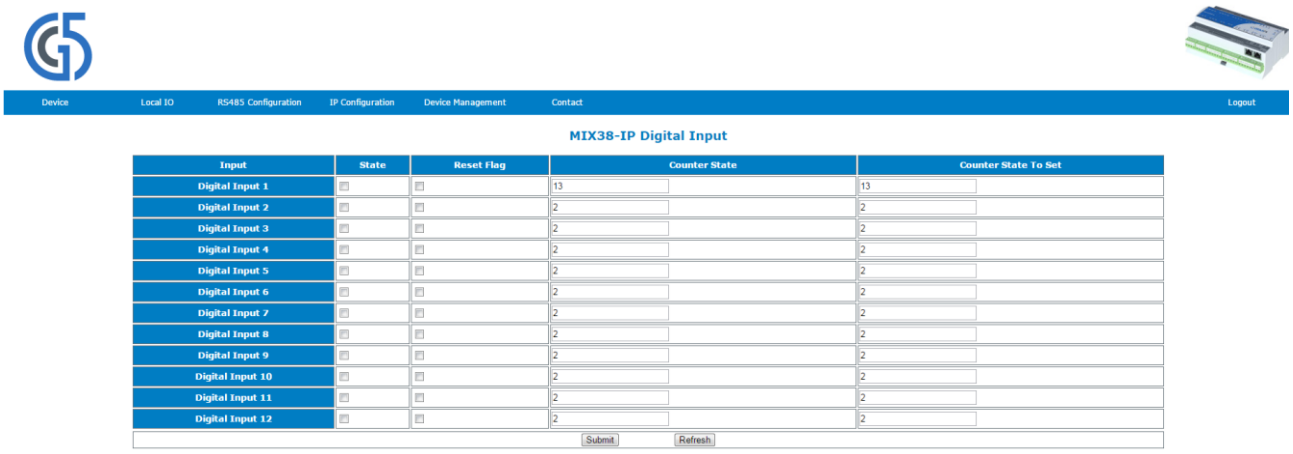

Figure 37 Digital Inputs page of MIX38-IP

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.

4.3.4 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.

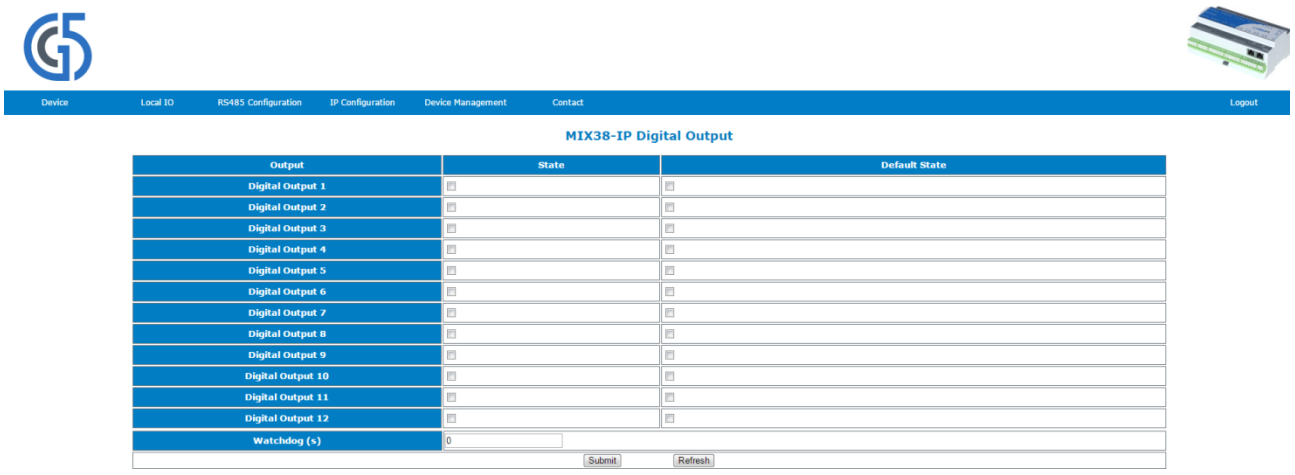

Figure 38 Digital Outputs page of MIX38-IP

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.
- Watchdog (Read & Write),device watchdog value in seconds.

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

4.3.5 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.

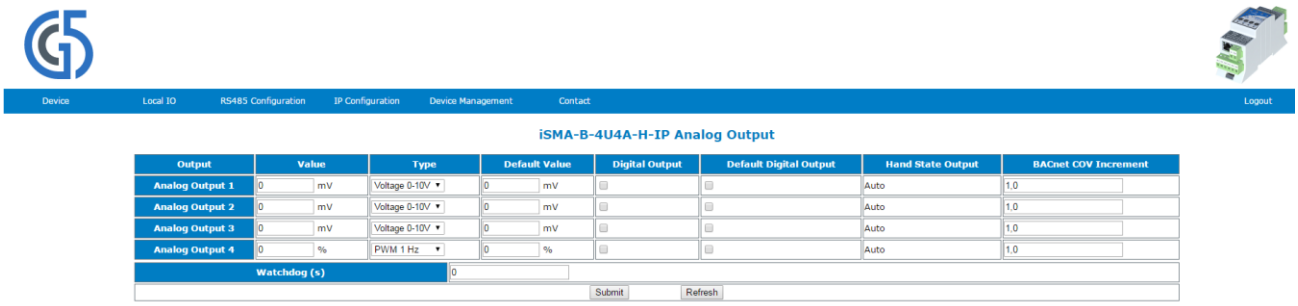

Figure 39 Analog Outputs page of 4U4A-H-IP

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

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

4.4 RS485 Configuration

This page allow to enter configuration parameters and show information of controllers RS485 port.

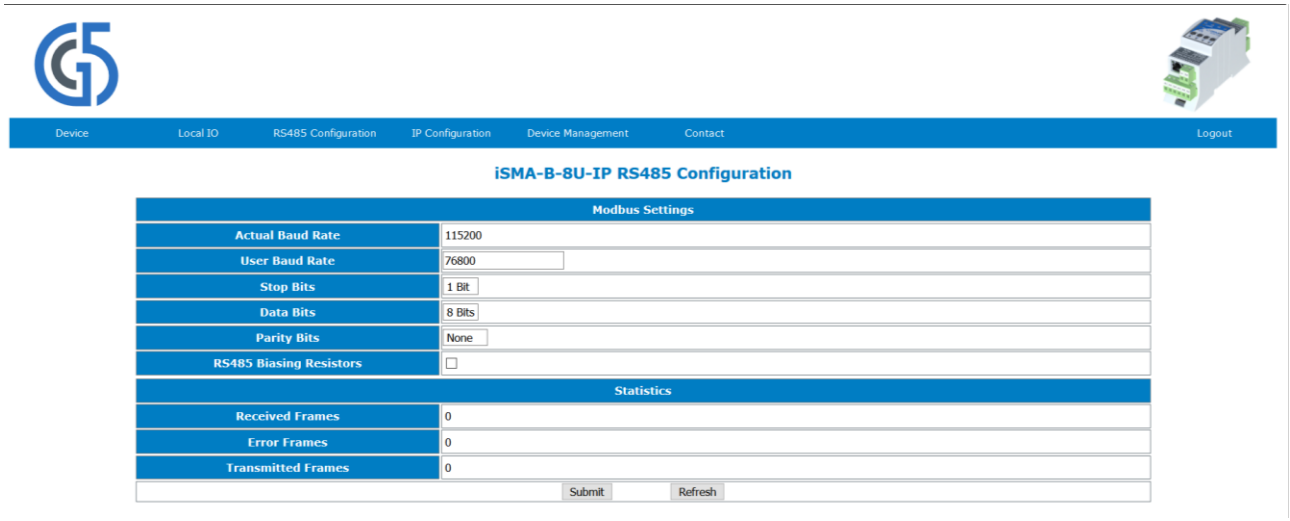

Figure 40 RS485 configuration page

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 , biasing resistors activation only for MINI modules 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.

4.5 IP Configuration

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

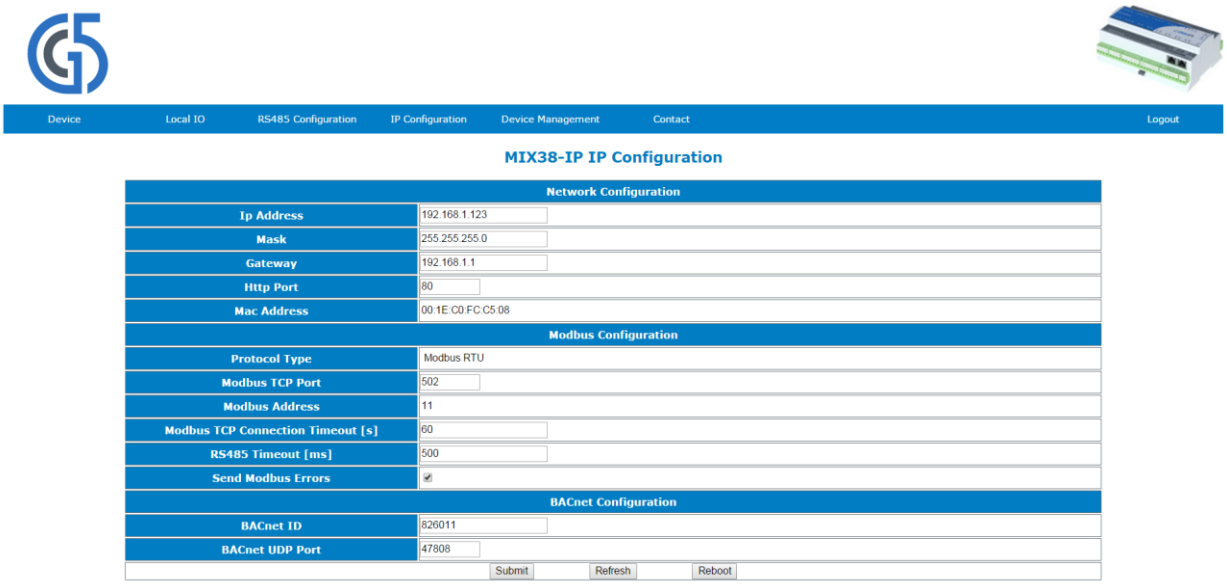

Figure 41 IP configuration page

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

4.6 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”

4.7 Contact

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

Figure 43 Contact page view

5 Modbus TCP/IP modules

5.1 Modbus TCP/IP

The device simultaneously supports up to 4 Modbus TCP clients. If the fifth device will want to connect to the module, TCP connection will be rejected. In order to secure the module before filling up the call list, it was introduced a mechanism for monitoring each Modbus TCP connection. There is a parameter called Modbus TCP Communication Timeout (default 60s), If during this time will not come any request from the Modbus TCP client, module will close the connection.

To read internal registers of the module need to generate the correct MODBUS TCP frame with address according to the setting of dipswitch, If the address is different the frame will be sent to the RS485 port.

If module receive an incorrect MODBUS TCP frame, it sends back a frame with error code:

0x01 - if the function code in the query is not supported

0x02 - if the address of the register is invalid

0x03 - If in the query disagrees the amount of data

If the query is correct, device instantly generates answer with the data or acknowledgment of receipt of data, depending on the query.

5.2 Module as Modbus TCP/IP Gateway to RS485

All IP version modules have built in Modbus TCP/IP to RS485 gateway which allows to connects using RS485 an additional I/O modules or 3rd party Modbus devices. In order to ensure proper operation of Modbus Gateway please make sure that all parameters of RS485 (Baud Rate, Stop Bits ect.) of all the devices connected to RS485 (Gateway and an addition I/O modules/devices) are same.

Operation of gateway is based on checking the MODBUS address in the MODBUS TCP query. If the address is different from the set on the dipswitch, data frame from query is converted to MODBUS RTU/ASCII, and sent to the RS485 port. Then the module waits for an answer from device connected to the RS485, if slave does not respond within the estimated time defined by the RS485 Timeout (default 500ms), an exception response will be given: error code 0x0B. If the slave answered the correct frame, it is converted to Modbus TCP and sent to the master.

Module in gateway functionality in case of not receive valid frame, send error code 0x0B. Some systems upon receipt of this error code, no repeats the query according to the settings. No retry may result in immediate going point to down mode. That is why modules have the ability to block the sending information about errors (Send Modbus Errors setting from built in web or iSMA-Configurator). Then in the absence of any response, the system retry the request according to the settings.

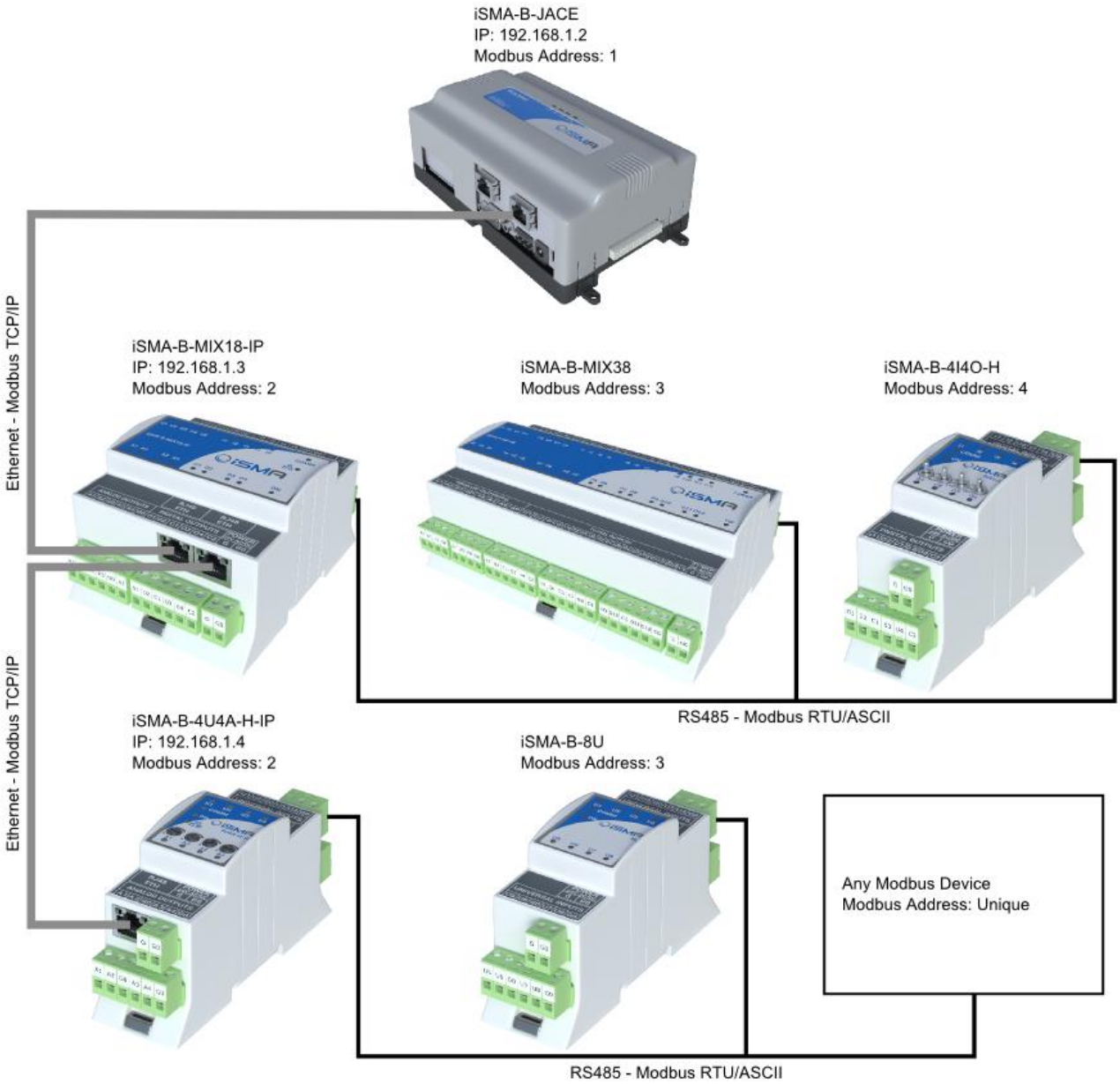

Figure 44 Modbus TCP/IP to RS485 Gateway an example

6 List of all Modbus Registers

Below is a table with all the registers available for all types of modules. Please notice that for some types of modules some of the registers are not available according to the physical number and types of Inputs and Outputs.

Modbus Addr	Dec Addr	Hex Addr	Register name	Access	Description
30001	0	0x00	VERSION AND MODULE TYPE	Read Only	
30002	1	0x01	MODULE ADDRESS (state of switch)	Read Only	
30003	2	0x02	BAUD RATE AND PROTOCOL (state of switch)	Read Only	
30004	3	0x03	COUNTER OF RECEIVED FRAMES (32 – bits)	Read Only	Default state is 0 Reset at the unit start and change of transmission parameters.
30006	5	0x05	COUNTER OF FRAMES WITH ERROR (32 – bits)	Read Only	Default state is 0 Reset at the unit start and change of transmission parameters.
30008	7	0x07	COUNTER OF SENT FRAMES (32 – bits)	Read Only	Default state is 0 Reset at the unit start and change of transmission parameters.
30015	14	0xE	STATUS OF MANUAL OPERATION	Read Only	Status of manual operation DO, TO and AO for modules MINI series
30016	15	0x0F	STATE OF DIGITAL INPUTS	Read Only	
30017	16	0x10	STATE OF UNIVERSAL INPUTS WORKING AS DIGITAL INPUTS	Read Only	Status of Universal Inputs working as digital inputs
40001	0	0x00	DEVICE ACTIONS	Read & Write	Allows to enable 1 of 3 device actions
40018	17	0x11	STATE OF DIGITAL OUTPUTS	Read & Write	State of Digital Outputs
40019	18	0x12	STATE OF ANALOG OUTUTS WORKING AS DIGITAL OUTPUTS	Read & Write	State of Analog Outputs working as Digital Outputs
40020	19	0x13	DIGITAL INPUTS COMMAND REGISTER	Read & Write	Digital Inputs command register
40021	20	0x14	DIGITAL INPUTS BLOCKING	Read & Write	Digital Inputs blocking register
40022	21	0x15	COUNTER RESET	Read &	Set bit in register to reset corresponding

Modbus Addr	Dec Addr	Hex Addr	Register name	Access	Description
				Write	counter.
40023	22	0x16	COUNTER 1 LSB	Read & Write Memory	32-bit counters for each Digital Input counting pulses.
40024	23	0x17	COUNTER 1 MSB		
40025	24	0x18	COUNTER 2 LSB	Read & Write Memory	
40026	25	0x19	COUNTER 2 MSB		
40027	26	0x1A	COUNTER 3 LSB	Read & Write Memory	
40028	27	0x1B	COUNTER 3 MSB		
40029	28	0x1C	COUNTER 4 LSB	Read & Write Memory	
40030	29	0x1D	COUNTER 4 MSB		
40031	30	0x1E	COUNTER 5 LSB	Read & Write Memory	
40032	31	0x1F	COUNTER 5 MSB		
40033	32	0x20	COUNTER 6 LSB	Read & Write Memory	
40034	33	0x21	COUNTER 6 MSB		
40035	34	0x22	COUNTER 7 LSB	Read & Write Memory	
40036	35	0x23	COUNTER 7 MSB		
40037	36	0x24	COUNTER 8 LSB	Read & Write Memory	
40038	37	0x25	COUNTER 8 MSB		
40039	38	0x26	COUNTER 9 LSB	Read & Write Memory	
40040	39	0x27	COUNTER 9 MSB		
40041	40	0x28	COUNTER 10 LSB	Read & Write Memory	
40042	41	0x29	COUNTER 10 MSB		
40043	42	0x2A	COUNTER 11 LSB	Read & Write Memory	
40044	43	0x2B	COUNTER 11 MSB		
40045	44	0x2C	COUNTER 12 LSB	Read & Write Memory	
40046	45	0x2D	COUNTER 12 MSB		
30071	70	0x46	UIVERSAL INPUT VOLTAGE 1	Read Only	Voltage measurement value is expressed in mV.
30072	71	0x47	UIVERSAL INPUT TEMPERATURE 1	Read Only	

Modbus Addr	Dec Addr	Hex Addr	Register name	Access	Description
30073	72	0x48	UIVERSAL INPUT VOLTAGE 2	Read Only	Formula for the current measurements: $I = \frac{U}{500}$ where: U – register value, 500 – value of attached resistor Temperature is expressed in Celsius degrees * 10 For a result, divide the registry value by 10: $T = \frac{registervalue}{10}$ Selection of the type sensor is done using UNIVERSAL INPUT CONFIGURATION register from 40151 to 40158 for each input separately
30074	73	0x49	UIVERSAL INPUT TEMPERATURE 2	Read Only	
30075	74	0x4A	UIVERSAL INPUT VOLTAGE 3	Read Only	
30076	75	0x4B	UIVERSAL INPUT TEMPERATURE 3	Read Only	
30077	76	0x4C	UIVERSAL INPUT VOLTAGE 4	Read Only	
30078	77	0x4D	UIVERSAL INPUT TEMPERATURE 4	Read Only	
30079	78	0x4E	UIVERSAL INPUT VOLTAGE 5	Read Only	
30080	79	0x4F	UIVERSAL INPUT TEMPERATURE 5	Read Only	
30081	80	0x50	UIVERSAL INPUT VOLTAGE 6	Read Only	
30082	81	0x51	UIVERSAL INPUT TEMPERATURE 6	Read Only	
30083	82	0x52	UIVERSAL INPUT VOLTAGE 7	Read Only	
30084	83	0x53	UIVERSAL INPUT TEMPERATURE 7	Read Only	
30085	84	0x54	UIVERSAL INPUT VOLTAGE 8	Read Only	
30086	85	0x55	UIVERSAL INPUT TEMPERATURE 8	Read Only	
30087	86	0x56	UIVERSAL INPUT VOLTAGE 1	Read Only	
30088	87	0x57	UIVERSAL INPUT VOLTAGE 2	Read Only	
30089	88	0x58	UIVERSAL INPUT VOLTAGE 3	Read Only	
30090	89	0x59	UIVERSAL INPUT VOLTAGE 4	Read Only	
30091	90	0x5A	UIVERSAL INPUT VOLTAGE 5	Read Only	
30092	91	0x5B	UIVERSAL INPUT VOLTAGE 6	Read Only	
30093	92	0x5C	UIVERSAL INPUT VOLTAGE	Read Only	

Modbus Addr	Dec Addr	Hex Addr	Register name	Access	Description
			7		
30094	93	0x5D	UIVERSAL INPUT VOLTAGE 8	Read Only	
30095	94	0x5E	UIVERSAL INPUT TEMPERATURE 1	Read Only	
30096	95	0x5F	UIVERSAL INPUT TEMPERATURE 2	Read Only	
30097	96	0x60	UIVERSAL INPUT TEMPERATURE 3	Read Only	
30098	97	0x61	UIVERSAL INPUT TEMPERATURE 4	Read Only	
30099	98	0x62	UIVERSAL INPUT TEMPERATURE 5	Read Only	
30100	99	0x63	UIVERSAL INPUT TEMPERATURE 6	Read Only	
30101	100	0x64	UIVERSAL INPUT TEMPERATURE 7	Read Only	
30102	101	0x65	UIVERSAL INPUT TEMPERATURE 8	Read Only	
30103	102	0x66	RESISTIVE INPUT 1 LSB	Read Only	Resistance measurement result expressed in Ω
30104	103	0x67	RESISTIVE INPUT 1 MSB	Read Only	
30105	104	0x68	RESISTIVE INPUT 2 LSB	Read Only	
30106	105	0x69	RESISTIVE INPUT 2 MSB	Read Only	
30107	106	0x6A	RESISTIVE INPUT 3 LSB	Read Only	
30108	107	0x6B	RESISTIVE INPUT 3 MSB	Read Only	
30109	108	0x6C	RESISTIVE INPUT 4 LSB	Read Only	
30110	109	0x6D	RESISTIVE INPUT 4 MSB	Read Only	
30111	110	0x6E	RESISTIVE INPUT 5 LSB	Read Only	
30112	111	0x6F	RESISTIVE INPUT 5 MSB	Read Only	
30113	112	0x70	RESISTIVE INPUT 6 LSB	Read Only	
30114	113	0x71	RESISTIVE INPUT 6 MSB	Read Only	
30115	114	0x72	RESISTIVE INPUT 7 LSB	Read Only	
30116	115	0x73	RESISTIVE INPUT 7 MSB	Read Only	
30117	116	0x74	RESISTIVE INPUT 8 LSB	Read Only	
30118	117	0x75	RESISTIVE INPUT 8 MSB	Read Only	
40121	120	0x78	VALUE OF ANALOG OUTPUT 1	Read & Write	The voltage at the Analog Outputs given
40122	121	0x79	VALUE OF ANALOG	Read &	

<table>
<tr><th>Modbus Addr</th><th>Dec Addr</th><th>Hex Addr</th><th>Register name</th><th>Access</th><th>Description</th></tr>
<tr><td></td><td></td><td></td><td>OUTPUT 2</td><td>Write</td><td rowspan="5">in the mV range from 0 to 10000mV</td></tr>
<tr><td>40123</td><td>122</td><td>0x7A</td><td>VALUE OF ANALOG OUTPUT 3</td><td>Read & Write</td></tr>
<tr><td>40124</td><td>123</td><td>0x7B</td><td>VALUE OF ANALOG OUTPUT 4</td><td>Read & Write</td></tr>
<tr><td>40125</td><td>124</td><td>0x7C</td><td>VALUE OF ANALOG OUTPUT 5</td><td>Read & Write</td></tr>
<tr><td>40126</td><td>125</td><td>0x7D</td><td>VALUE OF ANALOG OUTPUT 6</td><td>Read & Write</td></tr>
<tr><td>30125</td><td>124</td><td>0x7C</td><td>HAND STATUS VALUE 1</td><td>Read Only</td><td rowspan="4">The current value of Analog Output in the hand mode for MINI with AO</td></tr>
<tr><td>30126</td><td>125</td><td>0x7D</td><td>HAND STATUS VALUE 2</td><td>Read Only</td></tr>
<tr><td>30127</td><td>126</td><td>0x7E</td><td>HAND STATUS VALUE 3</td><td>Read Only</td></tr>
<tr><td>30128</td><td>127</td><td>0x7F</td><td>HAND STATUS VALUE 4</td><td>Read Only</td></tr>
<tr><td>30130</td><td>129</td><td>0x81</td><td>HARDWARE_VERSION</td><td>Read Only</td><td>The current hardware version of a device</td></tr>
<tr><td>30131</td><td>130</td><td>0x82</td><td>MAC_ADDRESS (32 – bits)</td><td>Read Only</td><td>The MAC address of a device</td></tr>
<tr><td>40136</td><td>135</td><td>0x87</td><td>BAUD RATE</td><td>Read & Write Memory</td><td>Transmission speed is defined by the user calculated using the formula:
$Baudrate = (registervalue) \cdot 10$
The value is considered only when sections 1, 2 and 3 of S3 switch is in the OFF position
The default value is 7680 (76800 bps)</td></tr>
<tr><td>40137</td><td>136</td><td>0x88</td><td>STOP BITS</td><td>Read & Write Memory</td><td>Supported values are 1 and 2
The default value 1</td></tr>
<tr><td>40138</td><td>137</td><td>0x89</td><td>DATA BITS</td><td>Read & Write Memory</td><td>Supported values are 7 and 8
The default value 8</td></tr>
<tr><td>40139</td><td>138</td><td>0x8A</td><td>PARITY BIT</td><td>Read & Write Memory</td><td>Parity bit (40139) The default value is 0 (no parity)
Allowed values:
<table>
<tr><th>Value</th><th>Description</th></tr>
<tr><td>0 (default)</td><td>none</td></tr>
<tr><td>1</td><td>Odd</td></tr>
<tr><td>2</td><td>Even</td></tr>
<tr><td>3</td><td>Always 1</td></tr>
<tr><td>4</td><td>Always 0</td></tr>
</table></td></tr>
<tr><td>40140</td><td>139</td><td>0x8B</td><td>RESPONSE DELAY</td><td>Read & Write</td><td>Delay in ms before sending response
The default value is 0.</td></tr>
</table>

<table>
<tr><th>Modbus Addr</th><th>Dec Addr</th><th>Hex Addr</th><th>Register name</th><th>Access</th><th>Description</th></tr>
<tr><td></td><td></td><td></td><td></td><td>Memory</td><td></td></tr>
<tr><td>40141</td><td>140</td><td>0x8C</td><td>WATCHDOG TIME</td><td>Read & Write Memory</td><td>Time in second before watchdog reset in case no transmission.
A value of 0 disables Watchdog.
The default value is 0s</td></tr>
<tr><td>40143</td><td>142</td><td>0x8E</td><td>DEFAULT STATE OF DIGITAL OUTPUTS</td><td>Read & Write Memory</td><td>State of Digital Outputs assigned at the start of the module and watchdog reset.
The default value is 0.</td></tr>
<tr><td>40144</td><td>143</td><td>0x8F</td><td>DEFAULT STATE OF ANALOG OUTPUTS (DIGITAL)</td><td>Read & Write Memory</td><td>State of Analog Outputs assigned at the start of the module and watchdog reset.
The default value is 0.</td></tr>
<tr><td>40145</td><td>144</td><td>0x90</td><td>DEFAULT STATE OF ANALOG OUTPUT 1</td><td>Read & Write Memory</td><td rowspan="7">In the registers is stored value that appears at the Analog Output after power on or watchdog reset.
The default value is 0.</td></tr>
<tr><td>40146</td><td>145</td><td>0x91</td><td>DEFAULT STATE OF ANALOG OUTPUT 2</td><td>Read & Write Memory</td></tr>
<tr><td>40147</td><td>146</td><td>0x92</td><td>DEFAULT STATE OF ANALOG OUTPUT 3</td><td>Read & Write Memory</td></tr>
<tr><td>40148</td><td>147</td><td>0x93</td><td>DEFAULT STATE OF ANALOG OUTPUT 4</td><td>Read & Write Memory</td></tr>
<tr><td>40149</td><td>148</td><td>0x94</td><td>DEFAULT STATE OF ANALOG OUTPUT 5</td><td>Read & Write Memory</td></tr>
<tr><td>40150</td><td>149</td><td>0x95</td><td>DEFAULT STATE OF ANALOG OUTPUT 6</td><td>Read & Write Memory</td></tr>
<tr><td>40151</td><td>150</td><td>0x96</td><td>UNIVERSAL INPUT CONFIGURATION 1</td><td>Read & Write Memory</td><td rowspan="5">Configuration of Universal Input and type of temperature sensor.
The default value is 1.<table><tr><th>Value</th><th>Description / Sensor</th></tr><tr><td>0</td><td>Resistance measurement off</td></tr><tr><td>1</td><td>10K3A1 NTC</td></tr><tr><td>2</td><td>10K4A1 NTC</td></tr><tr><td>3</td><td>10K NTC Carel</td></tr></table></td></tr>
<tr><td>40152</td><td>151</td><td>0x97</td><td>UNIVERSAL INPUT CONFIGURATION 2</td><td>Read & Write Memory</td></tr>
<tr><td>40153</td><td>152</td><td>0x98</td><td>UNIVERSAL INPUT CONFIGURATION 3</td><td>Read & Write Memory</td></tr>
<tr><td>40154</td><td>153</td><td>0x99</td><td>UNIVERSAL INPUT CONFIGURATION 4</td><td>Read & Write Memory</td></tr>
<tr><td>40155</td><td>154</td><td>0x9A</td><td>UNIVERSAL INPUT</td><td>Read &</td></tr>
</table>

<table>
<tr><th>Modbus Addr</th><th>Dec Addr</th><th>Hex Addr</th><th>Register name</th><th>Access</th><th>Description</th></tr>
<tr><td></td><td></td><td></td><td>CONFIGURATION 5</td><td>Write Memory</td><td rowspan="4"><table><tr><td>4</td><td>20K6A1 NTC</td></tr><tr><td>5</td><td>2,2K3A1 NTC B=3975K</td></tr><tr><td>6</td><td>3K3A1 NTC</td></tr><tr><td>7</td><td>30K6A1 NTC</td></tr><tr><td>8</td><td>SIE1</td></tr><tr><td>9</td><td>TAC1</td></tr><tr><td>10</td><td>SAT1</td></tr><tr><td>16</td><td>Pt1000</td></tr><tr><td>17</td><td>Ni1000</td></tr><tr><td>+128</td><td>Voltage measurement off</td></tr></table></td></tr>
<tr><td>40156</td><td>155</td><td>0x9B</td><td>UNIVERSAL INPUT CONFIGURATION 6</td><td>Read & Write Memory</td></tr>
<tr><td>40157</td><td>156</td><td>0x9C</td><td>UNIVERSAL INPUT CONFIGURATION 7</td><td>Read & Write Memory</td></tr>
<tr><td>40158</td><td>157</td><td>0x9D</td><td>UNIVERSAL INPUT CONFIGURATION 8</td><td>Read & Write Memory</td></tr>
<tr><td>40159</td><td>158</td><td>0x9E</td><td>FILTER TIME CONSTANT OF THE UNIVERSAL INPUT 1</td><td>Read & Write Memory</td><td rowspan="8">Filter time constant, expressed in seconds in the range from 0 to 60 seconds.
A value of 0 disables the filter.
The default value is 2s.</td></tr>
<tr><td>40160</td><td>159</td><td>0x9F</td><td>FILTER TIME CONSTANT OF THE UNIVERSAL INPUT 2</td><td>Read & Write Memory</td></tr>
<tr><td>40161</td><td>160</td><td>0xA0</td><td>FILTER TIME CONSTANT OF THE UNIVERSAL INPUT 3</td><td>Read & Write Memory</td></tr>
<tr><td>40162</td><td>161</td><td>0xA1</td><td>FILTER TIME CONSTANT OF THE UNIVERSAL INPUT 4</td><td>Read & Write Memory</td></tr>
<tr><td>40163</td><td>162</td><td>0xA2</td><td>FILTER TIME CONSTANT OF THE UNIVERSAL INPUT 5</td><td>Read & Write Memory</td></tr>
<tr><td>40164</td><td>163</td><td>0xA3</td><td>FILTER TIME CONSTANT OF THE UNIVERSAL INPUT 6</td><td>Read & Write Memory</td></tr>
<tr><td>40165</td><td>164</td><td>0xA4</td><td>FILTER TIME CONSTANT OF THE UNIVERSAL INPUT 7</td><td>Read & Write Memory</td></tr>
<tr><td>40166</td><td>165</td><td>0xA5</td><td>FILTER TIME CONSTANT OF THE UNIVERSAL INPUT 8</td><td>Read & Write Memory</td></tr>
<tr><td>40167</td><td>166</td><td>0xA6</td><td>RESOLUTION OF THE UNIVERSAL INPUTS</td><td>Read & Write Memory</td><td>Resolution of Analog Inputs. When bit is set measurement at corresponding input is done with 16-bit resolution.
By default, all measurements are done</td></tr>
</table>

<table>
<tr><th>Modbus Addr</th><th>Dec Addr</th><th>Hex Addr</th><th>Register name</th><th>Access</th><th>Description</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td>with 12-bit resolution.</td></tr>
<tr><td>40168</td><td>167</td><td>0xA7</td><td>ANALOG OUTPUT CONFIGURATION 1</td><td>Read & Write Memory</td><td rowspan="6">Configuring the mode of Analog Output according to the following table:
<table><tr><th>Value</th><th>Description</th></tr><tr><td>0 (default)</td><td>Voltage output 0-10V</td></tr><tr><td>1</td><td>PWM 1Hz</td></tr><tr><td>2</td><td>PWM 10Hz</td></tr><tr><td>3</td><td>PWM 100Hz</td></tr><tr><td>4</td><td>PWM 0.1Hz</td></tr><tr><td>5</td><td>PWM 0.01Hz</td></tr></table></td></tr>
<tr><td>40169</td><td>168</td><td>0xA8</td><td>ANALOG OUTPUT CONFIGURATION 2</td><td>Read & Write Memory</td></tr>
<tr><td>40170</td><td>169</td><td>0xA9</td><td>ANALOG OUTPUT CONFIGURATION 3</td><td>Read & Write Memory</td></tr>
<tr><td>40171</td><td>170</td><td>0xAA</td><td>ANALOG OUTPUT CONFIGURATION 4</td><td>Read & Write Memory</td></tr>
<tr><td>40172</td><td>171</td><td>0xAB</td><td>ANALOG OUTPUT CONFIGURATION 5</td><td>Read & Write Memory</td></tr>
<tr><td>40173</td><td>172</td><td>0xAC</td><td>ANALOG OUTPUT CONFIGURATION 6</td><td>Read & Write Memory</td></tr>
<tr><td>40176</td><td>175</td><td>0xAF</td><td>DIGITAL INPUT 1 CONFIGURATIO MODE</td><td>Read & Write Memory</td><td rowspan="9">DIGITAL INPUT CONFIGURATIO MODE table:
<table><tr><th>Value</th><th>Description</th></tr><tr><td>0</td><td>Ordinary IO</td></tr><tr><td>1</td><td>Monostable Relay</td></tr><tr><td>2</td><td>Bistable Relay</td></tr><tr><td>3</td><td>Time Relay</td></tr></table>
DIGITAL INPUT TIME VALUE in [ms] or in [s] – depends on mode selection

SETPOINT in °C multiplied by 10
Default value = 0</td></tr>
<tr><td>40177</td><td>176</td><td>0xB0</td><td>DIGITAL INPUT 1 TIME VALUE</td><td>Read & Write Memory</td></tr>
<tr><td>40178</td><td>177</td><td>0xB1</td><td>DIGITAL INPUT 1 SETPOINT</td><td>Read & Write Memory</td></tr>
<tr><td>40179</td><td>178</td><td>0xB2</td><td>DIGITAL INPUT 1 DIFFERENTIAL</td><td>Read & Write Memory</td></tr>
<tr><td>40180</td><td>179</td><td>0xB3</td><td>DIGITAL INPUT 2 CONFIGURATIO MODE</td><td>Read & Write Memory</td></tr>
<tr><td>40181</td><td>180</td><td>0xB4</td><td>DIGITAL INPUT 2 TIME VALUE</td><td>Read & Write Memory</td></tr>
<tr><td>40182</td><td>181</td><td>0xB5</td><td>DIGITAL INPUT 2 SETPOINT</td><td>Read & Write Memory</td></tr>
<tr><td>40183</td><td>182</td><td>0xB6</td><td>DIGITAL INPUT 2 DIFFERENTIAL</td><td>Read & Write Memory</td></tr>
</table>

Modbus Addr	Dec Addr	Hex Addr	Register name	Access	Description
40184	183	0xB7	DIGITAL INPUT 3 CONFIGURATIO MODE	Read & Write Memory	DIFFERENTIAL in °C multiplied by 10 Default value = 0
40185	184	0XB8	DIGITAL INPUT 3 TIME VALUE	Read & Write Memory	
40186	185	0xB9	DIGITAL INPUT 3 SETPOINT	Read & Write Memory	
40187	186	0xBA	DIGITAL INPUT 3 DIFFERENTIAL	Read & Write Memory	
40188	187	0xBB	DIGITAL INPUT 4 CONFIGURATIO MODE	Read & Write Memory	
40189	188	0xBC	DIGITAL INPUT 4 TIME VALUE	Read & Write Memory	
40190	189	0xBD	DIGITAL INPUT 4 SETPOINT	Read & Write Memory	
40191	190	0xBE	DIGITAL INPUT 4 DIFFERENTIAL	Read & Write Memory	

7 List of supported temperature sensors

No	1	No	2
Sensor	*10K3A1*	Sensor	*10K4A1*
β coeffictient	*3975K*	β coeffictient	*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 coeffictient	*3435K*	β coeffictient	*4262K*
°C	Ω	Manufacturers	*Honeywell*
		°C	Ω
-45	247700	-40	806800
-40	188500	-35	574400
-35	144100	-30	413400
-30	111300	-25	300400
-25	86430	-20	220600
-20	67770	-15	163480
-15	53410	-10	122260
-10	42470	-5	92220
-5	33900	0	70140
0	27280	5	53780
5	22050	10	41540
10	17960	15	32340
15	14690	20	25340
20	12090	25	20000
25	10000	30	15886
30	8313	35	12698
35	6940	40	10212
40	5827	45	8260
45	4912	50	6718
50	4161	55	5494
55	3536	60	4518
60	3020	65	3732
65	2588	70	3098
70	2228	75	2586
75	1924	80	2166
80	1668	85	1823
85	1451	90	1541
90	1266	95	1308
95	1108	100	1114
100	973	105	953
105	857	110	818

No	3	No	4
110	758	115	704
115	672	120	609
120	597	125	528
125	531		

No	5	No	6
Sensor	*2.2K3A1*	Sensor	*3K3A1*
β coeffictient	*3975K*	β coeffictient	*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 coeffictient	*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

No	16	No	16
260	1977,1	110	1687,9
270	2013,1	120	1759,8
280	2049,0	130	1833,4
290	2084,8	140	1909,0
300	2120,5	150	1986,6