4 Channel Analog Converters with ModBus Interface
XCIO4 Series

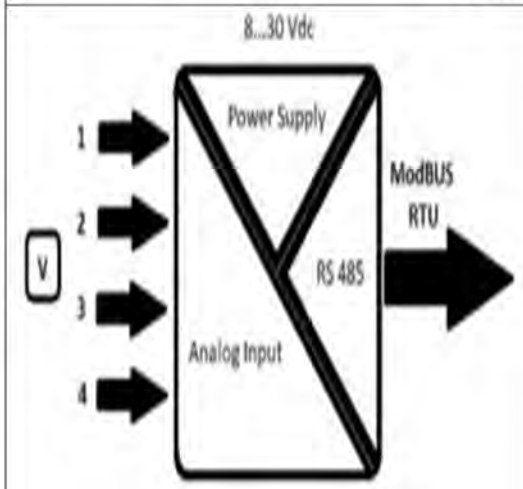
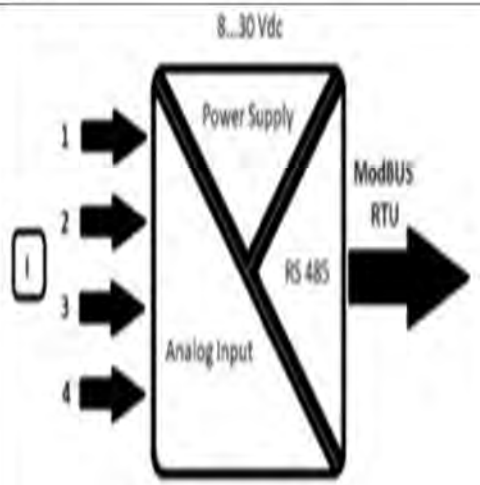
The XCIO4 devices are analog converters, fully programmable through a PC application and with ModBus communication interface. There are four different models:

- XCIO4VMB voltage converter
- XCIO4IMB current converter
- XCIO4RMB thermo resistance and potentiometer converter
- XCIO4TMB thermocouple converter

Each device has up to four independent channels, it is remotely configurable through the ModBus interface and in alternative with a uUSB port with no need for additional power supply. The devices are fully programmable by means of CaburLab software application or directly accessing the ModBus registers by means of a PLC. The on-board microprocessor manages all the peripherals and the data transfers. High level precision is guaranteed by the 16 bit A/D to make the device suitable for process control, remote control and building automation applications.

4 Channel Analog Converters with ModBus Interface
ASICIO4 Series

Technical Data:

Notes		Schematics	
(1)	The device is powered by the USB port when connected through USB. In this case no communication over ModBus is enabled. When both USB and ModBus are connected the ModBus interface has higher priority		
(2)	Green led = the device is ON; Red Led = alarm; Yellow led 1 = ModBus TX activity; Yellow led 2 = ModBus RX activity		
	Part Number:	XCIO4VMB	XCIO4IMB
	Type:	CIO4VMB	CIO4IMB
	INPUT DATA		
	Input Signal	±10 Vdc	±20 mA
	Input Resistance	1MΩ	56Ω
	Input Power	≤ 1W @ 24 Vdc	
	Number of Inputs	4	
	MODBUS PARAMETERS		
	Communication	Through ModBus RTU over RS485 Through uUSB for settings	

4 Channel Analog Converters with ModBus Interface
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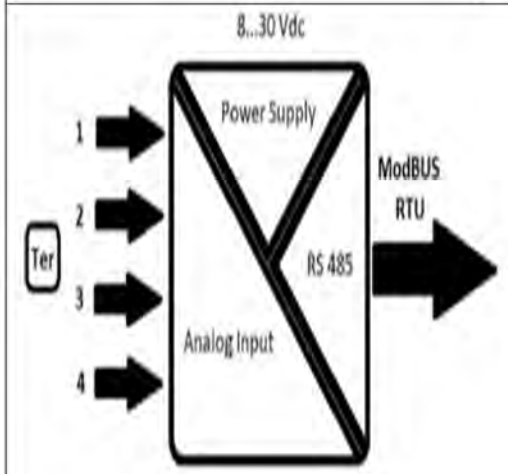
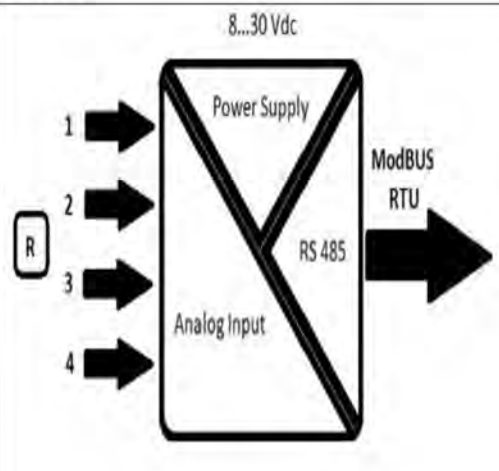
	Settings	Through CaburLab SW application
	Linearity Error	±0,1%
	Calibration Error	±0,05%
	Thermal Deviation	±0,005%/°C
	Baud Rate	1200÷230400 bps (configurable
	Parity	None, Odd, Even, Mark, Space
	Resolution	13 Bits
	GENERAL TECHNICAL DATA	
	Supply Voltage	8…30 Vdc (protected against polarity inversion)
	Operating Temperature	-20...+70°C
	Storage Temperature	-40...+85°C
	Humidity	0…90%
	Isolation	1500Vrms 1 minute (IN/OUT/Power)
	Sampling Rate	100 ms
	Signaling	Green LED IN / Red LED ALARM / Yellow LED TX / Yellow LED RX / Green LED x 4 (2)
	Protection Degree	IP20
	Standards	EN 61000-2, EN 61000-4
	Pollution Degree	2
	Overvoltage Category	II
	Connection Terminal Type	Pluggable 2.5 mm^2 screw connectors
	Enclosure Material	UL94V-0 plastic material
	Approximate Weight	100g
	Dimensions W x D x H	17.5x79x101mm
	Installation Information	Vertical on DIN rail, spacing 5mm from adjacent components

4 Channel Analog Converters with ModBus Interface
ASICIO4 Series

Technical Data:

Notes		Schematics	
(1)	The device is powered by the USB port when connected through USB. In this case no communication over ModBus is enabled. When both USB and ModBus are connected the ModBus interface has higher priority		
(2)	Green led = the device is ON; Red Led = alarm; Yellow led 1 = ModBus TX activity; Yellow led 2 = ModBus RX activity		
	Part Number:	XCIO4TMB	XCIO4RMB
	Type:	CIO4TMB	CIO4RMB
	INPUT DATA		
	Input Signal	Thermocouple J, K, S, R, B, E, T,	Thermo resistance (PT100_385, PT500_385, PT1000_385, PT1000_392, NI120, NIFE604,CU100,CU120), potentiometers 0÷2kΩ
	Temperature range	From -270 to +1820°C depending on TC	From -200 a +850°C depending on TR
	Input Resistance	1MΩ	1MΩ
	Input Power	≤ 1W @ 24 Vdc	
	Number of Inputs	4	

4 Channel Analog Converters with ModBus Interface
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MODBUS PARAMETERS	
Communication	Through ModBus RTU over RS485. (1) Through uUSB for settings.
Settings	Through CaburLab SW application
Linearity Error	±0.1%
Calibration Error	±0.05%
Thermal Deviation	±0.005%/°C
Baud Rate	1200÷230400 bps (configurable
Parity	None, Odd, Even, Mark, Space
Resolution	13 Bits
GENERAL TECHNICAL DATA	
Supply Voltage	8…30 Vdc (protected against polarity inversion)
Operating Temperature	-20...+70°C
Storage Temperature	-40...+85°C
Humidity	0…90%
Isolation	1500Vrms 1 minute (IN/OUT/Power)
Sampling Rate	100 ms
Signaling	Green LED IN / Red LED ALARM / Yellow LED TX / Yellow LED RX / Green LED x 4 (2)
Protection Degree	IP20
Standards	EN 61000-2, EN 61000-4
Pollution Degree	2
Overvoltage Category	II
Connection Terminal Type	Pluggable 2.5 mm^2 screw connectors
Enclosure Material	UL94V-0 plastic material
Approximate Weight	100g

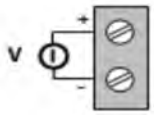
	Dimensions W x D x H	17.5x79x101mm
	Installation Information	Vertical on DIN rail, spacing 5mm from adjacent components

CONNECTION INSTRUCTIONS:

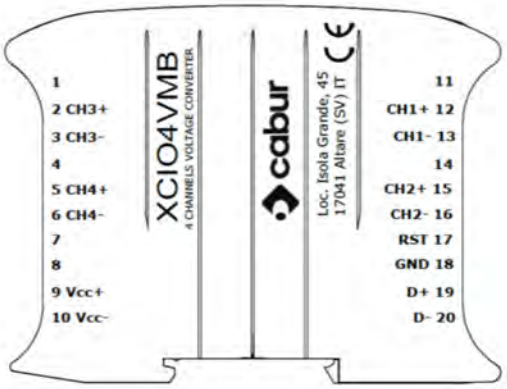
Inputs		Description
1	Nc	Not Connected
2	Ch3+	CH3 + INPUT
3	Ch3-	CH3 - INPUT
4	Nc	Not Connected
5	Ch4+	CH4 + INPUT
6	Ch4-	CH4 - INPUT
7	Nc	Not Connected
8	Nc	Not Connected
9	Vcc+	POWER SUPPLY (8...30VDC) +
10	Vcc-	POWER SUPPLY (8...30VDC) -
11	Nc	Not Connected
12	Ch1+	CH1 + INPUT
13	Ch1-	CH1 - INPUT
14	Nc	Not Connected
15	Ch2+	CH2 + INPUT
16	Ch2-	CH2 - INPUT
17	RST	RESET (CONNECT TO GND)
18	GND	GROUND
19	D+	+ MODBUS RS485
20	D-	- MODBUS RS485

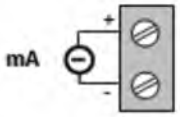
4 Channel Analog Converters with ModBus Interface
ASICIO4 Series

Your Source for Automation Components

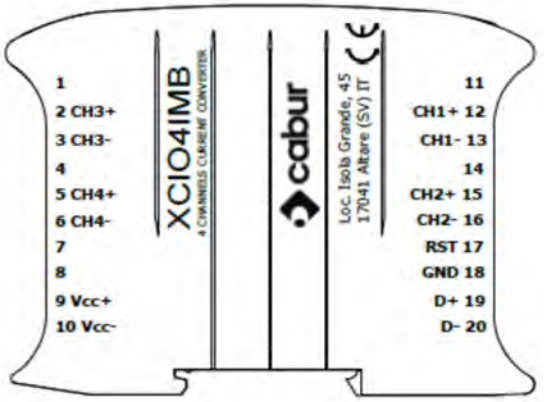


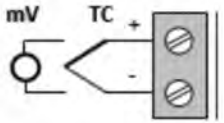
Voltage Sensor Connection XCIO4VMB



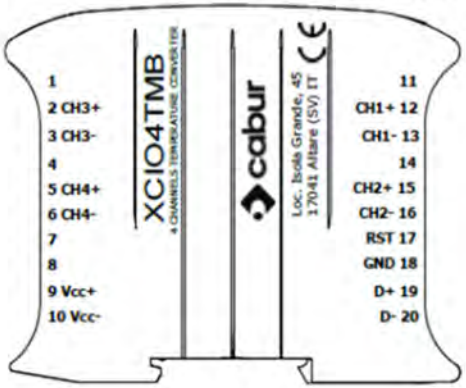


Current Sensor Connection XCIO4IMB



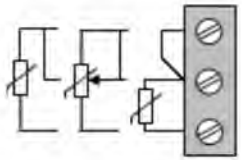


Potentiometer or Thermocouple Connection XCIO4TMB



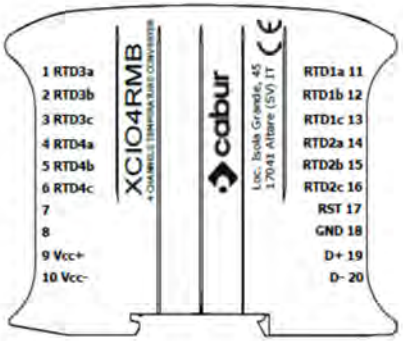
XCIO4RMB Module

Inputs		Description
1	RTD3a	SENSOR ACTIVATION INPUT CH3
2	RTD3b	SENSOR READING INPUT CH3
3	RTD3c	GROUND CH3
4	RTD4a	SENSOR ACTIVATION INPUT CH4
5	RTD4b	SENSOR READING INPUT CH4
6	RTD4c	GROUND CH4
7	Nc	Not Connected
8	Nc	Not Connected
9	Vcc+	POWER SUPPLY (8...30VDC) +
10	Vcc-	POWER SUPPLY (8...30VDC) -
11	RTD1a	SENSOR ACTIVATION INPUT CH1
12	RTD1b	SENSOR READING INPUT CH1
13	RTD1c	GROUND CH1
14	RTD2a	SENSOR ACTIVATION INPUT CH2
15	RTD2b	SENSOR READING INPUT CH2
16	RTD2c	GROUND CH2
17	RST	RESET (CONNECT TO GND)
18	GND	GROUND
19	D+	+ MODBUS RS485
20	D-	- MODBUS RS485

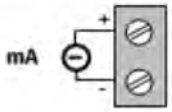


RTDxa
RTDxb

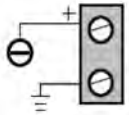
Connecting Thermo-resistance and 2 or 3 wire Resistive Sensors XCIO4RMB



ACTIVE AND PASSIVE SENSORS
The XCIO4IMB device supports both active and passive sensors



Active Sensor Connection



Passive Sensor Connection

OPEN CIRCUIT LOGIC: The XCIO4RMB model is capable to send an alarm in case one of the wires of the sensor is interrupted. To disable such alarm it is sufficient to connect a termination impedance on the channel.
When the channel is open the reading on the channel will be as follows: 2KΩ = 3200Ω; 500Ω = 500Ω; PT100/PT1000 = 916°C

LED SIGNALLING

LED GREEN	ON	the device is powered
	OFF	the device is not powered
LED RED	ON	out of range device
	OFF	in range device
LED YELLOW 1	ON	rx packet
	OFF	no rx packet
LED Yellow2	ON	response packet ok
	OFF	no response packet

MODBUS-RTU MAP REGISTERS

Baud Rate Table

Baud Rate	Base Code (decimal)
1200	1
2400	2
4800	3
9600	4
14400	5
19200	6
38400	7
57600	8
115200	9
230400	10

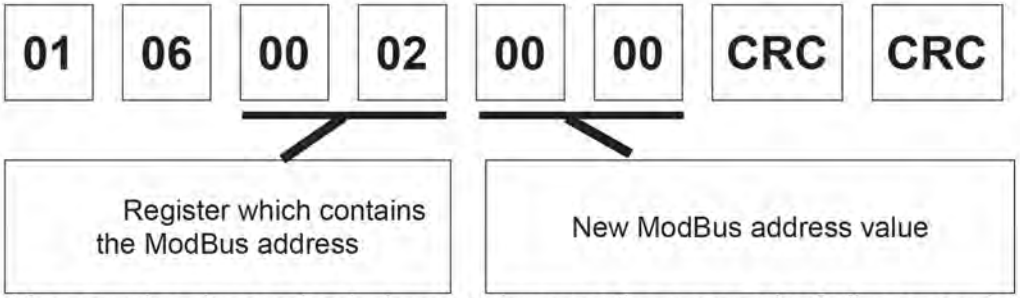
Parity	To be added to the Base Code
No	+0
Odd	+16
Even	+32
Mark	+48
Space	+64
-	-
-	-
-	-
-	-
-	-

Input Type Table

Input Type (XCIOTMB)	Input Type (XCIORMB)	Code (decimal)
TCB	PT100	0
TCE	PT500	1
TCJ	PT1000	2
TCK	NI100	3
TCN	NI120	4
TCR	CU100	5
TCS	CU120	6
TCT	NIFE604	7
mV	2KOhm	8
- - - -	5000Ohm	9

With the 06 function only one parameter can be written.

Ex: change the Modbus address from 01 to 02



After a setting change the device must be reset (by means of a Coil command on the reg 01).

REGISTER MAP

XCIO4VMB				
FUNC	**TYPE**	**IND.**	**RANGE**	**DESCRIPTION**
03	HoldingRegister	1	(v. Baud Rate Table)	RS485 baud rate (see v. Baud Rate Table)
03	HoldingRegister	2		Modbus address
03	SignedHoldingRegister	4	-10000 mV / +10000 mV	Lower limit threshold input channel 1
03	SignedHoldingRegister	5		Upper limit threshold input channel 1
03	SignedHoldingRegister	6	-10000 mV / +10000 mV	Lower limit threshold input channel 2
03	SignedHoldingRegister	7		Upper limit threshold input channel 2
03	SignedHoldingRegister	8	-10000 mV / +10000 mV	Lower limit threshold input channel 3
03	SignedHoldingRegister	9		Upper limit threshold input channel 3
03	SignedHoldingRegister	10	-10000 mV / +10000 mV	Lower limit threshold input channel 4
03	SignedHoldingRegister	11		Upper limit threshold input channel 4
03	HoldingRegister	14		Time constant IIR filter
04	InputRegister	1		HW/FW version
04	InputRegister	3		Status
04	InputRegister	4		BER Accumulator
04	SignedInputRegister	7		Analog Input 1
04	SignedInputRegister	8		Analog Input 2
04	SignedInputRegister	9		Analog Input 3
04	SignedInputRegister	10		Analog Input 4
04	SignedInputRegister	11		Analog Input 1 (synchronized)
04	SignedInputRegister	12		Analog Input 2 (synchronized)
04	SignedInputRegister	13		Analog Input 3 (synchronized)
04	SignedInputRegister	14		Analog Input 4 (synchronized)
04	FloatingInputRegister	17		Analog Input 1
04	FloatingInputRegister	19		Analog Input 2
04	FloatingInputRegister	21		Analog Input 3
04	FloatingInputRegister	23		Analog Input 4
04	FloatingInputRegister	25		Analog Input 1 (synchronized)
04	FloatingInputRegister	27		Analog Input 2 (synchronized)
04	FloatingInputRegister	29		Analog Input 3 (synchronized)
04	FloatingInputRegister	31		Analog Input 4 (synchronized)
03	SignedHoldingRegister	101		Analog Input 1
03	SignedHoldingRegister	102		Analog Input 2

03	SignedHoldingRegister	103		Analog Input 3
03	SignedHoldingRegister	104		Analog Input 4
03	FloatingHoldingRegister	107		Analog Input 1
03	FloatingHoldingRegister	109		Analog Input 2
03	FloatingHoldingRegister	111		Analog Input 3
03	FloatingHoldingRegister	113		Analog Input 4
05	Coil	1		Reset
05	Coil	2		BER counter reset (BiteErrorRate)
05	Coil	3		Read synchronization (on the 0 broadcast address)
05	Coil	4		Threshold enable
02	DiscreteInput	1		INIT Line state

XCIO4IMB				
FUNC	**TYPE**	**IND.**	**RANGE**	**DESCRIPTION**
03	HoldingRegister	1	(v. Baud Rate Table)	RS485 baud rate (see v. Baud Rate Table)
03	HoldingRegister	2		Modbus address
03	SignedHoldingRegister	4	-20000 mV / +20000 mV	Lower limit threshold input channel 1
03	SignedHoldingRegister	5		Upper limit threshold input channel 1
03	SignedHoldingRegister	6	-20000 mV / +20000 mV	Lower limit threshold input channel 2
03	SignedHoldingRegister	7		Upper limit threshold input channel 2
03	SignedHoldingRegister	8	-20000 mV / +20000 mV	Lower limit threshold input channel 3
03	SignedHoldingRegister	9		Upper limit threshold input channel 3
03	SignedHoldingRegister	10	-20000 mV / +20000 mV	Lower limit threshold input channel 4
03	SignedHoldingRegister	11		Upper limit threshold input channel 4
03	HoldingRegister	12		Input type (see table)
03	HoldingRegister	14		Time constant IIR filter
04	InputRegister	1		HW/FW version
04	InputRegister	3		Status
04	InputRegister	4		BER Accumulator
04	SignedInputRegister	7		Analog Input 1
04	SignedInputRegister	8		Analog Input 2
04	SignedInputRegister	9		Analog Input 3
04	SignedInputRegister	10		Analog Input 4

04	SignedInputRegister	11		Analog Input 1 (synchronized)
04	SignedInputRegister	12		Analog Input 2 (synchronized)
04	SignedInputRegister	13		Analog Input 3 (synchronized)
04	SignedInputRegister	14		Analog Input 4 (synchronized)
04	FloatingInputRegister	17		Analog Input 1
04	FloatingInputRegister	19		Analog Input 2
04	FloatingInputRegister	21		Analog Input 3
04	FloatingInputRegister	23		Analog Input 4
04	FloatingInputRegister	25		Analog Input 1 (synchronized)
04	FloatingInputRegister	27		Analog Input 2 (synchronized)
04	FloatingInputRegister	29		Analog Input 3 (synchronized)
04	FloatingInputRegister	31		Analog Input 4 (synchronized)
03	SignedHoldingRegister	101		Analog Input 1
03	SignedHoldingRegister	102		Analog Input 2
03	SignedHoldingRegister	103		Analog Input 3
03	SignedHoldingRegister	104		Analog Input 4
03	FloatingHoldingRegister	107		Analog Input 1
03	FloatingHoldingRegister	109		Analog Input 2
03	FloatingHoldingRegister	111		Analog Input 3
03	FloatingHoldingRegister	113		Analog Input 4
05	Coil	1		Reset
05	Coil	2		BER counter reset (BiteErrorRate)
05	Coil	3		Read synchronization (on the 0 broadcast address)
05	Coil	4		Threshold enable
02	DiscreteInput	1		INIT Line state

XCIO4TMB/ XCIO4RMB				
FUNC	**TYPE**	**IND.**	**RANGE**	**DESCRIPTION**
03	HoldingRegister	1	(v. Baud Rate Table)	RS485 baud rate (see v. Baud Rate Table)
03	HoldingRegister	2		Modbus address
03	SignedHoldingRegister	4	-32000 mV / +32000 mV	Lower limit threshold input channel 1
03	SignedHoldingRegister	5		Upper limit threshold input channel 1
03	SignedHoldingRegister	6	-32000 mV / +32000 mV	Lower limit threshold input channel 2

03	SignedHoldingRegister	7		Upper limit threshold input channel 2
03	SignedHoldingRegister	8	-32000 mV / +32000 mV	Lower limit threshold input channel 3
03	SignedHoldingRegister	9		Upper limit threshold input channel 3
03	SignedHoldingRegister	10	-32000 mV / +32000 mV	Lower limit threshold input channel 4
03	SignedHoldingRegister	11		Upper limit threshold input channel 4
03	HoldingRegister	12		Input type (see table)
03	HoldingRegister	14		Time constant IIR filter
04	InputRegister	1		HW/FW version
04	SignedInputRegister	2		Board temperature (Only for XCIO4TMB)
04	InputRegister	3		Status
04	InputRegister	4		BER Accumulator
04	SignedInputRegister	7		Analog Input 1
04	SignedInputRegister	8		Analog Input 2
04	SignedInputRegister	9		Analog Input 3
04	SignedInputRegister	10		Analog Input 4
04	SignedInputRegister	11		Analog Input 1 (synchronized)
04	SignedInputRegister	12		Analog Input 2 (synchronized)
04	SignedInputRegister	13		Analog Input 3 (synchronized)
04	SignedInputRegister	14		Analog Input 4 (synchronized)
04	SignedInputRegister	15		Board temperature (Only for XCIO4TMB)
04	FloatingInputRegister	17		Analog Input 1
04	FloatingInputRegister	19		Analog Input 2
04	FloatingInputRegister	21		Analog Input 3
04	FloatingInputRegister	23		Analog Input 4
04	FloatingInputRegister	25		Analog Input 1 (synchronized)
04	FloatingInputRegister	27		Analog Input 2 (synchronized)
04	FloatingInputRegister	29		Analog Input 3 (synchronized)
04	FloatingInputRegister	31		Analog Input 4 (synchronized)
04	FloatingInputRegister	33		Cold junction compensation equivalent voltage
03	SignedHoldingRegister	100		Board temperature (Only for XCIO4TMB)
03	SignedHoldingRegister	101		Analog Input 1
03	SignedHoldingRegister	102		Analog Input 2
03	SignedHoldingRegister	103		Analog Input 3
03	SignedHoldingRegister	104		Analog Input 4

03	FloatingHoldingRegister	107		Analog Input 1
03	FloatingHoldingRegister	109		Analog Input 2
03	FloatingHoldingRegister	111		Analog Input 3
03	FloatingHoldingRegister	113		Analog Input 4
05	Coil	1		Reset
05	Coil	2		BER counter reset (BiteErrorRate)
05	Coil	3		Read synchronization (on the 0 broadcast address)
05	Coil	4		Threshold enable
05	Coil	5		Cold junction compensation enable
02	DiscreteInput	1		INIT Line state

SCALE FUND:

When the value to read is out of range or no sensor is connected, the registers from 7 to 10 and the registers from 17 to 23 excluding even numbers contain the following out of range values:

Sensor	Out of range value (7 to 10 registers)	Out of range value (17 to 23 registers)
RTD (PT100, PT500, PT1000, NI100, NI120, CU100, CU120, NIFE604)	9160°C	916°C
2KOhm	32000 Ohm	3200 Ohm
500Ohm	5000 Ohm	500 Ohm