USER MANUAL

Z-8NTC

8 CHANNELS NTC TEMPERATURE SENSOR CONVERTER
WITH USB / RS485 PORT AND MODBUS RTU PROTOCOL

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ORIGINAL INSTRUCTIONS

Introduction

Contents of the present documentation refer to products and technologies described in it.
All technical data contained in the document may be modified without prior notice.
Content of this documentation is subject to periodical revision.
To use the product safely and effectively, read carefully the following instructions before use.
The product must be used only for the use for which it was designed and built: any other use must be considered with full responsibility of the user.
The installation, programming and set-up is allowed only to authorized operators, physically and intellectually suitable.
Set up shall be performed only after a correct installation and the user shall perform every operation described in the installation manual carefully.
Seneca is not considered liable for failure, breakdown, accident caused because of ignorance or failure to apply the indicated requirements.
Seneca is not considered liable for any unauthorized changes.
Seneca reserves the right to modify the device, for any commercial or construction requirements, without the obligation to promptly update the reference manuals.
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Use the concepts, examples and other content at your own risk.
There may be errors and inaccuracies in this document that may of course be damaging to your system.
Proceed with caution, and although this is highly unlikely, the author(s) do not take any responsibility for that.
Technical features subject to change without notice.

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Document revisions

DATE	REVISION	NOTES	AUTHOR
17/10/2017	1.0.0.0	First revision	MM
19/10/2017	1.0.1.0	Enhanced register 40071 explanation	MM
20/10/2017	1.0.2.0	Fixed Modbus Table integer registers	MM
27/02/2018	1.0.2.1	Added Ranges accuracy info Changed Z-8NTC image	MM

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1. DEVICE DESCRIPTION AND INTENDED USE

WARNING!

This User Manual extend the information from the installation manual about the device configuration. Use the installation manual for more info.

WARNING!

Under any circumstances, SENECA s.r.l. or its suppliers shall not be responsible for loss of recording data/incomes or for consequential or incidental damage due to neglect or reckless mishandling of the device, even though SENECA is well aware of these possible damages.
SENECA, its subsidiaries, affiliates, companies of the group, its suppliers and retailers shall not guarantee that the functions will satisfy completely customer's expectations or that device, the firmware and the software shall have no errors or work continuously.

1.1. Description

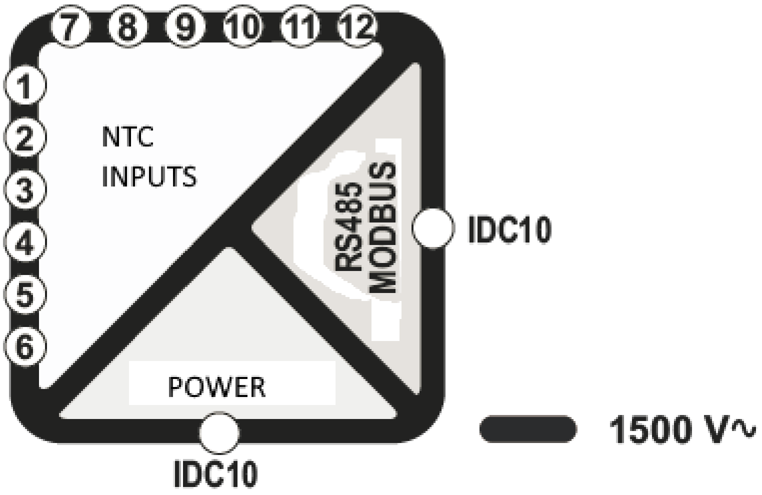
The Z-8NTC is an 8 channels NTC temperature converter with Modbus RTU protocol.
For the communication can be used the USB or the RS485 port.

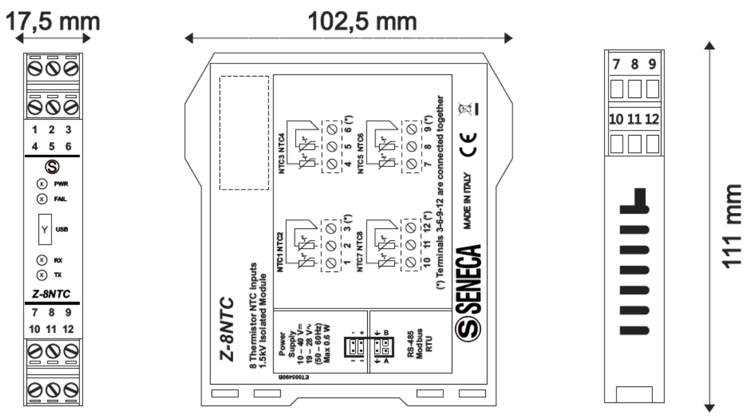
The device can measure up to 8 NTC (each channel can be individually configured).
The powerful Easy Setup software can be used for obtain the NTC parameters in a simple way.

1.2. Features

- 16-bit A/D conversion on three adjustable scales 100 Ω – 10 kΩ, 1 kΩ –100 kΩ, 5 kΩ – 500 kΩ.
- 0.5% accuracy on resistance value.
- Measurement available in the following types: Resistance (Ω) or Temperature (°C, °F, K) on Integer 32-bit and Floating point 32-bit, direct or swapped.
- Conversion From temperature to resistance with Steinhart-Hart high equation for high accuracy
- Each channel can be individually enabled and configured.
- Programmable filter for reading stabilization.
- Conversion time: 500 ms for all channels
- Linearization through configuration software for sensors: NTC, COSTER, KTY with Beta or Measure Points
- Easy power supply and serial bus wiring by means of the Seneca Z-BUS housed in the DIN rail.
- Removable screw terminals for section Max. 2.5 mm cable.
- DIP switches configurable or software configurable communication parameters.
- RS485 Serial communication with MODBUS-RTU protocol.
- Frontal USB Port for MODBUS-RTU configuration and communication.

1.3. Technical specifications

GENERAL SPECIFICATIONS	
Power supply	10 – 40 Vdc 19 – 28 Vac 50 – 60 Hz
Absorption max	Max. 0,6 W
Insulation	
NTC Inputs	Generic NTC with user-definable curve
Number of channels	8
Measurement range	1k resistance, Range from 100Ω to 10kΩ. 10k resistance, Range from 1kΩ to 100kΩ. 50k resistance, Range from 5kΩ to 500kΩ.
Resolution	16 bit, min. 0.02 % of the range at the scale limits
Accuracy	0.5 %
Stability	100 ppm max
Acquisition Speed	500 ms

BOX	
Dimensions	17,5 x 102,5 x 111 mm 
Box, protection degree	Material PA6, Black color.

RS485 COMMUNICATION PORTS	
Number	1
Protocol	Modbus RTU Slave
Baudrate	From 1200 to 115200 configurable
Parity ,Data bit, Stop Bit	Configurable from software

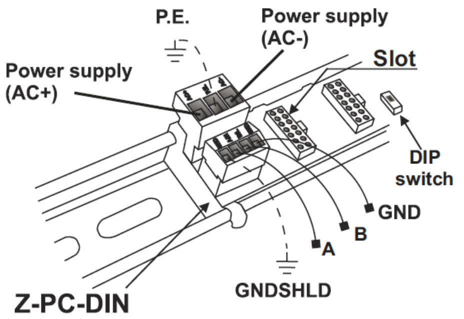
USB COMMUNICATION PORTS	
Number	1
Protocol	Modbus RTU Slave
Communication parameters	Fixed at 38400, 8 bit, No parity, 1 stop bit

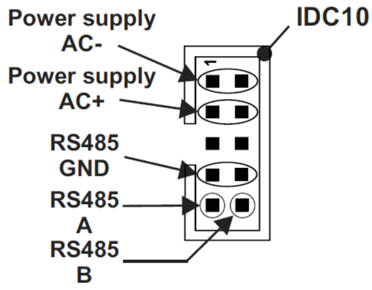
ENVIRONMENTAL CONDITIONS	
Temperature	-20°C ÷ +70°C
Humidity	30 ÷ 90% at 40°C non condensing
Storage temperature	-20°C ÷ +85°C

REFERENCE STANDARDS	
EN 61000-6-4/ 2007	Emission, industrial environmental
EN 61000-6-2/ 2005	Immunity, industrial environmental
EN 61010-1/ 2001	Safety

2. ELECTRICAL CONNECTIONS

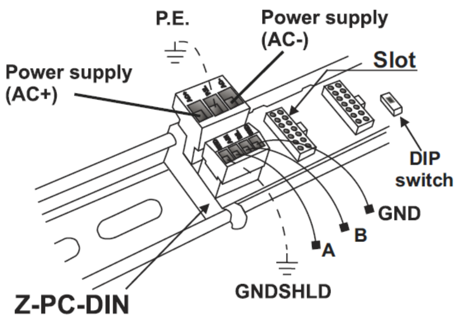
POWER SUPPLY

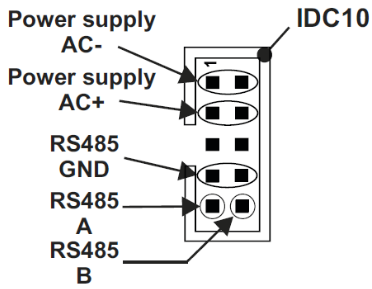




Connect the IDC10 rear connector to provide power supply to module.
The supply voltage must be between:
10 and 40Vdc (any polarity), or between 19 and 28 Vac.
The upper limits mus not be exceeded as this can seriously damage the module. If the power supply source is not protected against overload, a safety fuse of max. 2.5 A must be installed in the power supply line near the device.

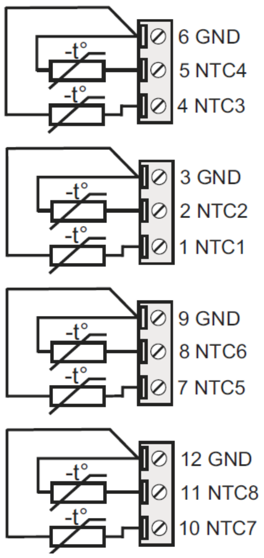
RS485 PORT





Connection for RS485 communication with the Modbus RTU master system through the Z-PC-DINAL2-17.5 accessory.
Note: the indication of the RS485 connection polarity is not standardized and in some Modbus RTU masters may be inverted

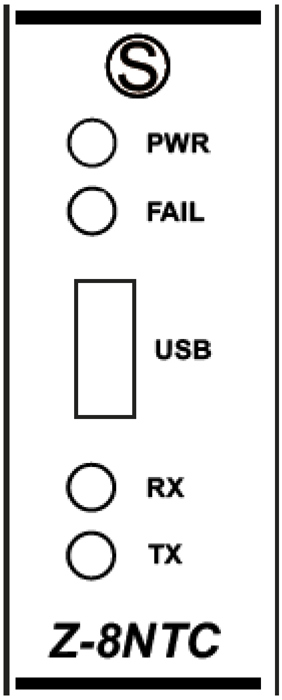
NTC INPUTS



The device allows:
resistors measurement within a range from 100 Ω to 500 kΩ or thermistors measurement within a range from 1 kΩ to 50 kΩ.
3, 6, 9 and12 terminals are internally connected to the same ground within the device.
If you want to measure resistors or thermistors with resistance < 1 kΩ then the conductors resistance introduces an important measurement error.
If the length of the cable does not exceed 100 m. you can reduce this error by using wires with a section greater than 1 mm².
You can also compensate this error using the configuration software.
The resistors and thermistors must be individually connected with two wires better if using shielded cable with a twisted pair for each channel.

3. FRONT SIDE PANEL LEDS

In the front-side panel there are 4 LEDs and their state refers to important operating conditions of the module.



LED NAME	*LED STATUS*	*MEANING*
PWR	ON	The device is powered
FAIL	ON	At least one channel is out of range
RX	Blinking	Data Receive from RS485 or USB
RX	ON	RS485 A or B inverted or connection error
TX	Blinking	Data Sending to RS485
TX	ON	RS485 / Device Failure

4. DIP SWITCH CONFIGURATION

The Device can be fully configured with the Seneca free configuration tools:

- Easy Setup
- Z-NET4

The modbus RTU configuration on the RS485 port can be configured also by dip switch.

WARNING!

Dip switches configuration are active only after a reboot!

WARNING!

The Dip Switch setting will overwrite the Flash setting so, if you need to use the flash configuration you MUST set ALL dip switches to "OFF".

WARNING!

The USB Baud Rate and Modbus Station Address are fixed to:
Baud Rate 38400, Modbus Station Address 1, 8 bit Data, 1 stop bit

The dip switch configuration can modify only the Modbus RTU communication parameters.

4.1. Loading Modbus RTU configuration from flash

If ALL Dip Switch 1…8 are OFF, the device use the Flash configuration (you must use the Easy Setup Software or Z-NET4 for configure)

Load Modbus RTU Configuration FROM FLASH	***DIP1***	***DIP2***	***DIP3***	***DIP4***	***DIP5***	***DIP6***	***DIP7***	***DIP8***
	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

4.2. Setting the RS485 Port Modbus RTU Station Address

Dip Switch 3..8 are using for configure the Modbus RTU Station Address:

Modbus RTU Address	*DIP3*	*DIP4*	*DIP5*	*DIP6*	*DIP7*	*DIP8*
1	OFF	OFF	OFF	OFF	OFF	ON
2	OFF	OFF	OFF	OFF	ON	OFF
3	OFF	OFF	OFF	OFF	ON	ON
4	OFF	OFF	OFF	ON	OFF	OFF
5	OFF	OFF	OFF	ON	OFF	ON
6	OFF	OFF	OFF	ON	ON	OFF
7	OFF	OFF	OFF	ON	ON	ON
8	OFF	OFF	ON	OFF	OFF	OFF
9	OFF	OFF	ON	OFF	OFF	ON
10	OFF	OFF	ON	OFF	ON	OFF
11	OFF	OFF	ON	OFF	ON	ON
….						
64	ON	ON	ON	ON	ON	ON

4.3. Setting the RS485 Baud rate

Dip Switch 1 and 2 are used for setting the Baud Rate

Baud Rate	*DIP1*	*DIP2*
9600	OFF	OFF
19200	OFF	ON
38400	ON	OFF
57600	ON	ON

⚠WARNING!

The Parity and the stop bit cannot be configured with the dip switches configuration but only from the Easy Setup software.
By setting the dip switches the parity is always set to “None” and the stop bit is set to 1.

4.4. Insert the RS485 Terminator

The Dip 10 can insert a RS485 Terminator if you encounter communication problems in the bus.
The terminator is inserted directly from A to B: in series a R = 120 Ohm with a C= 100 nF.

5. FRONT USB CONNECTION

The USB front connection allow a simple connection to a PC or an Android™ device with the USB OTG capability.
The communication protocol is Modbus RTU slave, the communication parameters for the USB port are fixed at:

Baud Rate: 38400
Modbus RTU Station Address: 1
Data Bit: 8
Stop Bit: 1

5.1. Virtual COM USB Drivers

The Virtual Com driver is installed with the Easy Setup software.
You can download the Easy Setup software from:

https://www.seneca.it/en/linee-di-prodotto/software/easy/easy-setup

6. MODBUS RTU PROTOCOL

The Modbus protocol supported by the Z-8NTC is:

- Modbus RTU Slave

For more information about these protocols, please refer to the Modbus specification website:

http://www.modbus.org/specs.php.

6.1. Modbus RTU function code supported

The following Modbus RTU functions are supported:

- Read Holding Register (function 3) Max 28 Registers
- Write Single Register (function 6)
- Write Multiple registers (function 16) Max 28 Registers

WARNING!

All 32 bits values are stored into 2 consecutive registers

WARNING!

You can Read a Maximum of 28 Modbus Registers with the Read Holding Register function (function 3)

WARNING!

You can Write a Maximum of 28 Modbus Registers with the Write Multiple Register function (function 16)

WARNING!

The registers with the RW* (stored in flash memory) can be written a maximum of 10000 times
It will be care of the PLC/Master Modbus programmer not to exceed this limit!

7. MODBUS REGISTERS TABLE

In the following table this abbreviations are used:

MS = Most significant
LS = Less significant
MSW = Most significant Word (16 bits)
LSW = Less significant Word (16 bits)
R = Read only register
RW = Read and writeable register
RW* = Read and writeable register, stored in flash memory (writeable max 10000 times)
Unsigned 16 bits = Integer Unsigned 16 bits register (from 0 to 65535)
Signed 16 bits = Integer 16 bits register with sign (from -32768 to +32767)
Float 32 bits = Floating point single precision 32 bits (IEEE 754) register
0x = Hexadecimal Value

REGISTER NAME	COMMENT	REGISTER TYPE	R/W	MODBUS ADDRESS	REGISTER OFFSET
Machine ID	Module ID code	Unsigned 16 bits	R	40001	0
Firmware Revision	Firmware Revision Code	Unsigned 16 bits	R	40002	1
Command	This register is used for sending commands to the device. The following commands are supported: 49568 Reset the Module After the command is executed the register will return to 0 value	Unsigned 16 bits	R/W	40007	6
Channel 1 Coefficient "A"	Coefficient A for the Steinhart-Hart equation	Floating Point 32 bits	R/W*	40015 (MSW) 40016 (LSW)	14-15

Channel 1 Coefficient "B"	Coefficient B for the Steinhart-Hart equation	Floating Point 32 bits	R/W*	40017 (MSW) 40018 (LSW)	16-17
Channel 1 Coefficient "C"	Coefficient C for the Steinhart-Hart equation	Floating Point 32 bits	R/W*	40019 (MSW) 40020 (LSW)	18-19
Channel 2 Coefficient "A"	Coefficient A for the Steinhart-Hart equation	Floating Point 32 bits	R/W*	40021 (MSW) 40022 (LSW)	20-21
Channel 2 Coefficient "B"	Coefficient B for the Steinhart-Hart equation	Floating Point 32 bits	R/W*	40023 (MSW) 40024 (LSW)	22-23
Channel 2 Coefficient "C"	Coefficient C for the Steinhart-Hart equation	Floating Point 32 bits	R/W*	40025 (MSW) 40026 (LSW)	24-25
Channel 3 Coefficient "A"	Coefficient A for the Steinhart-Hart equation	Floating Point 32 bits	R/W*	40027 (MSW) 40028 (LSW)	26-27
Channel 3 Coefficient "B"	Coefficient B for the Steinhart-Hart equation	Floating Point 32 bits	R/W*	40029 (MSW) 40030 (LSW)	28-29
Channel 3 Coefficient "C"	Coefficient C for the Steinhart-Hart equation	Floating Point 32 bits	R/W*	40031 (MSW) 40032 (LSW)	30-31
Channel 4 Coefficient "A"	Coefficient A for the Steinhart-Hart equation	Floating Point 32 bits	R/W*	40033 (MSW) 40034 (LSW)	32-33
Channel 4 Coefficient "B"	Coefficient B for the Steinhart-Hart equation	Floating Point 32 bits	R/W*	40035 (MSW) 40036 (LSW)	34-35
Channel 4 Coefficient "C"	Coefficient C for the Steinhart-Hart equation	Floating Point 32 bits	R/W*	40037 (MSW) 40038 (LSW)	36-37
Channel 5 Coefficient "A"	Coefficient A for the Steinhart-Hart equation	Floating Point 32 bits	R/W*	40039 (MSW) 40040 (LSW)	38-39
Channel 5 Coefficient "B"	Coefficient B for the Steinhart-Hart equation	Floating Point 32 bits	R/W*	40041 (MSW) 40042 (LSW)	40-41
Channel 5 Coefficient "C"	Coefficient C for the Steinhart-Hart equation	Floating Point 32 bits	R/W*	40043 (MSW) 40044 (LSW)	42-43
Channel 6 Coefficient "A"	Coefficient A for the Steinhart-Hart equation	Floating Point 32 bits	R/W*	40045 (MSW) 40046 (LSW)	44-45
Channel 6 Coefficient "B"	Coefficient B for the Steinhart-Hart equation	Floating Point 32 bits	R/W*	40047 (MSW) 40048 (LSW)	46-47

Channel 6 Coefficient “C”	Coefficient C for the Steinhart-Hart equation	Floating Point 32 bits	R/W*	40049 (MSW) 40050 (LSW)	48-49
Channel 7 Coefficient “A”	Coefficient A for the Steinhart-Hart equation	Floating Point 32 bits	R/W*	40051 (MSW) 40052 (LSW)	50-51
Channel 7 Coefficient “B”	Coefficient B for the Steinhart-Hart equation	Floating Point 32 bits	R/W*	40053 (MSW) 40054 (LSW)	52-53
Channel 7 Coefficient “C”	Coefficient C for the Steinhart-Hart equation	Floating Point 32 bits	R/W*	40055 (MSW) 40056 (LSW)	54-55
Channel 8 Coefficient “A”	Coefficient A for the Steinhart-Hart equation	Floating Point 32 bits	R/W*	40057 (MSW) 40058 (LSW)	56-57
Channel 8 Coefficient “B”	Coefficient B for the Steinhart-Hart equation	Floating Point 32 bits	R/W*	40059 (MSW) 40060 (LSW)	58-59
Channel 8 Coefficient “C”	Coefficient C for the Steinhart-Hart equation	Floating Point 32 bits	R/W*	40061 (MSW) 40062 (LSW)	60-61
Channel 1 Range Configuration	Channel Range Configuration 0 = 5 KOhm – 500 KOhm (*) 1 = 1KOhm - 100 KOhm (*) 2 = 100 Ohm – 10 KOhm (*) 3 = Channel disabled (*)= Note that out of these ranges, the 0,5% accuracy is not guaranteed	Unsigned 16 bits	R/W*	40063	62
Channel 2 Range Configuration	Channel Range Configuration 0 = 5 KOhm – 500 KOhm (*) 1 = 1KOhm - 100 KOhm (*) 2 = 100 Ohm – 10 KOhm (*) 3 = Channel disabled (*)= Note that out of these ranges, the 0,5% accuracy is not guaranteed	Unsigned 16 bits	R/W*	40064	63
Channel 3 Range Configuration	Channel Range Configuration 0 = 5 KOhm – 500 KOhm (*)	Unsigned 16 bits	R/W*	40065	64

	1 = 1KOhm - 100 KOhm (*) 2 = 100 Ohm – 10 KOhm (*) 3 = Channel disabled (*)= Note that out of these ranges, the 0,5% accuracy is not guaranteed				
Channel 4 Range Configuration	Channel Range Configuration 0 = 5 KOhm – 500 KOhm (*) 1 = 1KOhm - 100 KOhm (*) 2 = 100 Ohm – 10 KOhm (*) 3 = Channel disabled (*)= Note that out of these ranges, the 0,5% accuracy is not guaranteed	Unsigned 16 bits	R/W*	40066	65
Channel 5 Range Configuration	Channel Range Configuration 0 = 5 KOhm – 500 KOhm (*) 1 = 1KOhm - 100 KOhm (*) 2 = 100 Ohm – 10 KOhm (*) 3 = Channel disabled (*)= Note that out of these ranges, the 0,5% accuracy is not guaranteed	Unsigned 16 bits	R/W*	40067	66
Channel 6 Range Configuration	Channel Range Configuration 0 = 5 KOhm – 500 KOhm (*) 1 = 1KOhm - 100 KOhm (*) 2 = 100 Ohm – 10 KOhm (*) 3 = Channel disabled (*)= Note that out of these ranges, the 0,5% accuracy is not guaranteed	Unsigned 16 bits	R/W*	40068	67
Channel 7 Range Configuration	Channel Range Configuration 0 = 5 KOhm – 500 KOhm (*) 1 = 1KOhm - 100 KOhm (*) 2 = 100 Ohm – 10 KOhm (*)	Unsigned 16 bits	R/W*	40069	68

	3 = Channel disabled (*)= Note that out of these ranges, the 0,5% accuracy is not guaranteed				
Channel 8 Range Configuration	Channel Range Configuration 0 = 5 KOhm – 500 KOhm (*) 1 = 1KOhm - 100 KOhm (*) 2 = 100 Ohm – 10 KOhm (*) 3 = Channel disabled (*)= Note that out of these ranges, the 0,5% accuracy is not guaranteed	Unsigned 16 bits	R/W*	40070	69
General Configuration	Bit 0 = Not used Bit 1 = 0 Floating Point Registers from 40075 to 40090 In Big Endian (MSW FIRST) Bit 1 = 1 Floating Point Registers from 40075 to 40090 In Little Endian (LSW FIRST) Bit 2 = 0 AND Bit 3 = 0 Measure Type Resistence (Ohm) Bit 2 = 1 AND Bit 3 = 0 Measure Type Temperature (Kelvin) Bit 2 = 0 AND Bit 3 = 1 Measure Type Temperature (Celsius) Bit 2 = 1 AND Bit 3 = 1 Measure Type Temperature (Fahreneit) Bit 4 = 0 AND Bit 5 = 0 Filter disabled Bit 4 = 1 AND Bit 5 = 0 Filter Low enabled Bit 4 = 0 AND Bit 5 = 1 Filter Middle enabled Bit 4 = 1 AND Bit 5 = 1	Unsigned 16 bits	R/W*	40071	70

	Filter High enabled Bit 5 = Not Used Bit 6 = 0 RS485 Parity bit Disabled Bit 6 = 1 RS485 Parity bit Enabled Bit 7 = 0 RS485 Parity Bit Odd (if enabled) Bit 7 = 1 RS485 Parity Bit Even (if enabled) Bit 8 = 0 RS485 1 Stop Bit Bit 8 = 1 RS485 2 Stop Bits (only if parity disabled) Bit 9 = 0 Dinamic Filter disabled Bit 9 = 1 Dinamic Filter enabled, the filter is sensible to the input derived				
RS485 Baud Rate configuration	0 = 4800 baud 1 = 9600 baud 2 = 19200 baud 3 = 38400 baud 4 = 57600 baud 5 = 115200 baud 6 = 1200 baud 7 = 2400 baud	Unsigned 16 bits	R/W*	40072	71
Modbus RTU RS485 station Address	Modbus RTU Station address	Unsigned 16 bits	R/W*	40073	72
CHANNEL 1 FLOATING POINT MEASURE	Measure channel in Floating Point in Ohm, K, °C or °F	Floating Point 32 bits	R	40075 (MSW) 40076 (LSW) If selected Big Endian Float	74-75
CHANNEL 2 FLOATING POINT MEASURE	Measure channel in Floating Point in Ohm, K, °C or °F	Floating Point 32 bits	R	40077 (MSW) 40078 (LSW) If selected Big Endian Float	76-77
CHANNEL 3 FLOATING POINT MEASURE	Measure channel in Floating Point in Ohm, K, °C or °F	Floating Point 32 bits	R	40079 (MSW) 40080 (LSW) If selected Big Endian Float	78-79

CHANNEL 4 FLOATING POINT MEASURE	Measure channel in Floating Point in Ohm, K, °C or °F	Floating Point 32 bits	R	40081 (MSW) 40082 (LSW) If selected Big Endian Float	80-81
CHANNEL 5 FLOATING POINT MEASURE	Measure channel in Floating Point in Ohm, K, °C or °F	Floating Point 32 bits	R	40083 (MSW) 40084 (LSW) If selected Big Endian Float	82-83
CHANNEL 6 FLOATING POINT MEASURE	Measure channel in Floating Point in Ohm, K, °C or °F	Floating Point 32 bits	R	40085 (MSW) 40086 (LSW) If selected Big Endian Float	84-85
CHANNEL 7 FLOATING POINT MEASURE	Measure channel in Floating Point in Ohm, K, °C or °F	Floating Point 32 bits	R	40087 (MSW) 40088 (LSW) If selected Big Endian Float	86-87
CHANNEL 8 FLOATING POINT MEASURE	Measure channel in Floating Point in Ohm, K, °C or °F	Floating Point 32 bits	R	40089 (MSW) 40090 (LSW) If selected Big Endian Float	88-89
MEASURE LIMITS ERRORS	When at least one Bit is High the yellow FAIL led will be switched ON Bit 0 = 1 Channel 1 below the lower ADC limit Bit 1 = 1 Channel 2 below the lower ADC limit Bit 2 = 1 Channel 3 below the lower ADC limit Bit 3 = 1 Channel 4 below the lower ADC limit Bit 4 = 1 Channel 5 below the lower ADC limit Bit 5 = 1 Channel 6 below the lower ADC limit Bit 6 = 1 Channel 7 below the lower ADC limit Bit 7 = 1 Channel 8 below the lower ADC limit Bit 8 = 1 Channel 1 exceeds the high ADC level Bit 9 = 1 Channel 2 exceeds the high ADC level	Unsigned 16 bits	R	40091	90

	Bit 10 = 1 Channel 3 exceeds the high ADC level Bit 11 = 1 Channel 4 exceeds the high ADC level Bit 12 = 1 Channel 5 exceeds the high ADC level Bit 13 = 1 Channel 6 exceeds the high ADC level Bit 14 = 1 Channel 7 exceeds the high ADC level Bit 15 = 1 Channel 8 exceeds the high ADC level				
CHANNEL 1 INTEGER MEASURE	Measure channel in Integer format Ohm*10, K*10, °C*10 or °F*10 For example: 250 means 25.0°C	Signed 32 bits	R	40092 (MSW) 40093 (LSW)	91-92
CHANNEL 2 INTEGER MEASURE	Measure channel in Integer format Ohm*10, K*10, °C*10 or °F*10 For example: 250 means 25.0°C	Signed 32 bits	R	40094 (MSW) 40095 (LSW)	93-94
CHANNEL 3 INTEGER MEASURE	Measure channel in Integer format Ohm*10, K*10, °C*10 or °F*10 For example: 250 means 25.0°C	Signed 32 bits	R	40096 (MSW) 40097 (LSW)	95-96
CHANNEL 4 INTEGER MEASURE	Measure channel in Integer format Ohm*10, K*10, °C*10 or °F*10 For example: 250 means 25.0°C	Signed 32 bits	R	40098 (MSW) 40099 (LSW)	97-98
CHANNEL 5 INTEGER MEASURE	Measure channel in Integer format	Signed 32 bits	R	40100 (MSW) 40101 (LSW)	99-100

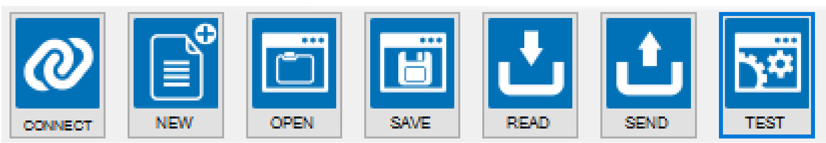
	Ohm*10, K*10, °C*10 or °F*10 For example: 250 means 25.0°C				
CHANNEL 6 INTEGER MEASURE	Measure channel in Integer format Ohm*10, K*10, °C*10 or °F*10 For example: 250 means 25.0°C	Signed 32 bits	R	40102 (MSW) 40103 (LSW)	101-102
CHANNEL 7 INTEGER MEASURE	Measure channel in Integer format Ohm*10, K*10, °C*10 or °F*10 For example: 250 means 25.0°C	Signed 32 bits	R	40104 (MSW) 40105 (LSW)	103-104
CHANNEL 8 INTEGER MEASURE	Measure channel in Integer format Ohm*10, K*10, °C*10 or °F*10 For example: 250 means 25.0°C	Signed 32 bits	R	40106 (MSW) 40107 (LSW)	105-106

8. FULL CONFIGURATION WITH EASY SETUP

For configure all the device parameters you can use the USB or the RS485 Port and the Easy Z-8NTC Software included in the Easy Setup Suite.
You can download the Easy Setup software for free from:

https://www.seneca.it/en/linee-di-prodotto/software/easy/easy-setup

8.1. Easy Setup Menu



Connect: Use the connect icon for connect the PC to the Device. Note that you need to specify if the connection is made from the RS485 bus or from the front USB. For configure the device from the RS485 bus you need a converter like Seneca S117P1 or S107USB for connect the device to a PC.
New: Load the default parameters in the actual project
Open: Open a stored project
Save: Save the actual project
Read: Read the actual configuration from the device
Send: Send the project configuration (if the dip switches from 1 to 8 are not ALL OFF the device use the dip switch configuration and NOT the sent configuration for the Modbus parameters)
Test: Start a Registers read and start/stop a Datalogger

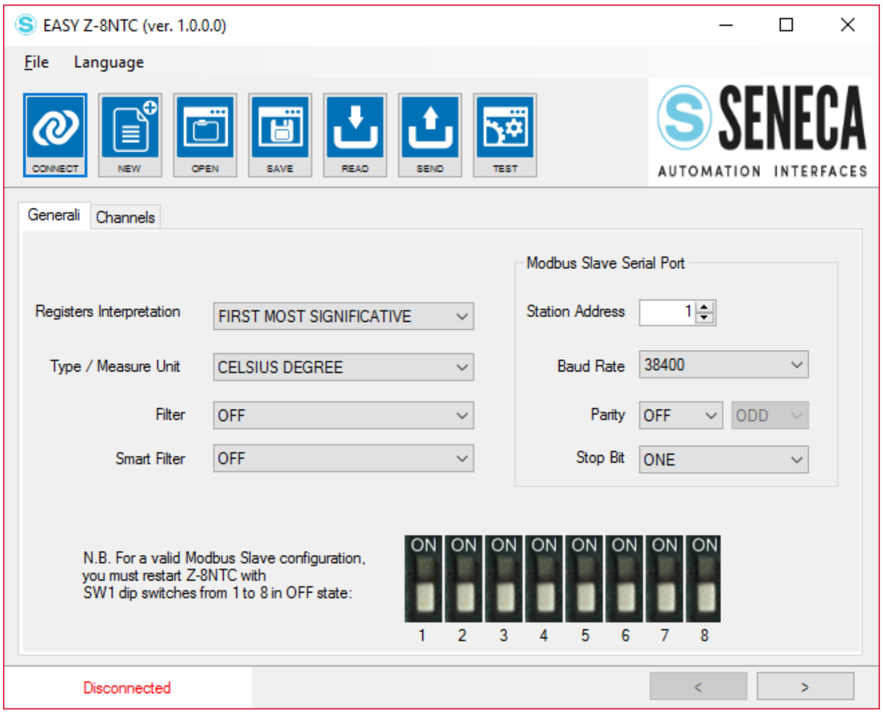
8.2. Creating a Project Configuration

⚠WARNING!

You must set all dip switches to OFF after sending the configuration to the device or the actual Modbus configuration will be overwritten from the dip switches configuration!

The parameters that can be configured are:

General TAB



Registers Interpretation: Select from Most Significative First (Big Endian) or Less Significative First (Little Endian) for the Floating Point Measure Modbus Registers. This parameter affect only the Floating Point measure registers.

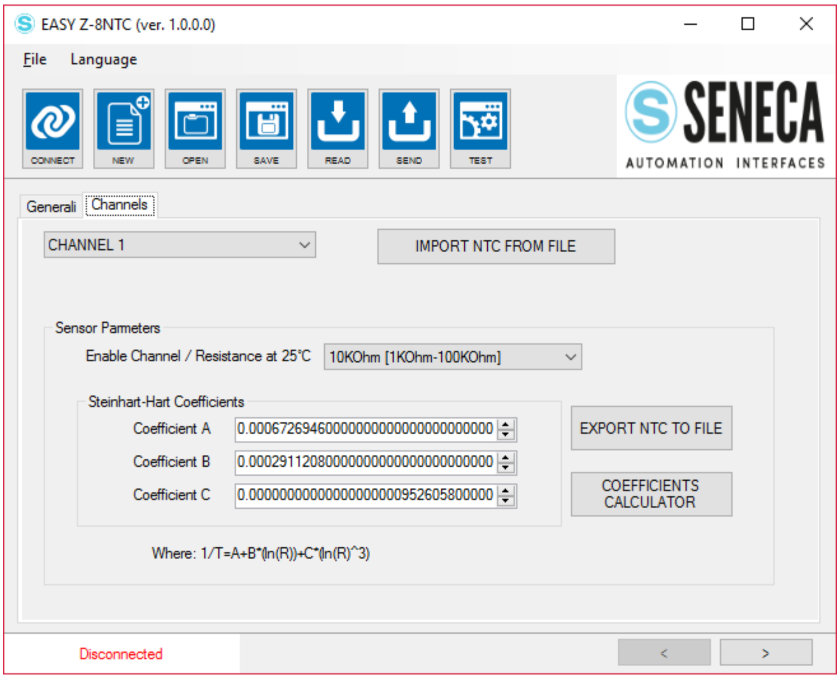
Type / Measure Unit: Select which type of measure the device must make from Temperature or Resistance, if Temperature you can select the measure unit from K, °C or °F. This parameter affect all the measure registers (floating point and integer).

Filter: Select the filter type from Disabled, Low, Middle or High

Smart Filter: If the filer is selected the smart filter is sensible to the input derivative

Station Address: Select The Modbus RTU station address for the RS485 port
Baud Rate: Select the Baud rate from 1200 to 115200 baud for the RS485 port
Parity: Select NONE, ODD or EVEN for the RS485 port
Stop Bit: Select the number of stop bits for the RS485 port

Channels TAB



In the channels tab you can select the NTC parameters for each channel.

Enable Channel / Resistance at 25°C: Select the resistance measure range from the NTC value at 25°C, note that out of these ranges, the 0,5% accuracy is not guaranteed

Steinhart-Hart Coefficients: Select the A, B and C coefficients for the NTC curve:

$$\frac{1}{T} = A + B * \ln(R) + C * (\ln(R))^3$$

where:

T = Temperature in K

R = Resistance in Ohm

When a NTC is characterized it's possible to save/import the parameters in a file with the "Export NTC to file" or "Import NTC from file".
The most used NTC are available from the "Import NTC from file".
The first revision of the software include parameters for the following NTC/Sensors:

CAREL Beta=3435K - 10KOhm at 25°C
CAREL Beta=3977K - 50KOhm at 25°C
COSTER SAB 010
COSTER SAB 010V-G-L-LI-LG
COSTER SAB 020
COSTER SAI010
COSTER SCB110-V-G-L-LI-LG
ELIWELL SN8DAC13002AV
GENERIC with Beta=3435K 10KOhm at 25°C
KTY81 110
KTY81 120
KTY84 130
KTY84 150
SEMITECH 102AT-2 1KOhm at 25°C
SEMITECH 103AT-2 10KOhm at 25°C
SEMITECH 202AT-2 2KOhm at 25°C
SEMITECH 502AT-2 5KOhm at 25°C

the number of NTC/sensor files is growing steadily.

The "Coefficient Calculator" button can be used for obtain the Steinhart-Hart coefficients for a custom NTC/Sensor. For more info about the coefficient calculator see the Chapter 9.

8.3. Testing the Device

When the configuration is sent to the device you can test the actual configuration by using the TEST icon.

The test configuration will acquire the measure from the Modbus registers.

8.3.1. The datalogger

The datalogger can be used for acquire data that can be used with an external software (for example Microsoft Excel ™). It is possible to set how much time to acquire the samples (minimum 1 second).
The datalogger will create a file in a standard .csv format that can be open with external tools.

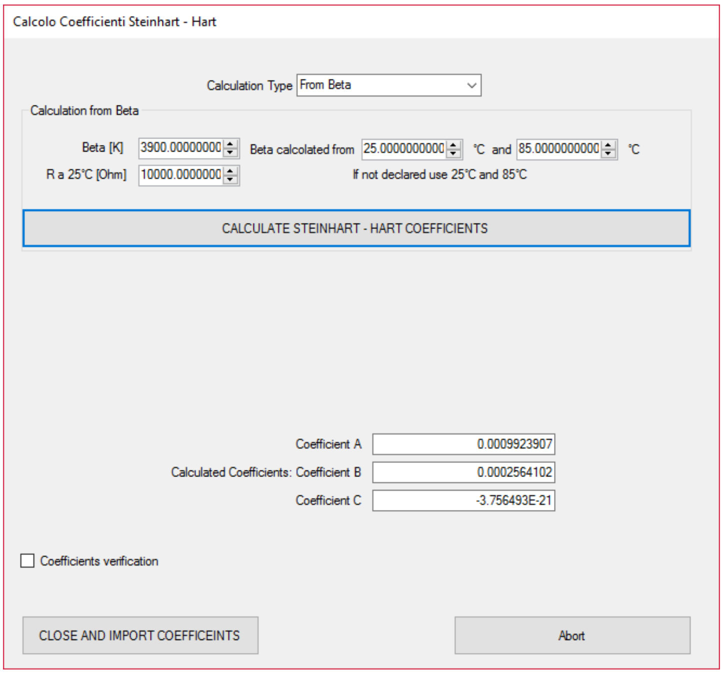
An example of log data format is:

	A	B	C	D	E	F	G
1	INDEX	TYPE	TIMESTAMP	I	IMAX	IMIN	VOUT
2	1	LOG	18/07/2017 17:37:16	9,94183	10,01664	0	5,501532
3	2	LOG	18/07/2017 17:37:17	9,984209	10,0598	0	5,502169
4	3	LOG	18/07/2017 17:37:18	10,04912	10,06021	0	5,46909
5	4	LOG	18/07/2017 17:37:19	9,9916	10,06021	0	5,500545
6	5	LOG	18/07/2017 17:37:20	10,0064	10,06021	0	5,49997
7	6	LOG	18/07/2017 17:37:21	10,00188	10,06021	0	5,503278
8	7	LOG	18/07/2017 17:37:22	9,944716	10,07788	0	5,501326
9	8	LOG	18/07/2017 17:37:23	9,977228	10,07788	0	5,502477
10	9	LOG	18/07/2017 17:37:24	10,06232	10,07788	0	5,50186
11	10	LOG	18/07/2017 17:37:25	9,991206	10,07788	0	5,501265
12	11	LOG	18/07/2017 17:37:26	10,03309	10,07788	0	5,500669
13	12	LOG	18/07/2017 17:37:27	10,03637	10,07788	0	5,500587
14	13	LOG	18/07/2017 17:37:29	10,00598	10,07788	0	5,501203
15	14	LOG	18/07/2017 17:37:30	9,976815	10,07788	0	5,50338
16	15	LOG	18/07/2017 17:37:31	10,01295	10,07788	0	5,50225
17	16	LOG	18/07/2017 17:37:32	10,01624	10,07788	0	5,500751
18	17	LOG	18/07/2017 17:37:33	10,0615	10,07788	0	5,502066
19	18	LOG	18/07/2017 17:37:34	10,03803	10,07788	0	5,502476
20	19	LOG	18/07/2017 17:37:35	10,01379	10,07788	0	5,503421
21	20	LOG	18/07/2017 17:37:36	10,0105	10,07788	0	5,502476
22	21	LOG	18/07/2017 17:37:37	10,00846	10,07788	0	5,501059
23	22	LOG	18/07/2017 17:37:38	10,05898	10,08692	0	5,500854
24	23	LOG	18/07/2017 17:37:39	10,03637	10,08692	0	5,501983
25	24	LOG	18/07/2017 17:37:40	10,03022	10,08692	0	5,501552
26	25	LOG	18/07/2017 17:37:41	10,00187	10,08692	0	5,502662
27	26	LOG	18/07/2017 17:37:42	10,00558	10,08692	0	5,502969

The file can also be open with a text editor:

```
INDEX;TYPE;TIMESTAMP;I;IMAX;IMIN;VOUT
1;LOG;18/07/2017 17:37:16;9,94182968139648;10,0166397094727;0;5,50153207778931
2;LOG;18/07/2017 17:37:17;9,98420906066895;10,0598001480103;0;5,50216913223267
3;LOG;18/07/2017 17:37:18;10,0491199493408;10,0602102279663;0;5,4690899848938
4;LOG;18/07/2017 17:37:19;9,99160003662109;10,0602102279663;0;5,50054502487183
5;LOG;18/07/2017 17:37:20;10,0064001083374;10,0602102279663;0;5,49996995925903
6;LOG;18/07/2017 17:37:21;10,0018796920776;10,0602102279663;0;5,50327777862549
7;LOG;18/07/2017 17:37:22;9,94471645355225;10,0778799057007;0;5,50132608413696
8;LOG;18/07/2017 17:37:23;9,97722816467285;10,0778799057007;0;5,50247716903687
9;LOG;18/07/2017 17:37:24;10,0623197555542;10,0778799057007;0;5,50186014175415
10;LOG;18/07/2017 17:37:25;9,99120616912842;10,0778799057007;0;5,50126504898071
11;LOG;18/07/2017 17:37:26;10,0330896377563;10,0778799057007;0;5,50066900253296
12;LOG;18/07/2017 17:37:27;10,0363702774048;10,0778799057007;0;5,50058698654175
13;LOG;18/07/2017 17:37:29;10,0059795379639;10,0778799057007;0;5,50120306015015
14;LOG;18/07/2017 17:37:30;9,97681522369385;10,0778799057007;0;5,50337982177734
15;LOG;18/07/2017 17:37:31;10,0129499435425;10,0778799057007;0;5,50225019454956
16;LOG;18/07/2017 17:37:32;10,0162401199341;10,0778799057007;0;5,50075101852417
17;LOG;18/07/2017 17:37:33;10,0614995956421;10,0778799057007;0;5,50206613540649
```

9. STEINHART-HART COEFFICIENT CALCULATOR



The NTC sensors datasheet usually do not provide directly the Steinhart-Hart coefficients.
The most used is the Beta value, other times, they provide a temperature / resistance table directly.

The software can calculate automatically the Steinhart-Hart coefficients from both the Beta or Table.

9.1. Calculating the Steinhart-Hart coefficients from Beta

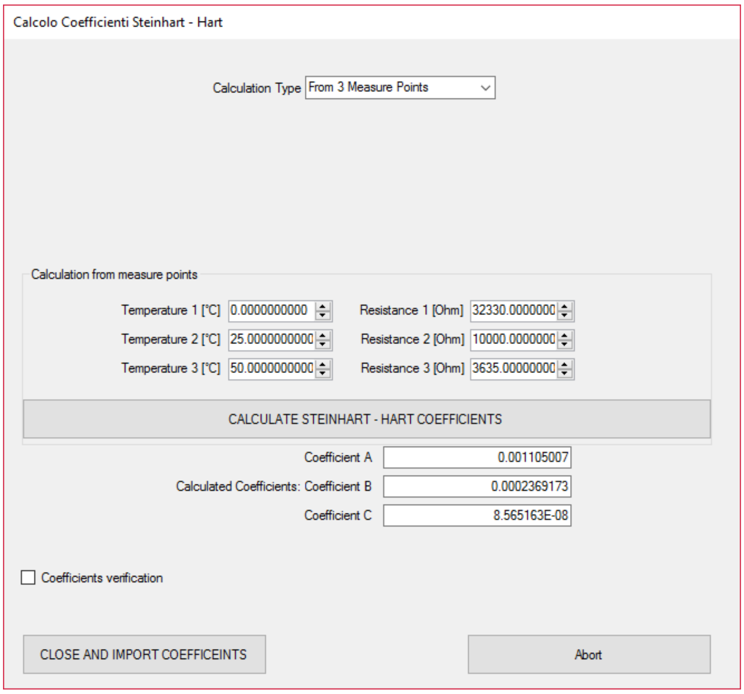
If your sensor datasheet declare a Beta value use this “Calculation Type”. You need to know in what range of temperature the Beta is declared (usually from 25°C to 85°C with simbol $Beta_{25/85}$).

Insert the requested data:
Beta, Resistance at 25°C and the Beta temperature range then press “Calculate Steinhart-Hart Coefficients”.
Then you can verify the coefficients by clicking on “Coefficients verification”:
Insert a Resistance (R1) value then click “Calculate T1” then the software will use the Coefficients for calculate the T1 value for debugging purposes:

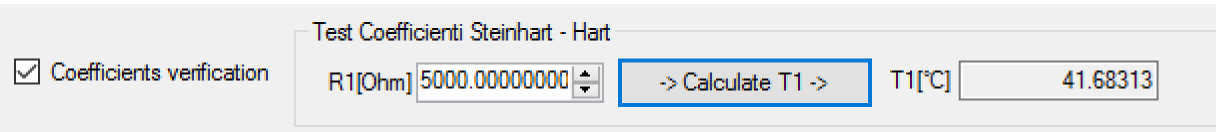
Then Click on “Close and import coefficients” for return to the configuration software with the new coefficient directly copied without having to manually insert them.

9.2. Calculating the Steinhart-Hart coefficients from Temperature/Resistance table

If your sensor datasheet include a Temperature/Resistance Table you can insert 3 couples of values for obtain the Steinhart-Hart coefficients:



Possibly select 3 points equally spaced in your measure range, for better precision insert also the value at 25°C.
Insert the requested data:
T1, T2, T3, R1, R2, R3 then press “Calculate Steinhart-Hart Coefficients”.
Then you can verify the coefficients by clicking on “Coefficients verification”:
Insert a resistance value (R1) value then click “Calculate T1” then the software will use the coefficients for calculate the T1 value for debugging purposes:



Then Click on “Close and import coefficients” for return to the configuration software with the new coefficient directly copied without having to manually insert them.