USER MANUAL

Z-8NTC

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

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ORIGINAL INSTRUCTIONS

Introduction

The 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.
The contents of this documentation are subject to periodical revision.
To use the product safely and effectively, read the following instructions carefully 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 are allowed only to authorized, physically and intellectually suitable operators.
Set up shall be performed only after a correct installation and the user shall perform every operation described in the installation manual carefully.
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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 extends 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/income 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.
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1.1. Description

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

The device can measure up to 8 NTC (each channel can be individually configured).
The powerful Easy Setup software can be used to 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 2.5 mm max section cable.
- Configurable DIP switches 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

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

2. 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 switch configuration is 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.

2.1. Loading Modbus RTU configuration from flash

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

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

2.2. Setting the RS485 Port Modbus RTU Station Address

Dip Switches 3..8 are used to 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

2.3. Setting the RS485 Baud rate

Dip Switches 1 and 2 are used to set 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.

2.4. 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 an R = 120 Ohm with a C= 100 nF.

3. FRONT USB CONNECTION

The USB front connection allows 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

3.1. 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

4. 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.

4.1. 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 bit 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
The PLC/Master Modbus programmer will take care not to exceed this limit!

5. MODBUS REGISTERS TABLE

In the following table these 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	Unsigned 16 bits	R/W*	40065	64

	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				
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	Unsigned 16 bits	R/W*	40068	67

	(*)= Note that out of these ranges, the 0.5% accuracy is not guaranteed				
Channel 7 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*	40069	68
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	Unsigned 16 bits	R/W*	40071	70

	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 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	Unsigned 16 bits	R	40091	90

	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 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	Signed 32 bits	R	40092 (MSW) 40093 (LSW)	91-92

	For example: 250 means 25.0°C				
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 Ohm*10, K*10, °C*10 or °F*10 For example: 250 means 25.0°C	Signed 32 bits	R	40100 (MSW) 40101 (LSW)	99-100
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	Signed 32 bits	R	40106 (MSW) 40107 (LSW)	105-106

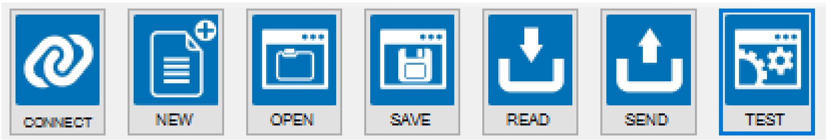
	Ohm*10, K*10, °C*10 or °F*10 For example: 250 means 25.0°C				

6. FULL CONFIGURATION WITH EASY SETUP

To 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 free from:

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

6.1. Easy Setup Menu



Connect: Use the connect icon to 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. To configure the device from the RS485 bus you need a converter like Seneca S117P1 or S107USB to connect the device to a PC.
New: Load the default parameters to 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 uses the dip switch configuration and NOT the sent configuration for the Modbus parameters)
Test: Start a Register read and start/stop a Datalogger

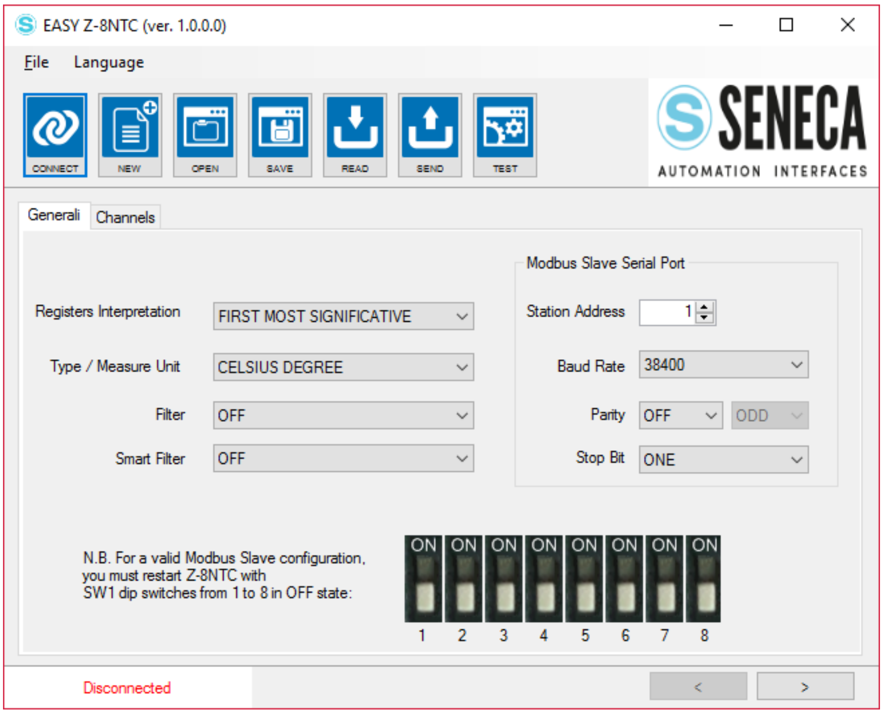
6.2. Creating a Project Configuration

WARNING!

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

The parameters that can be configured are:

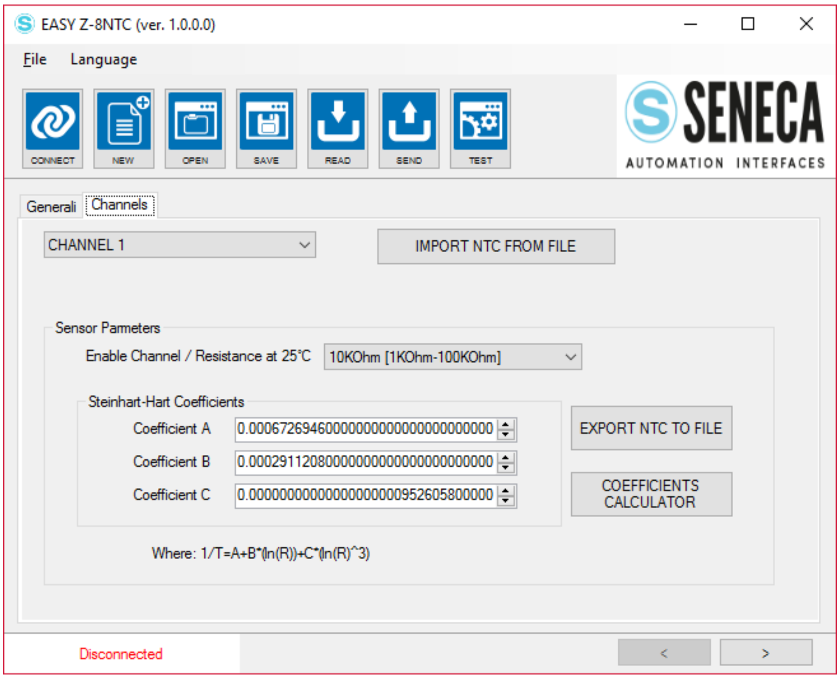
General TAB



Registers Interpretation: Select from Most Significant First (Big Endian) or Less Significant First (Little Endian) for the Floating Point Measure Modbus Registers. This parameter affects only the Floating Point measurement registers.
Type / Measurement Unit: Select which type of measurement the device must make from Temperature or Resistance, if Temperature you can select the measurement unit from K, °C or °F. This parameter affects all the measurement 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 sensitive 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

Channel TAB



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

Enable Channel / Resistance at 25°C: Select the resistance measurement 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 NTCs are available from the "Import NTC from file".

The first revision of the software includes 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 to obtain the Steinhart-Hart coefficients for a custom NTC/Sensor. For more info about the coefficient calculator see the Chapter 7.

6.3. Testing the Device

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

icon.

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

6.3.1. 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 the sampling acquisition time (minimum 1 second).
The datalogger will create a file in a standard .csv format that can be opened with external tools.

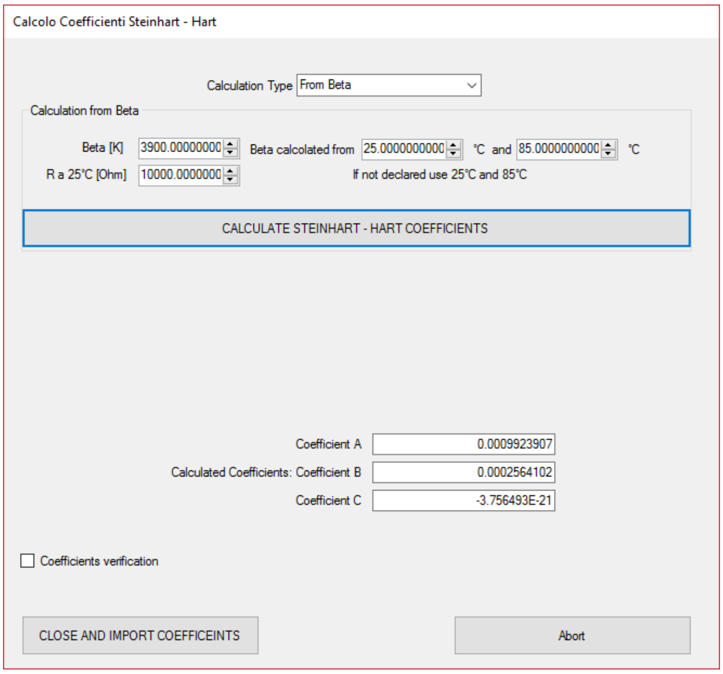
An example of log data format is:

	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 opened 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
```

7. STEINHART-HART COEFFICIENT CALCULATOR



The NTC sensor datasheets 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.

7.1. Calculating the Steinhart-Hart coefficients from Beta

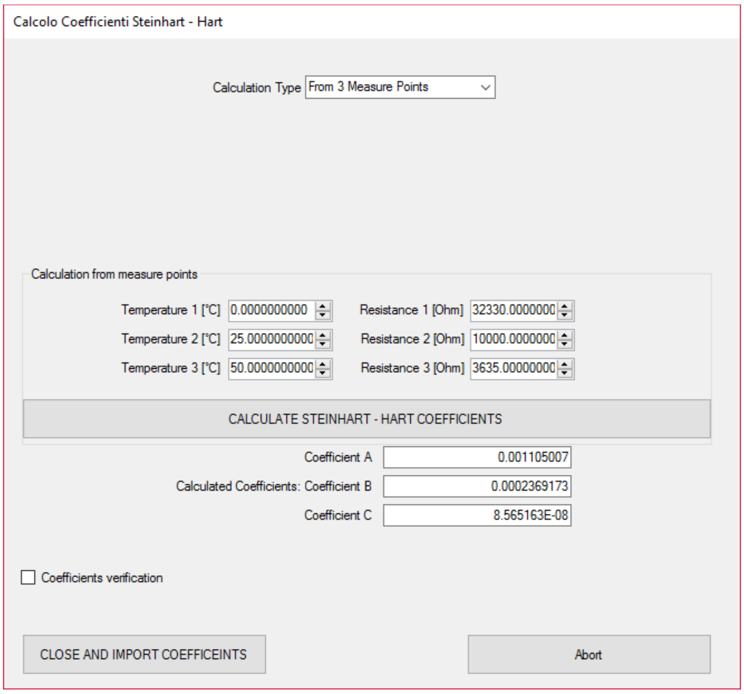
If your sensor datasheet declares a Beta value use this "Calculation Type". You need to know in what range of temperature the Beta is declared (usually from 25°C to 85°C with simbol $Beta_{25/85}$).

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 to calculate the T1 value for debugging purposes:

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

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

If your sensor datasheet includes a Temperature/Resistance Table you can insert 3 pairs of values to obtain the Steinhart-Hart coefficients:



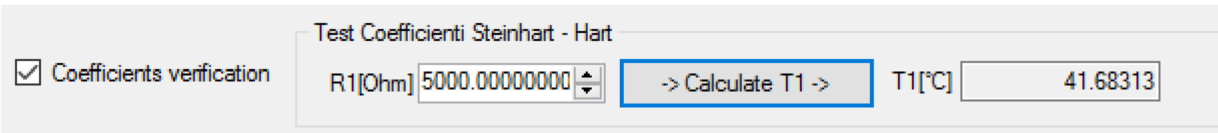
Possibly select 3 points equally spaced in your measure range, for better precision insert also the value at 25°C.

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) then click "Calculate T1" then the software will use the coefficients to calculate the T1 value for debugging purposes:



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