USER MANUAL

Z-8NTC

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



CE

SENECA®

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ORIGINAL INSTRUCTIONS

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1. DEVICE DESCRIPTION AND INTENDED USE

ATTENTION!

This user manual extends the information of the installation manual on the device configuration. For further information, use the installation manual.

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1.1. Description

The Z-8NTC device is an 8-channel NTC temperature converter with Modbus RTU protocol.
Communication can be via USB or RS485.

The device can measure up to 8 NTCs (each channel can be configured individually).
The powerful Easy Setup software allows for easy access to NTC parameters.

1.2. Functions

- 16-bit A/D conversion on three selectable scales: 100 Ω – 10 kΩ, 1 kΩ – 100 kΩ, 5 kΩ – 500 kΩ.
- Accuracy 0.5% of the resistance value.
- Measurement available in the following types: Resistance (Ω) or Temperature (°C, °F, K) on 32-bit integer and 32-bit floating point, direct or swapped.
- Resistance-to-temperature conversion with Steinhart-Hart equation for high accuracy.
- Individually switchable and configurable channels.
- Programmable filter to stabilise readings.
- Conversion time: 500 ms for all channels
- Linearisation via configuration software for sensors: NTC, COSTER, KTY with measuring points, or Beta
- Easy wiring of the power supply and serial bus via the Z-BUS bus housed on the DIN rail
- Removable terminals for cables with a maximum cross-section of 2.5 mm.
- Communication parameters configurable via DIP switches or software
- RS485 serial communication with MODBUS-RTU protocol.
- Front USB port for configuration and MODBUS-RTU communication.

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1.3. Technical Specifications

RS485 COMMUNICATION PORTS	
Number	1
Protocol	Modbus RTU Slave
Baud Rate	Configurable from 1200 to 115200
Parity, data bits and stop bits	Software configurable

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

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2. CONFIGURATION BY DIP SWITCH

The device is fully configurable with the free Seneca configuration tools:

- Easy Setup
- Z-NET4

Modbus RTU configuration on the RS485 port can also be performed via dip switches.

ATTENTION!

The configuration via dip switch is active only after a restart!

ATTENTION!

The Dip Switch setting overlaps the Flash setting and consequently, in the event that it is necessary to use the flash configuration, ALL the dip switches MUST be positioned in the "OFF" position.

ATTENTION!

The baud rate and Modbus station address are set to:
Baud rate 38400, Modbus station address 1, 8-bit data, 1 stop bit

The DIP switch configuration can only change 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 (for the configuration, use the Easy Setup software or Z-NET4)

Loading Modbus RTU configuration FROM FLASH	***DIP1***	***DIP2***	***DIP3***	***DIP4***	***DIP5***	***DIP6***	***DIP7***	***DIP8***
	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

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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
….						
63	ON	ON	ON	ON	ON	ON

2.3. RS485 Baud rate setting

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

ATTENTION!

The parity and stop bits cannot be configured via dip switches but only via the Easy Setup software. With the setting of the dip switches, the parity is always set to "None" and the stop bit is set to 1.

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2.4. Inserting the RS485 Terminator

Dip 10 can insert an RS485 terminator if there are bus problems.
The terminator is inserted directly from A to B: in series, R = 120 Ohm with C = 100 nF.

3. FRONT USB CONNECTION

The front USB connection allows for simple connection to a PC or Android™ device with USB OTG capability.
The communication protocol is Modbus RTU slave; the communication parameters for the USB port are set to:

Baud rate: 38400
Modbus RTU station address: 1
Data bit: 8
Stop bit: 1

3.1. USB virtual COM driver

The Virtual COM driver is installed with the Easy Setup software.
The Easy Setup software can be downloaded for free from:

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

4. MODBUS RTU PROTOCOL

The Modbus protocol supported by Z-8NTC is:

- Modbus RTU Slave

For more information on these protocols, 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

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ATTENTION!

All 32-bit values are stored in 2 consecutive registers

ATTENTION!

With the Read Holding Register function (function 3) a maximum of 28 Modbus registers can be read.

ATTENTION!

With the Write Multiple Register function (function 16), a maximum of 28 Modbus registers can be written

ATTENTION!

Registers with RW* (stored in flash memory) can be written up to 10,000 times.
The PLC/Modbus Master programmer will ensure this limit is not exceeded!

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5. MODBUS REGISTER TABLE

The following abbreviations are used in the following table:

MS = More significant
LS = Less significant
MSW = Most Significant Word (16 bits)
LSW = Least Significant Word (16 bits)
R = Read-Only Register
RW = Read-Write Register
RW* = Read-Write Register, stored in flash memory (writeable up to 10,000 times)
16-Bit Unsigned = 16-Bit Unsigned Integer Register (0 to 65,535)
16-Bit Signed = 16-Bit Signed Integer Register (-32,768 to +32,767)
Float 32 bit = 32-bit, single-precision floating-point register (IEEE 754)
Ox = 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

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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

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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

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	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

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	(*)= 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

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	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

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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

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	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

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	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

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

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6. COMPLETE CONFIGURATION WITH EASY SETUP

To configure all the device parameters, it is possible to use the USB or RS485 port and the Easy Z-8NTC software included in the Easy Setup suite.
The Easy Setup software can be downloaded for 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 your PC to the device. Please note that you must specify whether the connection is via RS485 bus or front USB. To connect the device to a PC and configure it via the RS485 bus, you must use a converter such as the Seneca S117P1 or S107USB.
New: loads the default parameters into the actual project
Open: opens a stored project
Save: saves the current project
Read: Reads the actual configuration from the device
Send: Sends the project configuration (if DIP switches 1 through 8 are not ALL OFF, the device uses the DIP switch configuration and NOT the configuration sent for the Modbus parameters)
Test: Initiates a Register read and starts/stops a Data Logger

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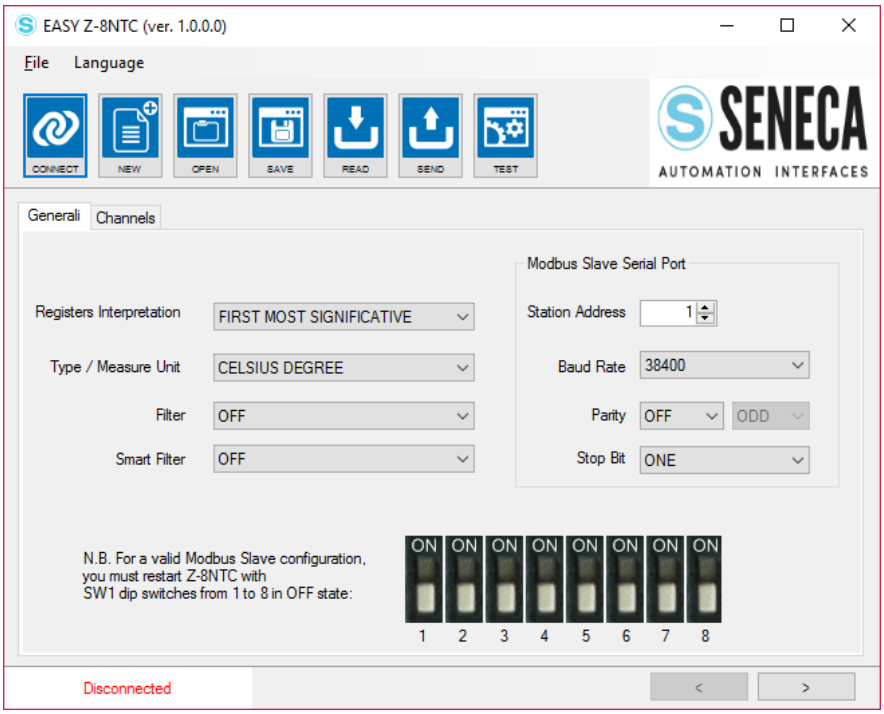
6.2. Creating a project configuration

ATTENTION!

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

The parameters to be configured are:

General TAB



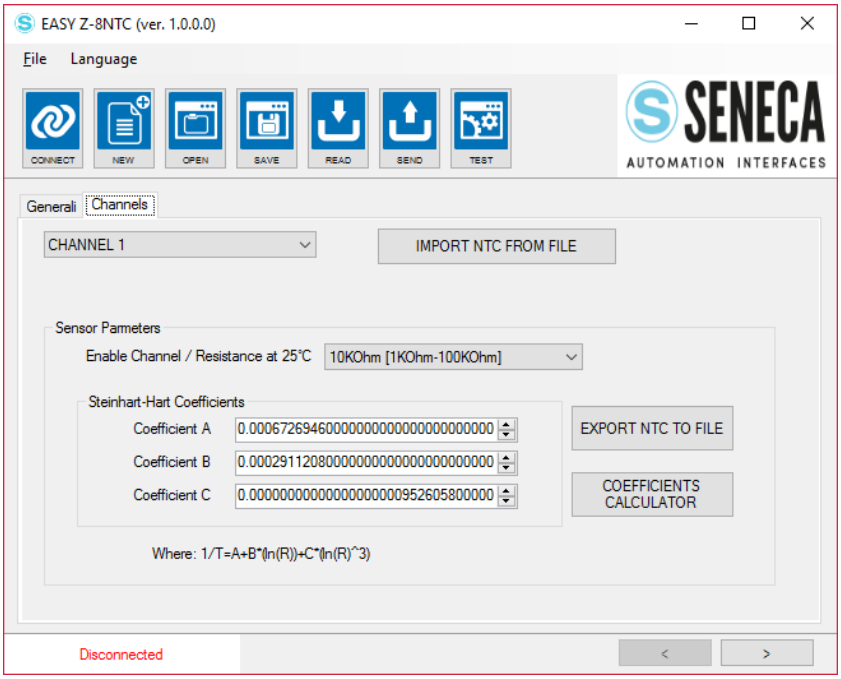
Register Interpretation: Select between Most Significant First (Big Endian) or Least Significant First (Little Endian) for the Modbus floating-point measurement registers. This parameter only affects floating-point measurement registers.
Measurement Type/Unit: Select the type of measurement the device will perform, either Temperature or Resistance, and, for temperature, the unit of measurement, either K, °C, or °F. This parameter affects all measurement registers (integer and floating-point).
Filter: Select the filter type, either Disabled, Low, Medium, or High.
Smart Filter: If filter 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 115,200 baud, for the RS485 port.
Parity: Select NONE, EVEN, or ODD for the RS485 port
Stop Bits: Select the number of stop bits for the RS485 port

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Channel TAB



n the channel tab, you can select the NTC parameters for each channel.

Activate Channel / Resistance at 25°C: Select the resistance measurement range from the NTC value at 25°C; note that accuracy of 0.5% is not guaranteed outside these ranges.

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

Once the NTC has been characterized, the parameters can be saved/imported to a file using "Export NTC to file" or "Import NTC from file."

The most commonly used NTC coefficients are available using “Import NTC from file.”

The first software revision includes parameters for the following NTCs/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

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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 constantly growing.

You can use the "Coefficient Calculator" button to obtain Steinhart-Hart coefficients for a custom NTC/sensor. For more information on the coefficient calculator, see Chapter 7.

6.3. Device test

When the configuration is sent to the device, it is possible to test the actual configuration, through the icon 

.

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

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6.3.1. The Data Logger

The data logger can be used to acquire data that can be used with external software (e.g. Microsoft Excel™).
The sample acquisition time can be set (minimum 1 second).
The data logger will create a standard .csv format file that you can open with external tools:

An example of a log data format is as follows:

	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

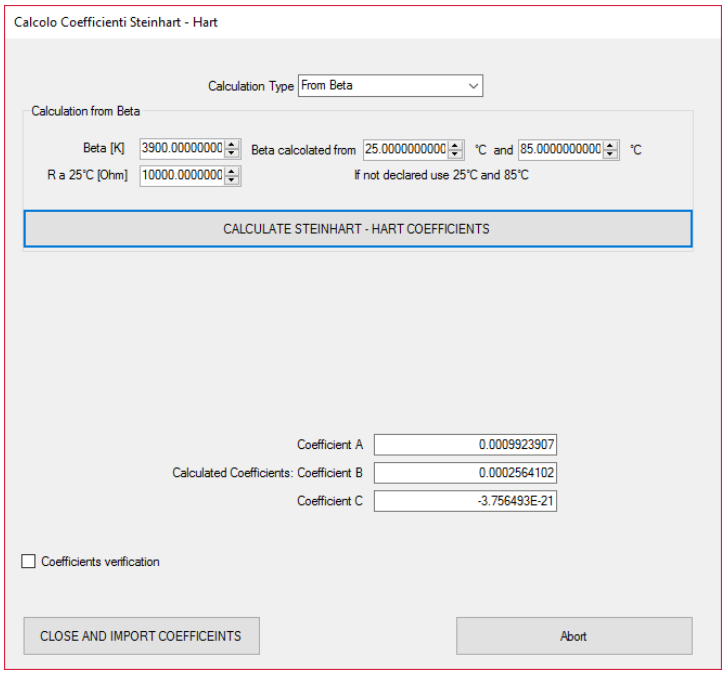
The file can also be opened with a text editor:

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

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7. STEINHART-HART COEFFICIENT CALCULATOR



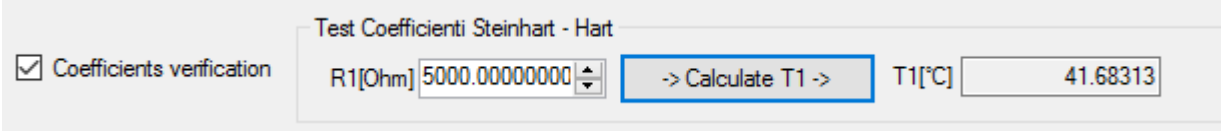
NTC sensor datasheets generally do not provide Steinhart-Hart coefficients directly.
The most commonly used is the Beta value; other times, datasheets directly provide a temperature/resistance table.

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

7.1. Calculating Steinhart-Hart Coefficients from Beta

If the sensor datasheet specifies a Beta value, use this “Calculation type.” You must know the temperature range in which the Beta value is declared (typically 25°C to 85°C with the symbol $Beta_{25/85}$).

Enter the required data:
Beta, Resistance at 25°C, and the Beta temperature range, then click "Calculate Steinhart-Hart coefficients."
You can then verify the coefficients by clicking "Verify coefficients":
Enter a value for Resistance (R1), then click "Calculate T1," and the software will use the coefficients to calculate the T1 value for debugging purposes.



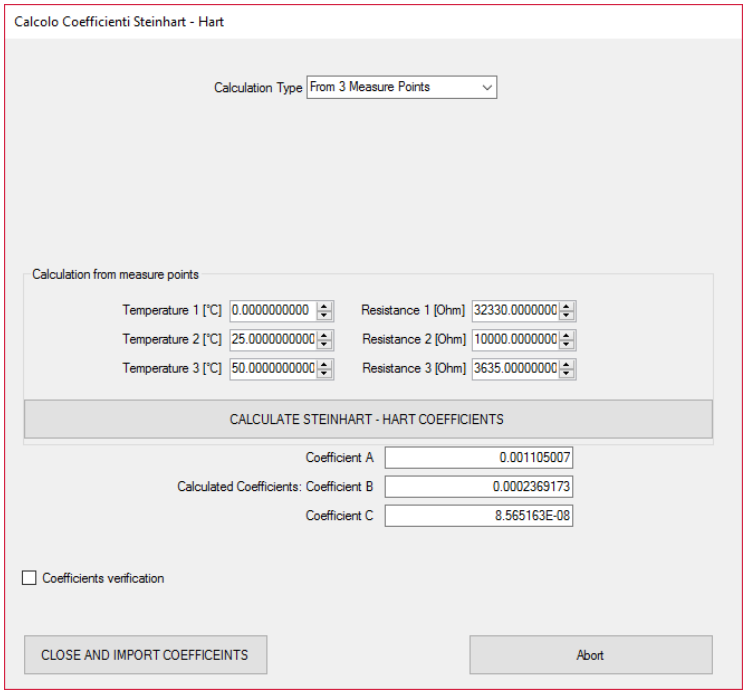
Then, click "Close and import coefficients" to return to the configuration software with the new coefficient copied directly without having to enter it manually.

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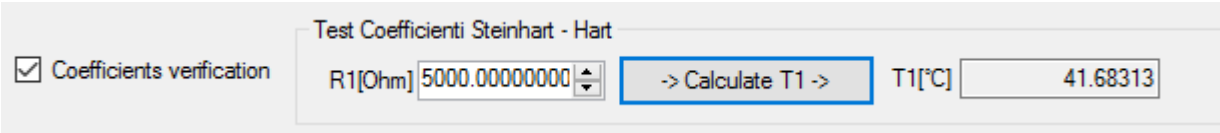
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7.2. Calculating Steinhart-Hart Coefficients from the Temperature/Resistance Table

If the sensor datasheet includes a Temperature/Resistance table, you can enter three pairs of valuesto obtain the Steinhart-Hart coefficients:



If possible, choose three evenly spaced points in the measurement field; for better accuracy, also enter the value at 25°C.
Enter the required data:
T1, T2, T3, R1, R2, R3, then press “Calculate Steinhart-Hart coefficients”.
You can then verify the coefficients by clicking "Verify coefficients":
Enter a value for Resistance (R1), then click "Calculate T1," and the software will use the coefficients to calculate the T1 value for debugging purposes.



Then, click "Close and import coefficients" to return to the configuration software with the new coefficient copied directly without having to enter it manually.

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