USER MANUAL

Z-8NTC

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







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ORIGINAL INSTRUCTIONS

User Manual

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Document revisions

| DATE | REVISION | NOTE | AUTHOR |
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| 19/10/2017 | 2 | Improved explanation of register 40071 | ММ |
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1. DEVICE DESCRIPTION AND INTENDED USE



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.



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 |



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.



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



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.



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 | DIP1 | DIP2 | DIP3 | DIP4 | DIP5 | DIP6 | DIP7 | DIP8 |
|---------------|------|------|------|------|------|------|------|------|
| Modbus RTU | | | | | | | | |
| configuration | OFF |
| FROM | | | | | | | | |
| FLASH | | | | | | | | |



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 |



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.

Z-8NTC



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





All 32-bit values are stored in 2 consecutive registers



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!



5. MODBUS REGISTER TABLE

The following abbreviations are used in the following table:

| | MS = I | Nore | sign | ificant |
|--|--------|------|------|---------|
|--|--------|------|------|---------|

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 |



| Channel 1 | | Flooting | D/\//* | 40040 (MCM) | 18-19 |
|-------------|-------------------------|----------|----------|-----------------|-------|
| | 0 (2 : 10 (1) | Floating | R/W* | 40019 (MSW) | 10-19 |
| Coefficient | Coefficient C for the | Point 32 | | 40020 (LSW) | |
| "C" | Steinhart-Hart equation | bits | | | |
| Channel 2 | | Floating | R/W* | 40021 (MSW) | 20-21 |
| Coefficient | Coefficient A for the | Point 32 | | 40022 (LSW) | |
| "A" | Steinhart-Hart equation | bits | | | |
| Channel 2 | · | Floating | R/W* | 40023 (MSW) | 22-23 |
| Coefficient | Coefficient B for the | Point 32 | | 40024 (LSW) | |
| "B" | Steinhart-Hart equation | bits | | 10021 (2011) | |
| Channel 2 | Otennart Hart equation | Floating | R/W* | 40025 (MSW) | 24-25 |
| Coefficient | Coefficient C for the | Point 32 | 17/ 77 | ` , | 24-23 |
| | | | | 40026 (LSW) | |
| "C" | Steinhart-Hart equation | bits | D 0 4 64 | 4000= (14014) | 22.25 |
| Channel 3 | | Floating | R/W* | 40027 (MSW) | 26-27 |
| Coefficient | Coefficient A for the | Point 32 | | 40028 (LSW) | |
| "A" | Steinhart-Hart equation | bits | | | |
| Channel 3 | | Floating | R/W* | 40029 (MSW) | 28-29 |
| Coefficient | Coefficient B for the | Point 32 | | 40030 (LSW) | |
| "B" | Steinhart-Hart equation | bits | | \ / | |
| Channel 3 | | Floating | R/W* | 40031 (MSW) | 30-31 |
| Coefficient | Coefficient C for the | Point 32 | | 40032 (LSW) | 000. |
| "C" | Steinhart-Hart equation | bits | | 4000Z (LOVV) | |
| Channel 4 | Otennart-Hart equation | Floating | R/W* | 40033 (MSW) | 32-33 |
| | Coefficient A for the | • | IT/VV | · · · | 32-33 |
| Coefficient | Coefficient A for the | Point 32 | | 40034 (LSW) | |
| "A" | Steinhart-Hart equation | bits | | 1000 - (0.0000) | 2125 |
| Channel 4 | | Floating | R/W* | 40035 (MSW) | 34-35 |
| Coefficient | Coefficient B for the | Point 32 | | 40036 (LSW) | |
| "B" | Steinhart-Hart equation | bits | | | |
| Channel 4 | | Floating | R/W* | 40037 (MSW) | 36-37 |
| Coefficient | Coefficient C for the | Point 32 | | 40038 (LSW) | |
| "C" | Steinhart-Hart equation | bits | | | |
| Channel 5 | • | Floating | R/W* | 40039 (MSW) | 38-39 |
| Coefficient | Coefficient A for the | Point 32 | | 40040 (LSW) | |
| "A" | Steinhart-Hart equation | bits | | .00.0 (2011) | |
| Channel 5 | Ctommart Hart Oquation | Floating | R/W* | 40041 (MSW) | 40-41 |
| Coefficient | Coefficient B for the | Point 32 | 17/77 | , | 10 11 |
| "B" | | | | 40042 (LSW) | |
| | Steinhart-Hart equation | bits | D/\//* | 40042 (M40M/) | 40.40 |
| Channel 5 | On afficient Of 11 | Floating | R/W* | 40043 (MSW) | 42-43 |
| Coefficient | Coefficient C for the | Point 32 | | 40044 (LSW) | |
| "C" | Steinhart-Hart equation | bits | | | |
| Channel 6 | | Floating | R/W* | 40045 (MSW) | 44-45 |
| Coefficient | Coefficient A for the | Point 32 | | 40046 (LSW) | |
| "A" | Steinhart-Hart equation | bits | | | |
| Channel 6 | | Floating | R/W* | 40047 (MSW) | 46-47 |
| Coefficient | Coefficient B for the | Point 32 | | 40048 (LSW) | |
| "B" | Steinhart-Hart equation | bits | | (==::) | |
| Channel 6 | Stemment Hair Squadoff | Floating | R/W* | 40049 (MSW) | 48-49 |
| Coefficient | Coefficient C for the | Point 32 | 1.7.4. | 40050 (LSW) | 10 70 |
| "C" | | | | 70000 (LOVV) | |
| U | Steinhart-Hart equation | bits | | | |



| Channel 7 | | Floating | R/W* | 40051 (MSW) | 50-51 |
|---------------|--------------------------|-----------|-----------|----------------|--------------------|
| Coefficient | Coefficient A for the | Point 32 | | 40052 (LSW) | |
| "A" | Steinhart-Hart equation | bits | | | |
| | Steirinait-Hart equation | | D // /* | 40050 (440)4() | 50.50 |
| Channel 7 | | Floating | R/W* | 40053 (MSW) | 52-53 |
| Coefficient | Coefficient B for the | Point 32 | | 40054 (LSW) | |
| "B" | Steinhart-Hart equation | bits | | , | |
| Channel 7 | | Floating | R/W* | 40055 (MSW) | 54-55 |
| | Coefficient C for the | | 1 1 7 7 7 | , | 0 1 -00 |
| Coefficient | Coefficient C for the | Point 32 | | 40056 (LSW) | |
| "C" | Steinhart-Hart equation | bits | | | |
| Channel 8 | | Floating | R/W* | 40057 (MSW) | 56-57 |
| Coefficient | Coefficient A for the | Point 32 | | 40058 (LSW) | |
| "A" | | bits | | 10000 (2011) | |
| | Steinhart-Hart equation | | D // 4 /# | 40050 (140)40 | 50.50 |
| Channel 8 | | Floating | R/W* | 40059 (MSW) | 58-59 |
| Coefficient | Coefficient B for the | Point 32 | | 40060 (LSW) | |
| "B" | Steinhart-Hart equation | bits | | , , | |
| Channel 8 | Stommart Hart Squation | Floating | R/W* | 40061 (MSW) | 60-61 |
| | 0 | _ | 17/77 | , , | 00-01 |
| Coefficient | Coefficient C for the | Point 32 | | 40062 (LSW) | |
| "C" | Steinhart-Hart equation | bits | | | |
| Channel 1 | Channel Range | Unsigned | R/W* | 40063 | 62 |
| Range | Configuration | 16 bits | | | - |
| _ | Comigaration | 10 010 | | | |
| Configuration | 0 5 1/01 500 1/01 | | | | |
| | 0 = 5 KOhm – 500 KOhm | | | | |
| | (*) | | | | |
| | 1 = 1KOhm - 100 KOhm (*) | | | | |
| | 2 = 100 Ohm – 10 KOhm | | | | |
| | (*) | | | | |
| | 3 = Channel disabled | | | | |
| | | | | | |
| | /*\- Note that aut of | | | | |
| | (*)= Note that out of | | | | |
| | these ranges, the 0.5% | | | | |
| | accuracy is not | | | | |
| | guaranteed | | | | |
| Channel 2 | Channel Range | Unsigned | R/W* | 40064 | 63 |
| | _ | _ | 1 1 7 7 7 | 10004 | 03 |
| Range | Configuration | 16 bits | | | |
| Configuration | | | | | |
| | 0 = 5 KOhm - 500 KOhm | | | | |
| | (*) | | | | |
| | 1 = 1KOhm - 100 KOhm (*) | | | | |
| | 2 = 100 Ohm – 10 KOhm | | | | |
| | (*) | | | | |
| | 3 = Channel disabled | | | | |
| | 5 – Charinei disabled | | | | |
| | (4) | | | | |
| | (*)= Note that out of | | | | |
| | these ranges, the 0.5% | | | | |
| | accuracy is not | | | | |
| | guaranteed | | | | |
| 01 1.0 | - | I I a a i | D/\A/* | 40005 | 0.4 |
| Channel 3 | Channel Range | Unsigned | R/W* | 40065 | 64 |
| Range | Configuration | 16 bits | | | |
| 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 | | | | |
|-------------------------------------|--|---------------------|------|-------|----|
| 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 |



| 68 |
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| | Magazira Tima Tamananati | | | | |
|---------------|---|----------|------|-------|----|
| | 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 | | | | |
| | Thigh chabled | | | | |
| | 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 | 0 = 4800 baud | Unsigned | R/W* | 40072 | 71 |
| Rate | 1 = 9600 baud | 16 bits | | | |
| configuration | 2 = 19200 baud | | | | |
| | 3 = 38400 baud | | | | |
| | 4 = 57600 baud | | | | |
| | 5 = 115200 baud | | | | |
| | 6 = 1200 baud | | | | |
| | 7 = 2400 baud | | | | |



| 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 | Unsigned 16 bits | R | 40091 | 90 |
| | Bit 0 = 1 Channel 1 below the lower ADC limit Bit 1 = 1 Channel 2 below the lower ADC limit | | | | |



| 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 |
|---------------------------------|--|-------------------|---|----------------------------|-------|
| CHANNEL 1 | 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 Bit 15 = 1 Channel 8 exceeds the high ADC level Bit 15 = 1 Channel 8 exceeds the high ADC level | Signed 32 | R | 40092 (MSW) | 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: | Signed 32 bits | R | 40094 (MSW) 40095 (LSW) | 93-94 |
| | 250 means 25.0°C | | | | |
| CHANNEL 3 INTEGER MEASURE | Measure channel in Integer format Ohm*10, K*10, °C*10 or °F*10 | nel in Signed 32 R 40096 (MSW) at bits 40097 (LSW) | | , | 95-96 |
| | For example: 250 means 25.0°C | | | | |
| CHANNEL 4 INTEGER MEASURE | Measure channel in Integer format Ohm*10, K*10, °C*10 or °F*10 | Signed 32 bits | R | 40098 (MSW) 40099 (LSW) | 97-98 |
| | For example: 250 means 25.0°C | | | | |
| CHANNEL 5 INTEGER MEASURE | Measure channel in Integer format Ohm*10, K*10, °C*10 or °F*10 | Signed 32 bits | R | 40100 (MSW) 40101 (LSW) | 99-100 |
| | 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: | Signed 32 bits | R | 40104 (MSW) 40105 (LSW) | 103-104 |
| CHANNEL 8 INTEGER MEASURE | 250 means 25.0°C Measure channel in Integer format | Signed 32 bits | R | 40106 (MSW) 40107 (LSW) | 105-106 |





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



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



6.2. Creating a project configuration



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



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.



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:

| | Α | В | С | 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 |

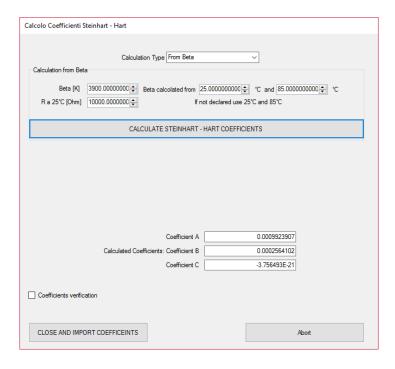
The file can also be opened with a text editor:

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



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.

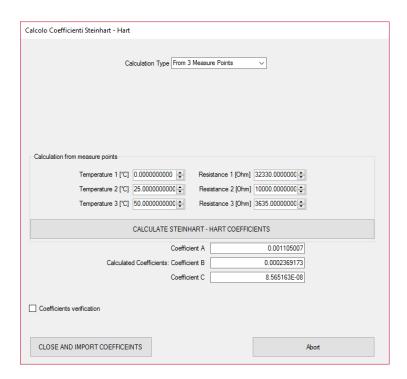


Then, click "Close and import coefficients" to return to the configuration software with the new coefficient copied directly without having to enter it manually.

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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 values to 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.