

USER MANUAL

Z-4TC1



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USER MANUAL – Z-4TC

Date	Revision	Notes
23/05/2017	1.01	-New manual -Added FW rev 667 Floating Point Registers
30/05/2017	1.02	-Fix Floating Point Registers Comments

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Seneca Z-4TC

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1. Introduction

The Z-4TC module acquires up to 4 single-ended signals (voltage-type, from the: signal generator or thermocouple) and it converts them to a digital format using the Modbus RTU Protocol.

A double serial interface (RS232 or RS485) it's also available (Modbus RTU protocol).

1.1. Features

- Internal Cold Junction compensation
- Easy configurable by free configuration software "Easy Setup"
- RS485 serial communication with MODBUS-RTU protocol, maximum 32 nodes.
- RS232 serial communication with Modbus RTU protocol for registers access and configuration
- Measuring mode Thermocouples or Voltage
- Configuration of a filter applied to each input signal
- Possibility to disable the automatic detection of thermocouple interruptions (to decrease the measure error of the acquired signals from the thermocouples)
- Possibility to add/remove the module to/from RS485-bus without disconnecting the communication or power supply
- Easy-wiring of power supply and serial bus by means of the bus housed in the DIN rail.

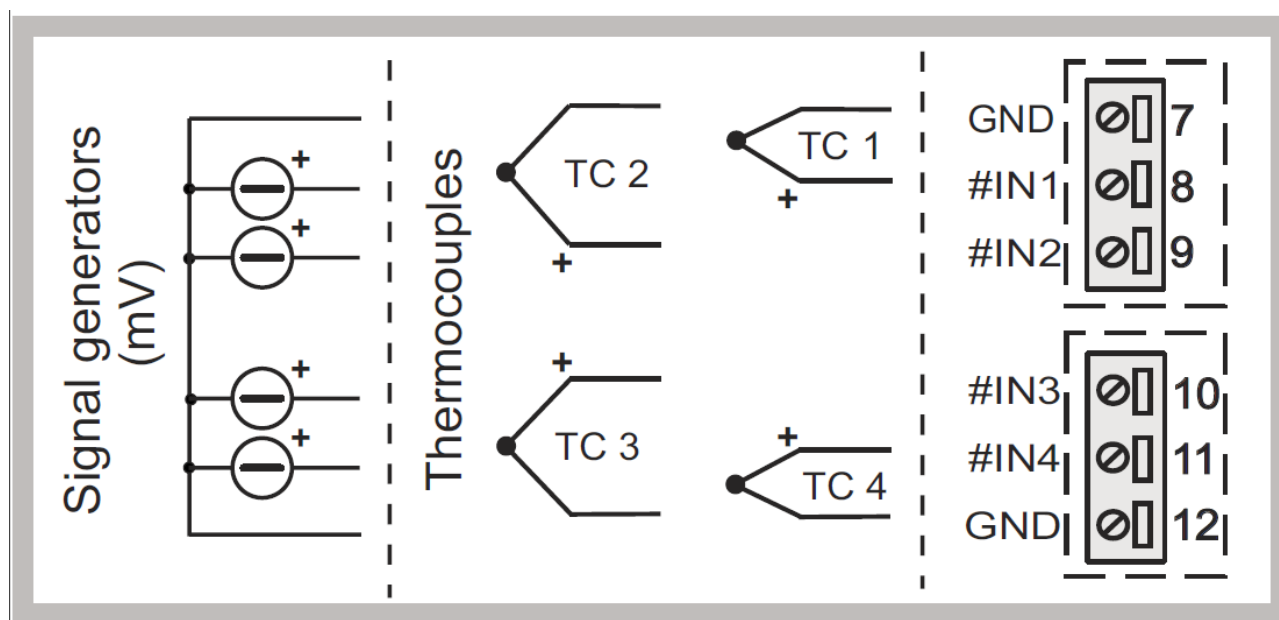
INPUT	
Number	4
Resolution	16 bits (15+1 sign)
Sampling time	Configurable between: 120 ms or 60 ms
Filter	Configurable between: 0(no filter is applied), from 1(min) to 6(max)
Accuracy	Initial: 0.1% of E.E.S.(Electrical End Scale)
	Linearity: 0.05°C (if TC J, TC K); 0.04°C (if TC N, TC T); 0.03°C (if TC B); 0.02°C (if TC E, TC S, TC R)
	Thermal stability: < 50 ppm/°K
	EMI: < 1%
	Cold-junction compensation (for TC-type input):<2°C (0-50°C)
Protection	± 30Vdc and 25mA
Voltage-type IN (from the generator)	Bipolar with E.S.S./E.E.S.(Electrical Start/End Scale) unchangeable between: ± 160mV. Input impedance: > 10 MΩ
Voltage-type IN (from the thermocouple)	TC-type: J, K, R, S, T, B, E, N. Automatic detection if a TC interruption occurs: if this option is enabled, test current:<200nA. Input impedance: > 10 MΩ
CONNECTIONS	

RS485 interface	IDC10 connector for DIN 46277 rail (back-side panel) or (alternative) the screw terminals: 4(GND), 5(B), 6(A)
RS232 interface	Jack stereo 3.5mm connector: plugs into COM port
1500 Vac ISOLATIONS	
	Between: power supply, ModBUS RS485, analog input

POWER SUPPLY	
Supply voltage	10 – 40 Vdc or 19 – 28 Vac (50Hz - 60Hz)
Power consumption	Min: 0.5W; Max: 1W

The power supply transformer necessary to supply the module must comply with EN60742 (Isolated transformers and safety transformers requirements). To protect the power supply, it is recommended to install a fuse.

2. Input connections





To decrease the signal-acquisition errors due to noise effects, short-circuit each unused TC-type input (screw terminals 8, 9, 10 or 11) to the GND (equipotential screw terminals: 7 or 12).

In the following figure are shown the cable colors for each type of thermocouple.

THERMOCOUPLE	ALLOY	ANSI MC96.1 (USA)		DIN43710 (D)		IEC 584-3 (EUROPE)	
		-	+	-	+	-	+
TC J	Fe-Co	red	white	blue	red	white	black
TC K	Cr-Al	red	yellow	green	red	white	green
TC R	Pt13%Rh-Pt	red	black	white	red	white	orange
TC S	Pt10%Rh-Pt	red	black	white	red	white	orange
TC T	Cu-Co	red	blue	brown	red	white	brown
TC E	Cr-Co	red	purple	black	red	white	purple
TC B	Pt30%Rh-Pt6%Rh	red	grey	red	grey	white	grey
TC N	Nicrosil-Nisil	red	brown	/	/	white	pink

3. Dip-switches table

BAUD-RATE (Dip-Switches: DIP-SWITCH STATUS)		
1	2	Meaning
OFF	OFF	Baud-rate=9600 Baud
OFF	ON	Baud-rate=19200 Baud
ON	OFF	Baud-rate=38400 Baud
ON	ON	Baud-rate=57600 Baud

ADDRESS (Dip-Switches: DIP-SWITCH STATUS)						
3	4	5	6	7	8	Meaning
OFF	OFF	OFF	OFF	OFF	OFF	Address and Baud-Rate are acquired from memory(EEPROM)
OFF	OFF	OFF	OFF	OFF	ON	Address=1
OFF	OFF	OFF	OFF	ON	OFF	Address=2
OFF	OFF	OFF	OFF	ON	ON	Address=3
OFF	OFF	OFF	ON	OFF	OFF	Address=4
X	X	X	X	X	X
ON	ON	ON	ON	ON	ON	Address=63
RS485 TERMINATOR (Dip-Switches: DIP-SWITCH STATUS)						
9	10	Meaning				
OFF	OFF	RS485 terminator disabled				
OFF	ON	RS485 terminator enabled				

4. THERMOCOUPLES RANGES

The input scale range values, for thermocouple-type input selected, are shown in the following table.

TC-type	Scale range	TC-type	Scale range
J	-210°C..1200°C	S	-50°C..1768°C
K	-200°C..1372°C	R	-50°C..1768°C
E	-200°C..1000°C	B	250°C..1820°C
N	-210°C..1300°C	T	-200°C..400°C

5. MODBUS RTU PROTOCOL

The Modbus protocols supported by the Z-4TC is:

Modbus RTU Slave

for more information about this protocols please refer to Modbus specification website:

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

5.1. MODBUS RTU DEFAULT CONFIGURATION

The RS232 port is always configured in:

Baud Rate: 2400, Data: 8Bit, Parity: None, Stop Bit 1, Modbus Station Address: 1

The RS485 port is configured from dip switch and from the Easy Setup Software.

5.2. MODBUS RTU FUNCTION CODE

The following Modbus functions are supported:

Read Holding Register (function 3)

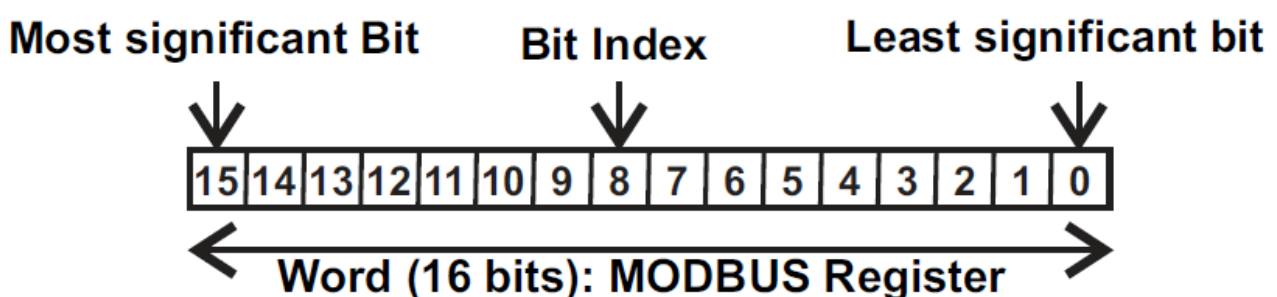
Write Single Register (function 6)

Write Multiple registers (function 16)

5.3. MODBUS RTU Register table

An Holding Register is composed by 16 bit from 0 to 15.

The Least significant bit is represented with BIT[0], the most significant bit with BIT[15]:



A single Floating point (32 bit) register is composed by two Holding Registers.

Register Name	Comment	Register Type	R/W	Default value or Start Value	Modbus Address	Offset
MachineID	Module ID code	Unsigned 16 bits	R	Internal code	40001	0
Baudrate / Address	Bit [15:8] Baud-rate for RS485 0=4800 1=9600 2=19200 3=38400 4=57600 5=115200 6=1200 7=2400 Bit [7:0] Station Address for RS485 Modbus RTU from 0x01=1 to 0xFF=255	Unsigned 16 bits	R/W	38400 BAUD Station address 1	40002	1
Eprflag	[Bit 5... 16] Not used [Bit 4] Parity for RS485: 0=even parity 1=odd parity [Bit 3] 0 = no parity 1 = parity enabled [Bit 2] Delay on communication response: pauses between the end of Rx message	Unsigned 16 bits	R/W	No parity No delay on response	40003	2

	<p>and the start of Tx message:</p> <p>0=disabled</p> <p>1=enabled</p> <p>[Bit 1]</p> <p>Sampling time:</p> <p>0=120 ms for channel</p> <p>1=60 ms for channel</p> <p>[Bit 0]</p> <p>Automatic detection if a TC interruption occurs</p> <p>0=activated</p> <p>1=deactivated</p>					
INPUT 1 TYPE	<p>0=Voltage ($\pm 160\text{mV}$)</p> <p>1=TC J</p> <p>2=TC K</p> <p>3=TC R</p> <p>4=TC S</p> <p>5=TC T</p> <p>6=TC B</p> <p>7=TC E</p> <p>8=TC N</p>	Unsigned 16 bits	R/W	Voltage	40004	3
INPUT 2 TYPE	<p>0=Voltage ($\pm 160\text{mV}$)</p> <p>1=TC J</p> <p>2=TC K</p> <p>3=TC R</p> <p>4=TC S</p> <p>5=TC T</p> <p>6=TC B</p>	Unsigned 16 bits	R/W	Voltage	40005	4

	7=TC E 8=TC N					
INPUT 3 TYPE	0=Voltage ($\pm 160\text{mV}$) 1=TC J 2=TC K 3=TC R 4=TC S 5=TC T 6=TC B 7=TC E 8=TC N	Unsigned 16 bits	R/W	Voltage	40006	5
INPUT 4 TYPE	0=Voltage ($\pm 160\text{mV}$) 1=TC J 2=TC K 3=TC R 4=TC S 5=TC T 6=TC B 7=TC E 8=TC N	Unsigned 16 bits	R/W	Voltage	40007	6
IN1-FILTER	0 = not active 1= minimum filter ... 6 = maximum filter	Unsigned 16 bits	R/W	Not active	40008	7
IN2-FILTER	0 = not active 1= minimum filter ... 6 = maximum filter	Unsigned 16 bits	R/W	Not active	40009	8

IN3-FILTER	0 = not active 1= minimum filter ... 6 = maximum filter	Unsigned 16 bits	R/W	Not active	40010	9
IN4-FILTER	0 = not active 1= minimum filter ... 6 = maximum filter	Unsigned 16 bits	R/W	Not active	40011	10
Status	[BIT15] Input 4 burn-out error [BIT14] Input 3 burn-out error [BIT13] Input 2 burn-out error [BIT12] Input 1 burn-out error [BIT 11] Input 4 acquisition error [BIT 10] Input 3 acquisition error [BIT 9] Input 2 acquisition error [BIT 8] Input 1 acquisition error [BIT 7] Save Configuration in Flash memory (if bit =1) [BIT 6..4]	Unsigned 16 bits	R/W	\	40012	11

	<p>Not used</p> <p>[BIT 3]</p> <p>Configuration error</p> <p>[BIT 2]</p> <p>Data-configuration acquisition error</p> <p>[BIT 1]</p> <p>Generic error (linked to led blinking)</p> <p>[BIT 0]</p> <p>Reset, if set to 1 the device will reboot</p>					
Channel 1 Integer Measure	<p>Channel 1 Measure in °C*10 or mV/0.005</p> <p>Example (TC)</p> <p>220 = 22.0°C</p> <p>Example (Voltage)</p> <p>1848 = 9.24 mV</p>	Signed 16 bits	R	/	40013	12
Channel 2 Integer Measure	<p>Channel 2 Measure in °C*10 or mV/0.005</p> <p>Example (TC)</p> <p>220 = 22.0°C</p> <p>Example (Voltage)</p> <p>1848 = 9.24 mV</p>	Signed 16 bits	R	/	40014	13
Channel 3 Integer Measure	<p>Channel 3 Measure in °C*10 or mV/0.005</p> <p>Example (TC)</p> <p>220 = 22.0°C</p> <p>Example (Voltage)</p> <p>1848 = 9.24 mV</p>	Signed 16 bits	R	/	40015	14

Channel 4 Integer Measure	Channel 4 Measure in °C*10 or mV/0.005 Example (TC) 220 = 22.0°C Example (Voltage) 1848 = 9.24 mV	Signed 16 bits	R	/	40016	15
FIRMWARE REVISION	Firmware revision internal code	Unsigned 16	R	/	40017	16
Errors	BIT[15:12] Not Used BIT[11] ADC Zero error BIT[10] Not Used BIT[9] Setting error BIT[8] Calibration Error BIT[7..3] Not Used BIT[2] Cold Junction TC 3-4 Error BIT[1] Cold Junction TC 1-2 Error BIT[0] ADC Error	Unsigned 16 bits	R	/	40019	18
Channel 1 Floating	Channel 1 Measure in °C or mV Available only from revision firmware 667	Floating Point 32 Bit	R	/	40027-40028	26-27

Point Measure						
Channel 2 Floating Point Measure	Channel 2 Measure in °C or mV Available only from revision firmware 667	Floating Point 32 Bit	R	/	40029-40030	28-29
Channel 3 Floating Point Measure	Channel 3 Measure in °C or mV Available only from revision firmware 667	Floating Point 32 Bit	R	/	40031-40032	30-31
Channel 4 Floating Point Measure	Channel 4 Measure in °C or mV Available only from revision firmware 667	Floating Point 32 Bit	R	/	40033-40034	32-33

6. LEDs for signalling

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

LED	LED status	Meaning
PWR	Constant light	The power is on
ERR	Blinking light	The module has at least one of the errors described in RS485 Registers table
	Constant light	Module failure
RX	Constant light	Verify if the bus connection is corrected
	Blinking light	The module received a data packet
TX	Blinking light	The module sent a data packet
	Constant light	Module failure

7. Easy-SETUP

To configure the Seneca Z-PC Line modules, you can use the Easy-SETUP software, download the software from:

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

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The configuration can be performed by RS232 or RS485 bus communication.

You Need the S117P1 for configuring through the RS232 Jack port or RS485 the device:

<https://www.seneca.it/en/linee-di-prodotto/acquisizione-dati-e-automazione/moduli-di-comunicazione/convertitori-seriali-usb/s117p1>