INSTALLATION MANUAL

Z-8TC-LAB

Modbus RTU Module
with 8 ThermoCouple Inputs

EN



SENECA

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MODULE DESCRIPTION

Z-8TC-LAB is a digital converter for thermocouples, with 8 measurement channels, collected into 4 terminal groups, insulated up to 1.5 kV, among them, from power supply and from serial communication line. The module is characterized by a six-point overall insulation.

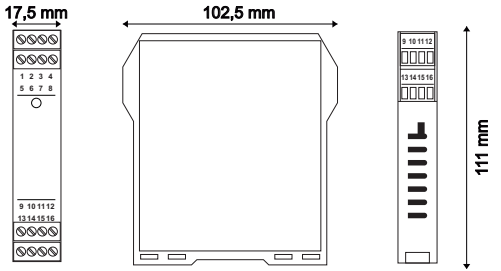
GENERAL CHARACTERISTICS

- Thermocouples measurement type: J, K, E, N, S, R, B, T.
- Measurement available in the following sizes: Voltage (µV) or Temperature (°C, °F, °K) on Integer 16 bit and Floating-point 32 bit, direct o swapped.
- High acquisition speed.
- Protection against electrostatic discharge (ESD) up to 4 kV.
- Programmable value in case of fault or freezing of last measurement.
- Easy power supply and serial bus wiring by means of the Seneca Z-BUS housed in the DIN rail.
- Removable screw terminals for section Max. 1.5 mm^2 cable.
- DIP switches configurable or software configurable communication parameters.
- RS485 Serial communication with MODBUS-RTU protocol.
- Frontal USB Port for MODBUS-RTU configuration and communication.
- Channels individually activable and configurable in pairs.

For the two inputs of each terminal group, the following common settings are available:

- Measurement adjustable for temperature or mV.
- Programmable filter for reading stabilization.
- Rejection programmable at 50 Hz or 60 Hz.
- Three configurable acquisition speeds (two 14-bit and one 15-bit).
- Integrated cold-junction compensation.

MODULE LAYOUT



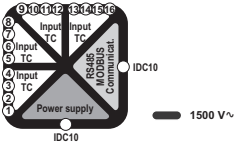
Dimensions (L×H×W)	17,5 x 102,5 x 111 mm
Weight	140 g.
Case	Material PA6, Black color.

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LED SIGNALLING ON FRONT PANEL

LED	State	LEDs Meaning
PWR (Green)	On	Power supply presence
	Off	The device is powered off
FAIL (Yellow)	On	Fault or Failure: power supply lack, failed channel, failed Thermocouple, internal communication error.
RX (Red)	On	Data reception from RS485 communication port.
TX (Red)	On	Data transmission to RS485 communication port.

TECHNICAL SPECIFICATIONS

STANDARDS	**EN61000-6-4** Electromagnetic emission, industrial environment **EN61000-6-2** Electromagnetic immunity, industrial environment **EN61010-1** Safety
INSULATION	
ENVIRONMENTAL COND. *Temperature* *Humidity* *Altitude* *Storage temperature* *Protection degree*	 -20 – +65°C. EEPROM storing guaranteed in the range: 0 – 50 °C. 30% – 90% not condensing Up to 2000 m a.s.l. -20 – + 85°C IP20
MOUNTING	IEC EN60715 DIN Rail
CONNECTIONS	Removable 4-way terminals, 3.5 mm pitch, for cable max. 1.5mm^2. Rear IDC10 connector for CEI EN60715 rail Micro USB frontal panel connector.
POWER SUPPLY *Tension* *Power absorbed*	 10 – 40 Vdc or 19 – 28 Vac 50 – 60 Hz Max. 0.6W
COMMUNICATION PORTS	RS485 on IDC10 rear connector.
PROTOCOLS	MODBUS-RTU.
TC INPUTS *Number of channels*	Thermocouple type: J, K, E, N, S, R, B, T. 8

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TECHNICAL SPECIFICATIONS

TC INPUTS

Measurement range

TC type	Allowed Range	Linearization error	TC type	Allowed Range	Linearization error
J	-210 – 1200 °C	0.05 °C	S	-50 – 1768 °C	0.02 °C
K	-200 – 1372 °C	0.05 °C	R	-50 – 1768 °C	0.02 °C
E	-200 – 1000 °C	0.02 °C	B	250 – 1820 °C (*)	0.03 °C
N	-200 – 1300 °C	0.04 °C	T	-200 – 400 °C	0.04 °C

(*)Up to 250 °C: the input is considered equivalent to a null temperature value.

Span mV	-10,1 – 81,4 mV.
Impedance	10 MΩ.
ADC	Configurable to 14 or 15 bit.
Total error	14 bit ADC and Rejection 50 Hz: "(0,040 % + 13 µV). 15 bit ADC and Rejection 50 Hz: "(0,035 % + 10 µV). 14 bit ADC and Rejection 60 Hz: "(0,045 % + 16 µV). 15 bit ADC and Rejection 60 Hz: "(0,040 % + 12 µV).
Thermal Drift	< 100 ppm/K.
Disturbance Rejection	Configurable to 50 Hz or to 60 Hz.
Cold Junction Error	<1 °C.
Test Current	<50 nA.
CMRR (1)	>155 dB (tested port towards all the other ones at GND).
DMRR (1) (2)	>60 dB.

(1) The values are valid at the setted rejection frequency, with the filter ON.
(2) For disturbance values where the input signal peak does not exceed the limit of acceptability.

Refernce Standard	EN60584-1 (ITS-90).

PRELIMINARY WARNINGS



Before performing any operation is mandatory to read the full contents of this manual. The module may only be used by qualified and skilled technicians in the field of electric installation. Specific documentation is available for download at website: www.seneca.it/products/z-8tc-lab.



Only the Manufacturer is authorized to repair the module or to replace damaged parts. The product is susceptible to electrostatic discharge, take appropriate countermeasures during any operation.



No warranty is granted in connection with faults resulting from improper use, from modifications or repairs carried out by Manufacturer-unauthorized personnel on the device, or if the content of this user Manual is not followed..



It is forbidden to place anything that could obstruct the ventilation slits.
It is forbidden to install the module near heat sources.

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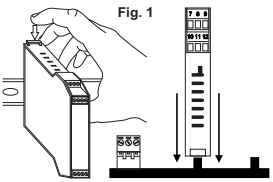
PRELIMINARY WARNINGS

Disposal of electrical & electronic equipment (applicable throughout the EU and other countries with separate collection programs). The symbol found on this product or on its packaging, indicates that this product it must be handed over to an authorised collection point for **the recycling of electrical and electronic equipments.**

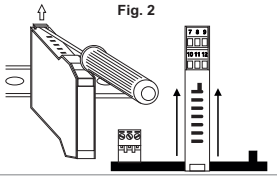
INSTALLATION RULES

In order to ensure optimum performance and a longest working life, the module(s) must be provided with adequate ventilation and no raceways or other objects that obstruct the ventilation slots.
Never install the modules near heat sources.
We recommend installation in the lower part of the control panel.

INSTALLATION ON AND REMOVAL FROM IEC EN 60715 DIN RAIL



Insertion on the IEC EN 60715 DIN rail:
1) Move the two hooks on the back of the module outwards as illustrated in **Pic.2**.
2) Insert the module rear IDC10 connector into a free slot of DIN rail accessory as you can see in **Pic.1**.
(the insertion is one way only because the connectors are polarized).
3) To secure the module to the IEC EN 60715 DIN rail, tighten the two hooks on the side of the IDC10 rear connector as shown in **Pic.1**.



Removal from IEC EN 60715 DIN rail:
As shown in **Pic.2**:
1) Move outwards the two hooks on the side of the module, with the help of a screwdriver.
2) Extract the module from the IEC EN 60715 DIN rail.

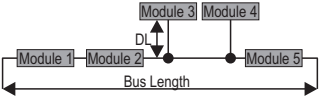
MODBUS CONNECTION STANDARDS

1) Install the modules on the DIN rail (max 120).
2) Connect the remote modules using cables of proper length.
On the table the following data about the cables length are provided:
-Bus Length: Modbus network maximum length as a function of the Baud rate.
It is the length of the cables which connect the two bus terminators modules (see ● **MODBUS** table).
-Drop Length: maximum length of a drop line (see ● **MODBUS** table).

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MODBUS CONNECTION STANDARDS

• MODBUS



DL: Derivation Length

Bus length	Derivation Length	Baudrate
1200 m	2 m	115kbps

In order to obtain maximum performances it's recommended to use a specific shielded cable, as an example BELDEN 9841.

USE OF Z-PC-DINAL ACCESSORY

Don't force the insertion of the IDC10 connector into the Z-PC-DIN bus.
The rear IDC10 connector of the module will be inserted on a free slot of Z-PC-DIN accessory.
In the figure you can see the meaning of the various pins of the rear IDC10 connector if you want to provide the signals directly through this connector. The pictures **Pic.3** and **Pic.4** show how to connect powersupply and RS485 COM1 port to the rear IDC10 connector.

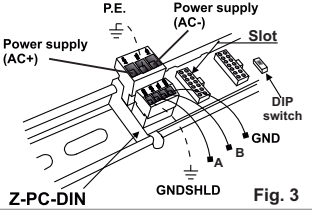


Fig. 3

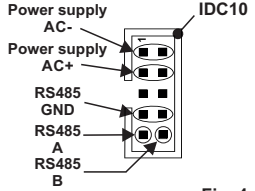


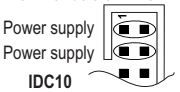
Fig. 4

In case of Z-PC-DINAL2-17,5 accessory use, the signals may be provided by terminal blocks.
The figure shows the meaning of terminals and the position of DIP-switch (present on each DIN rail supports) for network termination (not used in case of Modbus network).
GNDSHLD: Shield to protect the signal inside the connection cables from electromagnetic disturbances (recommended).

ELECTRICAL CONNECTIONS

• POWER SUPPLY

19 – 28Vac 50 – 60 Hz
10 – 40Vdc 0.6 W Max



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

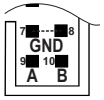
• USB

The module has a micro USB port on frontal panel for configuration and MODBUS-RTU parameters communication.

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ELECTRICAL CONNECTIONS

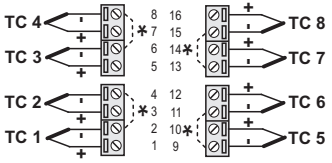
• RS485



RS485
IDC10

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

• 8 TC INPUTS



The module input accepts thermocouples type:
J, K, E, N, S, R, B, T.
For electrical connections it is recommended to use shielded cable.

* The two channels that are part of the same terminal block have the ground terminal internally connected and aren't isolated between them. However, 1.5 kV insulation is guaranteed between channels of different terminal blocks.

MODBUS REGISTERS

Detailed information about list of MODBUS registers and their functions are available inside the **USER MANUAL** (Z-8TC).

CONFIGURATIONS

• INPUT FILTER

The filtering methods can be set for each pair of channels.
The filter consists of two independent low-pass filters:
-FIR Filter , in running average, able to increase the rejection of disturbances to the mains power line frequency and to reduce measuring noise.
-IIR exponential Filter, with programmable time constant, able to dampen fluctuations.

If an step input variation higher than 0.75 mA is detected, both filters are forced to adapt rapidly to the new value, stabilising it only later on.
Detailed information about filter settings are available inside the **USER MANUAL** in the REGISTER MODBUS section.

• SOFTWARE CONFIGURATIONS

The **EASY SETUP** configuration software, allows the parameter setting.
This software is available for free on the Internet site: www.seneca.com.
Some parameters can also be set using **DIP-switches.**

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DIP-SWITCHES CONFIGURATION

Before setting the DIP switches you must disconnect the power supply.
The DIP-switches position defines the Modbus Address and Baud Rate communication parameters. In the following table the Baud Rate and Address values are listed as a function of the DIP-switches position.

BAUD RATE	SW1	
	1	2
9600		
19200		
38400		
57600		

ADDRESS	SW1					
	3	4	5	6	7	8
1						
2						
...	...	...	...	...	...	...
63						

LEGENDA	
	ON
	OFF

BAUD RATE AND ADDRESS FROM EEPROM								
SW1	1	2	3	4	5	6	7	8

Terminatore RS485	SW1
	10
ON	
OFF	

Note: If switches from 1 to 8 are in OFF position, communication settings are retrieved from EEPROM.
2nd Note: The termination of the RS485 line must be carried out only at the ends of the communication line.

FACTORY SETTINGS

• DEFAULT CONDITION FOR THE CONFIGURATION PARAMETERS OF THE MODULE

The instrument is configured from the factory with **All DIP-switches at OFF position ⬇**

RS485 MODBUS protocol comunication parameters:	38400, 8,N,1 Addr. 1

• DEFAULT INPUT CONDITIONS FOR CHANNEL GROUPS OF THE MODULE

Enabling	Both channels are enabled
Given data	°C
Cold joint compensation	Enabled
Rejection	50 Hz
ADC / Filter	ADC 15 bit with average filter
Thermocouple type	J for both channels

USB COMMUNICATION PORT

The USB communication port has priority over the port RS485 and is closed after 3 s of inactivity. The parameters (not configurable) for USB port are: 2400, 8,N,1 Addr. 1. The protocol is MODBUS RTU.

CONTACTS

Technical support	support@seneca.it	Product Informations	sales@seneca.it

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