



4 input current – voltage acquisition module Z-4AI

GENERAL SPECIFICATIONS

- Voltage and current input up to +/- 10Vdc, +/- 20 mAdc.
- Sampling time 400 ms @ 14 bit + sign, 200 ms @ 13 bit + sign
- Input protection up to 60 V.
- 1.500Vac input insulation with respect to remaining low voltage circuits.
- Possibility of power supply and serial bus facilitated wiring by means of a bus that can be housed in the DIN guide alternatively to the terminals.
- RS485 serial communication with MODBUS – RTU protocol, maximum 32 nodes.
- Insertion in and removal from bus without interruption of bus communication or power supply.
- Communication times below 20 ms (@ 38400 baud).
- Connection distance up to 1200 m.

TECHNICAL SPECIFICATIONS

Power Supply	19–40 Vdc, 19–28 Vac 50-60Hz, max 2.5 W; 1.0 W @ 24 Vdc without sensors power supply.				
Communication port	2 wire RS485 serial with settable speed: 9600, 19200, 38400, 57600 baud.				
Protocol	Modicon MODBUS – RTU.				
Voltage input	Two-pole with f.s. +/-10 Vdc or +/- 2 Vdc, input impedance 100 Kohm, resolution: 14/13 bit + sign.				
Current input	Two-pole with f.s. 20 mA, with loop power supply, input impedance 100 ohm, resolution 14/13 bit + sign				
Supply sensor	Supply for sensor 20 Vdc, 40 mA max, protect against overload.				
Errors	Calibration	Linearity	Zero stability	Thermal stability	Other
Voltage	0.1% d.m.	0.02% d.s	0.02% d.s	0.01%/°C d.m.	1% d.s. (1)
Current	0.2% d.m.	0.02% d.s	0.02% d.s	0.01%/°C d.m.	1% d.s. (1)
Ambient conditions	Temperature: 0..55°C, min. humidity: 30%, max 90% at 40°C non-condensing				
Protection rating	IP20				
Weight, dimensions	140g, 100 x 112 x 17.5 mm				
CE Standards	The instrument complies with the following standards: EN50081-2 (electromagnetic emission, industrial environment), EN50082-2 (electromagnetic immunity, industrial environment), EN61010-1 (safety) All circuits must be insulated with double insulation against circuits under dangerous voltage. The power supply transformer must comply with EN60742 standards for insulation transformers and safety transformers.				
(1) for possible electromagnetic interference					



IMPORTANT

A program known as Z-PROG can be downloaded from the www.seneca.it site for the initial programming and testing of the product.

The module has been designed for vertical installation on a DIN 46277 guide. For optimal operation and long life, adequate ventilation must be provided for the module(s), avoiding positioning channels that obstruct the ventilation louvers. Avoid fitting modules above equipment that generates heat; you are advised to fit them at the bottom of the panel.

HARSH OPERATING CONDITIONS:

When the modules are fitted side by side it may be if the panel temperature is above 45°C and operating conditions are harsh.

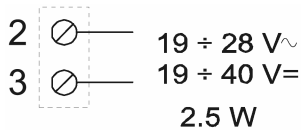
The following constitute harsh operating conditions:

- High power supply voltage (> 30Vdc / > 26 Vac).
- Sensors power supply with high power consumption (> 20 mA).

NOTE: Use of the DIN guide connectors supplied on request ensures practical fitting and correct ventilation of the modules, in addition to reducing the number of electrical cables.

ELECTRICAL CONNECTIONS

POWER SUPPLY



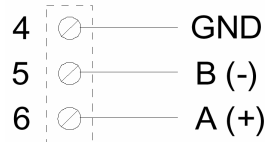
The power supply voltage must be between 19 and 40 Vdc (any polarity) or 19 and 28 Vac; see also section **INSTALLATION**.

The upper limit must not be exceeded as this can seriously damage the module.

The power supply source must be protected from any failures in the module by means of a suitably sized fuse. The module can be powered via the DIN guide connectors.

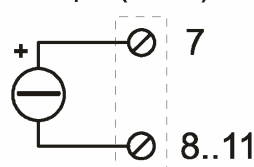
INPUTS / OUTPUTS

RS-485



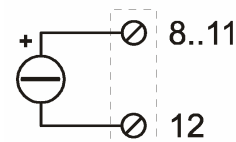
Connection for communication RS485 with system master MODBUS. For other information see section SERIAL INTERFACE.

mA input (2 wire)

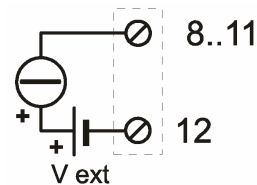


Connection for passive sensor (2 wire) 4..20 mA. (*)
Not more of two sensors with this kind of connection.
The module can't supply max 40 mA to load.

mA input

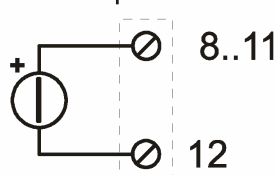


Connection for active sensor 4..20 mA or 0..20 mA. (*)



Connection for passive sensor (2 wire) 4..20 mA with external power supply. (*)

V input



Connection for sensor with voltage output up to a +/-10 Vdc.

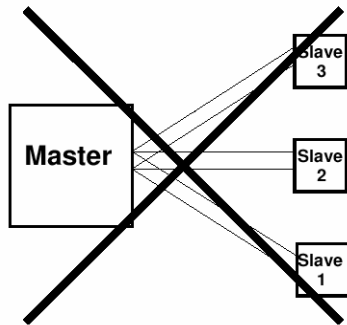
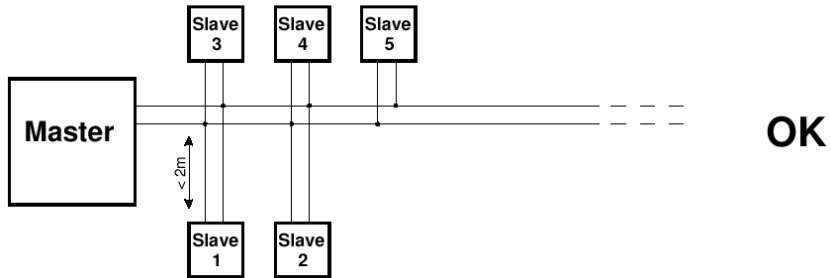
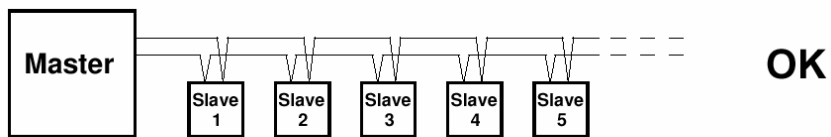
(*) to use current input dip switch must be closed (ON). This operation inserts a resistance from 100 ohm in parallel to input and allow to obtain a signal of +/- 2000 mV corresponding of +/- 20 mA.

The RS485 serial interface is based on a balanced differential communication line with typical impedance of 120 ohm. The maximum length of the connection is not defined but depends on the communication speed, the signal-interference ratio and the cable quality.

Generally the maximum length with guaranteed operation is fixed at 1200 m. The connection cable does not have to be shielded if the distance is only a few metres in a "low noise" electrical environment. For distances between 15 and 100 m a shielded twisted cable can be used without particular specifications whereas for connections over 100 m you are advised to use, for example, CEAM CPR 6003 or BELDEN 9841 cable.

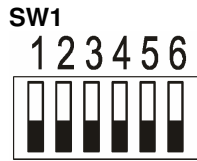
The communication line should preferably be of the chain type, avoiding star configurations and limiting branches to a few metres (see figure below). The ends of the line must be terminated by setting the related dip-sw on the module to ON, or by fitting a resistance of 120 ohm parallel to the line.

The cable shield must be connected to the terminal on both sides, and connected to earth on at least one side. If necessary to reduce interference, the other side should be connected to earth by means of a 10 nF capacitor.



SETTING THE DIP-SWITCHES

One side of the module features the dip-switches which are useful for selecting the following functions:



To use current input the dip switches have to be set ON. 100 ohm resistance allows to convert 4..20 mA signal into a 0/4.. 2 V voltage readable by the module.

Dip-switch	Status	Function
SW1.1	ON	Insert a 100 ohm resistance on channel 1
SW1.2	ON	Insert a 100 ohm resistance on channel 2
SW1.3	ON	Insert a 100 ohm resistance on channel 3
SW1.4	ON	Insert a 100 ohm resistance on channel 4
SW1.5	ON	Address, baud rate, parity, etc, read on EEPROM or setted by user.
	OFF	Address=001, baud rate=9.600, parity=none, nR bit=8, stop bit=1.
SW1.6		Not used

During the first programming it is possible to use the settings from EEPROM (SW 1.5=ON) which are programmed originally with **Address=001, Baud Rate=38.400, Parity=none, Bit Number=8, Stop bit=1.** When reprogramming the module (when address and speed are not known, for example) it is possible to use the default position that sets the fixed parameters visible in the box.

NOTE: At the end of programming, the dip-switch1.5 must be set to and the module re-set.

RS485 line termination

1



OFF



ON

The RS485 line must be terminated only at the ends of the communication line.

Reserved position

2



These dip-switch positions are reserved for future use.

Below, the numerical values are decimals unless indicated otherwise by the prefix '0x' for hexadecimal values or '0b' for binary values. The suffix (H) indicates the upper part of a word and (L) indicates the lower part.

MODBUS COMMANDS SUPPORTED

Command code	Description
3 - Read Holding Register	Permits reading of the RAM and EEPROM registers up to a maximum of 12 at a time.
6 – Preset Single Register	Permits writing of the RAM and EEPROM registers individually.
16 – Preset Multiple Register	Permits writing of the RAM registers up to a maximum of 10 at a time.

The following table lists and describes the Holding Registers present in the module.

For many registers the original copy exists in EEPROM. The address of this copy is given by the register number increased by 64. In the table below, for each address the EEPROM address is indicated if present. When the device is switched on (or at reset controlled by serial line) the RAM registers are initialised with the values contained in EEPROM. The EEPROM registers must therefore be programmed for configuration of the module. This configuration can be performed both with the module inserted in the bus together with other modules (obviously with a different address) or with module connected to the PC alone.

Address	Description / Valuers	Function
40001	MYTPE, VERS 0701, 0702	Contains the type (H) and number of the version (L) of the module. For the module Z-4AI we will have:: type=7, version=1 or 2. The value read is therefore worth 0x0701=1793 or 0x0702=1794. It can be used to automatically recognise a module inserted in the bus to replace a faulty one and appropriately re-programme it. Note: the version of the instrument can vary from the value indicated above according to the revisions and/or updates carried out.
40002 40066	BAUDR 0..4(H), 1..255(L)	Communication speed (H) and address (L) of the module. The speed can have the following values 0=4800bps, 1=9600, 2=19200, 3=38400, 4=57600. The address can be between 1 and 255.
40003 40067	EPRFLG	Flags for setting various functions, see details further on.
40004 40068	INFILT1 0..6	Filter on measure, setting values from 0 to 6, correspondents to: 0 = no filter, 1 = lower filter.... 6 = upper filter.
40005 40069	INFILT2 0..6	See before.
40006 40070	INFILT3 0..6	See before.
40007 40071	INFILT4 0..6	See before.
40008 40072	FSCALE1	Scale end on mV measured; when value join value setting on FSCALEx register NCHx assumes value 10000.
40009 40073	FSCALE2	See before.
40010 40074	FSCALE3	See before.
40011 40075	FSCALE4	See before.
40012 40076	ISCALE1	Beginning of scale in mV; when value join setting value on FSCALEx register NCHx takes value 0.
40013 40077	ISCALE2	See before.
40014 40078	ISCALE3	See before.
40015 40079	ISCALE4	See before.
40016	STATUS	Flags state indication, see beyond for details.

40017	NCH1	Measured value of channel with scale 0..10000, normalized with span and zero setting by FSCALEx e ISCALEx.
40018	NCH2	See before.
40019	NCH3	See before.
40020	NCH4	See before.
40021	UCH1	Measured value of channel with scale $\pm 0..16000$ not normalized. From FSCALEx and ISCALEx depends end scale used that can't be 2000 mV or 10 Vdc.
40022	UCH2	See before
40023	UCH3	See before
40024	UCH4	See before

Details of some register:

EPRFLG This register must be considered in binary format, i.e. each register bit activates (1) or de-activates (0) a function. The table shows the functions associated with each bit.

Bit	Function
40003.0	None
40003.1	=1: enables the double conversion speed function (at the expense of resolution). Practically speaking, the 400 ms speed used to convert all the channels becomes 200 ms and resolution passes from 14 bit (+ sign) to 13 bit (+ sign). In any case however, numerical representation remains identical: ± 16000 points.
40003.2	=1: sets the serial communication response delay. If enabled, there will be a minimum delay of 12 ms.
40003.3	Sets the use of serial communication parity bit: 0 = no parity, 1 = active parity.
40003.4	Sets the type of parity: 0 = even, 1 = odd.
40003.5	None
40003.6	None
40003.7	None
40003.8	None
40003.9	None
40003.10	None
40003.11	None
40003.12	None
40003.13	None
40003.14	None
40003.15	None

STATUS: This register must be considered in binary format, i.e. each active bit (=1) of the register corresponds to an error or warning status. The table shows the functions associated with each bit.

Bit	Function
40016.0	This bit can be set on 1 to obtain module RESET . After this operation automatically will return to 0.
40016.1	Reserved, not use.
40016.2	=1: EEPROM programming error. Results active if last programming of a register EEPROM is failed.
40016.3	=1: date programming error. Results active if settings of input type or filter value is not comprised between those admitted.
40016.4	None
40016.5	None
40016.6	None
40016.7	None
40016.8	=1: if the value of the channel 1 is upper than the maximum positive value allowed for the selected type input.
40016.9	=1: if the value of the channel 1 is lower than the maximum negative value allowed for the selected type input.
40016.10	=1: if the value of the channel 2 is upper than the maximum positive value allowed for the selected type input.
40016.11	=1: if the value of the channel 2 is lower than the maximum negative value allowed for the selected type input.

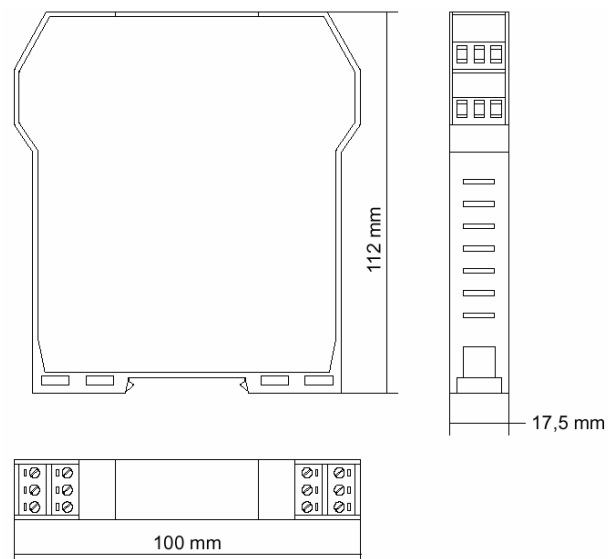
40016.12	=1: if the value of the channel 3 is upper than the maximum positive value allowed for the selected type input.
40016.13	=1: if the value of the channel 3 is lower than the maximum negative value allowed for the selected type input.
40016.14	=1: if the value of the channel 4 is upper than the maximum positive value allowed for the selected type input.
40016.15	=1: if the value of the channel 4 is lower than the maximum negative value allowed for the selected type input.

ERROR CODES

In some situations the module may respond with an exception message. The following table lists the situations and the related response codes.

Situation	Response code
Illegal register address	02
Number of registers requested illegal	04
EEPROM register programming error	08

DIMENSIONS



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