USER MANUAL

Z-4AI

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ORIGINAL INSTRUCTIONS

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Document revisions

DATE	REVISION	NOTES	AUTHOR
13/04/2011	E-MI002570	First release	EP
14/03/2016	E-MI002571	Changed company address. Added information on input filtering.	MM
23/12/2025	E-MI002572	Replacement of the graphic template in the manual. The registers present on the new firmware have been added. Replaced device configuration connection from RS232 to USB Micro.	AC

INDICE

1. *WARNINGS*

ATTENTION!

This user manual extends the information from the installation manual to the configuration of the device. Use the installation manual for more information.

ATTENTION!

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2. INTRODUCTION

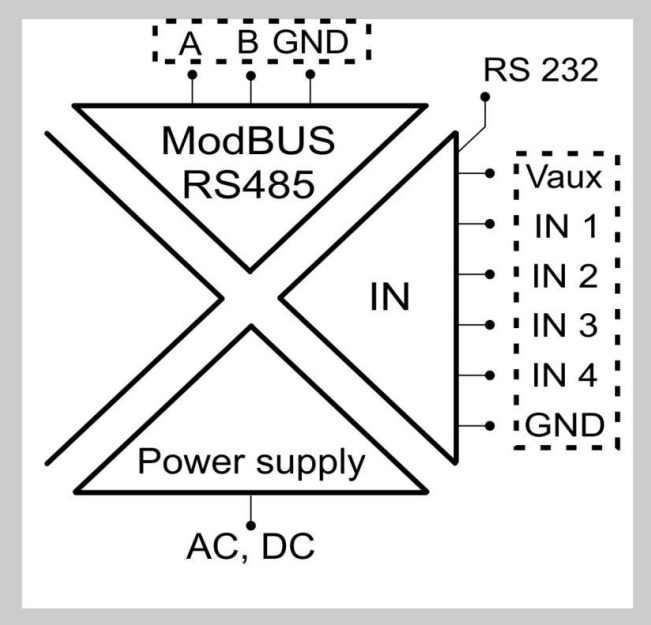
The Z-4AI module acquires up to 4 single-ended input signals (voltage or current type) and it converts them to a digital format (normalized measure).

3. GENERAL CHARACTERISTICS

- Each input configurable in voltage/current type
- Each input can be enable/disable
- Each input value can be scaled
- Modbus RTU communication
- Address and baud-rate configurable also by Dip-Switches
- Complete configuration from Easy Setup or ZNET software

4. FEATURES

INPUT	
Number	4
Resolution	16 bits (15+1 sign). If Electrical End-Scale (E.E.S.)<2V, resolution=60µV; if 2V<E.E.S.<10V, resolution=300µV
Sampling time	Configurable between: 120 ms or 60 ms
Accuracy	Initial: 0.1% of E.E.S.. If E.E.S.<2V, accuracy=2mV; if 2V<E.E.S.<10V, accuracy=10mV Linearity: 0.03% of E.E.S. (see initial accuracy) Zero: 0.05% of E.E.S. (see initial accuracy) Thermal stability: < 100 ppm/°K EMI: < 1%
Protection	± 30Vdc and 25mA
Voltage-type IN	Bipolar with E.S.S./E.E.S.(Electrical Start/End Scale) configurable between: ± 10Vdc. Input impedance: > 100 kΩ
Current-type IN	Bipolar with E.S.S./E.E.S. configurable between: ±20mA.Internal shunt:50Ω. To enable these shunts, use the «Analog inputs» Dip-Switches
Internal supply Vaux	The #7 screw terminals: power 13V to max90mA
CONNECTIONS	
RS485 interface	IDC10 connector for DIN 46277 rail (back-side panel) or (alternative) the screw terminals: 4(GND), 5(B), 6(A)
USB Micro	USB port for configuration
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: 2W (to power 4 current loop)

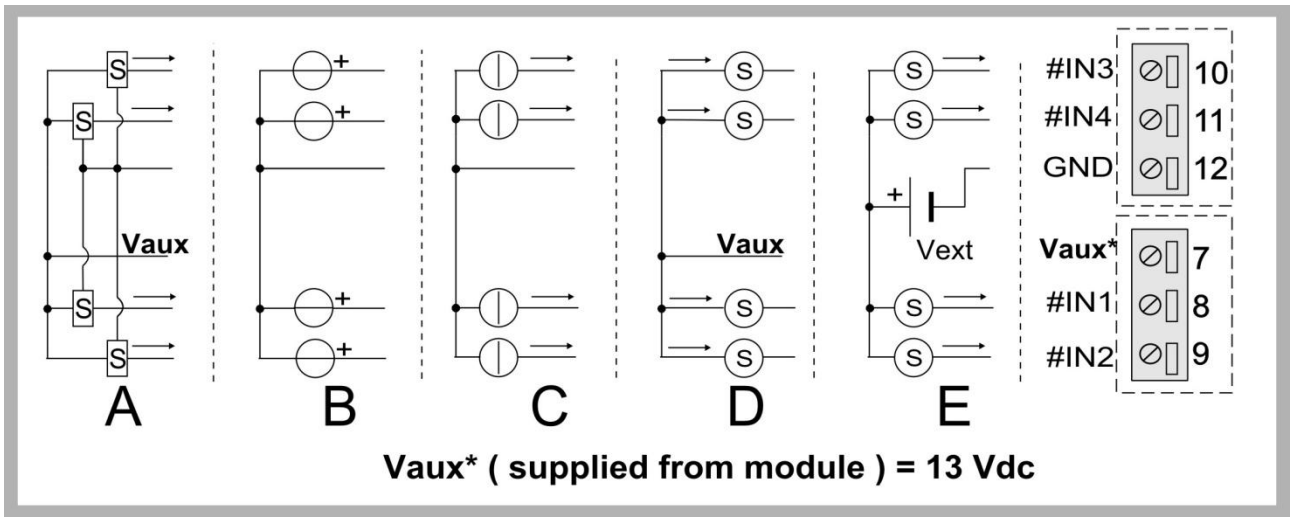
The power supply transformer necessary to supply the module must comply with EN60742 (Isolated transformers and safety transformers requirements). To protect the power supply, it is recommended to install a fuse.

5. INPUT CONNECTIONS

It is possible to connect two types of sensors to the Z-4AI module:

- Passive sensors, indicated with “S” label (these sensors have to be supplied: by a module external voltage Vext or by the module internal voltage Vaux);
- Active sensors, indicated with “voltage generator” or “current generator” label (these sensors have already been powered).

In the following figure are shown five possible sensor connections.



	Acquired signal	Up to	Connection modality	Sensors power supply
A	Voltage or current type	4 passive sensors	3-wire	Vaux (*)
B	Voltage type	4 sensors as voltage generator	2-wire	/
C	Current type	4 sensors as CURRENT generator	2-wire	/
D	Current-active type	4 sensori passivi	2-wire	Vaux (*)
E	Current-passive type	4 passive sensors	2-wire	Vext (connect “-” to GND)

(*) A and D connections are possible only if the absorbed currents sum from all sensors: <90mA.

6. *DIP-SWITCHES TABLE*

BAUD-RATE (Dip-Switches: DIP-SWITCH STATUS) – (SW1)		
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) – (SW1)						
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	**o**	OFF	OFF	Address = 4
…	…	…	…	…	…	……
ON	ON	ON	ON	ON	ON	Address = 63

RS485 TERMINATOR (Dip-Switches: DIP-SWITCH STATUS) – (SW1)		
9	10	Meaning
OFF	OFF	RS485 terminator disabled
OFF	ON	RS485 terminator enabled

INPUT TYPE (Dip-Switches: ANALOG INPUTS) – (SW2)								
1	2	3	4	5	6	7	8	Meaning
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	Voltage IN1
ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	Current IN1
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	Voltage IN2
OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	Current IN2
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	Voltage IN3
OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	Current IN3
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	Voltage IN4
OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	Current IN4

7. RS485 REGISTER TABLE

ADDRESS (4x)	ADDRESS OFFSET	REGISTER	RANGE	DESCRIPTION	R/W	TYPE
40001	0	MachineID	-	Id_Code (Module ID) - Default: 0x07 - Bit [15:8]	R	MSB, LSB
				Ext_Rev (Module version) - Bit [7:0]		
40002	1	Baudrate Address	-	Baud-rate for RS485 (baud-rate of module/node if parameters are configurated by memory modality): 0=4800; 1=9600; 2=19200; 3=38400; 4=57600; 5=115200; 6=1200; 7=2400 - Default: 38400 - Bit [15:8]	R/W	MSB, LSB
				Address for RS485(address of module if parameters are configurated by memory modality):from 0x01=1 to 0xFF=255 - Defaut: 1 - Bit [7:0]		
40003	2	Eprflag	-	These bits aren't used - Default: / - Bit [15:5]	R/W	MSB, LSB
				Parity for RS485: 0=even parity; 1=odd parity – Default: 0 - Bit 4		
				Parity for RS485: 0=there isn't; 1=there is - Default: 0 – Bit 3		
				Delay for RS485 (delay of communication response: pauses between the end of Rx message and the start of Tx message): 0=there isn't; 1=there is - Default: 0 - Bit 2		
				Sampling time: 0=120 ms; 1=60 ms - Default: 0 - Bit 1		

ADDRESS (4x)	ADDRESS OFFSET	REGISTER	RANGE	DESCRIPTION	R/W	TYPE
				Compatibility with: 0=Z-4AI-0; 1=Z-4AI-1 - Default: 1 - Bit 0		
40004	3	IN1 - FILTER	Between: 0, 6	Filter applied to input 1 signal: 0=deactivated; 1=filtering min-value; 6=filtering max-value Default: 0	R/W	WORD
40005	4	IN2-FILTER	Between: 0, 6	Filter applied to input 2 signal: 0=deactivated; 1=filtering min-value; 6=filtering max-value Default: /	R/W	WORD
40006	5	IN3-FILTER	Between: 0, 6	Filter applied to input 3 signal: 0=deactivated; 1=filtering min-value; 6=filtering max-value Default: /	R/W	WORD
40007	6	IN4-FILTER	Between: 0, 6	Filter applied to input 4 signal: 0=deactivated; 1=filtering min-value; 6=filtering max-value Default: /	R/W	WORD
40008	7	IN 1-EES	±10000 [mV] (if voltage), ±20000 [µA] (if current)	Electrical End Scale (E.E.S.) of input 1 [mV or µA] Default: 10000 [mV]	R/W	WORD
40009	8	IN 2-EES	±10000 [mV] (if voltage), ±20000 [µA] (if current)	Electrical End Scale (E.E.S.) of input 2 [mV or µA] Default: 10000 [mV].	R/W	WORD
40010	9	IN 3-EES	±10000 [mV] (if voltage), ±20000 [µA] (if current)	Electrical End Scale (E.E.S.) of input 3 [mV or µA] Default: 10000 [mV]	R/W	WORD
40011	10	IN 4-EES	±10000 [mV] (if voltage), ±20000 [µA] (if current)	Electrical End Scale (E.E.S.) of input 4 [mV or µA] Default: 10000 [mV]	R/W	WORD
40012	11	IN 1-ESS	±10000 [mV] (if voltage), ±20000 [µA] (if current)	Electrical Start Scale (E.S.S.) of input 1 [mV or µA] Default: 0 [mV]	R/W	WORD
40013	12	IN 2-ESS	±10000 [mV] (if voltage), ±20000 [µA] (if current)	Electrical Start Scale (E.S.S.) of input 2 [mV or µA] Default: 0 [mV]	R/W	WORD

ADDRESS (4x)	ADDRESS OFFSET	REGISTER	RANGE	DESCRIPTION	R/W	TYPE
40014	13	IN 3-ESS	±10000 [mV] (if voltage), ±20000 [µA] (if current)	Electrical Start Scale (E.S.S.) of input 3 [mV or µA] Default: 0 [mV]	R/W	WORD
40015	14	IN 4-ESS	±10000 [mV] (if voltage), ±20000 [µA] (if current)	Electrical Start Scale (E.S.S.) of input 4 [mV or µA] Default: 0 [mV]	R/W	WORD
40016	15	Status	-	Input 4 underflow: 0=no; 1=yes - Bit 15 Default: / Input 4 overflow: 0=no; 1=yes - Bit 14 Default: / Input 3 underflow: 0=no; 1=yes - Bit 13 Default: / Input 3 overflow: 0=no; 1=yes is - Bit 12 Default: / Input 2 underflow: 0=no; 1=yes - Bit 11 Default: / Input 2 overflow: 0=no; 1=yes - Bit 10 Default: / Input 1 underflow: 0=no; 1=yes - Bit 9 Default: / Input 1 overflow: 0=no; 1=yes - Bit 8 Default: / Save configuration in memory (EEPROM): 0=deactivated; 1=activated - Bit 7 Default: 0 These bits aren't used - Bit [6:2] Default: /	R/W	BIT

ADDRESS (4x)	ADDRESS OFFSET	REGISTER	RANGE	DESCRIPTION	R/W	TYPE
				Reset of filter: 0=deactivated; 1=activated - Bit 1 Default: 0 Reset of module: 0=deactivated; 1=activated - Bit 0 Default: 0		
40017	16	IN 1	Between: IN 1-NSS, IN 1-NES (if bit 40003.0=0); unchangeable between: 0,10000 (if bit40003.0=1)	Normalized measure of input 1	R	WORD
40018	17	IN 2	Between: IN 2-NSS, IN 2-NES (if bit 40003.0=0); unchangeable between: 0,10000 (if bit40003.0=1)	Normalized measure of input 2	R	WORD
40019	18	IN 3	Between: IN 3-NSS, IN 3-NES (if bit 40003.0=0); unchangeable between: 0,10000 (if bit40003.0=1)	Normalized measure of input 3	R	WORD
40020	19	IN 4	Between: IN 4-NSS, IN 4-NES (if bit 40003.0=0); unchangeable between: 0,10000 (if bit40003.0=1)	Normalized measure of input 4	R	WORD
40025	24	INType	-	These bits aren't used - Bit [15:4] Default: / Input 4-type: 0=voltage; 1=current - Bit 3 Default: 0 Input 3-type: 0=voltage; 1=current - Bit 2 Default: 0	R/W	BIT

ADDRESS (4x)	ADDRESS OFFSET	REGISTER	RANGE	DESCRIPTION	R/W	TYPE
				Input 2-type: 0=voltage; 1=current - Bit 1 Default: 0 Input 1-type: 0=voltage; 1=current - Bit 0 Default: 0		
40026	25	IN 1-NES	±32000	Normalized End Scale (N.E.S.) of input 1 Default: 10000	R/W	WORD
40027	26	IN 2-NES	±32000	Normalized End Scale (N.E.S.) of input 2 Default: 10000	R/W	WORD
40028	27	IN 3-NES	±32000	Normalized End Scale (N.E.S.) of input 3 Default: 10000	R/W	WORD
40029	28	IN 4-NES	±32000	Normalized End Scale (N.E.S.) of input 4 Default: 10000	R/W	WORD
40030	29	IN 1-NSS	±32000	Normalized Start Scale (N.S.S.) of input 1 Default: 0	R/W	WORD
40031	30	IN 2-NSS	±32000	Normalized Start Scale (N.S.S.) of input 2 Default: 0	R/W	WORD
40032	31	IN 3-NSS	±32000	Normalized Start Scale (N.S.S.) of input 3 Default: 0	R/W	WORD
40033	32	IN 4-NSS	±32000	Normalized Start Scale (N.S.S.) of input 4 Default: 0	R/W	WORD
40035	34	FWREV	-	Firmware Code	R	WORD
40036	35	Errors	-	These bits aren't used - Bit [15:5] Default: / Parity for RS485: 0=even parity; 1=odd parity - Bit 4 Default: 0 Parity for RS485: 0=there isn't; 1=there is - Bit 3 Default: 0	R	BIT

ADDRESS (4x)	ADDRESS OFFSET	REGISTER	RANGE	DESCRIPTION	R/W	TYPE
				Delay for RS485 (delay of communication response: pauses between the end of Rx message and the start of Tx message): 0=there isn't; 1=there is - Bit 2 Default: 0 Sampling time: 0=120 ms; 1=60 ms - Bit 1 Default: 0 Compatibility with: 0=Z-4AI-0; 1=Z-4AI-1 - Bit 0 Default: 1		
40055	54	(IN2-IN1)	-	Register active since firmware revision 737. This register calculates the difference between the channels.	R	WORD
40056	55	(IN1-IN2)	-	Register active since firmware revision 737. This register calculates the difference between the channels.	R	WORD
40057	56	(IN4-IN3)	-	Register active since firmware revision 737. This register calculates the difference between the channels.	R	WORD
40058	57	(IN3-IN4)	-	Register active since firmware revision 737. This register calculates the difference between the channels.	R	WORD

8. LED 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
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

9. FILTER

A filter can be configured from Easy Setup or ZNET4 software. The filter effect is represented in the following table:

	Conversion time 60 ms	Conversion time 120 ms
Filter Value	Response time at 62% of final value [s]	
0	0,24	0,48
1	0,48	0,96
2	0,72	1,44
3	1,2	2,4
4	2,6	5,3
5	5	10
6	10	20

The filter is an exponential $(1 - e^{(-\frac{t}{\tau})})$ of the first order.

10. Easy-SETUP

To configure the Seneca Z-PC Line modules, it is possible to use Easy-SETUP software, Free-downloadable from the www.seneca.it; the configuration can be performed by RS232 or RS485 bus communication.