USER MANUAL

ZC-3AO

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MI00271-2

Seneca Z-PC Line module: **ZC-3AO**

The ZC-3AO supplies 3 single-ended analog signals (voltage or current type), with two types of communication: CANopen protocol, ModBUS protocol (RS232 serial).

General characteristics

Hardware

- Analog outputs either in current 0–20 mA or in bidirectional voltage -10 – 10 V
- High accuracy and resolution.
- Fast response time (typical <20ms)
- 1500 VAC isolation amongst outputs, power supply and CAN interface.
- Protection against ESD discharge up to 4 kV.
- Adjustable rejection at 50 and 60Hz.
- Simplified power supply and serial bus wiring by means of the bus housed in the DIN rail.
- Output protection, both in voltage output (against short circuit or applied voltage) or in current output (against applied voltage)

Software

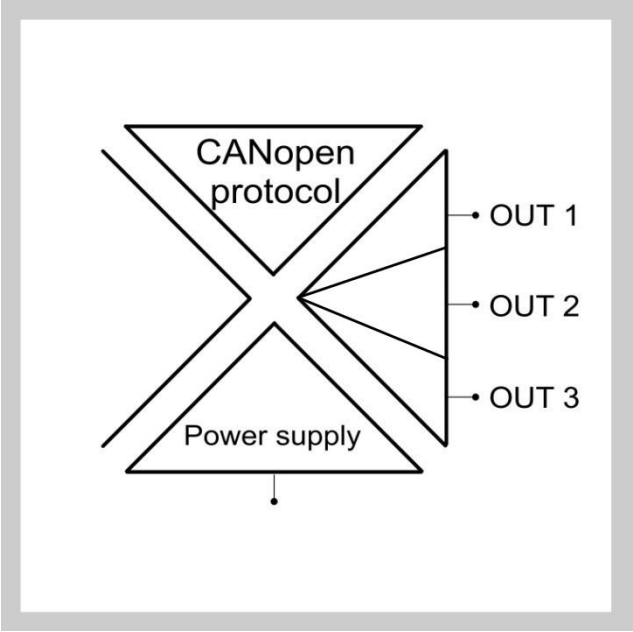
- Singularly activable channels.
- Output either in current or in voltage selectable by programming
- Minimum and maximum values for the three analog outputs selectable independently each other
- Led Indications: Power Supply, CAN communication, MODBUS-RTU communication, Inputs fault.

Communication

- CAN Interface with CANopen protocol: up to 1 Mbps speed.
- CANopen Baud rate and Node ID configurability by DIP-switches or software.
- Node guarding or heartbeat
- RS232 Serial Communication with MODBUS-RTU protocol
- Complete configurability through specific software downloadable in the website www.seneca.it

Features

OUTPUT	
Number	3
Type	Selectable by programming Bidirectional -10.5 V..10.5V, push-pull configuration Unidirectional 0..20.5 mA, current source configuration
Accepted impedance	Voltage output: > 1 kΩ Current output: < 600 Ω
Max open circuit voltage	~17 V for one current output
CONVERSION/ACCURACY SPECIFICATIONS	
DAC	14 bits
Accuracy	Calibration: 0.01% Linearity: 0.02%
Thermal drift	< 100 ppm/°C
Noise rejection	50 or 60 Hz
CONNECTIONS	
Removable terminals	Removable 3-way screw terminals, 5.08 mm pitch
IDC10 rear connector	CAN interface and power supply (for DIN rail)
Stereophonic frontal jack	3.5 mm for RS232 connection (COM)
1500 Vac ISOLATIONS	
	Between: power supply, CAN, outputs



POWER SUPPLY	
Supply voltage	10 – 40 Vdc or 19 – 28 Vac (50Hz - 60Hz)
Power consumption	Max: 2.5 W

The power supply transformer necessary to supply the module must comply with EN60742 (Isolated transformers and safety transformers requirements).

NOTE: "0x" means a hexadecimal number interpretation.

CANOpen features

TECHNICAL DATA	
Baud rate	20, 50, 125, 250, 500, 800, 1000 kbps
Typ min to max output time	20 ms for all 3 outputs
Channel range in voltage mode	From -10.5 V to +10.5 V
Channel range in current mode	From 0 to 20.5 mA
CANOpen TECHNICAL DATA	
NMT	slave Node guarding, heartbeat
Node ID	HW switch or software
Number of PDO	1 RX
PDO modes	Event triggered, Sync (cyclic), Sync (acyclic)
PDO mapping	Variable
PDO linking	supported
Number of SDO	1 server
Error message	yes
Supported application	Cia 301 v4.02
Layer	Cia 401 v2.01

CANOpen TPDOs transmission type supported

Object Value 0x180x Sub 2	TRANSMISSION TYPE
0	Synchronous - acyclic
From 1 to 240	Synchronous - cyclic
255	Asynchronous

CANOpen PDOs mapping

OBJECTS FOR DEFAULT MAPPING				
PDO NR	**COB-ID**	**MAPPED OBJECTS**	**INDEX**	**SUBINDEX**
RPDO2	0x00000300 + NodeId	Output value CH1 ±10000	0x6411	1
		Output value CH2 ±10000	0x6411	2
		Output value CH3 ±10000	0x6411	3

Note that TPDO COB-ID must start with 0x4.

CANOpen emergency message

The Emergency message is composed by:

2 bytes of EEC (Emergency error code)

1 bytes of ER (Error register)

4 bytes MEF (Manufacturer error filled objects) (0x1002)

For EEC code 0xFF10, the emergency message is:

EMERGENCY MESSAGE				
BYTE 0	BYTE 1	BYTE 2	BYTE 3	BYTE 4
0xFF10		0x81	MEF	

With this MEF:

MEF (Manufacturer-specific Error Field) for EEC 0xFF10		
BIT	**DESCRIPTION**	**OBJECT FOR ERROR DETAILS**
15	Disability ch1	0x2120 subindex 1
14	Disability ch2	0x2120 subindex 2
13	Disability ch3	0x2120 subindex 3
12	NA	
11	Channel 1 saturation	
10	Channel 2 saturation	
9	Channel 3 saturation	
8	NA	
7	Communication error	0x2121 subindex 1
6	Channels global error	
5..0	NA	

For “voltage error”, the emergency message is:

EMERGENCY MESSAGE				
BYTE 0	BYTE 1	BYTE 2	BYTE 3	BYTE 4
0xFF10		0x85	Object 0x2100	

For a “timeout command” or “error command”, the emergency message is:

EMERGENCY MESSAGE					
BYTE 0	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5
0xFF11		0x81	Channel ID	Object 0x2103 subindex channelID	

Where the meaning of CHANNEL ID is:

CHANNEL ID	
CHANNEL ID	**DESCRIPTION**
0x01	Channel 1-2
0x02	Channel 3-4
0x03	Channel 5-6
0x04	Channel 7-8

For “CPU ERROR” the Emergency message will be:

EMERGENCY MESSAGE						
BYTE 0	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6
0xFF20		0x81	Object 0x1002			

EEC	
CODE	**DESCRIPTION**
0x0000	No error
0x1000	Generic error
0x4201	CPU temperature over T_HIGH_HIGH
0x4202	CPU temperature over T_HIGH
0x4203	CPU temperature under T_LOW
0x8110	Communication Can Overrun
0x8120	Error passive
0x8130	Life Guard error
0x8140	Recovered from bus off
0xFF10	General input channels error
0xFF11	Command for input channel error
0xFF20	CPU error

ER							
BIT 7	**BIT 6**	**BIT 5**	**BIT 4**	**BIT 3**	**BIT 2**	**BIT 1**	**BIT 0**
Generic	0	Voltage	temperature	communication	0	0	Manufacture

Where bit equal to “0” means “no error”.

Object 0x1002: manufacturer status register

Object 0x1002 is the CPU status.

OBJECT 1002	
BIT	**DESCRIPTION**
31..10	NA
9	Good data value
8	Precision data value
7..1	NA
0	Flash CRC ERROR

Object 0x1006: communication window lenght

OBJECT 1006	
MIN VAL [ms]	**MAX VAL [ms]**
10	10000

Object 0x1007: synchronous window lenght

OBJECT 1007	
MIN VAL [ms]	**MAX VAL [ms]**
2	2000

CANOpen manufacturer specific profile

If dip-switches are in “from memory” mode, the node address is selectable by **Object 0x2001**.

NODE ADDRESS (Object 0x2001)	
Object value	**Description**
0..127	Node address

If dip-switches are in “from memory” mode, the baud rate is selectable by **Object 0x2002**.

BAUDRATE (Object 0x2002)	
Object value	**Description**
1	20 kbit/s
2	50 kbit/s
3	125 kbit/s
4	250 kbit/s
5	500 kbit/s
6	800 kbit/s
7	1 Mbit/s

Object 0x2030 can be used to monitor the CPU temperature.

CPU TEMPERATURE (Object 0x2030)	
Subindex	**Description**
1	Actual temperature [°C/10]
2	Temperature for HOT STOP ERROR [°C/10] 95.0°C
3	Temperature for HOT ERROR [°C/10] 90.0°C
4	Temperature for COLD ERROR [°C/10] -25.0°C

The HOT STOP temperature sends in pre-operational the station.

The HOT ERROR and the COLD ERROR temperature sends the Emergency Object.

The Object is Read Only.

Object 0x2100 contains the channel status:

CHANNEL STATUS (Object 0x2100)	
Command code	**Description**
15	Channel 1 disable
14	Channel 2 disable
13	Channel 3 disable
12	NA
11	Channel 1 saturation
10	Channel 2 saturation
9	Channel 3 saturation
8	NA
7	Channels communication error
6	Channels fail
5..0	NA

Object 0x2106 contains the channel configuration:

CHANNEL CONFIGURATION (Object 0x2106)	
Subindex	**Description**
1	Channel 1 enable (0=disable, 1=enable)
2	Channel 2 enable (0=disable, 1=enable)
3	Channel 3 enable (0=disable, 1=enable)
4	Channel 1 mode (0=voltage, 1=current)
5	Channel 2 mode (0=voltage, 1=current)
6	Channel 3 mode (0=voltage, 1=current)
7	Channel 1 fault action (0=last good, 1=load preset)
8	Channel 2 fault action (0=last good, 1=load preset)
9	Channel 3 fault action (0=last good, 1=load preset)

Integer scale process

Integer input objects can be scaled by a BEGIN (referred to 0 mV or 0 µA) for a 0 integer value and a END (referred to 10000mV or 20000 µA) for a 10000 integer value.

The formula is: Out=BGN + ((END-BGN)/10000)*VAL

Begin for integer scale

The object sets the customization of the associated mV or µA output value to the 0 integer value.

0x2600	
Subindex	**Description**
1	Begin value for channel 1 [mV] or [µA]
2	Begin value for channel 2 [mV] or [µA]
3	Begin value for channel 3 [mV] or [µA]

End for integer scale

The object sets the customization of the associated mV or µA output value to the 10000 integer value.

0x2601	
Subindex	**Description**
1	End value for channel 1 [mV] or [µA]
2	End value for channel 2 [mV] or [µA]
3	End value for channel 3 [mV] or [µA]

DIP-SWITCH configuration

BAUD-RATE (Dip-Switches: SW1)			
1	2	3	Meaning
			Only Baud-Rate is acquired from memory(EEPROM)
		●	20 kbps
	●		50 kbps
	●	●	125 kbps
●			250 kbps
●		●	500 kbps
●	●		800 kbps
●	●	●	1 Mbps

ADDRESS (Dip-Switches: SW1)							
4	5	6	7	8	9	10	Meaning
							Only address is acquired from memory(EEPROM)
						●	Address=1
					●		Address=2
					●	●	Address=3
				●			Address=4
				●		●	Address=5
X	X	X	X	X	X	X	……
●	●	●	●	●	●	●	Address=127

CANOpen LED description

SERVICE (DIAGNOSTIC) LED DESCRIPTION		
LED	**LED status**	**Meaning**
RUN	Blinking light	Pre-operational mode
	Single flash	Stop mode
	ON	Operational mode
ERROR	Single flash	At least one error counter has reached or exceed the warning level
	Double flash	Guard event
	Triple flash	The SYNC has not received within the configurated communication cycle timeout period
	ON	The CAN controller is bus off
	OFF	No error
FAIL	Blinking	Data receiving from RS232
	ON	At least one channel is in error mode
POWER	ON	Power supply

Object for analog data

Object 0x6411 contains the ±10000 values for channel 1..3 (in agreement with objects 0x2600, 0x2601 and 0x2106) (±10000 for voltage mode, 0..10000 for current mode).

OUTPUT VALUE (Object 0x6411)	
Subindex	**Description**
1	Channel 1 ±10000 output value
2	Channel 2 ±10000 output value
3	Channel 3 ±10000 output value

Object 0x6443 contains the fault mode for outputs.

If FAULT MODE=0 Hold last value

If FAULT MODE=1 Load object 0x6444 value

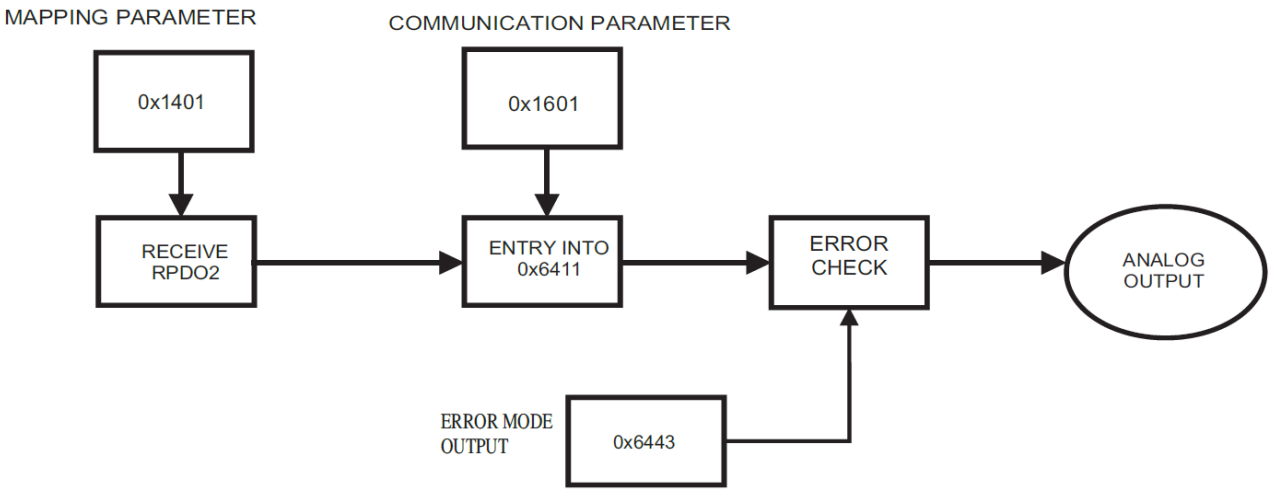
FAULT OUTPUT MODE (Object 0x6443)	
Subindex	**Description**
1	Channel 1 fault mode
2	Channel 2 fault mode
3	Channel 3 fault mode

Object 0x6444 contains the ±10000 values for channels 1..3 to load in case of fault (±10000 for voltage mode, 0..10000 for current mode).

FAULT OUTPUT VALUE (Object 0x6444)	
Subindex	**Description**
1	Channel 1 fault output value
2	Channel 2 fault output value
3	Channel 3 fault output value

CANOpen functional diagram

counter mode ON (subindex 1 Object 0x6003=”0”)



CANOpen Object dictionary

COMMUNICATION PROFILE AREA						
INDEX	**SUB INDEX**	**NAME**	**DESCRIPTION**	**TYPE**	**ACCESS**	**DEFAULT**
0x1000	0	Device type	Profile 401=0x191	UNSIGNED 32	RO	0x00080191
0x1001	0	Error register	Error register (DS401)	UNSIGNED 8	RO	0
0x1002	0	Manufacturer Status register	Status register	UNSIGNED 32	RO	0
0x1005	0	SYNC COB-ID	The device consumes the SYNC message	UNSIGNED 32	RW	0x00000080
0x1006	0	Comm. window lenght	Sync interval [us]	UNSIGNED 32	RW	0
0x1007	0	Synchronous window lenght	The window [us] for the PDO transmission after the SYNC	UNSIGNED 32	RW	0
0x1008	0	Manufacturer Device name	Device name	VISIBLE STRING	RO	“ZC-3AO”
0x1009	0	Manufacturer HW version	Hardware version	VISIBLE STRING	RO	“SC000000”
0x100A	0	Manufacturer SW version	Software version	VISIBLE STRING	RO	“SW001150”
0x100C	0	Guard Time	[ms]	UNSIGNED 16	RW	0
0x100D	0	Life time factor	Max delay between two guarding telegrams= Guard_Time· Life_Time_Factor	UNSIGNED 8	RW	0
0x1010	0	Store parameters/ number of mapped object	Max subindex number	UNSIGNED 8	RO	5
	1	Save all parameters	Store not volatile parameters (write in ASCII “save” for store process MSB 0x65766173 LSB)	UNSIGNED 32	RW	1
	2	Save communication parameters	Store not volatile parameters (write in ASCII “save” for store process MSB 0x65766173 LSB)	UNSIGNED 32	RW	1
	3	Save application parameters	Store not volatile parameters (write in ASCII “save” for store process MSB 0x65766173 LSB)	UNSIGNED 32	RW	1
	4	Save manufacturer parameters	Store not volatile parameters (write in ASCII “save” for store process MSB 0x65766173 LSB)	UNSIGNED 32	RW	1
	5	Save slave parameters	Store not volatile parameters (write in ASCII “save” for store process MSB 0x65766173 LSB)	UNSIGNED 32	RW	1

0x1011	0	Restore default/ number of mapped object	Max subindex number	UNSIGNED 8	RO	5
	1	Restore all parameters	Restore not volatile parameters (write in ASCII “load” for store process MSB 0x64616F6C LSB)	UNSIGNED 32	RW	0
	2	Restore communication parameters	Restore not volatile parameters (write in ASCII “load” for store process MSB 0x64616F6C LSB)	UNSIGNED 32	RW	0
	3	Restore application parameters	Restore not volatile parameters (write in ASCII “load” for store process MSB 0x64616F6C LSB)	UNSIGNED 32	RW	0
	4	Restore Manufacturer parameters	Restore not volatile parameters (write in ASCII “load” for store process MSB 0x64616F6C LSB)	UNSIGNED 32	RW	0
	5	Restore slave parameters	Restore not volatile parameters (write in ASCII “load” for store process MSB 0x64616F6C LSB)	UNSIGNED 32	RW	0
0x1014	0	COB-ID emergency Object		UNSIGNED 32	RO	$NODEID+ 0x80
0x1017	0	Heartbeat producer time	Time (ms) 0x0000=there is not heartbeat service	UNSIGNED 16	RW	0
0x1018	0	Identity object/ number of mapped object	Max subindex number	UNSIGNED 8	RO	4
	1	Vendor ID	Seneca srl	UNSIGNED 32	RO	0x00000249
	2	Product code	ZC-3AO Machine ID Code	UNSIGNED 32	RO	0x0000001E
	3	Revision number		UNSIGNED 32	RO	0
	4	Serial number		UNSIGNED 32	RO	0
0x1200	0	1st SDO port/ number of mapped object	Max subindex number	UNSIGNED 8	RO	2
	1	COB-ID SDO Client-> Server	COB-ID of receive SDO	UNSIGNED 32	RO	$NODEID+ 0x600
	2	COB-ID SDO Server-> Client	COB-ID of transmit SDO	UNSIGNED 32	RO	$NODEID+ 0x580
0x1400	0	1st receive PDO parameter/	Max subindex number	UNSIGNED 8	RO	2

		number of mapped object				
	1	COB-ID used by PDO	COB-ID of TxPDO1	UNSIGNED 32	RO	$NODEID+ 0x200
	2	Transmission type		UNSIGNED 8	RO	255
0x1401	0	2nd receive PDO parameters /number of mapped object	Max subindex number	UNSIGNED 8	RO	3
	1	COB-ID used by PDO		UNSIGNED 32	RW	$NODEID+ 0x300
	2	Transmission type	Transmission type forTxPDO2 0x00=synchronous-acyclic 0x01 to 0xF0 =synchronous- cyclic 0xFF=asynchronous	UNSIGNED 8	RW	0xFF
	3	Inhibit time		UNSIGNED 16	RW	0x00
0x1600	0	1st receive PDO mapping parameter/ number of mapped object	Max subindex number	UNSIGNED 8	RO	0
0x1601	0	2nd receive PDO mapping parameter	Max subindex number	UNSIGNED 8	RW	3
	1	1st object to be mapped	First object (default: channel 1, ±10000 output)	UNSIGNED 32	RW	0x64110110 Object=0x6411 Subindex=1 Length=16bit
	2	2nd object to be mapped	Second object (default: channel 2, ±10000 output)	UNSIGNED 32	RW	0x64110210 Object=0x6411 Subindex=2 Length=16bit
	3	3rd object to be mapped	Third object (default: channel 3, ±10000 output)	UNSIGNED 32	RW	0x64110310 Object=0x6411 Subindex=3 Length=16bit

MANUFACTURER PROFILE AREA

INDEX	SUB INDEX	NAME	DESCRIPTION	TYPE	ACCESS	DEFAULT
0x2001	0	Module address	Station address (only if dip switch 4,5,6,7,8,9,10 are OFF)	UNSIGNED 8	RW	0x7F=127
0x2002	0	Baudrate	Station Baudrate (only if dip switch 1,2,3 are OFF) 1=20kbps 2=50kbps 3=125kbps 4=250kbps 5=500kbps 6=800kbps	UNSIGNED 8	RW	0x01

			7=1Mbps			
0x2003	0	Master firmware code		UNSIGNED 16	RO	1152
0x2030	0	Device temperature/ number of parameters	Max subindex number	UNSIGNED 8	RO	4
	1	Internal temperature	Station internal temperature [°C/10]	INTEGER 16	RO	0
	2	Hi Hi temperature	Critical hot temperature (all operations stop) [°C/10]	INTEGER 16	RO	950
	3	Hi temperature	Warning for too hot temperature [°C/10]	INTEGER 16	RO	900
	4	Low temperature	Critical low temperature (all operations stop) [°C/10]	INTEGER 16	RO	-250
0x2106	0	Channel configuration/ number of parameters	Max subindex number	UNSIGNED 8	RO	6
	1	Channel 1 enable	0=disable 1=enable	UNSIGNED 8	RW	1
	2	Channel 2 enable	0=disable 1=enable	UNSIGNED 8	RW	1
	3	Channel 3 enable	0=disable 1=enable	UNSIGNED 8	RW	1
	4	Channel 1 mode	0=voltage 1=current	UNSIGNED 8	RW	0
	5	Channel 2 mode	0=voltage 1=current	UNSIGNED 8	RW	0
	6	Channel 3 mode	0=voltage 1=current	UNSIGNED 8	RW	0
0x2600	0	Begin integer scale/ number of parameters	Max subindex number	UNSIGNED 8	RO	3
	1	Begin scale CH1	Begin scale [mV] or [µA]	INTEGER 16	RW	0
	2	Begin scale CH2	Begin scale [mV] or [µA]	INTEGER 16	RW	0
	3	Begin scale CH3	Begin scale [mV] or [µA]	INTEGER 16	RW	0
0x2601	0	End integer scale	Max subindex number	UNSIGNED 8	RO	3
	1	End scale CH1	End scale [mV] or [µA]	INTEGER 16	RW	10000
	2	End scale CH2	End scale [mV] or [µA]	INTEGER 16	RW	10000

	3	End scale CH3	End scale [mV] or [µA]	INTEGER 16	RW	10000
STANDARD DEVICE PROFILE AREA						
INDEX	**SUB INDEX**	**NAME**	**DESCRIPTION**	**TYPE**	**ACCESS**	**DEFAULT**
0x6411	0	±10000 Output/ number of output	Max subindex number	UNSIGNED 8	RO	3
	1	Output 1h	Channel 1 value ±10000 (from 0 to 10000 for current)	INTEGER 16	RW	0
	2	Output 2h	Channel 2 value ±10000 (from 0 to 10000 for current)	INTEGER 16	RW	0
	3	Output 3h	Channel 3 value ±10000 (from 0 to 10000 for current)	INTEGER 16	RW	0
0x6443	0	Error mode output/ number of output	Max subindex number	UNSIGNED 8	RO	3
	1	Error mode output 1	0=keep last 1=load object 0x6444	UNSIGNED 8	RW	0
	2	Error mode output 2	0=keep last 1=load object 0x6444	UNSIGNED 8	RW	0
	3	Error mode output 3	0=keep last 1=load object 0x6444	UNSIGNED 8	RW	0
0x6444	0	Error value output/ number of error value	Max subindex number	UNSIGNED 8	RO	3
	1	Error value output 1	Channel 1 integer analogue interrupt upper limit value [mV] or [µA]	INTEGER 16	RW	0
	2	Error value output 2	Channel 2 integer analogue interrupt upper limit value [mV] or [µA]	INTEGER 16	RW	0
	3	Error value output 3	Channel 3 integer analogue interrupt upper limit value [mV] or [µA]	INTEGER 16	RW	0

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.