USER MANUAL

ZC-24DI

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MI00268-4

Seneca Z-PC Line module: **ZC-24DI**

The ZC-24DI module acquires 24 single-ended digital signals, it converts them to a digital format (IN 1-24 state) and it counts the input-pulse number (pulse counter for IN 1-8).

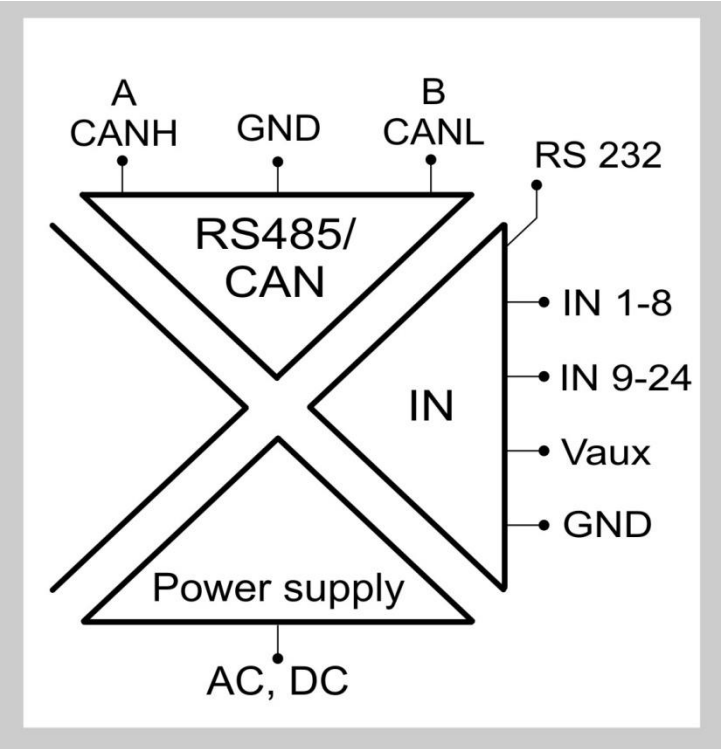
General characteristics

- Acquisition of digital signals from sensor: reed, NPN, PNP, proximity, contact, etc...
- Configuration of a filter applied to input signals IN1-IN8 (noise filter) to attenuate the noise overlapped to the digital signals
- Pulse counters for digital signals IN1-IN8, with max frequency equal to 10kHz, 32bit-registers
- Advanced management of the pulse counters for digital signals IN1-IN8 (for each pulse counter: overflow, preset value and reset/preset command are available)
- Power of 24 sensors using internal supply voltage (Vaux=16V)
- It is possible to configure the module (node) address and baud-rate by Dip-Switches
- It is possible to add/remove the module to/from RS485-bus without disconnecting the communication or power supply
- It is possible to switch automatically RS485 to RS232 or vice versa
- CAN interface with CANOpen protocol: max 1Mbps

Features

INPUT	
Number	24
Type	Polarity (EN 61131 – 2 type 2): sink (pnp)
Equivalent low-pass-filter cut-off frequency	Configurable between: 16 Hz and 2.1kHz
Pulse min duration (ton)	250µs
Sensor=off (input threshold)	The sensor is detected «off» if: acquired signal voltage between 0Vdc and 7 Vdc
Sensor=on (input threshold)	The sensor is detected «on» if: acquired signal voltage between 11Vdc and 30Vdc
Switching delay	Typical: 1.2ms; max: 3ms
Adsorbed current	3mA (for each input)
Internal supply Vaux	The screw terminals 24-32 (Vaux) supply 16 V with reference to the screw terminal 7-15-23-31 (GND)

CONNECTIONS	
RS485 interface	IDC10 connector for DIN 46277 rail (back-side panel)
1500 Vac ISOLATIONS	
	Between: power supply, ModBUS RS485, digital inputs



POWER SUPPLY	
Supply voltage	10 – 40 Vdc or 19 – 28 Vac (50Hz - 60Hz)
Power consumption	Typical: 1.5W; Max: 2.5W

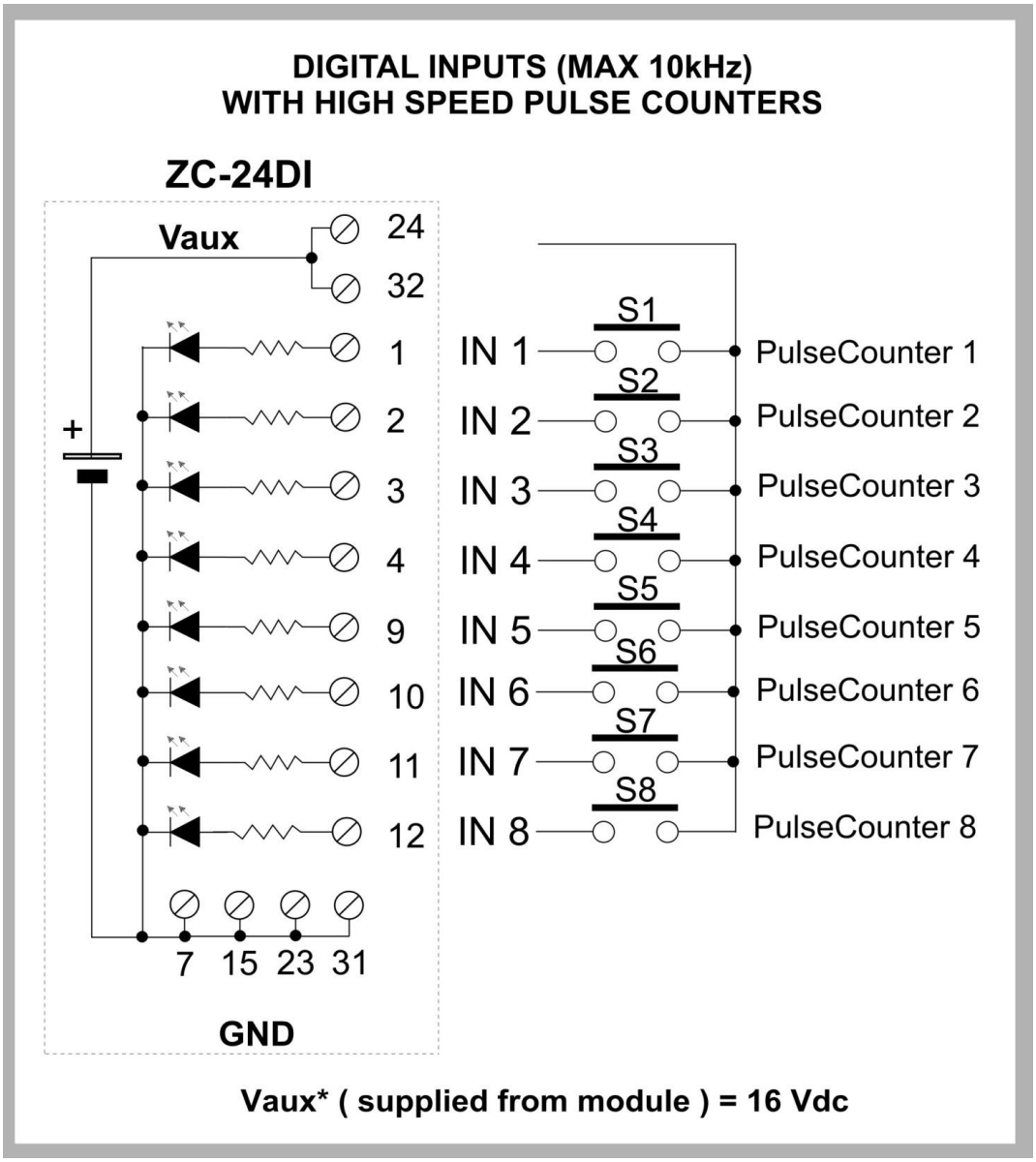
The power supply transformer necessary to supply the module must comply with EN60742 (Isolated transformers and safety transformers requirements). To protect the power supply, it is recommended to install a fuse.

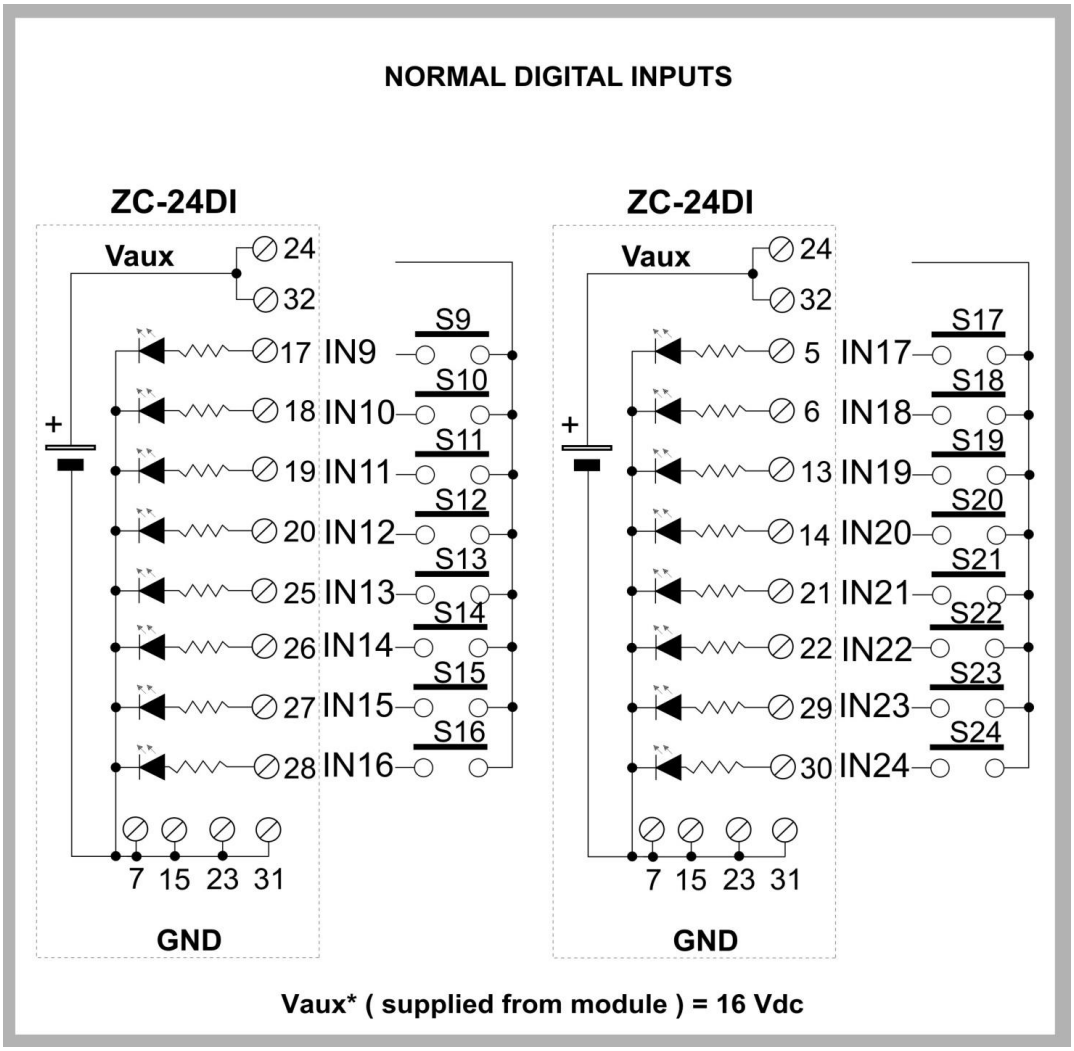
MODULE CASE	
Case-type	PBT, black
Dimensions	Width W = 100 mm, Height H = 112mm, Depth D = 35 mm
Terminal board	Removable 4-way screw terminals: pitch 3.5mm, sections 2.5mm^2
Protection class	IP20 (International Protection)

Input connections

Power on the module with < 40 Vdc or < 28 Vac voltage supply. These upper limits must not be exceeded to avoid serious damage to the module.

In the following figures are shown the connection of the sensors to the 24 inputs of ZC-24DI module. It's possible to connect to the module the sensors: Reed, NPN, PNP, Proximity, contact, etc... To power these sensors, connect each of them between the screw terminal 24 or 32 (Vaux=16V with reference to the screw terminal 7, 15, 23 or31 =GND) and one of the inputs IN1-24.




NORMAL DIGITAL INPUTS
ZC-24DI
Vaux
24
32
17 IN9
18 IN10
19 IN11
20 IN12
25 IN13
26 IN14
27 IN15
28 IN16
S9
S10
S11
S12
S13
S14
S15
S16
+
7 15 23 31
GND
ZC-24DI
Vaux
24
32
5 IN17
6 IN18
13 IN19
14 IN20
21 IN21
22 IN22
29 IN23
30 IN24
S17
S18
S19
S20
S21
S22
S23
S24
+
7 15 23 31
GND
Vaux* (supplied from module) = 16 Vdc

Dip-switches table

Power off the module before configuring it by Dip-Switches to avoid serious damage due to electrostatic discharges.

☞ In the following tables: box without circle means Dip-Switch=0 (OFF state); box with circle means Dip-Switch=1 (ON state).

BAUD-RATE (Dip-Switches: SW1)			
1	2	3	Meaning
			Only Baud-Rate is acquired from memory(EEPROM)
		●	Baudrate=2400
	●		Baudrate=4800
	●	●	Baudrate=9600
●			Baudrate=19200
●		●	Baudrate=38400
●	●		Baudrate=57600
●	●	●	Baudrate=115200

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

RS485 TERMINATOR (Dip-Switches: SW3)	
1	Meaning
	RS485 terminator disabled
●	RS485 terminator enabled

COMMUNICATION PROTOCOL (Dip-Switch: SW2 and SW4)		
SW2	**SW4**	
1	1	
		Protocol is ModBUS
●	●	Protocol is CANOPEN

RS485 Register table

Name	Range	Interpretation of register	R/W	Default	Address
MyType	/	MSB, LSB	R		40001
	Id_Code (Module ID)			0x20 (32 decimal)	Bit [15:8]
	Ext_Rev (Module version)				Bit [7:0]
FWREV	/	Word	R		40002
	Firmware Code				
Errors	/	Bit	R		40006
	These bits aren't used			/	Bit [15:8]
	Memory error (EEPROM): 0=there isn't; 1=there is			/	Bit 7
	These bits aren't used			/	Bit [6:4]
	Over-temperature error: 0=there isn't; 1=there is			/	Bit 3
	These bits aren't used			/	Bit [2:0]
Command	/	Word	R/W		40201
Reg.40201=0x5Cnn (preset counter values are loaded into pulse counters, using a bit interpretation to mask the inputs): load 40030,40031…40044,40045 into 40008, 40009…40022,40023. Examples: 0x5C01 allows to load PresetCounter1 into PulseCounter1 0x5C02 allows to load PresetCounter2 into PulseCounter2 0x5C03 allows to load PresetCounter1 into PulseCounter1 **and** PresetCounter2 into PulseCounter2 (**not** PresetCounter3 into PulseCounter3) and so on 0x5CFF allows to load every PresetCounter into corresponding PulseCounter					
Reg.40201=0x5Dnn (pulse counters value are loaded with zero values, using a bit interpretation to mask the inputs) Examples: 0x5D01 allows to load PulseCounter1 with zero value 0x5D02 allows to load PulseCounter2 with zero value 0x5D03 allows to load PulseCounter1 **and** PresetCounter2 with zero value (**not** PresetCounter3 with zero value) and so on 0x5DFF allows to load every PulseCounter with zero value					
Reg.40201=0x5Enn (counter overflows reset, using a bit interpretation to mask the inputs) Examples: 0x5E01 allows to reset PulseCounter1 overflow 0x5E02 allows to reset PulseCounter2 overflow 0x5E03 allows to reset PulseCounter2 overflow **and** to reset PulseCounter2 overflow (**not** to reset PulseCounter3 overflow) and so on 0x5EFF allows to reset every PulseCounter overflow					
Reg.40201=0x6BAC (the module writes the Dip-Switches-state in reg.40202)					
Reg.40201=0xBAB0 (save data in EEPROM memory)					
Reg.40201=0xC1A0 (module reset)					
Command aux		Bit	R		40202
	These bits aren't used			/	Bit [15:10]
	Dip-Switches "SW1 [4:10]" state. They correspond to the module baud-rate			/	Bit [9:3]
	Dip-Switches "SW1 [1:3]" state. They correspond to the module address			/	Bit [2:0]
Filter [IN1-8] masked	/	Word	R/W		40024
	These bits aren't used			/	Bit [15:8]

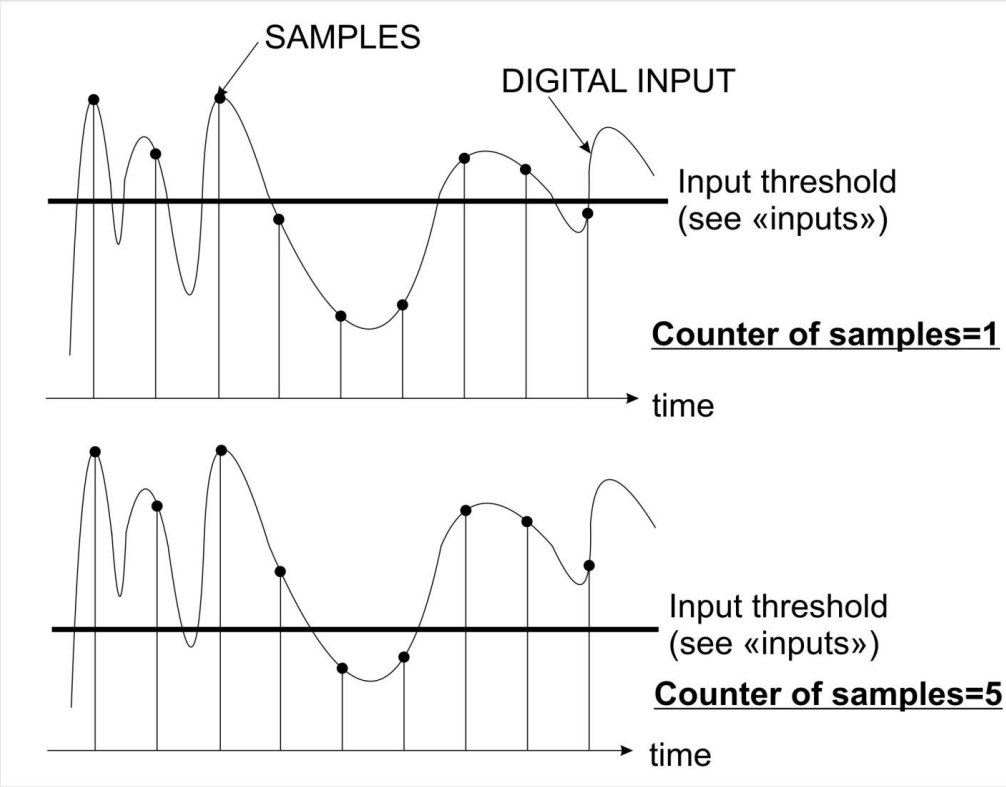
	Input [1..8] Filter enable Mask (only 0x00 or 0xFF allowed) 0x00 = Filter disabled (and Counters 1..8 Enabled) 0xFF = Filter enabled (and Counters 1..8 Disabled)			0xFF	Bit [7:0]
Filter [IN9-16] masked	/	Word	RO		40025
	These bits aren't used			/	Bit [15:8]
	Filter activation for inputs IN9-IN16 using a bit interpretation to mask the inputs: are always deactivated			0x00	Bit [7:0]
Filter [IN17-24] masked	/	Word	RO		40026
	These bits aren't used			/	Bit [15:8]
	Filter activation for inputs IN17-IN24 using a bit interpretation to mask the inputs: are always deactivated			0x00	Bit [7:0]

Filter Number Of Samples	From 0 to 255	Word	R/W		40027
	These bits aren't used				Bit [15:8]
	Number of samples for filter			0x28 (40 decimal)	Bit [7:0]
Filter Sup	From 0 to 255	Word	R/W		40028
	These bits aren't used				Bit [15:8]
	Inferior threshold for filter			0x14 (20 decimal)	Bit [7:0]
Filter Inf	From 0 to 255	Word	R/W		40029
	These bits aren't used				Bit [15:8]
	Superior threshold for filter			0x14 (20 decimal)	Bit [7:0]


Default equivalent filter value is 100Hz (cut-off frequency).

Filter functioning

Input filter operates in the following way: the ZC-24DI module samples the digital input with a frequency equal to 20kHz, and some samples are obtained (in the following figure there are 9 samples).



If counter of samples is greater than (or equal to) reg.40028 (Filter Sup), input signal is detected as “1”.

If counter of samples is less than (or equal to) reg.40029 (Filter Inf), input signal is detected as “0”.

If counter of samples is between reg.40029 (Filter Inf) and reg.40028 (Filter Sup), filter value is kept stored at the previous value.

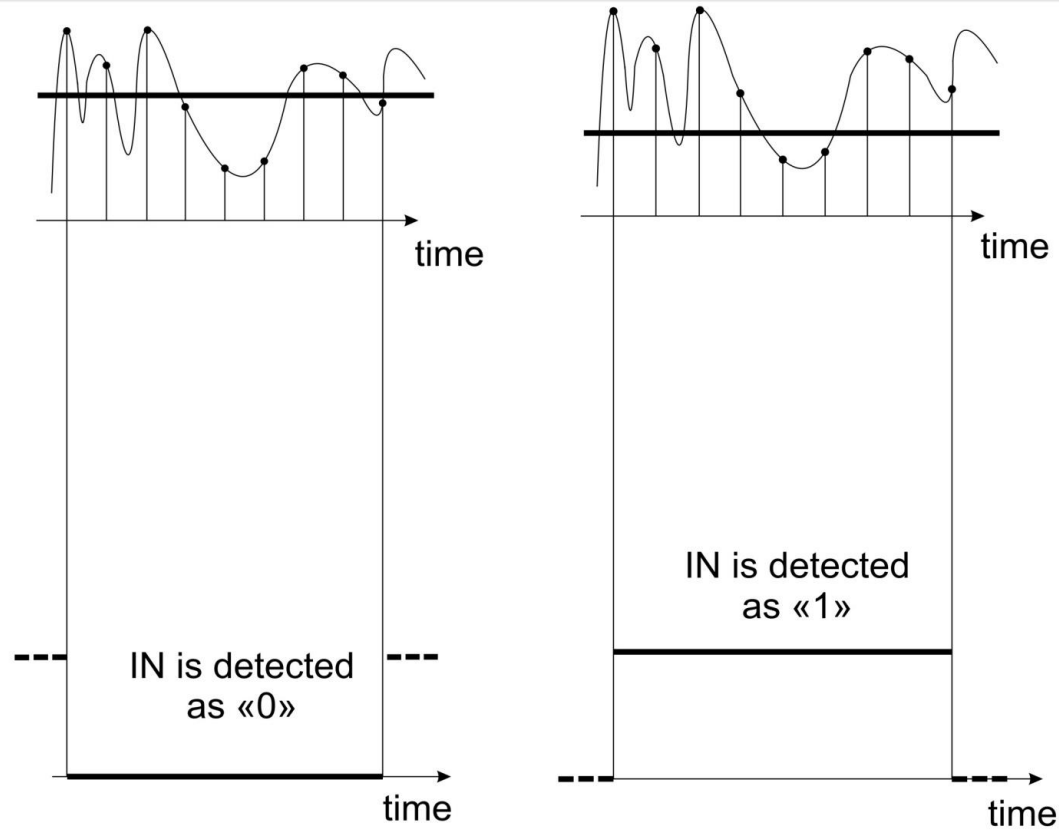
Example: with reference to the previous figure

A) Counter of samples (for superior figure)=0+1+1+1-1-1-1+1+1-1=**1**

If Filter Inf =2, Filter Sup=4: 1 ≥ 4 is false, 1 < 2 is true. So input is detected as “0”

B) Counter of samples (for inferior figure)=0+1+1+1+1-1-1+1+1+1=**5**

If Filter Inf =2, Filter Sup=4: 5 ≥ 4 is true, 5 < 2 is false. So input is detected as “1”



To deactivate the filter, write: reg.40027=0x01, reg.40028=0x00, reg.40029=0x00.

This filter action is described in configuration software as a low pass digital filter, with cut-off frequency from 16Hz to 2.1kHz.

Address Parity	Address: from 0x01=1 to 0xFF=255	MSB, LSB	R/W		40048
	Address for RS485 (address of module/node if parameters are configurated by memory modality)			1	Bit [15:8]
	Parity for RS485: 0=no parity; 1=even; 2=odd			0	Bit [7:0]
Baudrate Delay	Delay: from 0x00=0 to 0xFF=255	MSB, LSB	R/W		40049
	Baud-rate for RS485 (baud-rate of module/node if parameters are configurated by memory modality): 1=2400; 2=4800; 3=9600; 4=19200; 5=38400; 6=57600; 7=115200			38400	Bit [15:8]
	Delay for RS485 (delay of communication response: pauses between the end of Rx message and the start of Tx message)			0	Bit [7:0]
State IN1-IN8		Bit	R		40003
	These bits aren't used			/	Bit [15:8]
	IN8 state: 0=S8 open; 1=S8 closed			/	Bit 7
	IN7 state: 0=S7 open; 1=S7 closed			/	Bit 6
	IN6 state: 0=S6 open; 1=S6 closed			/	Bit 5
	IN5 state: 0=S5 open; 1=S5 closed			/	Bit 4
	IN4 state: 0=S4 open; 1=S4 closed			/	Bit 3
	IN3 state: 0=S3 open; 1=S3 closed			/	Bit 2
	IN2 state: 0=S2 open; 1=S2 closed			/	Bit 1
	IN1 state: 0=S1 open; 1=S1 closed			/	Bit 0
State IN9-IN16		Bit	R		40004
	These bits aren't used			/	Bit [15:8]
	IN16 state: 0=S16 open; 1=S16 closed			/	Bit 7
	IN15 state: 0=S15 open; 1=S15 closed			/	Bit 6
	IN14 state: 0=S14 open; 1=S14 closed			/	Bit 5
	IN13 state: 0=S13 open; 1=S13 closed			/	Bit 4
	IN12 state: 0=S12 open; 1=S12 closed			/	Bit 3
	IN11 state: 0=S11 open; 1=S11 closed			/	Bit 2
	IN10 state: 0=S10 open; 1=S10 closed			/	Bit 1
	IN9 state: 0=S9 open; 1=S9 closed			/	Bit 0
State IN17-IN24		Bit	R		40005
	These bits aren't used			/	Bit [15:8]
	IN24 state: 0=S24 open; 1=S24 closed			/	Bit 7
	IN23 state: 0=S23 open; 1=S23 closed			/	Bit 6
	IN22 state: 0=S22 open; 1=S22 closed			/	Bit 5
	IN21 state: 0=S21 open; 1=S21 closed			/	Bit 4
	IN20 state: 0=S20 open; 1=S20 closed			/	Bit 3
	IN17 state: 0=S19 open; 1=S19 closed			/	Bit 2
	IN18 state: 0=S18 open; 1=S18 closed			/	Bit 1
	IN17 state: 0=S17 open; 1=S17 closed			/	Bit 0
State IN1-IN16		Bit	R		40301
	IN16 state: 0=S16 open; 1=S16 closed			/	Bit 15
	IN15 state: 0=S15 open; 1=S15 closed			/	Bit 14
	IN14 state: 0=S14 open; 1=S14 closed			/	Bit 13
	IN13 state: 0=S13 open; 1=S13 closed			/	Bit 12
	IN12 state: 0=S12 open; 1=S12 closed			/	Bit 11
	IN11 state: 0=S11 open; 1=S11 closed			/	Bit 10
	IN10 state: 0=S10 open; 1=S10 closed			/	Bit 9
	IN9 state: 0=S9 open; 1=S9 closed			/	Bit 8
	IN8 state: 0=S8 open; 1=S8 closed			/	Bit 7
	IN7 state: 0=S7 open; 1=S7 closed			/	Bit 6
	IN6 state: 0=S6 open; 1=S6 closed			/	Bit 5

	IN5 state: 0=S5 open; 1=S5 closed			/	Bit 4
	IN4 state: 0=S4 open; 1=S4 closed			/	Bit 3
	IN3 state: 0=S3 open; 1=S3 closed			/	Bit 2
	IN2 state: 0=S2 open; 1=S2 closed			/	Bit 1
	IN1 state: 0=S1 open; 1=S1 closed			/	Bit 0
State IN17-IN24		Bit	R		40302
	These bits aren't used			/	Bit [15:8]
	IN24 state: 0=S24 open; 1=S24 closed			/	Bit 7
	IN23 state: 0=S23 open; 1=S23 closed			/	Bit 6
	IN22 state: 0=S22 open; 1=S22 closed			/	Bit 5
	IN21 state: 0=S21 open; 1=S21 closed			/	Bit 4
	IN20 state: 0=S20 open; 1=S20 closed			/	Bit 3
	IN19 state: 0=S19 open; 1=S19 closed			/	Bit 2
	IN18 state: 0=S18 open; 1=S18 closed			/	Bit 1
	IN17 state: 0=S17 open; 1=S17 closed			/	Bit 0

PulseCounter1_MSW	Between:0; (2^31)-1	FP32bit-MSW	R		40008
PulseCounter1_LSW		FP32bit-LSW	R		40009
	32-bit pulse counter for input 1				
PresetCounter1_MSW	Between:0; (2^31)-1	FP32bit-MSW	R/W		40030
PresetCounter1_LSW		FP32bit-LSW	R/W		40031
	Preset counter value of PulseCounter1				
PulseCounter2_MSW	Between:0; (2^31)-1	FP32bit-MSW	R		40010
PulseCounter2_LSW		FP32bit-LSW	R		40011
	32-bit pulse counter for input 2				
PresetCounter2_MSW	Between:0; (2^31)-1	FP32bit-MSW	R/W		40032
PresetCounter2_LSW		FP32bit-LSW	R/W		40033
	Preset counter value of PulseCounter2				
PulseCounter3_MSW	Between:0; (2^31)-1	FP32bit-MSW	R		40012
PulseCounter3_LSW		FP32bit-LSW	R		40013
	32-bit pulse counter for input 3				
PresetCounter3_MSW	Between:0; (2^31)-1	FP32bit-MSW	R/W		40034
PresetCounter3_LSW		FP32bit-LSW	R/W		40035
	Preset counter value of PulseCounter3				
PulseCounter4_MSW	Between:0; (2^31)-1	FP32bit-MSW	R		40014
PulseCounter4_LSW		FP32bit-LSW	R		40015
	32-bit pulse counter for input 4				
PresetCounter4_MSW	Between:0; (2^31)-1	FP32bit-MSW	R/W		40036
PresetCounter4_LSW		FP32bit-LSW	R/W		40037
	Preset counter value of PulseCounter4				

PulseCounter5_MSW	Between:0; (2^31)-1	FP32bit-MSW	R		40016
PulseCounter5_LSW		FP32bit-LSW	R		40017
	32-bit pulse counter for input 5				
PresetCounter5_MSW	Between:0; (2^31)-1	FP32bit-MSW	R/W		40038
PresetCounter5_LSW		FP32bit-LSW	R/W		40039
	Preset counter value of PulseCounter5				
PulseCounter6_MSW	Between:0; (2^31)-1	FP32bit-MSW	R		40018
PulseCounter6_LSW		FP32bit-LSW	R		40019
	32-bit pulse counter for input 6				
PresetCounter6_MSW	Between:0; (2^31)-1	FP32bit-MSW	R/W		40040
PresetCounter6_LSW		FP32bit-LSW	R/W		40041
	Preset counter value of PulseCounter6				
PulseCounter7_MSW	Between:0; (2^31)-1	FP32bit-MSW	R		40020
PulseCounter7_LSW		FP32bit-LSW	R		40021
	32-bit pulse counter for input 7				
PresetCounter7_MSW	Between:0; (2^31)-1	FP32bit-MSW	R/W		40042
PresetCounter7_LSW		FP32bit-LSW	R/W		40043
	Preset counter value of PulseCounter7				
PulseCounter8_MSW	Between:0; (2^31)-1	FP32bit-MSW	R		40022
PulseCounter8_LSW		FP32bit-LSW	R		40023
	32-bit pulse counter for input 8				
PresetCounter8_MSW	Between:0; (2^31)-1	FP32bit-MSW	R/W		40044
PresetCounter8_LSW		FP32bit-LSW	R/W		40045
	Preset counter value of PulseCounter8				
Overflow		Bit	R		40007
	These bits aren't used			/	
	Pulse counter 8 overflow: 0=there isn't; 1=there is			/	
	Pulse counter 7 overflow: 0=there isn't; 1=there is			/	
	Pulse counter 6 overflow: 0=there isn't; 1=there is			/	
	Pulse counter 5 overflow: 0=there isn't; 1=there is			/	
	Pulse counter 4 overflow: 0=there isn't; 1=there is			/	
	Pulse counter 3 overflow: 0=there isn't; 1=there is			/	
	Pulse counter 2 overflow: 0=there isn't; 1=there is			/	
	Pulse counter 1 overflow: 0=there isn't; 1=there is			/	

The «Input Status»-type registers used for ZC-24DI module are shown in the following table:

Name	Range	Interpretation of register	R/W	Default	Address
State IN1	0-1	Word	R		10001
	IN1 state: 0=S1 open; 1=S1 closed			/	
State IN2	0-1	Word	R		10002
	IN2 state: 0=S2 open; 1=S2 closed			/	
State IN3	0-1	Word	R		10003
	IN3 state: 0=S3 open; 1=S3 closed			/	
State IN4	0-1	Word	R		10004
	IN4 state: 0=S4 open; 1=S4 closed			/	
State IN5	0-1	Word	R		10005
	IN5 state: 0=S5 open; 1=S5 closed			/	
State IN6	0-1		R		10006
	IN6 state: 0=S6 open; 1=S6 closed			/	
State IN7	0-1		R		10007
	IN7 state: 0=S7 open; 1=S7 closed			/	
State IN8	0-1		R		10008
	IN8 state: 0=S8 open; 1=S8 closed			/	
State IN9	0-1		R		10009
	IN9 state: 0=S9 open; 1=S9 closed			/	
State IN10	0-1		R		10010
	IN10 state: 0=S10 open; 1=S10 closed			/	
State IN11	0-1	Word	R		10011
	IN11 state: 0=S11 open; 1=S11 closed			/	
State IN12	0-1	Word	R		10012
	IN12 state: 0=S12 open; 1=S12 closed			/	
State IN13	0-1	Word	R		10013
	IN13 state: 0=S13 open; 1=S13 closed			/	
State IN14	0-1	Word	R		10014
	IN14 state: 0=S14 open; 1=S14 closed			/	
State IN15	0-1	Word	R		10015
	IN15 state: 0=S15 open; 1=S15 closed			/	
State IN16	0-1	Word	R		10016
	IN16 state: 0=S16 open; 1=S16 closed			/	
State IN17	0-1	Word	R		10017
	IN17 state: 0=S17 open; 1=S17 closed			/	
State IN18	0-1	Word	R		10018
	IN18 state: 0=S18 open; 1=S18 closed			/	
State IN19	0-1	Word	R		10019
	IN19 state: 0=S19 open; 1=S19 closed			/	
State IN20	0-1	Word	R		10020
	IN20 state: 0=S20 open; 1=S20 closed			/	
State IN21	0-1	Word	R		10021
	IN21 state: 0=S21 open; 1=S21 closed			/	
State IN22	0-1	Word	R		10022
	IN22 state: 0=S22 open; 1=S22 closed			/	
State IN23	0-1	Word	R		10023
	IN23 state: 0=S23 open; 1=S23 closed			/	
State IN24	0-1	Word	R		10024
	IN24 state: 0=S24 open; 1=S24 closed			/	

LEDs for signalling

In the front-side panel there are 28 LEDs and their state refers to important operating conditions of the module.

LED	LED status	Meaning
PWR	Constant light	The power is on
FAIL	Blinking light	The module received a data packet through RS232 port
ERR (TX)	Constant light	Verify if the bus connection is corrected
	Blinking light	The module sent a data packet
RUN (RX)	Blinking light	The module received a data packet
	Constant light	Verify if the bus connection is corrected
1-24	Constant light	IN1-24 state equal to «1»
	No light	IN1-24 state equal to «0» (if the power is on)

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.

Seneca Z-PC Line module: **ZC-24DI (CANOpen)**

In this chapter are described the features of ZC-24DI module, based on CANOpen protocol.

NOTE: "0x" means an exadecimal number interpretation.

CANOpen features

TECHNICAL DATA	
Baud rate	20, 50, 125, 250, 500, 800, 1000 kbps
Counters nr/type	8 (32bit) from input 1..8
Max frequency for counters	10 kHz
Typical ON/OFF delay	1 ms (with filter disabled)
CANOpen TECHNICAL DATA	
NMT	slave
	Node guarding, heartbeat
Node ID	HW switch or software
Number of PDO	5 TX
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**
TPDO1	0x40000180 + NodeId	Digital input [1..8]	0x6000	1
		Digital input [9..16]	0x6000	2
		Digital input [17..24]	0x6000	3
		Overflow counter [1..8]	0x6000	4
TPDO5	0x40000280 + NodeId	Counter 1 value	0x2210	1
		Counter 2 value	0x2210	2
TPDO6	0x40000380 + NodeId	Counter 3 value	0x2210	3
		Counter 4 value	0x2210	4
TPDO7	0x40000480 + NodeId	Counter 5 value	0x2210	5
		Counter 6 value	0x2210	6
TPDO8	0x40000300 + NodeId	Counter 7 value	0x2210	7
		Counter 8 value	0x2210	8

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)

EMERGENCY MESSAGE						
BYTE 0	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6
EER		ER	MEF			

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
0xFF20	CPU error

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

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

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 0x2051 is used to send commands to the station module.

CPU COMMAND (Object 0x2051)	
Command code	**Description**
0x5C0n	Force the preset value (object 0x2211) for counter n
0x5D0n	Force the reset for counter n
0x5E0n	Force the overflow reset (object 0x6000 sub 4)

Object 0x2200 is used to customize the input filter.

FILTER PARAMETERS (Object 0x2200)	
Subindex	**Description**
1	Samples number for filter (default 40)
2	Counter threshold for high level (default 20)
3	Counter threshold for low level (default 20)

For a high level sample the filter counter is incremented, otherwise for a low level the filter counter is decremented.

When the filter counter is greater or equal to subindex2, the input is stated “high”.

When the filter counter is lower or equal to subindex3, the input is stated “low”.

Between subindex2 and subindex3, no state is asserted (dead zone).

Note that the filter can be disabled by selecting:

Subindex1=1

Subindex2=0

Subindex3=0

Object 0x2210 stores the values of the 8 counters in 32bit format.

DIGITAL COUNTERS (Object 0x2210)	
Subindex	**Description**
1	Counter 1 value
2	Counter 2 value
3	Counter 3 value
4	Counter 4 value
5	Counter 5 value
6	Counter 6 value
7	Counter 7 value
8	Counter 8 value

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

RS485 TERMINATOR (Dip-Switches: SW3)	
1	Meaning
	RS485 terminator disabled
●	RS485 terminator enabled

COMMUNICATION PROTOCOL (Dip-Switch: SW2 and SW4)		
SW2	**SW4**	
1	1	
		Protocol is ModBUS
●	●	Protocol is CANOPEN

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	ON Blinking	Data receiving from RS232
POWER	ON	Power supply
INPUT LED DESCRIPTION		
LED	**LED status**	**Meaning**
1-8	ON	Input [1..8] is high
	OFF	Input [1..8] is low
9-24	ON	Input [9..24] is high
	OFF	Input [9..24] is low

CANOpen digital input management

Object 0x6003 is used for input filter configuration.

FILTER CONSTANT INPUT (Object 0x6003)	
Subindex	**Description**
1	Filter enabled for input [1..8]
2	Filter enabled for input [9..16] read only
3	Filter enabled for input [17..24] read only

Object 0x6005 is used for Interrupt Enable:

If the value is “1” the station can generate a synchronous TxPDO (DEFAULT setting).

If the value is “0” the station can’t generate a synchronous TxPDO.

Object 0x6007 is used as Digital Interrupt Mask Low to High.

INTERRUPT MASK LOW TO HIGH (Object 0x6007)	
Subindex	**Description**
1	Interrupt mask on rising edge input [1..8]
2	Interrupt mask on rising edge input [9..16]
3	Interrupt mask on rising edge input [17..24]
4	Interrupt mask for counters

For subindex from 1 to 3 if value is “1”, the generation of TxPDO on rising edge is enabled.

If subindex 4 value is “1”, the generation of TxPDO on all 8 counters overflows is enabled.

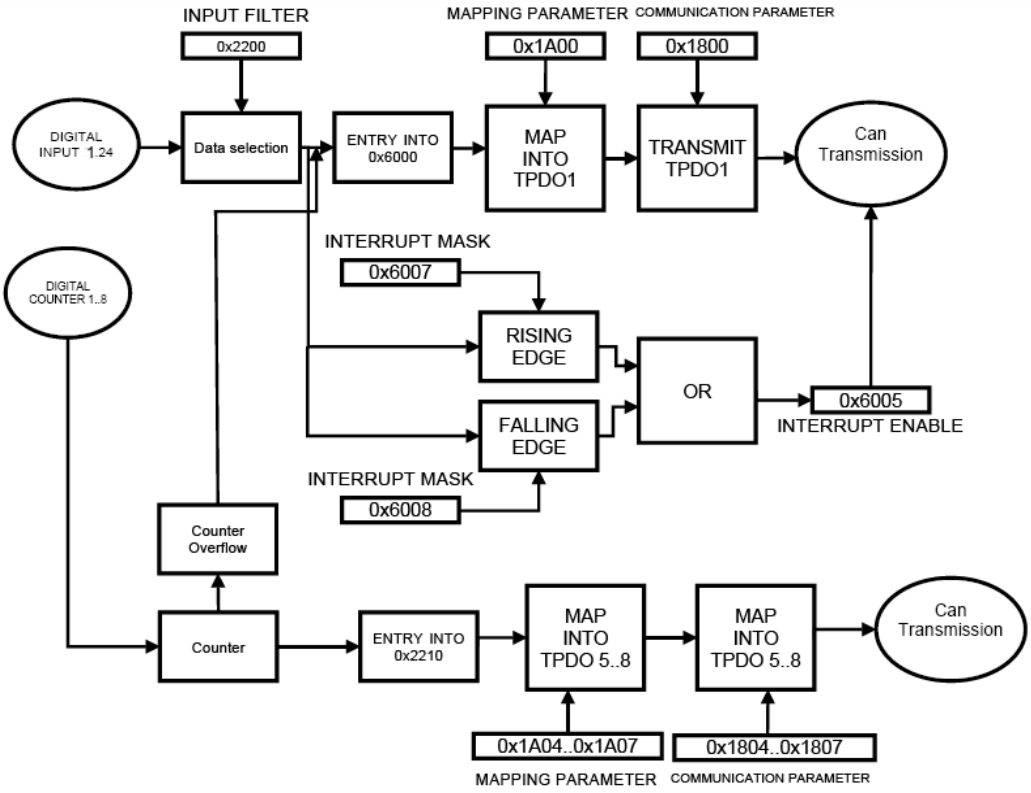
Object 0x6008 is used as Digital Interrupt Mask High to Low.

INTERRUPT MASK HIGH TO LOW (Object 0x6008)	
Subindex	**Description**
1	Interrupt mask on falling edge input [1..8]
2	Interrupt mask on falling edge input [9..16]
3	Interrupt mask on falling edge input [17..24]

For subindex from 1 to 3, if value is “1” the generation of TxPDO on falling edge is enable.

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	0x00010191
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-24DI”
0x1009	0	Manufacturer HW version	Hardware version	VISIBLE STRING	RO	“SC000000”
0x100A	0	Manufacturer SW version	Software version	VISIBLE STRING	RO	“SW001171”
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	4
	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	UNSIGNED 32	RW	1
	4	Save manufactures parameters	Store not volatile parameters	UNSIGNED 32	RW	1

0x1011	0	Restore default/ number of mapped object	Max subindex number	UNSIGNED 8	RO	4
	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 Manufactures 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-24DI Machine ID Code	UNSIGNED 32	RO	0x00000020
	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
0x1800	0	1st transmit PDO parameters /number of mapped object	Max subindex number	UNSIGNED 8	RO	3
	1	COB-ID used by PDO	COB-ID of TPDO1	UNSIGNED 32	RW	$NODEID+ 0x40000180
	2	Transmission type	Transmission type forTxPDO1 0x00=synchronous-acyclic	UNSIGNED 8	RW	0xFF

			0x01 to 0xF0 =synchronous- cyclic 0xFF=asynchronous			
	3	Inhibit time	Min delay for the next PDO (ms/10)	UNSIGNED 16	RW	0x0000
0x1804	0	5th transmit PDO parameters /number of mapped object	Max subindex number	UNSIGNED 8	RO	3
	1	COB-ID used by PDO	COB-ID of TPDO5	UNSIGNED 32	RW	$NODEID+ 0x40000280
	2	Transmission type	Transmission type forTxPDO5 0x00=synchronous- acyclic 0x01 to 0xF0 =synchronous- cyclic 0xFF=asynchronous	UNSIGNED 8	RW	0x01
	3	Inhibit time	Min delay for the next PDO (ms/10)	UNSIGNED 16	RW	0x0000
0x1805	0	6th transmit PDO parameters /number of mapped object	Max subindex number	UNSIGNED 8	RO	3
	1	COB-ID used by PDO	COB-ID of TPDO6	UNSIGNED 32	RW	$NODEID+ 0x40000380
	2	Transmission type	Transmission type forTxPDO6 0x00=synchronous- acyclic 0x01 to 0xF0 =synchronous- cyclic 0xFF=asynchronous	UNSIGNED 8	RW	0x01
	3	Inhibit time	Min delay for the next PDO (ms/10)	UNSIGNED 16	RW	0x0000
0x1806	0	7th transmit PDO parameters /number of mapped object	Max subindex number	UNSIGNED 8	RO	3
	1	COB-ID used by PDO	COB-ID of TPDO7	UNSIGNED 32	RW	$NODEID+ 0x40000480
	2	Transmission type	Transmission type forTxPDO7 0x00=synchronous- acyclic 0x01 to 0xF0 =synchronous- cyclic 0xFF=asynchronous	UNSIGNED 8	RW	0x01
	3	Inhibit time	Min delay for the next PDO (ms/10)	UNSIGNED 16	RW	0x0000

0x1807	0	8th transmit PDO parameters /number of mapped object	Max subindex number	UNSIGNED 8	RO	3
	1	COB-ID used by PDO	COB-ID of TPDO8	UNSIGNED 32	RW	$NODEID+ 0x40000300
	2	Transmission type	Transmission type forTxPDO8 0x00=synchronous-acyclic 0x01 to 0xF0 =synchronous- cyclic 0xFF=asynchronous	UNSIGNED 8	RW	0x01
	3	Inhibit time	Min delay for the next PDO (ms/10)	UNSIGNED 16	RW	0x0000
0x1A00	0	1st Transmit PDO mapping parameter/ number of mapped object	Max subindex number	UNSIGNED 8	RW	4
	1	1st object to be mapped	First object (default: input 1..8)	UNSIGNED 32	RW	0x60000108 Object=0x6000 Subindex=1 Length=8bit
	2	2nd object to be mapped	Second object (default: input 9..16)	UNSIGNED 32	RW	0x60000208 Object=0x6000 Subindex=2 Length=8bit
	3	3rd object to be mapped	Third object (default: input 17..24)	UNSIGNED 32	RW	0x60000308 Object=0x6000 Subindex=3 Length=8bit
	4	4th object to be mapped	Fourth object (default: counter overflow)	UNSIGNED 32	RW	0x60000408 Object=0x6000 Subindex=4 Length=8bit
0x1A04	0	5th Transmit PDO mapping parameter/ number of mapped object	Max subindex number	UNSIGNED 8	RW	2
	1	1st object to be mapped	First object (default: counter 1)	UNSIGNED 32	RW	0x22100120 Object=0x2210 Subindex=1 Length=32bit
	2	2nd object to be mapped	Second object (default: counter 2)	UNSIGNED 32	RW	0x22100220 Object=0x2210 Subindex=2 Length= 32bit

0x1A05	0	6th Transmit PDO mapping parameter/ number of mapped object	Max subindex number	UNSIGNED 8	RW	2
	1	1st object to be mapped	First object (default: counter 3)	UNSIGNED 32	RW	0x22100320 Object=0x2210 Subindex=3 Length=32bit
	2	2nd object to be mapped	Second object (default: counter 4)	UNSIGNED 32	RW	0x22100420 Object=0x2210 Subindex=4 Length= 32bit
0x1A06	0	7th Transmit PDO mapping parameter/ number of mapped object	Max subindex number	UNSIGNED 8	RW	2
	1	1st object to be mapped	First object (default: counter 5)	UNSIGNED 32	RW	0x22100520 Object=0x2210 Subindex=5 Length=32bit
	2	2nd object to be mapped	Second object (default: counter 6)	UNSIGNED 32	RW	0x22100620 Object=0x2210 Subindex=6 Length= 32bit
0x1A07	0	8th Transmit PDO mapping parameter/ number of mapped object	Max subindex number	UNSIGNED 8	RW	2
	1	1st object to be mapped	First object (default: counter 7)	UNSIGNED 32	RW	0x22100720 Object=0x2210 Subindex=7 Length=32bit
	2	2nd object to be mapped	Second object (default: counter 8)	UNSIGNED 32	RW	0x22100820 Object=0x2210 Subindex=8 Length= 32bit

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 7=1Mbps	UNSIGNED 8	RW	0x01

0x2003	0	Master firmware code		UNSIGNED 16	RO	1179
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
0x2051	0	Command	Command to execute Supported commands: 0x5Cnn force preset for counter mask nn 0x5Dnn force reset for counter mask nn 0x5Enn force overflow for counter mask nn	UNSIGNED 16	RW	0
0x2052	0	Aux command	reserved	UNSIGNED 16	RW	0
0x2200	0	Input filter parameter/ number of parameters	Max subindex number	UNSIGNED 8	RO	3
	1	Filter lenght	Number of samples to evaluate	UNSIGNED 8	RW	40
	2	Counter threshold for high level	If counter >= threshold_high input is stated “high”	UNSIGNED 8	RW	20
	3	Counter threshold for low level	If counter <= threshold_low input is stated “low”	UNSIGNED 8	RW	20
0x2210	0	Input counters/ number of counter	Max subindex number	UNSIGNED 8	RO	0x8
	1	Counter 1 value		UNSIGNED 32	RO	0

	2	Counter 2 value		UNSIGNED 32	RO	0
	3	Counter 3 value		UNSIGNED 32	RO	0
	4	Counter 4 value		UNSIGNED 32	RO	0
	5	Counter 5 value		UNSIGNED 32	RO	0
	6	Counter 6 value		UNSIGNED 32	RO	0
	7	Counter 7 value		UNSIGNED 32	RO	0
	8	Counter 8 value		UNSIGNED 32	RO	0
0x2211	0	Preset for input counters/ number of counters		UNSIGNED 8	RO	0x8
	1	Counter 1 preset value		UNSIGNED 32	RW	0
	2	Counter 2 preset value		UNSIGNED 32	RW	0
	3	Counter 3 preset value		UNSIGNED 32	RW	0
	4	Counter 4 preset value		UNSIGNED 32	RW	0
	5	Counter 5 preset value		UNSIGNED 32	RW	0
	6	Counter 6 preset value		UNSIGNED 32	RW	0
	7	Counter 7 preset value		UNSIGNED 32	RW	0
	8	Counter 8 preset value		UNSIGNED 32	RW	0

STANDARD DEVICE PROFILE AREA

INDEX	SUB INDEX	NAME	DESCRIPTION	TYPE	ACCESS	DEFAULT
0x6000	0	8 bit digital input counter1 overflow/ number of input 8 bit	Max subindex number	UNSIGNED 8	RO	4
	1	Input [1..8] value	Read input [1..8] value	UNSIGNED 8	RO	0
	2	Input [9..16] value	Read input [9..16] value	UNSIGNED 8	RO	0
	3	Input [17..24] value	Read input [17..24] value	UNSIGNED 8	RO	0
	4	Counter [1..8] overflow	Overflow status counter [1..8]	UNSIGNED 8	RO	0
0x6003	0	Filter mask enable/ number of input 8 bit	Max subindex number	UNSIGNED 8	RO	3

	1	Input [1..8] filter mask enable	Input [1..8] Filter enable Mask (only 0x00 or 0xFF allowed) 0x00 = Filter disabled (and Counters 1..8 Enabled) 0xFF = Filter enabled (and Counters 1..8 Disabled)	UNSIGNED 8	RW	0xFF
	2	Input [9..16] filter mask enable	Filter activation for inputs IN9-IN16 using a bit interpretation to mask the inputs: are always deactivated	UNSIGNED 8	RO	0x00
	3	Input [17..24] filter mask enable	Filter activation for inputs IN17-IN24 using a bit interpretation to mask the inputs: are always deactivated	UNSIGNED 8	RO	0x00
0x6005	0	Global interrupt enabled	0=TxPDO asynchronous disabled 1=TxPDO asynchronous enabled	UNSIGNED 8	RW	1
0x6007	0	Interrupt mask Low to High/number of input	Max subindex number	UNSIGNED 8	RO	4
	1	Mask interrupt input [1..8]	Input [1..8] rising interrupt mask enable Mask bit0=rising interrupt disabled Mask bit1=rising interrupt enabled	UNSIGNED 8	RW	0xFF
	2	Mask interrupt input [9..16]	Input [9..16] rising interrupt mask enable Mask bit0=rising interrupt disabled Mask bit1=rising interrupt enabled	UNSIGNED 8	RW	0xFF
	3	Mask interrupt input [17..24]	Input [17..24] rising interrupt mask enable Mask bit0=rising interrupt disabled Mask bit1=rising interrupt enabled	UNSIGNED 8	RW	0xFF

	4	Mask interrupt counter overflow	Counter [1..8] rising interrupt mask enable Mask bit0=rising interrupt disabled Mask bit1=rising interrupt enabled	UNSIGNED 8	RW	0x00
0x6008	0	Interrupt mask High to Low/number of input	Max subindex number	UNSIGNED 8	RO	3
	1	Mask interrupt input [1..8]	Input [1..8] falling interrupt mask enable Mask bit0= falling interrupt disabled Mask bit1=rising interrupt enabled	UNSIGNED 8	RW	0xFF
	2	Mask interrupt input [9..16]	Input [9..16] falling interrupt mask enable Mask bit0= falling interrupt disabled Mask bit1= falling interrupt enabled	UNSIGNED 8	RW	0xFF
	3	Mask interrupt input [17..24]	Input [17..24] falling interrupt mask enable Mask bit0= falling interrupt disabled Mask bit1= falling interrupt enabled	UNSIGNED 8	RW	0xFF
0x6020	0	Read input 1 bit/ number of input bit	Max subindex number	UNSIGNED 8	RO	24
	1	Input 1 value	0=input is “low” 1=input is “high”	BOOLEAN	RO	
	2	Input 2 value	0=input is “low” 1=input is “high”	BOOLEAN	RO	
	3	Input 3 value	0=input is “low” 1=input is “high”	BOOLEAN	RO	
	4	Input 4 value	0=input is “low” 1=input is “high”	BOOLEAN	RO	
	5	Input 5 value	0=input is “low” 1=input is “high”	BOOLEAN	RO	
	6	Input 6 value	0=input is “low” 1=input is “high”	BOOLEAN	RO	
	7	Input 7 value	0=input is “low” 1=input is “high”	BOOLEAN	RO	
	8	Input 8 value	0=input is “low” 1=input is “high”	BOOLEAN	RO	
	9	Input 9 value	0=input is “low” 1=input is “high”	BOOLEAN	RO	
	10	Input 10 value	0=input is “low” 1=input is “high”	BOOLEAN	RO	
	11	Input 11 value	0=input is “low”	BOOLEAN	RO	

			1=input is “high”			
	12	Input 12 value	0=input is “low” 1=input is “high”	BOOLEAN	RO	
	13	Input 13 value	0=input is “low” 1=input is “high”	BOOLEAN	RO	
	14	Input 14 value	0=input is “low” 1=input is “high”	BOOLEAN	RO	
	15	Input 15 value	0=input is “low” 1=input is “high”	BOOLEAN	RO	
	16	Input 16 value	0=input is “low” 1=input is “high”	BOOLEAN	RO	
	17	Input 17 value	0=input is “low” 1=input is “high”	BOOLEAN	RO	
	18	Input 18 value	0=input is “low” 1=input is “high”	BOOLEAN	RO	
	19	Input 19 value	0=input is “low” 1=input is “high”	BOOLEAN	RO	
	20	Input 20 value	0=input is “low” 1=input is “high”	BOOLEAN	RO	
	21	Input 21 value	0=input is “low” 1=input is “high”	BOOLEAN	RO	
	22	Input 22 value	0=input is “low” 1=input is “high”	BOOLEAN	RO	
	23	Input 23 value	0=input is “low” 1=input is “high”	BOOLEAN	RO	
	24	Input 24 value	0=input is “low” 1=input is “high”	BOOLEAN	RO	