# USER MANUAL

# Seneca Z-PC Line

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# Manual purpose

The purpose of this Manual is to provide the User with all information necessary to use the modules of the Seneca Z-PC Line.

This Manual contains the general characteristics and features to know and use the modules of Seneca Z-PC Line.

# Manual validity

This Manual contains informations concerning to Seneca Z-PC Line, in particular: Constructor data identification, electrical and communication connections, functioning, RS485 registers, CANOpen objects and features, decommissioning and disposal.

The modules of the Seneca Z-PC Line are shown in the following table.

| Z-PC Line module | Description | Protocol |
|---|---|---|
| Z-D-IN | 5-CH Digital input module / RS485 | ModBUS |
| Z-10-D-IN | 10-CH Digital Input module / RS485 | ModBUS |
| Z-D-OUT | 5-CH Digital output module / RS485 | ModBUS |
| Z-10-D-OUT | 10-CH digital output module / RS485 | ModBUS |
| Z-D-IO | 8-CH, 6 digital inputs - 2 digital outputs control module | ModBUS |
| ZC-24DI | 24 CH digital input CANopen / ModBUS | ModBUS/CanOpen |
| ZC-24DO | 24 CH digital output CANopen / ModBUS | ModBUS/CanOpen |
| ZC-16DI-8DO | 16 CH digital input - 8 CH digital output CANopen / ModBUS | ModBUS/CanOpen |
| Z-4AI | 4-CH analog input module / RS485 | ModBUS |
| Z-8AI | 8-CH analog input module / RS485 | ModBUS |
| Z-3AO | 3-CH analog output module / RS485 | ModBUS |
| Z-4TC | 4-CH thermocouple input module / RS485 | ModBUS |
| Z-8TC | 8-CH thermocouple input module / RS485 | ModBUS |
| Z203 | AC single phase network analyzer | ModBUS |
| Z-4RTD-2 | 4-CH RTD input module / RS485 | ModBUS |
| Z-SG | Strain gauge input module | ModBUS |
| Z-DAQ-PID | 1-CH universal analog I/O Modbus module with PID control | ModBUS |
| S203T | Advanced triple phase network analyzer, 100 mA input | ModBUS |
| S203TA | Advanced triple phase network analyzer up to 5 Arms input | ModBUS |
| ZC-3AO | 3 CH analog output (mA, V) CANopen module | CanOpen |
| ZC-4RTD | 4 Ch RTD (P100, Ni100, Pt500, Pt1000) input CANopen module | CanOpen |
| ZC-8AI | 8 CH analog input (mA, V) CANopen module | CanOpen |
| ZC-8TC | 8 CH Thermocouple (J,K,E,N,S,R,B,T) CANopen module | CanOpen |
| ZC-SG | 1 CH strain gauge CANopen module | CanOpen |

**CANopen**® is a registered trademark of the CAN in Automation User's Group.

**Modbus®** is a registered trademark of Modicon, Incorporated.

# Z-PC Line standards

The Z-PC Line modules comply with the CEE 2004/108/CE.

The buses communication of Z-PC Line comply the following standards:

-EIA RS-232 (RS-232 serial interface for bus communication)

-EIA RS-485 (RS-485 serial interface for bus communication)

-Cia 301 v4.02, Cia 401 v2.01 (CANopen)

# Distributed automation and ModBUS

### *Distributed systems*

At the same time and in very large spaces, a industrial automation system have to manage:
- many sensors;
- many actuators;
- many control subsystems;
- outwards communication;
- data storage (the data will be used to subsequent processing);
- machine and human safely.

In particular, an industrial automation system is always constituted by:
- a microprocessor system: CPU, memories, timers, remote interface systems (RS485, RS232, TCP/IP, etc…), human interface systems (keyboards, displays, etc…);
- a capture-data system, which is able to acquire analog or digital signals, depending on the control application;
- a transducer system, which allows to carry out the control signals.

For industrial automation, there are two types of microcontroller-based control systems:
- embedded systems: integrated systems into a single electronic circuit;
- distributed systems: more electronic circuits connected to a single bus communication.

A communication bus is a set of electrical cables through which informations (address, data, signals, etc…) are transmitted.

Embedded systems allows to optimize the control system and to obtain high performance, but they have high cost of design (hardware, software) and it isn't possible to adapt them for other automation systems.
Instead, distributed systems have low cost of design (software) and it is possible to adapt them for other automation systems, at the price of a lower optimization. Moreover, distributed systems allows:
- to connect to a single bus a very high number of devices with variable degree of intelligence;
- to implement control systems with electrical strength through a simple programming.

**In this context, Seneca proposes the Z-PC Line: embedded systems with ModBUS-RTU communication protocol based on RS232/RS485 serial interface. These systems are able to capture input signals** (voltage, current, form thermocouple, from thermoresistance, etc…) **and to provide output signals** (voltage, current, by relay, by mosfet, etc…)**, to process analog and digital signals for industrial automation control system** (drives, actuactors, etc…).

### *Why ModBUS protocol?*

ModBUS is a high-level protocol and one of the most widespread standard used for the communication between control devices. The main features of the ModBUS protocol are shown in the following points:
- **it's easy to perform electrical connections;**
- **it's easy to perform setting parameters;**
- **it's easy to perform integration on supervision, control and automation systems;**
- **good performance;**
- **there aren't hardware constraints.**

The ModBUS protocol defines the format and communication modality between a single master and one slave/more slaves, which responds to the queries come from master by transactions; the ModBUS protocol doesn't define the interpretation of the data (contents of registers), but it defines:

- **communication modality between master and slaves;**
- **identification modality between transmitter and receiver;**
- **data interchange modality;**
- **errors.**

The ModBUS protocol implemented in Seneca Z-PC Line allows the single query/single response transaction, with reference to a single slave.

The ModBUS protocol implemented in Seneca Z-PC Line does not allow the broadcast transaction.

The electrical data interchange is based on half-duplex transmission and the ModBUS protocol allows to connect the modules by two alternative modalities:
- **point to point modality (RS232 serial interface)**
- **multipoint modality (RS485 serial interface)**

The ModBUS protocol is used to perform communications between intelligent systems, for example: address identification of a data packet or module, implementation of control actions, response transmission, etc…
The Modbus protocol is aligned with many industrial automation products: PLCs, Temperature Controllers, displays, data registers, etc., which are able to communicate with a common supervisor easily.

## *ModBUS protocol description*

Field buses are used as systems to transmit the data, alternative to the analog signals; in particular, the ModBUS protocol is used to connect a supervisor computer to a Remote Terminal Unit (RTU) and to control a data acquisition system (SCADA, Supervisory Control And Data Acquisition).
The ModBUS protocol has been developed to allow the information interchange between control modules in industrial field, through a Master-Slave hierarchy: the slave modules are connected to a same bus communication and each is identified by its address. These modules are queried by a single Master periodically (polling); only the master can start a transaction through RS485 bus communication.

Master devices are Personal computer or controller, slave devices are used to detect signals or to perform some operations. Master device sends data-packet (query) to the Slaves: as each device is associated with a univocal address, only one device will respond with the required data.

There are two versions of the ModBUS protocol, which differ for the different numeric data representation (mostly): ModBUS RTU and ModBUS ASCII.
- **The ModBUS ASCII has a redundant data representation (the data representation is more readable by persons).**
- **The ModBUS RTU has a hexadecimal-base data representation (the data representation is more compact; moreover ModBUS RTU is implemented using CRC, so it is more safety).**

Most important ModBUS RTU specifications are shown in the following table.

| | |
|---|---|
| **Characters** | Binary values between 0-255 |
| **Start of frame** | Silence of 3.5 times |
| **End of frame** | Silence of 3.5 times |
| **Initial bit** | 1 |
| **Data bits** | 8 |
| **Pause in message** | 1.5 times of a byte |
| **Check redundancy** | CRC (Cyclic Redundancy Check) |

ModBUS RTU allows to transmit through bus a quantity of information greater than ModBUS ASCII, while ModBUS RTU is more safety. Communications are managed by a master and they are half-duplex; communications between slaves are not possible.

# RS232 and RS485 serial interfaces

Serial data transmission has many advantages, if it is compare to analog transmission:

- More robust error check
- More noise immunity
- More precision data interchange
- It is possible to send through bus any information type
- It is possible to implement advanced function to control and configure the devices.

In particular, the serial interface is the physical medium that realize a serial data transmission and implement the ModBUS protocol. There are two types of physical interface: RS232 or RS485. The main features of the ModBUS protocol interfaces are:

- ***Serial***: the information bits are sent in sequence (one by one) through a wire.
- ***Asynchronous***: the information bits are transmitted without additional bits necessary to synchronize the data interchange between transmitter and receiver. The synchronization between transmitter and receiver is implemented by a pause in the data packet: if the time of bus-communication pause is greater than 3.5 character time, the following received byte will be interpretated as an address (first byte of a new data packet) by receiver.

### *RS232 serial interface*

The electrical medium of the ModBUS protocol is the RS232 serial interface: it is based on a not-balanced communication line with a "Point to point" master/slave connection. The voltage signal is measured with reference to a common point. In particular, the amplitude of digital signal through RS232-bus communication can be: -12V or +12V. The value -12V corresponds to "1" logic value (mark), instead +12V corresponds to "0" logic value (space).

| | |
|---|---|
| **Standard** | ANSI/EIA-232-D (see "EIA RS-232 specification") |
| **Transmission** | Asynchronous, baseband |
| **Transmission type** | Not balanced |
| **Number of transmission line** | 1 |
| **Logic value** | Logic value is the voltage referred to the signal ground SG |
| **Max distance** | 15 m |
| **Number of transmitter** | 1 |
| **Number of receiver** | 1 |
| **Logic value "0"** | +12V |
| **Logic value "1"** | -12V |

For small distances, signal ground (reference) is uniquely defined; for this reason, use RS232 cable for distances less than 15 m.

Tipically, for the modules of Seneca Z-PC Line, the RS232-bus sampling time is equal to 417 µs because unchangeable baud-rate is 2400 baud (1/2400 baud=417 µs). The unchangeable configuration for the RS232-bus communication parameters is shown in the following table.

| Communication | Data structure of register | Baud-rate | Address of node |
|---|---|---|---|
| RS232 | 8N1 | 2400 | 1 |

Data structure of register equal to 8N1 means that the register is structured as follows: 8 data bits, no parity control (N), 1 stop bit.

### *RS485 serial interface*

The electrical medium of the ModBUS protocol is the RS485 serial interface: it is based on a differential and balanced communication line, with a characteristic impedance equal to 120 Ω. The voltage signal associated to a transmitted bit is the potential difference between two wires: A and B, with reference to a ground wire (GND). In every time, only one transmitter is enabled. Moreover, it is necessary a master that manage which device can transmit data.

| | |
|---|---|
| **Standard** | ANSI/EIA-485 (see “EIA RS-485 specification”) |
| **Transmission** | Asynchronous |
| **Transmission type** | Balanced |
| **Number of transmission line** | 1 |
| **Logic value** | Logic value is the voltage referred to the voltage difference between two values (not referred to signal ground) |
| **Max distance** | 1200 m (max shunt derivation: 2 m) |
| **Number of transmitter** | >1 |
| **Number of receiver** | >1 |

The RS485 serial interface allows data transmission through bus with length greater than RS232 serial interface case. Moreover, the data transmission through RS485-bus communication is more robust (more noise immunity) than RS232-bus communication.

Tipically, for the modules of Seneca Z-PC Line, the RS485-bus sampling time is equal to 26 µs because changeable baud-rate is 38400 baud (1/38400 baud=26 µs). The changeable configuration for the RS485-bus communication parameters is shown in the following table.

| Communication | Data structure of register | Baud-rate | Address of node |
|---|---|---|---|
| RS485 | 8N1 | 1200; 2400; 4800; 9600; 19200; 38400(D); 57600; 115200 | From 1(D) to 255 |

(D) Default value for each module of Seneca Z-PC Line

Data structure of register equal to 8N1 means that the register is structured as follows: 8 data bits, no parity control (N), 1 stop bit.

## *Parity*

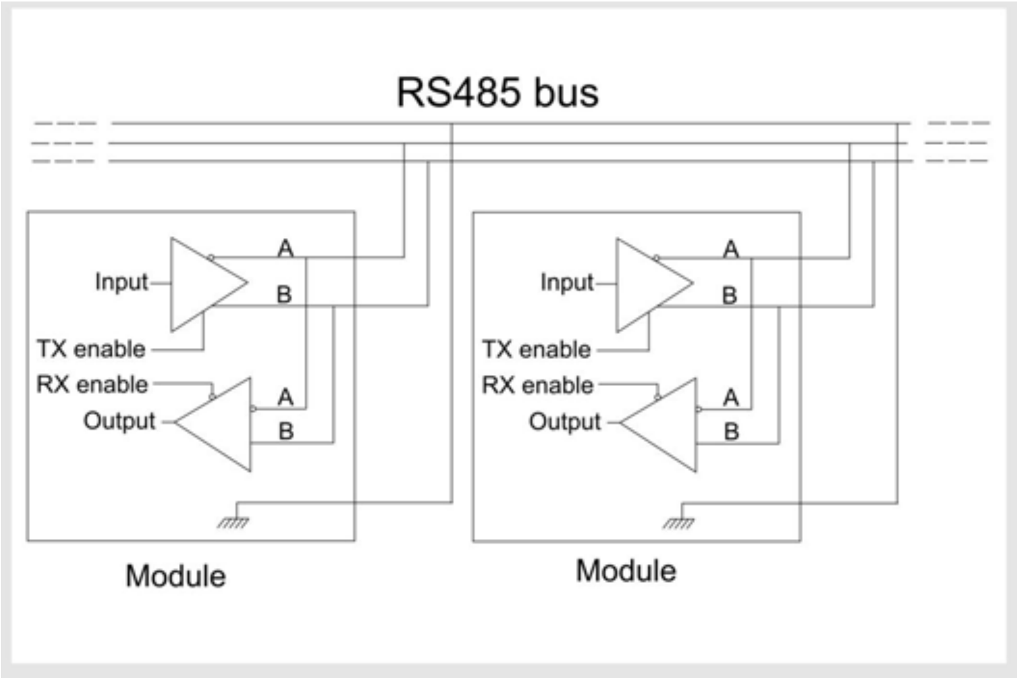
The parity is a control system to manage communication errors: infact coupled electrical noises through bus communication correspond to a change of one bit/some bits. The parity allows to detect if there is or there isn't a change of a single bit (error) in data packet but doesn't allow to detect if there is or there isn't a change of more bits (error) in data packet. If the parity is enabled, it defines the number of "0" and "1" logic values transmitted through bus; this number can be configured: even or odd.

This control system allows to detect possible communication errors, but it can not to correct them. To implement this correction, there are more advanced control system (CRC) based on complex algorithms.

The modules of the Seneca Z-PC Line allow to manage the parity; in particular, there are three alternative modalities to configure the parity: no parity, even parity, odd parity.

### *RS485-bus electric topology*

The electrical topology used to connect to RS485 bus the modules of Seneca Z-PC Line is shown in the following figure.




As shown, there are three wires assigned to communication: A, B and GND. This topology allows an half-duplex transmission between electrical-equivalent modules (this means that tx and rx are not enabled at the same time). The modules of Seneca Z-PC Line has a integrated transmitter and a integrated receiver.

With reference to RS485 standard, max 32 receivers with RS485-port input impedance equal to 1 ”load” can be connected to bus communication, max 64 receivers with RS485-port input impedance equal to 1/2 ”load” can be connected to bus communication, and so on.

$$32 = R \cdot U = 32 \cdot 1 = 64 \cdot \frac{1}{2} = 128 \cdot \frac{1}{4}$$

where R is the number of the receivers and U is the unit load for each type of receiver.

Connections of receivers with input impedance different from each other are allowed: for example,

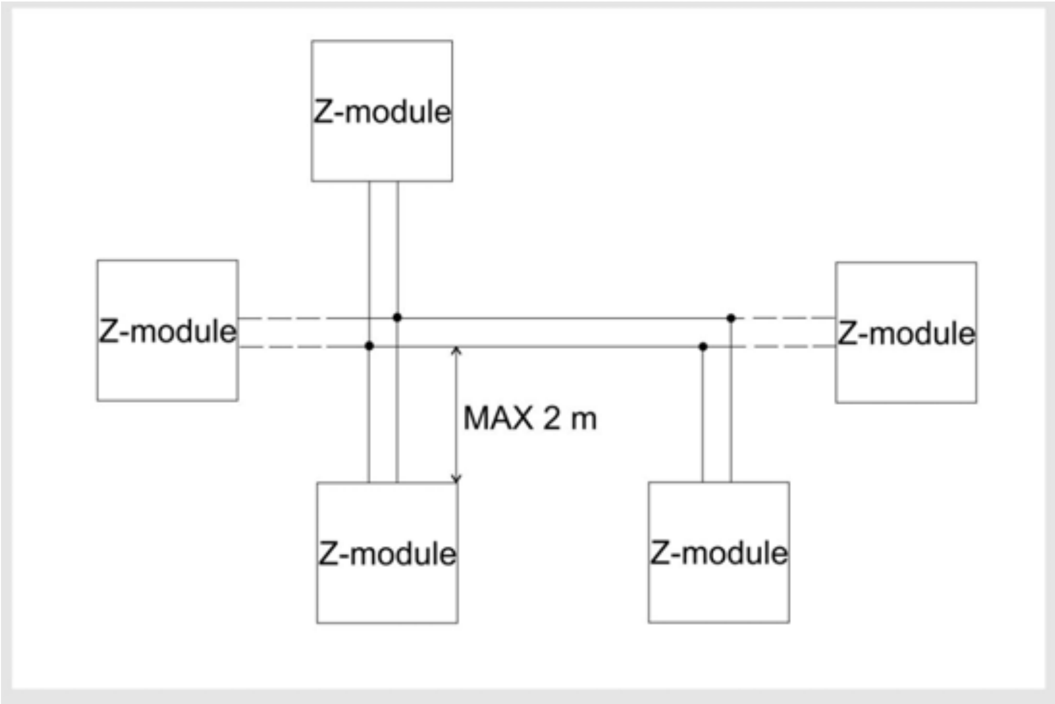
$$32 = R1 \cdot U1 + R2 \cdot U2 = 64 \cdot \frac{1}{4} + 32 \cdot \frac{1}{2}$$

**WARNING**

Connect the master module to slave modules using chain connections; in this configuration, **it’s forbidden** to perform length connection over 1200 m and derivations over 2 m without using K107A module.

**NOTE!**

**It's forbidden** to connect the slave modules to the master module using star connections without K107A module.



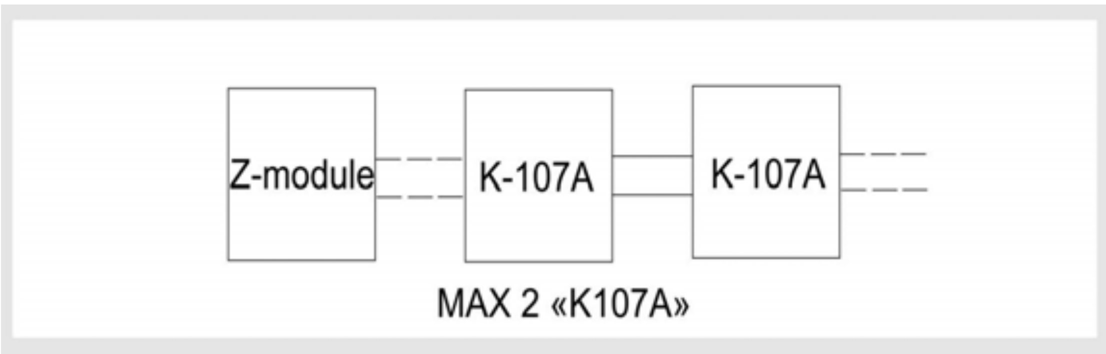

**K107A module is a half-duplex RS485-bus repeater. It allows to exceed the limits of RS485 serial interface, in particular:**

**- to increase the maximum number of modules connected to the RS485 bus communication (32, 64, 96, etc…);**

**- to increase the length of RS485-bus communication (1200 m, 2400 m, 3600 m, etc…);**

**- perform star connections.**

**To know more information about K107A module, visit the Internet site www.seneca.it. Max two K-module can be connected in series.**



**WARNING**

The RS485 bus is a transmission line, so characteristic-impedance matching must be performed. Infact if a transmission line is mismatched, the transmitted signal isn't absorbed by its load completely: a part of this signal is reflected back through transmission line and it can cause interferences.

To avoid reflection phenomena through RS485-bus communication (for long cable mainly), it is necessary to match characteristic-impedance. This operation allows to enable the RS485-terminator resistance in modules of the Seneca Z-PC Line. This operation has the following weakness points:

- **the current absorption is greater;**
- **the RS485 voltage-signal damping is greater.**

To choose if it's necessary or it isn't necessary to match characteristic-impedance, look on the baud-rate and RS-485 cable length.

***A pratical example***

In the following hypothesis:

- **RS-485 bus length is equal to 1200 m (EIA RS-485 max value)**
- **RS-485 signal propagation velocity through RS485 bus cable is equal to 70% of light velocity**

the RS-485 signal takes 5.7 µs

$$t = \frac{1}{0.7 \cdot c} \cdot 1200 = 5.7\ \mu s$$

to complete a round trip.

If the baud-rate is equal to 4800, the bit time is equal to 208 µs: since 208 µs is greater than $10 \cdot 5.7$ µs, characteristic-impedance matching is not required.

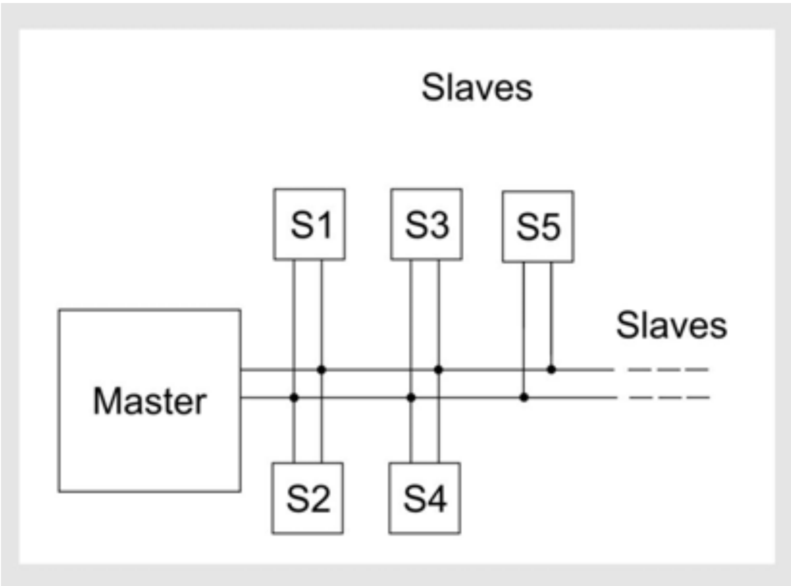
If the baud-rate is equal to 115200, the bit time is equal to 9 µs: since 9 µs isn't greater than $10 \cdot 5.7$ µs, characteristic-impedance matching is required.

In the following table are shown some examples about the use of RS485 terminator.

| Bus length | Time to complete a round trip | If Baudrate=4800 (bit time=208µs) | If Baudrate=115200 (bit time=9µs) |
|---|---|---|---|
| 1200 m | 5.7 µs | 208 µs >> 57 µs (**TERMINATOR CAN BE OFF**) | 9 µs < 57 µs (**TERMINATOR MUST BE ON**) |
| 600 m | 2.9 µs | 208 µs >> 29 µs (**TERMINATOR CAN BE OFF**) | 9 µs < 29 µs (**TERMINATOR MUST BE ON**) |
| 300 m | 1.43 µs | 208 µs >> 14 µs (**TERMINATOR CAN BE OFF**) | 9 µs < 14 µs (**TERMINATOR MUST BE ON**) |
| 10 m | 47.6 ns | 208 µs >> 480 ns (**TERMINATOR CAN BE OFF**) | 9 µs > 480 ns (**TERMINATOR MUST BE ON**) |
| 1 m | 4.76 ns | 208 µs >> 48 ns (**TERMINATOR CAN BE OFF**) | 9 µs >> 48 ns (**TERMINATOR CAN BE OFF**) |

To match characteristic-impedance in RS485-bus communication (for long cable mainly), execute the following operations (with reference to the following figure, which shows an example of a ModBUS network):

- **switch the "RS485-terminator" resistance in Master and Slave5 modules to "ON" (see the following figure: Master and Slave5 modules are the two opposite ends of the RS485-bus communication)**
- **switch the "RS485-terminator" resistance in Slave2-Slave4 modules to "OFF" (see the following figure: Slave2-Slave4 modules are connected to RS485-bus communication and they allow data transmission)**



## *Cable selection*

Cable selection is important for plants that require high baud rate, high distance and in very-noise environment especially.

In these conditions, the signal through the cable decrease its amplitude because there is a non-zero resistance and there are losses due to dielectric-type used for insulation; tipically, a twisted pair cable is used.

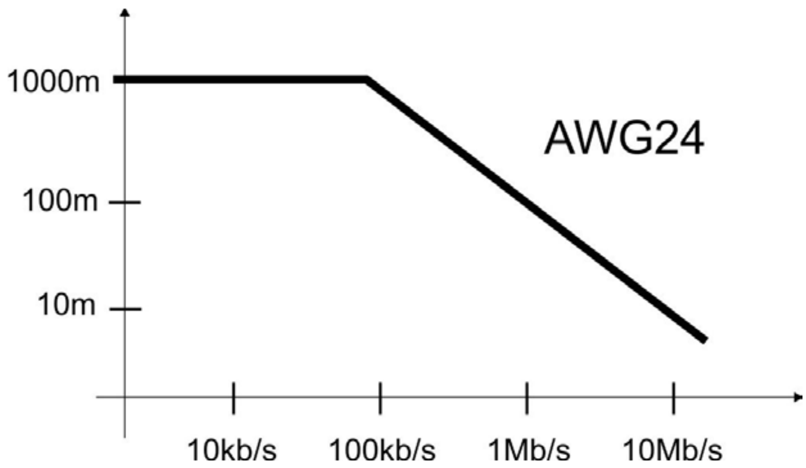
To implement a RS485-bus communication, three cables are necessary: two for signal (A, B), one for reference (GND). Moreover, for high baud rate, is important to regard the characteristic impedance.

The sizing of RS485-bus electrical cable have to look on:

- **number of the wires (for RS485-bus: A, B, GND)**
- **cable characteristic impedance (tipically: 120 Ω)**
- **shielding**

Tipically, the RS485-bus communication is constituted by a twisted-pair cable AWG24 or AWG22.

Cable manufacturers provide specific diagrams that show cable length in function of the required baud rate (example: see the following figure for AWG24). For this type of diagrams it is important to consider the operative conditions used to obtain these ones (signal type, RS485 terminator).




## *Shielding*

In very noised industrial plants and/or for long distances (> 100 m), use a shield twisted-pair cable. To avoid closed rings, connect the shield to the GND at one point of the network.

Moreover, the shielded cables are used to have a mechanical strength greater than no-shielded cables mainly too.

**NOTE!**

**It's forbidden** to use the shield as ground connector.

High-frequencies: for each cable, connect the shield to the GND at both of ends, but ground connection have to be performed to one point (to avoid loops); for very-noised environment, connect every GND to ground using a 10 nF 400 V capacitance.

In the following table are shown the RS485 communication cable features.

| Distance between Master and Slave – RS485 communication cable length | RS485 communication cable features |
|---|---|
| Few meters | No-shielded cable |
| <100m | Twisted and shielded cable |
| >100m | Special cable (example: CEAM CPR 6003 or BELDEN 9841) |

# Message format

With reference to the Seneca Z-PC Line, the ModBUS transactions always involving the master module (it manages the RS485-bus communication) and a single slave to each data interchange.

### *Data communication modality*

The Seneca Z-PC Line has been developed using ModBUS RTU protocol, which is based on a communication message constituted by: 1 start bit (unchangeable), 8 data bits, 1 parity bit (optional), 1 or 2 stop bits and a bit sequence to control the data packet (CRC-16, 16 bit Cyclic Redundancy Checksum). The structure of an data packet is shown in the following figure:

| Module Address | Functional Code | Data Field | CRC-16 |
|---|---|---|---|

**- Module Address** (first byte). When a Master node requires the data, it sends (through bus) a data packet with Module Address equal to the queried-Slave address;
**- Functional Code**: it represents the function to execute or has already been executed;
**- Data Field** (2 bytes to each value). it represents all the data necessary to detail the operation to execute;
**- CRC-16.**

With reference to the Seneca Z-PC Line, the module address can't be "0".

A typical communication through ModBUS consists in three steps:

1) a node makes a request to another node;
2) execution of actions necessary to satisfy the request;
3) return to initial node of the resulting informations.

### *ModBUS functional code*

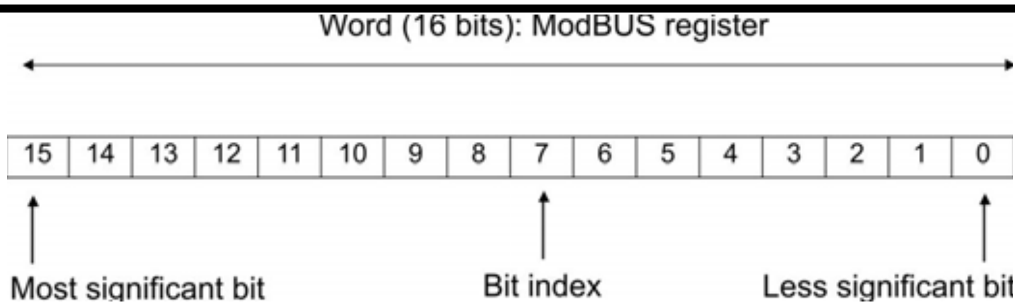
The module is designed to communicate as slave according to the ModBUS-RTU protocol rules. The functional codes supported by modules of the Seneca Z-PC Line are shown in the following table.

| Functional code | First register address | Name | Functional code | Name |
|---|---|---|---|---|
| 01 | 00001 | Read Coil Status | 05 | Force Single Coil |
| 02 | 10001 | Read Input Status | 06 | Preset Single Register |
| 03 | 40001 | Read Holding Register | 15 | Write Multiple Coils |
| 04 | 30001 | Read Input Register | 16 | Write Multiple Registers |

Some modules of the Seneca Z-PC Line do not support all functional codes shown in the previous table.

To each functional code there is a registers range, and the first register has physical address equal to 0000. In particular, in nxxxx notation: "n" means functional code, "xxxx" means address register (for example: if functional code=03, the first address is 40001).

In particular, the structure of an «Holding» register is shown in the following figure:




Many modules of the Seneca Z-PC Line allow to manage floating point data format, with reference to Holding Registers:

- **to have at disposal an amount information greater than word data format;**
- **to identify very different type of numbers at the same time (for example: 23.367°C and 5.23e-6).**

In this case, the content of two 16 bits-registers with consecutives addresses needs to be interpreted as a 32 bits-floating point number:

| Holding register address | Interpretation (Reverse floating point) |
|---|---|
| 4xxxx | More significant 16 bits, with reference to a FP-32bit number |
| 4xxxx+1 | Less significant 16 bits, with reference to a FP-32bit number |

| Holding register address | Interpretation (Floating point) |
|---|---|
| 4xxxx | Less significant 16 bits, with reference to a FP-32bit number |
| 4xxxx+1 | More significant 16 bits, with reference to a FP-32bit number |

To understand the RS485 registers table (for each module), see the following table.

| LEGEND OF REGISTERS TABLE | |
|---|---|
| **Term** | **Meaning** |
| / | The number in registers table require a decimal-base interpretation |
| 0x | As prefix, the following number N requires a hexadecimal-base interpretation |
| 0b | As prefix, the following number N requires a binary-base interpretation |
| M(L)SB | More (Less) significant 8 bits, with reference to one word (=16 bit register) |
| FP 32bit | The content of two 16 bits-registers with consecutive addresses needs to be interpreted as a 32 bit-floating point number. The register description and scale range refer to the FP 32 bit number |
| M(L)SW | More (Less) significant 16 bits, with reference to a FP 32 bit number |
| Bit [x:y] | Bit sequence between x and y (x, y included), with reference to one 16 bits register (=1 word). If the term “Bit [x:y]” does not appear in a line, the register description refers to full 16-bits sequence in connection with this word (“Bit [15:0]”) |
| / | For registers with “R/W” (reading/writing) equal to “R”, the terms in column “Default” represent the unchangeable contents of these ones |

# Error management in ModBUS protocol

There are two types of error in ModBUS protocol:

1) **Transmission Errors**: these errors change the message format, message parity (if there is the parity) or CRC. A drive detects if there is a transmission errors into message: it considers “invalid” the message and it does not reply;
2) **Operative Errors**: if there is a operative error, the function can’t be execute and the drive replies with a exception message. This message has: drive address, required function code, error code and CRC.

***An example:***

A master requires the content of Coil 1180 (=0x049C) register at drive address 11 (=0x0B); read outputs status has “0x01” function code.

| ADDR | FUNCTION CODE | DATA start (Addr HI) | DATA start (Addr LO) | DATA Bit # HI | DATA Bit # LO | CRC HI | CRC LO |
|---|---|---|---|---|---|---|---|
| 0x0B | 0x01 | 0x04 | 0x9C | XX | XX | XX | XX |

The Coil 1180 register does not exist into slave: the slave replies with a message that contains the “Illegal data address” error code (“0x02”) and function code “129” (=0x81).

| ADDR | FUNCTION CODE | DATA Exception code | CRC HI | CRC LO |
|---|---|---|---|---|
| 0x0B | 0x81 | 0x04 | XX | XX |

As a rule, ModBUS protocol allows to manage four types of exception code:

| Exception Code | Name | Meaning |
|---|---|---|
| 01 | Illegal function | The received function code (it is “0x01” in the previous example) does not correspond to a function that can be executed in addressed slave (it is “0x0B” in the previous example) |
| 02 | Illegal data address | The address in DATA field (it is “0x049C” in the previous example) does not correspond to a register in addressed slave (it is “0x0B” in the previous example) |
| 03 | Illegal data value | The data value to assign does not correspond to a valid value with reference to this register |
| 07 | Negative acknowledgement | The function can be executed or attempt to write in a only-read parameter |

# The Z-PC CANopen System

### *Introduction*

The Z-PC CANopen system allows the complete management of CANopen field bus.

It consist of:

- NR 2 CANopen master stations developed according to standard CiA DS-301 v4.02 (TWS3 and TWS64).

- NR 8 CANopen slave stations developed according to standard CiA DS-301 v4.02 and DS-401 v2.0 (ZC-24DI, ZC-16DI8DO, ZC-24DO, ZC-8TC, ZC-4RTD, ZC-8AI, ZC-3AO, ZC-SG).

- BUS SENECA that allows easy installation of CANopen SENECA stations, equipped with internal termination resistors.

- ZC-107FO repeater signal CANopen-based fiber optics

Thanks to Z-PC CANopen the station address and the baud rate is selectable through the configurator or by dip switches, making it even easier installation of the network. The stations performance combined with the baud rate up to 1Mbit / s leading the Z-CANopen PC at the top of the category.

# Basics on CANOpen Networking

### *Introduction*

The CAN protocol (Controller Area Network) was developed in the mid-80s for applications related to motor vehicles from the German Robert Bosch. It describes the communication protocol at the physical layer and data layer (levels 1 and 2 of the OSI model). Not anything specific in relation to higher levels and in particular with regard to the Protocol relating to the application level (level 7 of the OSI model). The CANopen protocol was standardized by the International CiA and is a protocol-level application that is based on CAN protocol with respect to the lower levels. It defines what data and services must be transmitted and the significance of data for different categories of devices.

CANopen Protocol is a standard application specific and is defined by the CIA DS301. The network management services defined in CANopen allow a simple initialization of the network. CAN is a communication system multi master. Unlike other bus systems, the connected modules are not identified, so are the messages sent on the bus. Participants in the network are authorized to send messages whenever the bus is free. Conflicts are resolved on the bus through a priority linked to the messages. CAN always sends broadcast messages that are divided into different levels of priority. All participants to the network have the same rights, then the communication is possible even without a master on the bus. The sending of data is decided independently by each station, but the data can be obtained from a remote station using a special message called "remote frame".

The CANopen specific (DS 301) indicates the technical and functional characteristics that each device must meet to be plugged into the network CANopen. The concepts underlying the CANopen are:

• The bus can contain up to 127 stations
• The device description is made by using a text file with .EDS extension. That file is supplied by the device manufacturer and is used to configure and use the device
• Communication is object-oriented through the use of messages PDO and SDO
• Complex services or low-priority messages are transmitted via SDO
• Data can be sent via PDO messages from all slaves on event or in response to the synchronization message.

### *Standards*

The CiA DS-301 profile communication specifies mechanisms for configuration and communication between devices in real time environments. CANOpen is used for transmission at Level 2 specification ISO 11898 and CAN 2.0 A + B. The CANopen device TWS is based on communication profile CiA draft CANOpen 301 Standard Version 4.01. The ZC SLAVE CANopen devices meet the profile for modules I / O CiA 401 Draft Standard Version 1.4.

### *PDO/SDO Messages*

CANopen implements communications services differ depending on the different types of communications objects transmitted. The two basic types of objects are the Process Data Object (PDO) and Service Data Objects (SDO). The PDO contains information such as real-time message identified with high priority. The maximum number of data contained into a PDO is 8 Bytes. The SDO contains system settings with low priority identifiers and can send, thanks to the automatic message fragmentation, even large moles of data. The exchange of data can be controlled by events or by a synchronization message (SYNC). Sending data on events greatly reduces the load of the bus, **allowing a high-performance communication even with a reduced speed of the bus**. It’s also possibile to use the system with both modes simultaneously active. The Service Data Objects are transmitted using point to point mode. In addition to the SDO and PDO, CANopen offers other communication objects:

• Communication Objects for synchronize inputs and outputs
• Communication Objects for boot-up procedures (starting)
• Communication Objects for the "life guarding / node guarding"
• Communication Objects for emergency messages

### *The Object Dictionary*

The Object dictionary of a device gives the items required for the configuration of the device.

Access to the dictionary objects (read or write of parameters) is performed by SDO services. The dictionary object is composed of several parts:

• Features that apply to all CANopen devices (DS 301)
• Features that are valid for Input / Output devices
• Features that are manufacturer-dependent

The index for access to objects is standardized within the CANopen profiles, except for items defined by the manufacturer. The communication profile supports the objects 0x1000 and 0x1018. There are also objects for the configuration of PDO communication (index 0x1400, 0x1600).

With regard to the profile DS401 items are placed in the 0x6000 area.

### *PDO Mapping*

The mapping of PDO allows the customization of data to send / receive in order to optimize the employment of network bandwidth. Each PDO can contain up to 8 bytes of data.
The PDO is divided into TPDO and RPDO: TPDOs are related to the transmission of output data from the station, while RPDOs containing data transmitted to the station.

The types of possible transmission type for the PDO are illustrated in the following table:

| Type Nr | Cyclic | Acyclic | Synchronous | Asynchronous | RTR Only |
|---|---|---|---|---|---|
| 0 | | X | X | | |
| 1-240 | X | | X | | |
| 241-251 | | | Reserved | | |
| 252 | | | X | | |
| 253 | | | | X | X |
| 254 | | | | X | X |
| 255 | | | | X | |

The type from 1 to 240 is the number of SYNC objects between two PDO transmissions.
The type 252 updates values on SYNC reception but are not send.
The type 253 updates values on RTR reception.

The type 254 provides an application-specific device.
The type 255 provides an application defined in the profile of the device.

### PDO Linking

The Z-PC CANopen stations support the PDO Linking, this means that you can direct a TPDO from a CANopen slave station into a RPDO of another slave station without increase the master station CPU load.

# Technical Specifications

## CANopen MASTER Stations

The CANopen devices TWS3 and TWS64 have the capabilities of master CANOpen and implement the following features:

### CAN

• Managing CAN 2.0A network (that is, with a 11 bit identifier).
• Transmission rates supported: 10, 20, 50, 100, 125, 250, 500, 800.1000 Kbits/s)

### CANopen

• Standard DS 301 V4.0
• Supported profile DS 401 IO modules (digital and analog)

### NMT MASTER

• Single Master
• Management of 127 stations (from 1 to 127)
• Configuring stations through SDO messages
• NMT Start of sigle stations
• Monitoring through Node guarding
• Receiving emergency messages EMYC
• Generation of messages sync SYNC
• Master Heartbeat

### Input / Output

• Management of synchronous and asynchronous transmission
• Auto Grouping of inputs and outputs on PLC memory
• 256 transmission PDO containing a maximum of 8 bytes (1024 bytes maximum output)
• 256 receive PDO containing a maximum of 8 bytes (1024 bytes maximum input)

### CANopen Manager

• Read and import of EDS files
• Diagnostic data from devices
• Automatic generation of PDO messages

# CANopen SLAVE Stations

The CANOpen slave devices implement the following features:

### CAN

• CAN 2.0A network (that is, with a 11 bit identifier).
• Transmission rates supported: 20, 50, 125, 250, 500, 800.1000

### CANOpen

• Standard DS 301 V4.0
• Supported profile DS 401 IO modules (digital and analog)

### NMT SLAVE

• Address set (from 1 to 127) also from dip switches
• baudrate set also by dip switches
• Stations Configuartions through SDO messages
• Node guarding
• Emergency messages EMYC

### Input / Output Devices

• Send / Receive PDO synchronous and asynchronous
• Up to 5 PDO in transmission containing up to 8 bytes
• 1 PDO receive containing up to 8 bytes

### INPUT/OUTPUT

Depending on station type they are equipped with the following inputs / outputs:

• up to 24 digital inputs
• up to 24 digital outputs

• up to 8 digital outputs and 16 digital inputs on the same station
• up to 8 thermocouple inputs
• up to 4 inputs RTD
• up to 8 inputs current / voltage DC
• up to 3 analog output current / voltage DC
• 1 strain gauge bridge input

### CANopen ZC-107FO Repeater

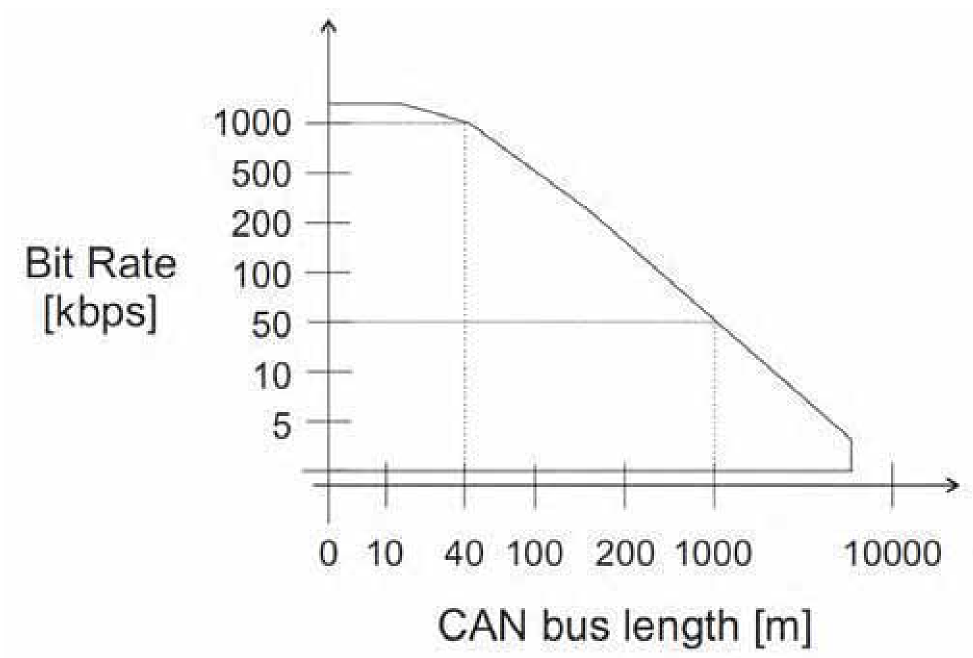
The ZC-107FO is a CAN signal repeater through fiber optics. The repeater can also be used to expand the number of nodes within the same bus.
By connecting two ZC-107FO with each other through the fiber optic the CAN communication can be extended to a maximum length of two kilometers for a maximum Buade rate of 1Mbit/s.

### *Some guidelines to establish bus-cable dimensions*

Cable and bus-termination resistance requirements must comply with the ISO 11898. In particular, the following table contains the maximum values of the bus-cable length as a function of conductor section and the number of the units connected to its (N). As you can see: the higher the conductor section, the higher the maximum length.

| Conductor section [$mm^2$] | Maximum length [m] | | |
|---|---|---|---|
| | N=32 | N=64 | N=100 |
| 0.25 | 200 | 170 | 150 |
| 0.5 | 360 | 310 | 270 |
| 0.75 | 550 | 470 | 410 |

In addition, the following figure shows how the bus speed influences the maximum bus length achievable.




# Connecting the Z-PC CANOpen Series to the Seneca bus

### *Bus Topology*

CAN is based on a linear topology type with a shielded cable with two wires and termination resistors on each end of the cable. The communication speed varies between 10 kbit / s (> 1000 m) and 1 Mbit / s (25 m), depending on the length of the network.

### *Communication Speed (Baudrate) and BUS Length*

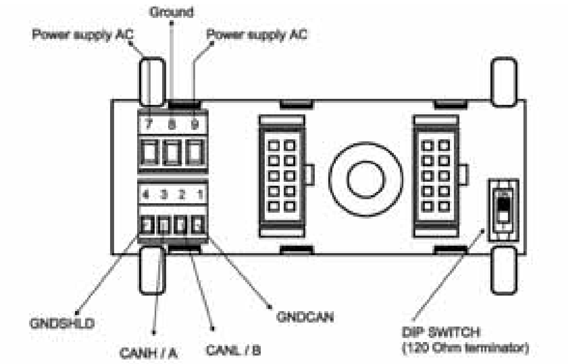
The maximum distance reached via the CANopen network depends on the speed of communication selected, the figure shows the different possibilities.

| ***Speed*** | 10 kbit/s | 20 kbit/s | 50 kbit/s | 125 kbit/s | 250 kbit/s | 500 kbit/s | 800 kbit/s | 1 Mbit/s |
|---|---|---|---|---|---|---|---|---|
| ***BUS Lenght*** | 5000 m (2) | 2500 m (2) | 1000 m (2) | 500 m (1) | 250 m (1) | 100 m | 50 m | 25 m |

(1) For distances over 200 meters is recommended the use of opto couplers.
(2) For distances over 1,000 meters is recommended the use of repeater signal ZC-107FO.

### *The SENECA BUS*

The Seneca bus has the following pinout:




### *For AC Supply:*

Connect the AC supply to the Power Supply AC pins.

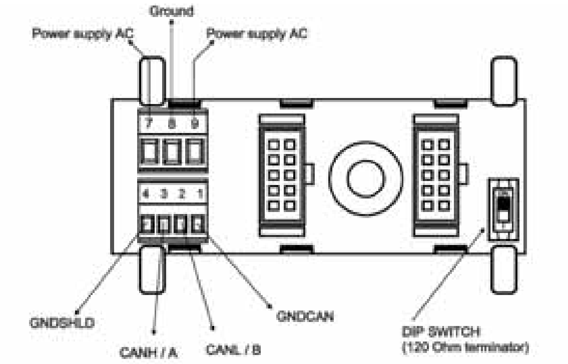
Pull pin 8 (Ground) to earth on the cabinet board.

### *For DC Supply:*

Connect the DC supply to the Power Supply pins, it is not necessary to respect the supply polarity.

Pull pin 8 (Ground) to earth on the cabinet board.

### *Connection of Z-PC-SLAVE CANopen and ZC-107FO stations to the SENECA BUS via the back IDC10 connector.*

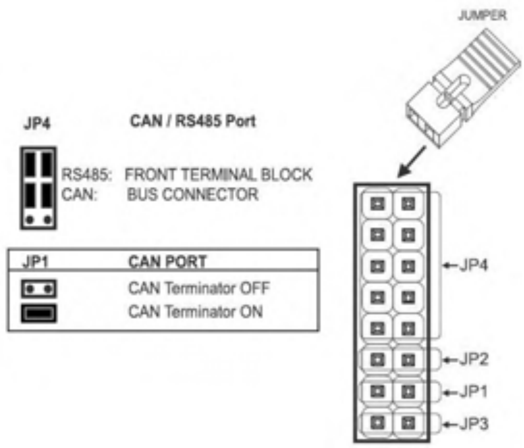



The connection to the bus of CANopen Slave station is done by inserting the back IDC10 plug in the bus Seneca.
The pin 1 to 4 of the bus are used to extend the CANopen bus outside the SENECA bus, in this case the signal GNDCAN (pin 1) should be linked to obtain a robust communication. The pin 4 (GNDSHLD) should be connected to the briding of the cable used to connect.
If it is necessary to use a T connection from the main bus line, see the following table for their maximum length (from ISO / DIS 11898):

| Speed | Max bus Length | Max T connection Length |
|---|---|---|
| 20 kbit/s | 1000 m | 7,5 m |
| 125 kbit/s | 200 m | 3,75 m |
| 500 kbit/s | 100 m | 0,75 m |
| 1000 Mbit/s | 25 m | 0,3 m |

### *Connection of the CANopen Master TWS3/TWS64 Station to the SENECA BUS via the back IDC10 connector*

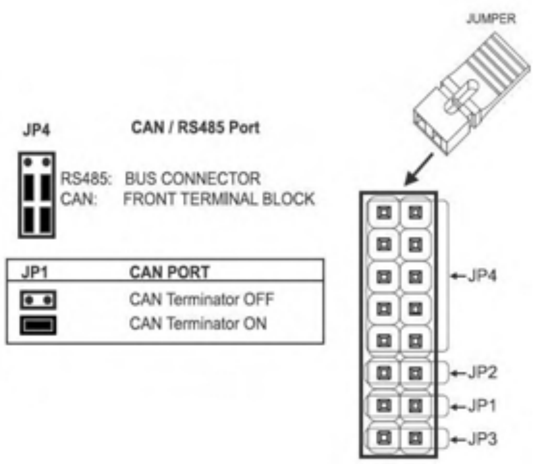
Set the jumpers as shown:



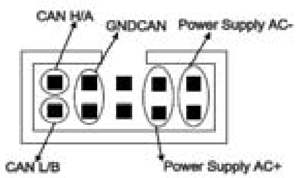

The connection is done by inserting the station back connector to the SENECA bus

## *Connection of CANopen Master TWS3/ TWS64 station to theSENECA BUS via Side Clamp*

Set the jumpers as shown:




The pinout of IDC10 connector is :



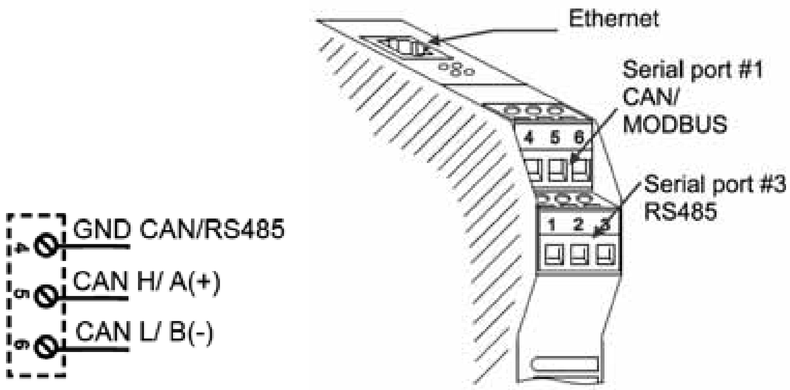

### *For AC Supply:*

Connect the AC supply to the IDC10 connector Power Supply AC pins.

### *For DC Supply:*

Connect the DC supply to the IDC10 connector Power Supply pins it is not necessary to respect the supply polarity.

### *BUS Signals:*

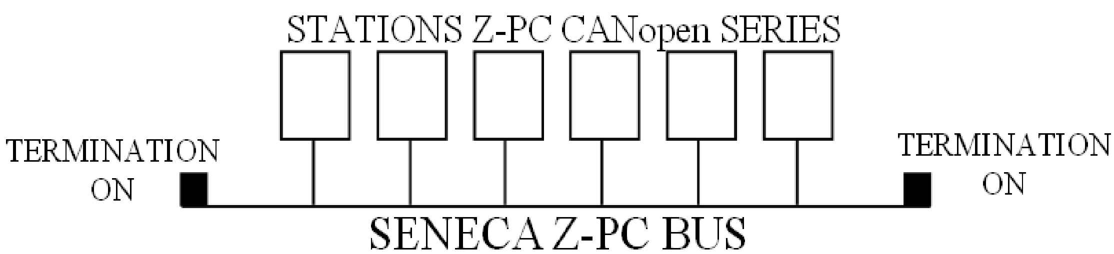



The pins CANH, CANL and GNDCAN are used for CANopen bus signals, the GNDCAN signal must be connected to obtain a robust communication. If it is necessary to use a T connection from the main bus line, see the following table for their maximum length (from ISO / DIS 11898):

| Speed | Max BUS Length | Max T connection length |
|---|---|---|
| 20 kbit/s | 1000 m | 7,5 m |
| 125 kbit/s | 200 m | 3,75 m |
| 500 kbit/s | 100 m | 0,75 m |
| 1000 Mbit/s | 25 m | 0,3 m |

### *Terminations Enable and Verification on SENECA BUS*

The 120 Ω termination between signals CAN_L and CAN_H is already included in the SENECA bus and must be enabled using the on board dip switch.
The termination should be enabled both at the beginning (typically before the CANopen master) and end of the BUS (typically after the last CANopen slave station):




Note that a termination may be enabled directly to the TWS3/TWS64 stations through JP1 jumper.

After the enable operation, using a tester to verify the various impedances indicated:

| Measure | Value | Meaning |
|---|---|---|
| Between GND and CAN_L | Infinity | OK |
| | 0 | CAUTION:<br>Short circuit between GND and CAN_L |
| Between GND and CAN_H | Infinity | OK |
| | 0 | CAUTION:<br>Short circuit between GND and CAN_H |
| Between CAN_L and CAN_H | About 60 Ω | OK<br>Both terminations enabled |
| | About 120 Ω | CAUTION:<br>Only one termination enabled |
| | < 50 Ω | CAUTION:<br>More than two termination enabled |

# Connection of Z-PC CANOpen Series to a generic bus

### *Bus Topology*

CAN is based on a linear topology type with a shielded cable with two wires and termination resistors on each end of the cable. The communication speed varies between 10 kbit / s (> 1000 m) and 1 Mbit / s (25 m), depending on the length of the network.

### *Communication Speed (Baudrate) and BUS Length*

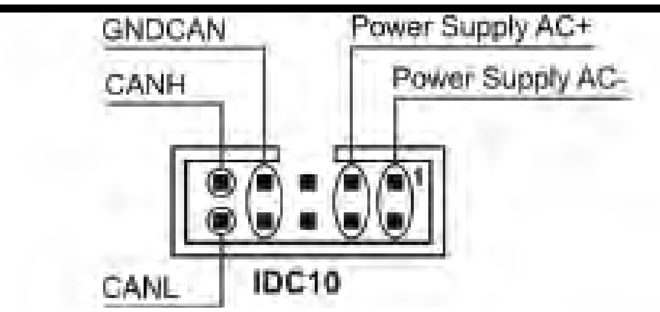
The maximum distance reached via the CANopen network depends on the speed of communication selected, the figure shows the different possibilities.

| ***Speed*** | 10 kbit/s | 20 kbit/s | 50 kbit/s | 125 kbit/s | 250 kbit/s | 500 kbit/s | 800 kbit/s | 1 Mbit/s |
|---|---|---|---|---|---|---|---|---|
| ***BUS Lenght*** | 5000 m (2) | 2500 m (2) | 1000 m (2) | 500 m (1) | 250 m (1) | 100 m | 50 m | 25 m |

(1) For distances over 200 meters is recommended the use of opto couplers.
(2) For distances over 1,000 meters is recommended the use of repeater signal ZC-107FO.

### *Connection of Z-PC-SLAVE CANopen and ZC-107FO stations to the SENECA BUS via the back IDC10 connector.*

The pinout of IDC10 connector is :




### *For AC Supply:*

Connect the AC supply to the Power Supply AC pins.

### *For DC Supply:*

Connect the DC supply to the Power Supply pins, it is not necessary to respect the supply polarity.

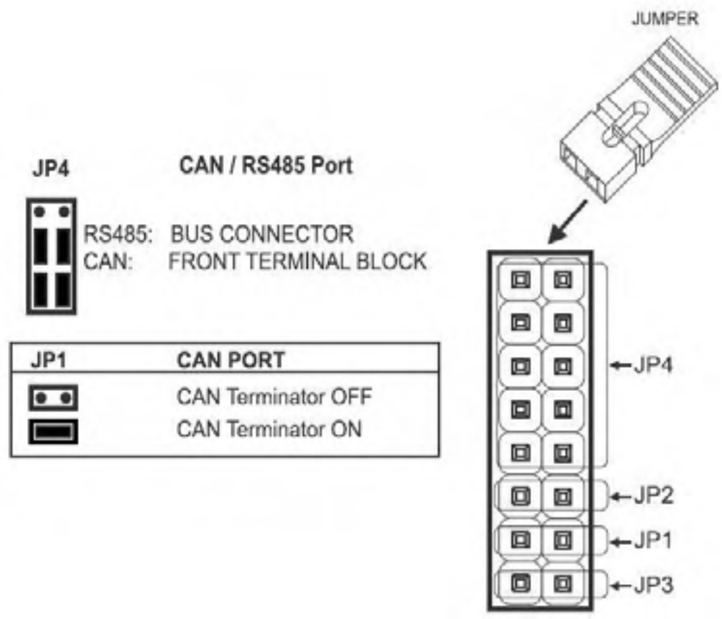
### *BUS Signals:*

The pins CANH, CANL and GNDCAN are used for CANopen bus signals, the GNDCAN signal must be connected to obtain a robust communication. If it is necessary to use a T connection from the main bus line, see the following table for their maximum length (from ISO / DIS 11898):

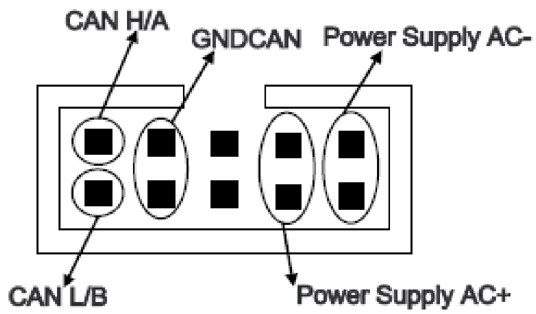
| Speed | Max BUS Length | Max T connection length |
|---|---|---|
| 20 kbit/s | 1000 m | 7,5 m |
| 125 kbit/s | 200 m | 3,75 m |
| 500 kbit/s | 100 m | 0,75 m |
| 1000 Mbit/s | 25 m | 0,3 m |

### *Connection of TWS3/TWS64 stations to a generic CANopen BUS via the back IDC10 connector*

Set  the jumpers as shown:




The pinout of IDC10 connector is :



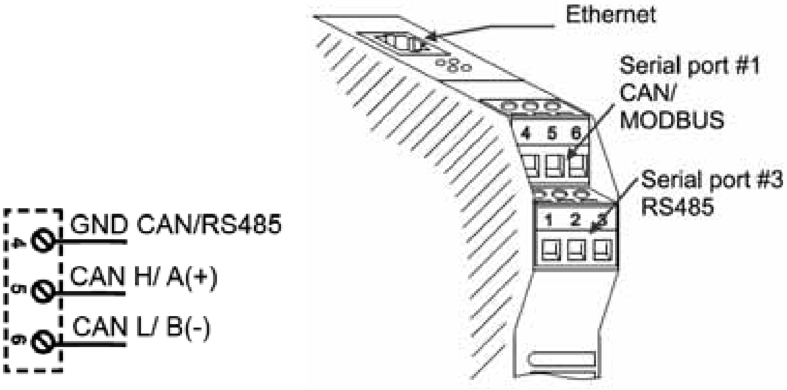

### *For AC Supply:*

Connect the AC supply to the Power Supply AC pins.

### *For DC Supply:*

Connect the DC supply to the Power Supply pins, it is not necessary to respect the supply polarity.

***BUS Signals:***



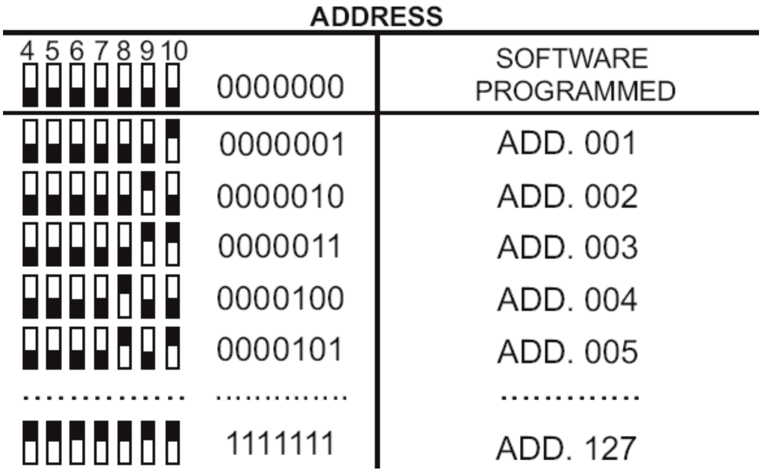

The pins CANH, CANL and GNDCAN are used for CANopen bus signals, the GNDCAN signal must be connected to obtain a robust communication. If it is necessary to use a T connection from the main bus line, see the following table for their maximum length (from ISO / DIS 11898):

| Speed | Max BUS Length | Max T connection length |
|---|---|---|
| 20 kbit/s | 1000 m | 7,5 m |
| 125 kbit/s | 200 m | 3,75 m |
| 500 kbit/s | 100 m | 0,75 m |
| 1000 Mbit/s | 25 m | 0,3 m |

# Setting the dip-switches of Z-PC Stations

### *Setting the station address by dip switches on CANopen slave devices*

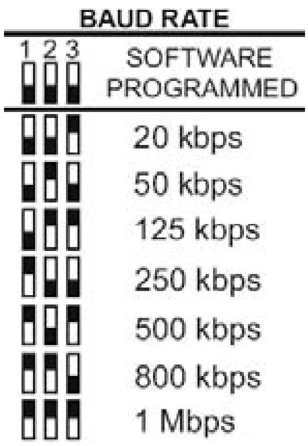
The Z-PC CANopen SLAVE devices have a series of DIP switches accessible from the hole on the container. The DIP switches are used for both the setting of the station number (ID) and for setting the speed of communication. The ID station is used to calculate the COB-ID of PDO, the SDO and Emergency objects. The binary weight of each DIP switch increases by the number of the switch, for example if the ID 1 is obtained by DIP4 = ON, the ID 8 is obtained by DIP8 = ON, etc..
The nodes can have values from 1 to 127. The COB ID allocation is made according to the Default Set Connection (CiA DS 301, 8.4.1).




The combination of the dip from 4 to 10 in OFF (Software Programmed) lets you configure the address from a CANopen configurator by the SDO protocol.

### *Setting the communication speed of the CANopen slave stations*

The communication speed setting is done through the first three DIP switches. The figure shows the pattern of allocation of speeds through the DIP switches.



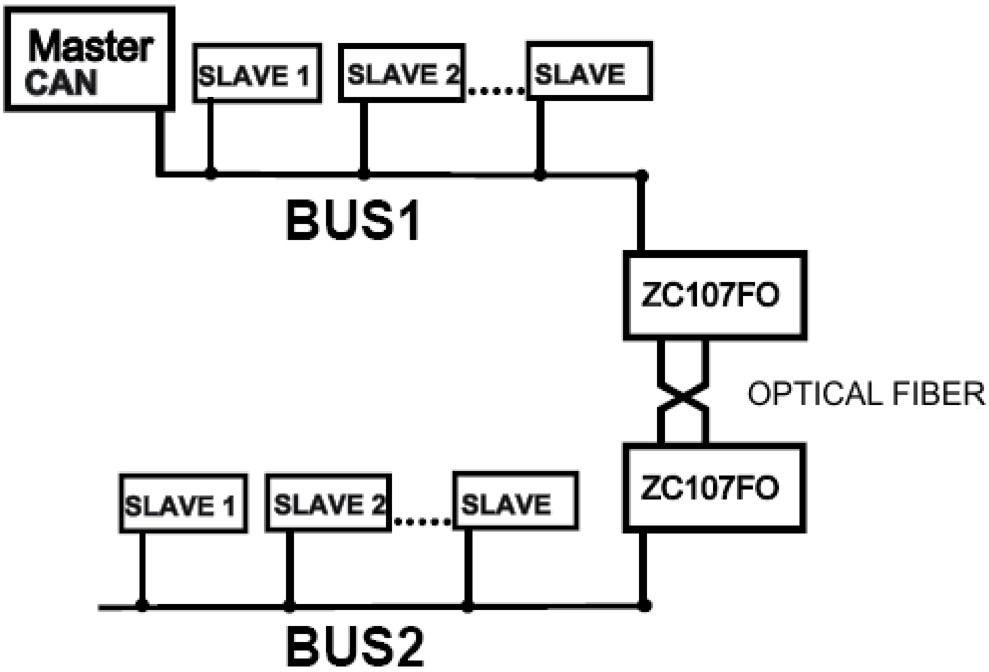

The figure is an example of a possible setting of DIP switches. The setting is the condition ID = 32 and communication speed = 500 kbits/s.

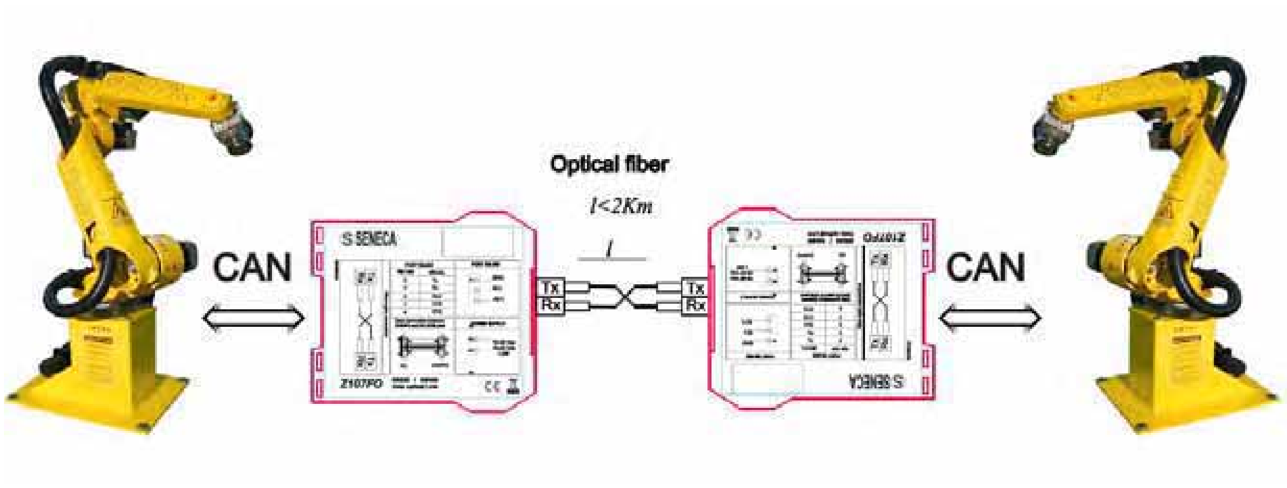
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| ON | OFF | ON | OFF | OFF | OFF | OFF | OFF | ON | OFF |

The combination of dip 1 .. 3 to OFF (Software Programmed) lets you set the baud rate by using a CANopen configurator by the SDO protocol.

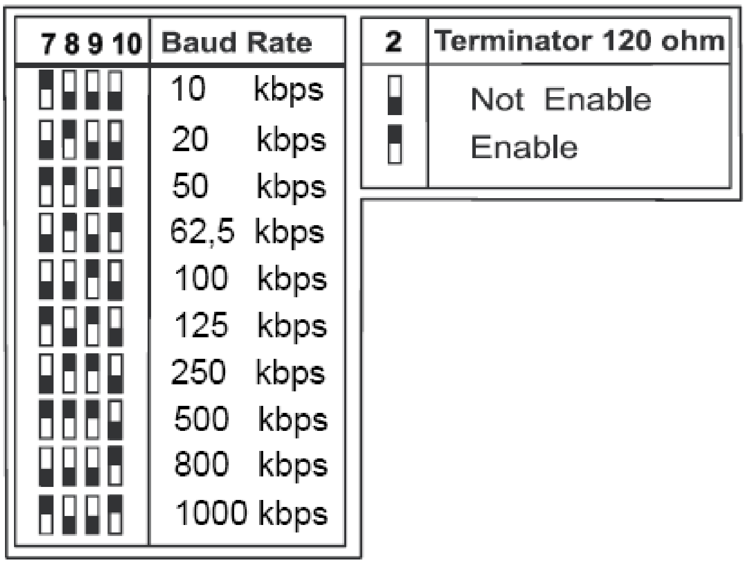
# Extending a CANopen bus with the ZC-107FO signal repeater

A clear example of the use of the ZC-107FO repeater is:



### *Setting the Baud rate BUS on ZC-107FO CANopen repeater*



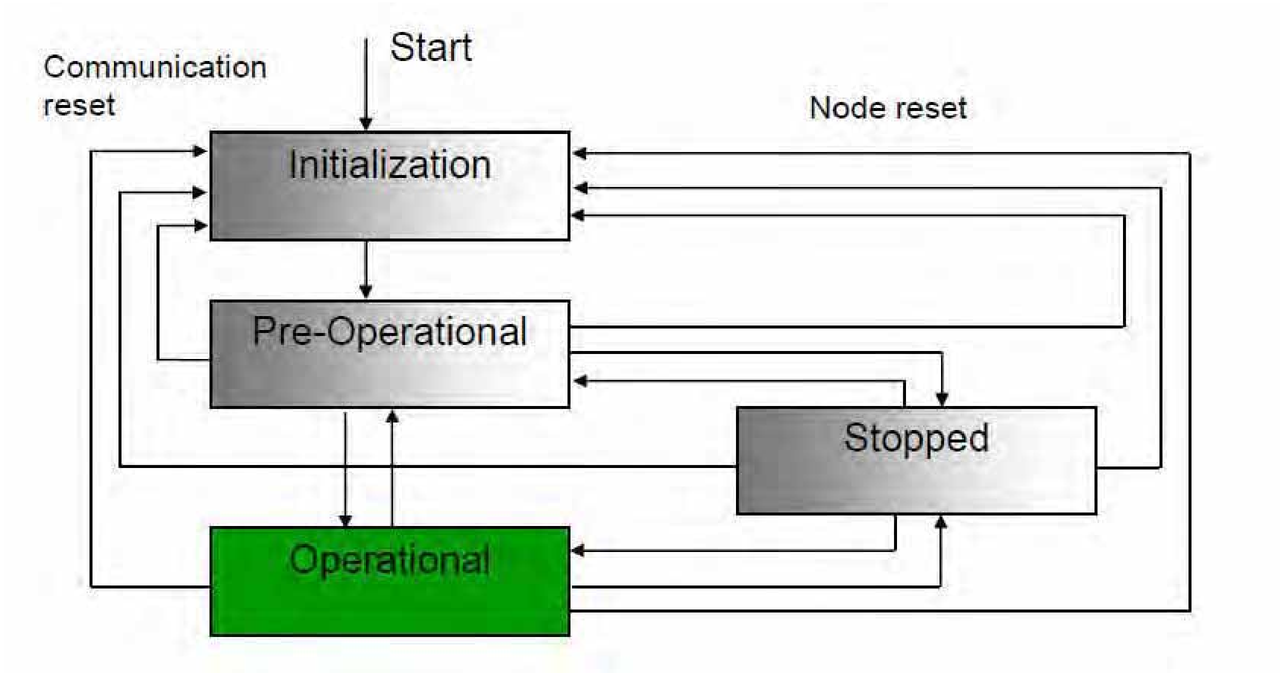

**It is essential to set on the pair of ZC-107FO repeaters the same baud rate, the baud rate must coincide with the CANopen network that you want to extend.**
The baud rate is adjustable via dip switches 7 .. 10, you can also insert directly on the repeater the termination resistance.

# How it works

The following chapter sets out the main aspects of the Z-PC CANopen SLAVE devices.

### *Start procedure*

When a device is switched on is carried in the state INITIALIZATION, the application and communication objects are assigned at this stage. When this phase is successfully completed, the device is automatically carried in PRE-OPERATIONAL state.




When the device is in PRE-OPERATIONAL state, communication via SDO is initiated. In this state, you can run the following settings via SDO:

• Setting the Guard Time and Life Time Factors.
• Setting the communication parameters of PDOs.
• Mapping of PDOs.
• Saving information.

In PRE-OPERATIONAL state the device is unable to perform either the PDO communication or transmit emergency messages.
In the OPERATIONAL stage the device can automatically send messages PDO and emergency messages.
In the STOPPED state (also indicated with PREPARED) the communication on the bus is turned off (SDO and PDO communication not possible), the only accepted command is a network command (for example a Start Remote Node).

### *Default Set Connections*

At start up by default the PDO reception is available, for example RPDO1 and RPDO2, with the COB-ID:

RPDO1 = 200h + Node ID
RPDO2 = 300h + Node ID

At start up by default the PDO transmission is available, for example TPDO1 and TPDO2, with the COB-ID:

TPDO1 = 180h + Node ID
TPDO2 = 280h + Node ID

Through the CANOpen network configurator you can change the default setting of the connections.

### Node Guarding

The Node Guarding enables the network administrator (typically a CANopen master station) to verify if a slave station has a fault. To detect what slave is in fault, the master sends the message to the Guard ID (100Eh) of a slave, every "Node Guard Time" through an RTR message for each node. The slaves reply with a Guard message, which contains a toggle bit, and the slave status. This reply message is used by the CANopen master to update the status of all slaves nodes connected and properly functioning.

### Life Guarding

While node guarding is used by the network administrator to detect if a slave station is in fault, the slave use the guarding messages to see if the master is present. This slave monitoring function is called life guarding. **To detect a broken cable and force the outputs to the condition of fault with the CANOpen, you must use both the node and life guarding.** To activate the life guarding the station master configures the Guard Time (item 100Ch) and the Life Time Factor (item 100Dh). If time monitoring resulting from Life Time = Life Time Factor · Guard Time [ms] expire before that the slave has received a telegram of guarding, the device sets the exits/inputs in fault mode and considers the communication with the master interrupted.

### Heart beat

The NMT slave sends to the NMT master a Nodeguarding event on a settable interval time. If the NMT master does not receive a valid Nodeguarding event from the slave within this time, the slave is asserted “fail”.

# Quick start: CANopen with CODESYS 2.3

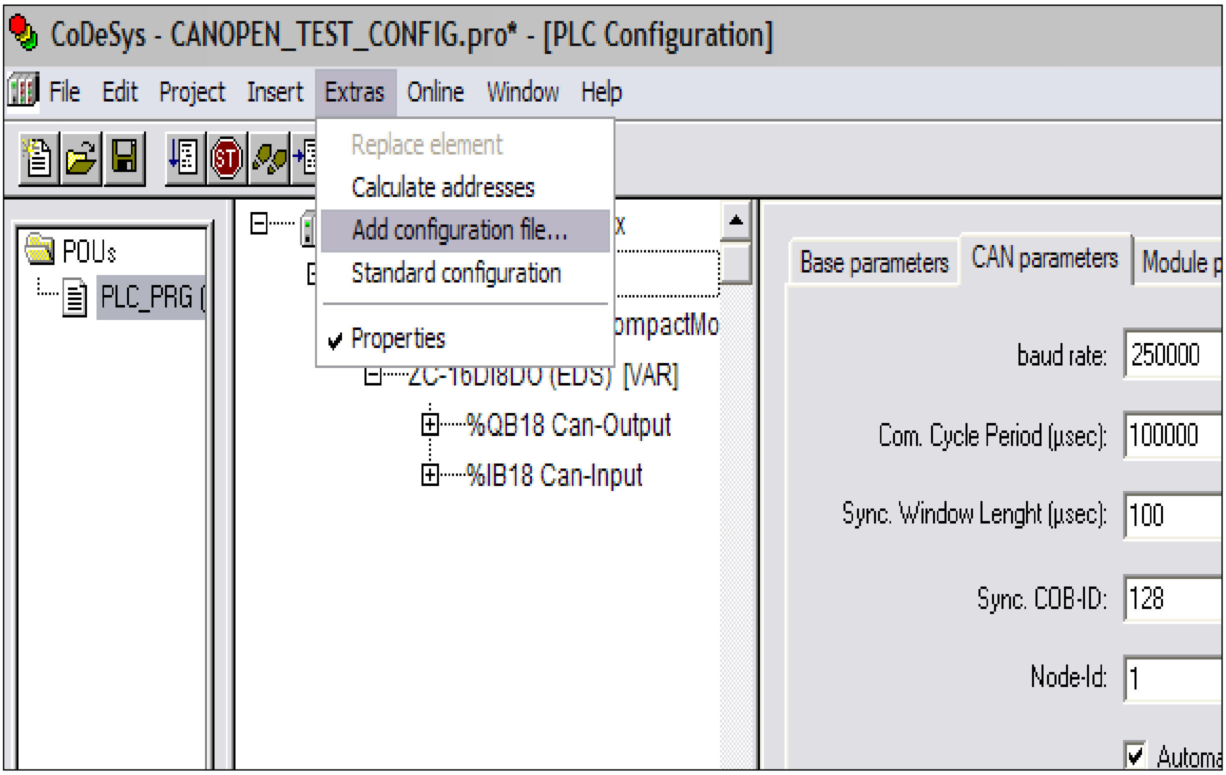
This chapter discusses the using and configuration process of the CANopen Master station into the CodeSys development environment used for the programming of PLC TWS3/TWS64. This environment uses an integrated CANOpen network configurator.

### Using the CodeSys CANopen integrated configurator

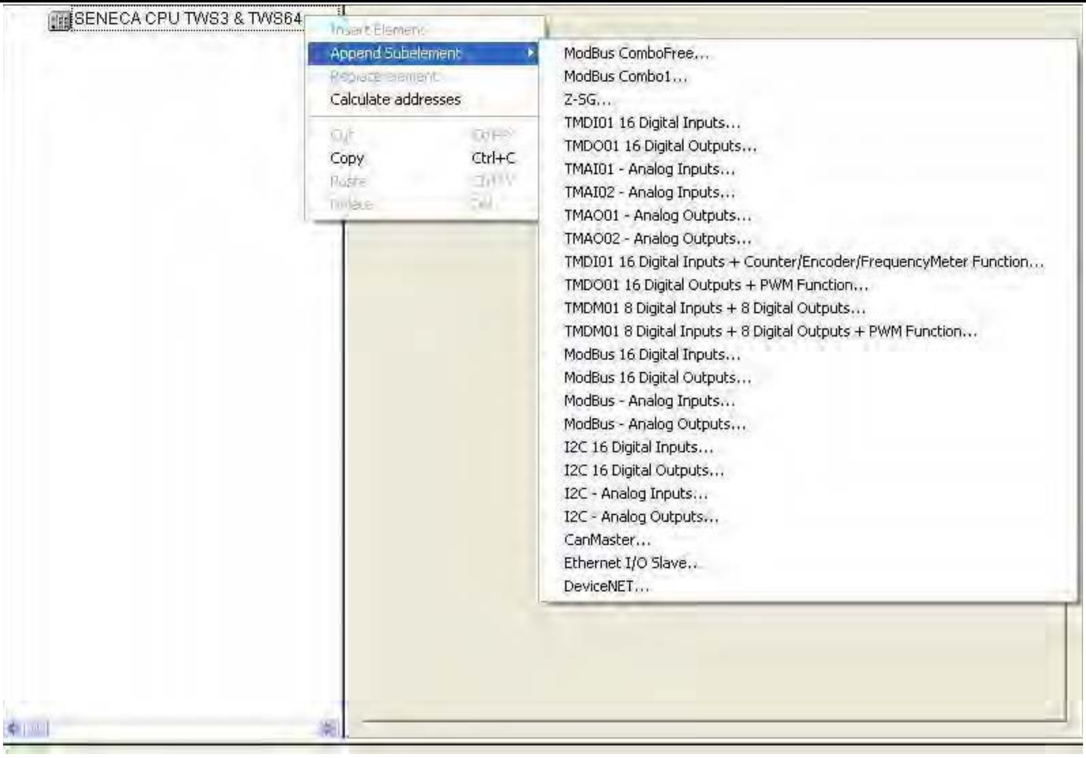
This section describes the use of the CodeSys CANopen integrated configurator to configure the network connected to the TWS3/TWS64 Master CANOpen. Please refer to the CodeSys software manuals for proper installation and a detailed description of its use.

### *Loading of EDS files*

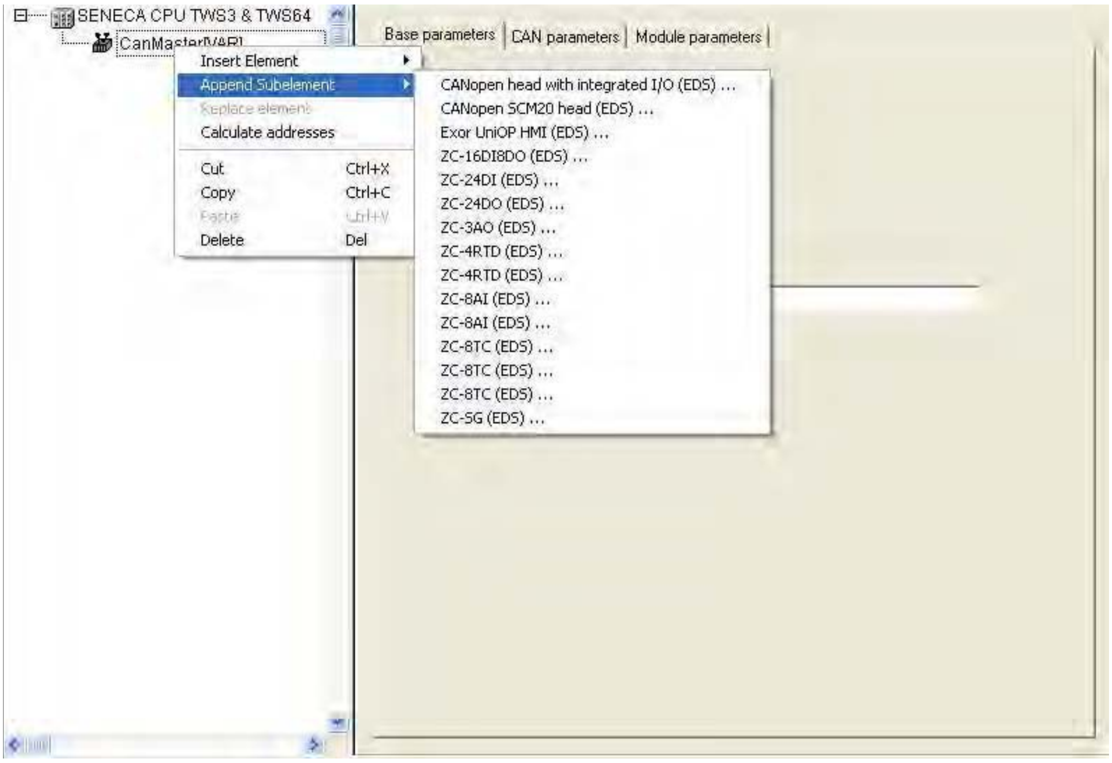
It's essential to use the menu *Extras* | *Add Configuration file* to install the EDS device file before inserting it into the CANOpen net:



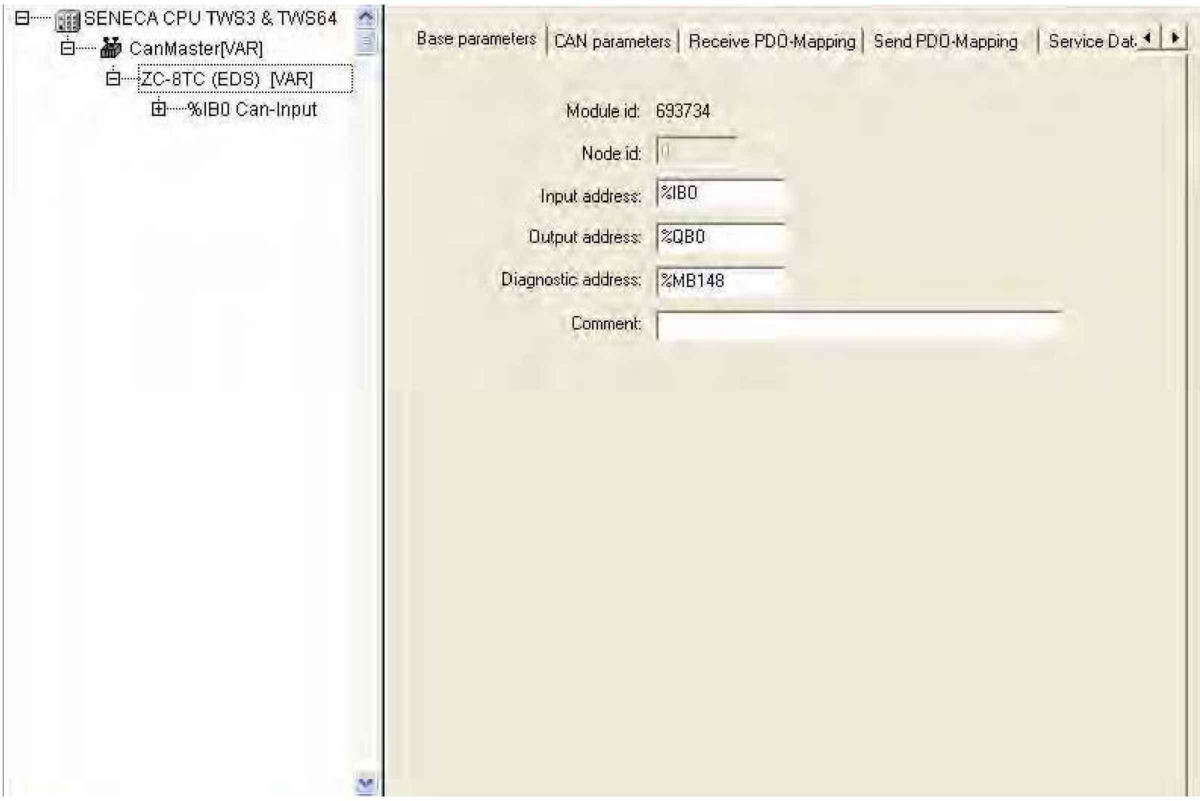

Once this operation was done by positioning itself in *Resources* | *PLC Configuration*, you can right click on the node "SENECA CPU TWS3 & TWS64" and add a "CanMaster":




Once inserted the CANMaster positioning on right click menu you can view the various slave available and include them in the configuration:

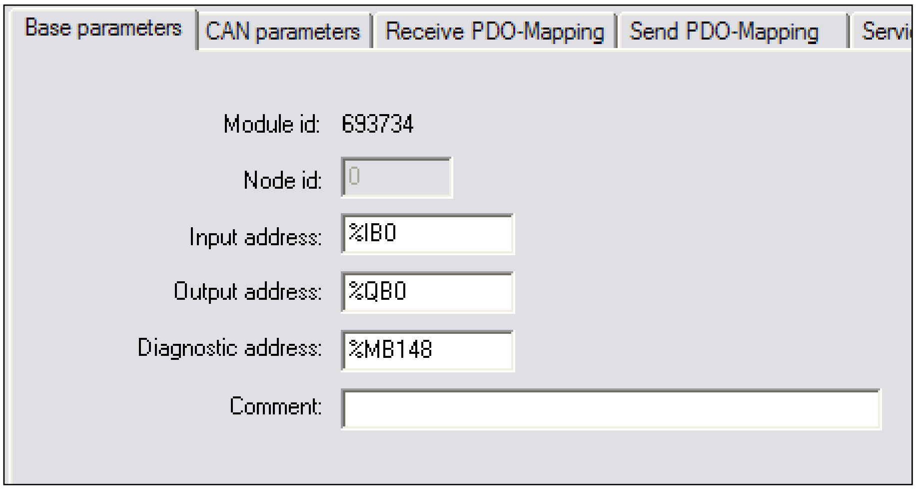


In the below figure is shown the result obtained by selecting the ZC-8TC station:



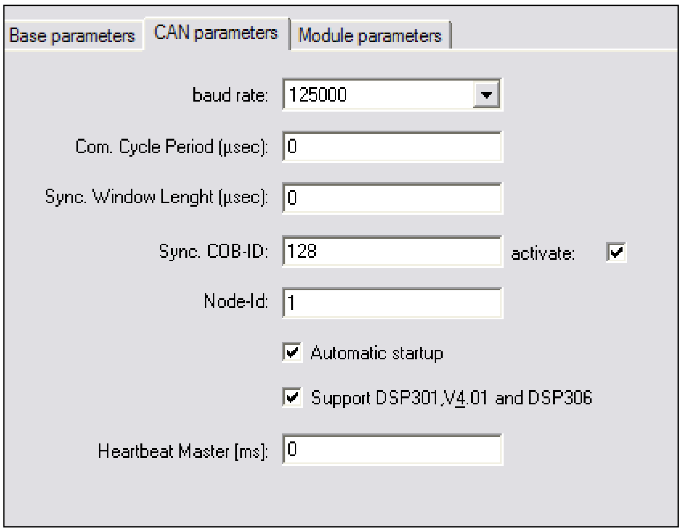

### *Configuration of the TWS Master CANOpen parameters*

Positioning on CANMASTER[VAR], you can set its operating parameters.

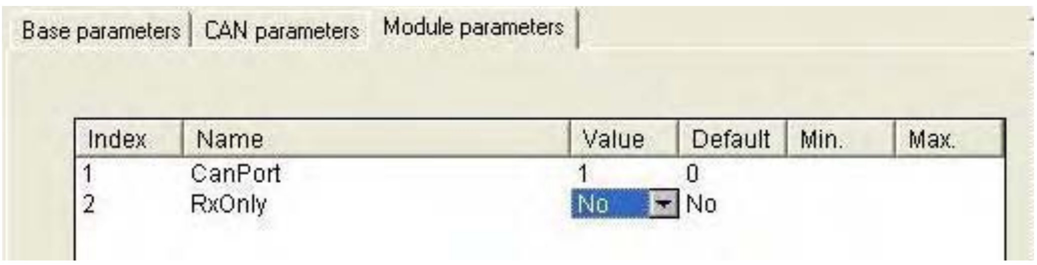



In the Basic Parameters window it's possible to insert the following parameters:
• Input Address: Shows the input memory location where the configurator starts to place the data of the Master CANOpen.
• Output Address: Shows the output memory location where the configurator starts to place the data of the Master CANOpen.

• Diagnostic address: indicates the location in memory where the CANopen Master diagnostics data are saved.



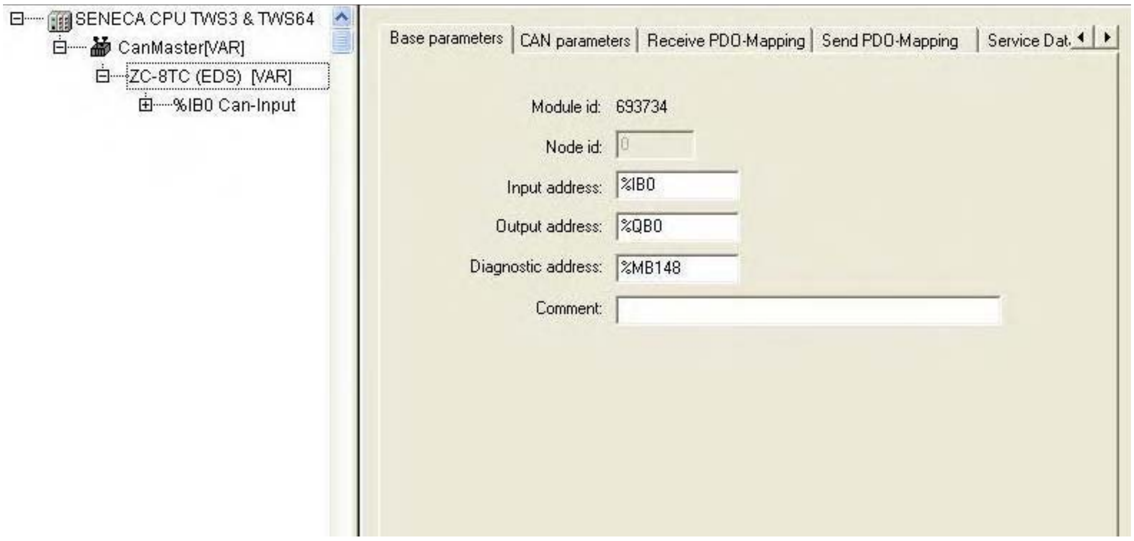

In the CAN parameters window you can configure the following parameters:
• Baud rate: Shows the speed of CANOpen network operations and must match the set of the DIP SWITCHES slaves stations
• Com Cycle Period: means the period between the release of two SYNC message
• Sync Window Length: temporal window within must be sent the synchronous PDOs
• Sync COB-ID: COB-ID  assigned to the SYNC message sends from the master if you check the option "activate".
• Node-Id: The Node-id (1-127) is the node number which is used by the master for addressing the device in a CANopen network.
• Automatic Startup: If this option is activated, at a download or at starting up the PLC the CAN bus will be initialized and started automatically: If the option is not activated, the CanDevice will wait for an appropriate command.
• Support DSP301, DSP306 and v4.01: active option extensions to the Protocol, in particular the functionality of Heartbeat Master (ways of monitoring the station presence where slave stations also act actively). When activated, you can indicate in the next fields the generation time of the Heartbeat message. It is recalled that the Heartbeat protocol is not supported by the Z-PC CANopen slaves stations.




In the MODULE parameters window you can configure the following parameters:
• CANPort: Shows the position of the CAN master port on TWS3/TWS64. Usually the first card has CanPort = 1, you can connect through TP-WIRE CAN additional ports on the same TWS3/TWS64 station.

### *Parameters Settings of a ZC Slave*

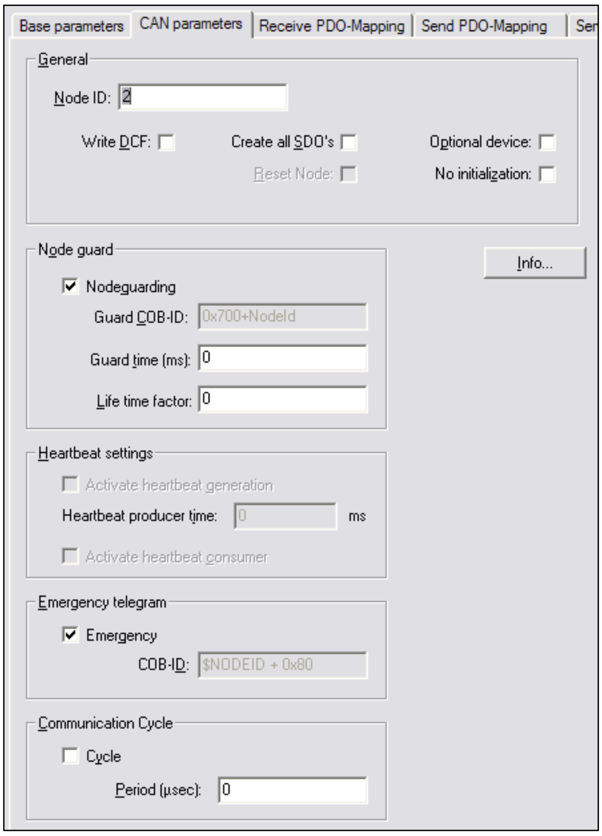
By clicking on the inserted ZC Slave module you can set its operating parameters.




In the base parameters window, you can enter the following parameters:

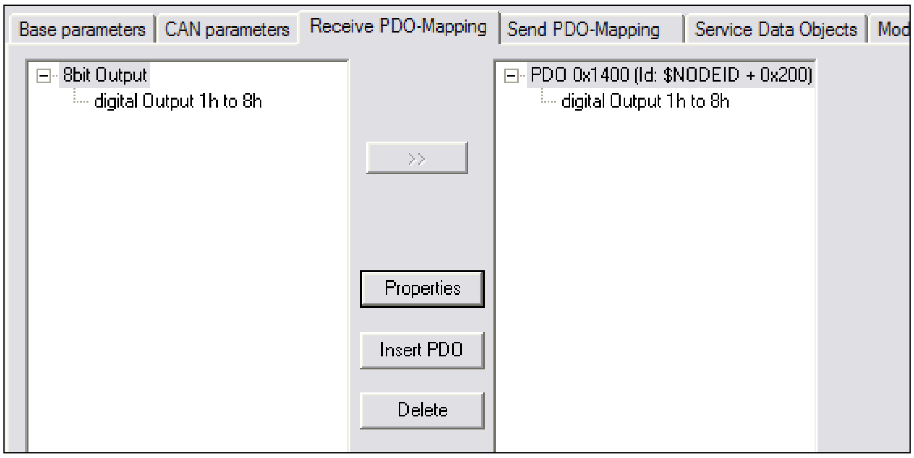
• Input Address: Shows the input memory location where the configurator starts to place the data of the CANOpen Slave.
• Output Address: Shows the output memory location where the configurator starts to place the data of the CANOpen Slave.

• Diagnostic address: indicates the location in memory where the CANopen Slave diagnostics data are saved

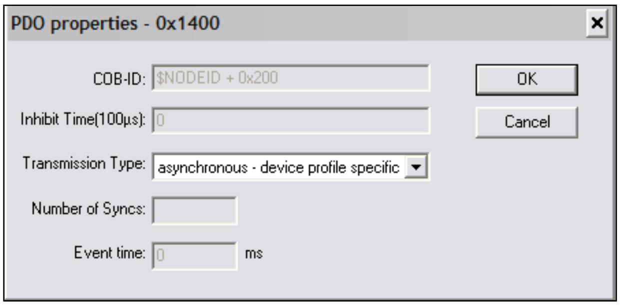



In the CAN parameters window you can configure the following parameters:

• Node ID: Node ID assigned to the slave CANOpen (valid only if the Z-PC CANopen slave station dip switches has dips 4 .. 10 in OFF.
• Write DCF: creates a DCF file for the node in question (this is an EDS file with the values instantiated in the configurator)
• Create all SDO's: creates and initializes all SDO items indicated in the EDS file, not just those that are changed
• Optional Device: the master checks for the slave device, if there is not recognised continues in its normal operation
• No initialization, the master initiates communication with the node without initialize the objects of the dictionary via SDO.
• Node Guarding: activates or deactivates the NodeGuard protocol for verifying the presence of the station by the slave master.
• Guard time: the period to send the NodeGuard message in milliseconds.
• Life time factor: shows within time intervals the slave must receive a Guard message from the master, if not the slave pass in preoperational state.
• Activate Heartbeat generation: used to activate the Hertbeat protocol (Not supported by Z-PC CANopen slaves stations).
• Activate Heartbeat consumer: Allows to consume heartbeat messages (Not supported by Z-PC CANopen slaves stations).
• Emergency Telegram: The station can produce the emergency messages in case of errors or failures.
• Communication Cycle is the time between two SYNC messages

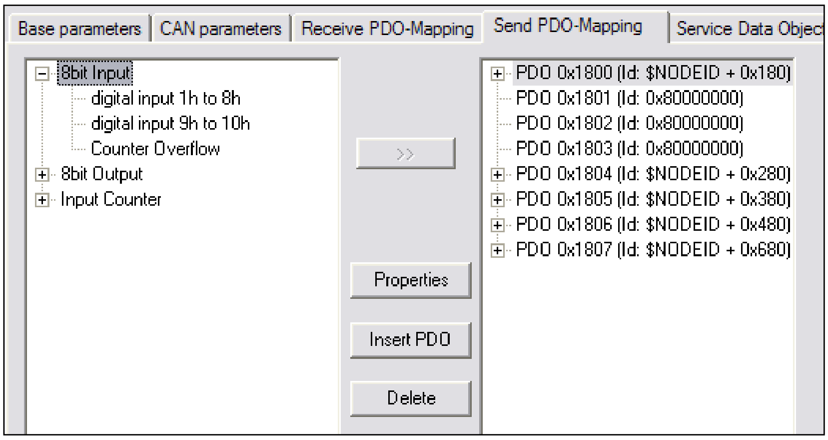



In the Receive PDO Mapping window, you can configure and view the PDO telegrams sent from the master to the slave. On the left you can see the data that the slave is able to receive through PDOs. In the figure case is an 8 digital outputs. On the right you see the link between the PDO and data output.

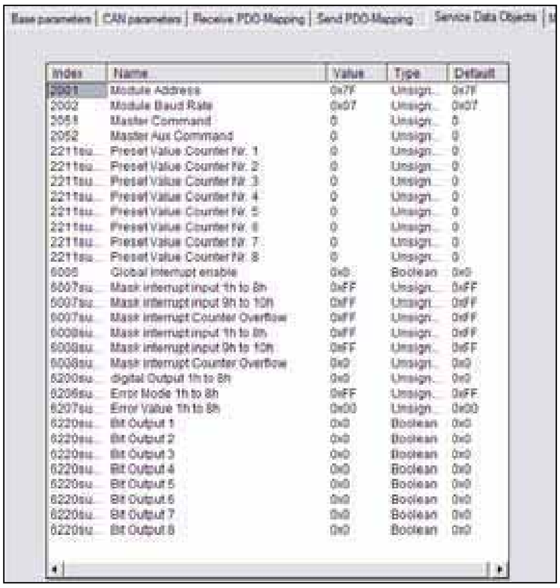



Clicking to the Properties button it's possible to configure the properties of the PDO. In the window that appears this is an asynchronous transmission type PDO (the PDO is sent only in a trigger condition). If the type of transmission chosen is synchronous you can select after many SYNC the value must be updated.

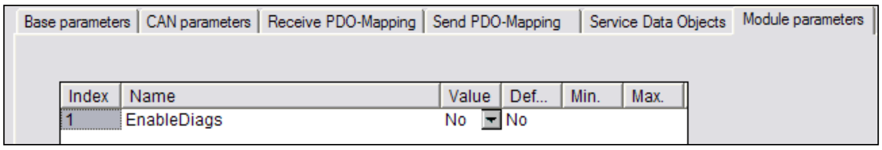
In the Send SDO-Mapping window, you can configure and display the PDO sent by the slave master. On the left you can see the data that the slave is able to send via PDO. In the figure case is a 16 digital inputs and 8 digital ouputs. On the right you see the link between the PDO and data entry. Similarly to Receive PDO you can set the properties of individual PDO through the appropriate keys.




Through the Service Data Objects, you can configure different values from the default items listed in the dictionary (EDS file). For the meaning of individual items you must refer to the slave documentation. Only the changed values are sent via SDO communication at the slave initialization.

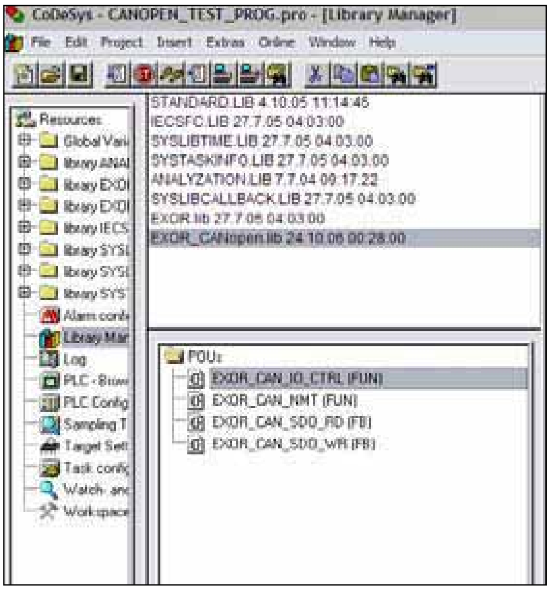


The parameter module window enables the specific slave property into the TWS PLC, in this case the diagnosis



### *The CANopen library for CodeSys*

This section describes the use of the program library for exchanging data between the master TWS3/TWS64 and the CANopen slave. Please refer to the software manuals for a detailed description.
In order to manage the CANopen code communication it is necessary to include the library EXOR_CANOpen.lib into the project. This transaction is obtained through the window opened from the menu Window | Library Manager:




### *EXOR_CAN_NMT Function*

Through the EXOR_CAN_NMT function it's possible to act selectively or generally. Selecting the zero address the command is sent to all stations. If the address is different from zero the command is sent only to the station with the same slave node number.
For the value Command are possible the following values:

*Start Remote Node (CS=1),*

*Stop Remote Node (CS=2),*

*Enter Pre-Operational (CS=128),*

*Reset Node (CS=129) and*

*Reset Communication (CS=130).*

```
0009
0010 R_TRIG1(CLK:=Start_NMT);
0011 EXOR_CAN_NMT(R_TRIG1.q , 1, ucCmd, ucNodeId);   (*Cmd= 1 start all node, 2 stop all node, 128 preoperational *)
0012
```

### *EXOR_CAN_SDO_RD Function*

Through the EXOR_CAN_SDO_RD it's possible to read objects from a slave dictionary object.

The meaning of individual parameters are:

• bEnable: the reading occurs on FALSE-TRUE toggle
• wCanPort: CAN card port number
• wTXCOBID COB-ID used for the TX SDO message. In the figure case the node-id is 3 (0x600 + nodeid = 1539)
• wRXCOBID COB-ID used for the RX SDO message. In the figure case the node-id is 3 (0x580 + nodeid)
• windex: index of the object that you want to read
• ucSubinex: sub index of the object you want to read

In the next parameters the function returns the data type of reading and the actual value or the error if, for example, the object does not exist.

```
EXOR_CAN_SDO_RD_1(
    bEnable:=Start_Read ,
    wCanPort:= 1,
    wTxCOBID:=1539 ,
    wRxCOBID:= 1411,
    wIndex:=Indice_R ,
    ucSubIndex:=Sub_Indice_R ,
    wDataType:= ,
    bDone=> ,
    diErrCod=> ,
    dwAbortCod=> ,
    diIntegerValue=> ,
    rFloatValue=> );
```

### *EXOR_CAN_SDO_WR Function*

Through the EXOR_CAN_SDO_WR it's possible to write CAN objects from the slave dictionary object.

The meaning of individual parameters are:

• bEnable: the writing occurs on FALSE-TRUE toggle
• wCanPort: CAN card number through which you are writing
• wTXCOBID number the user's message SDO used for transmission. In the case of the node with id 3 (600hex + nodeid)
• wRXCOBID number the user's message SDO used to receive. In the case of the node with id 3 (580hex + nodeid)
• windex: index of the object that you want to write
• ucSubinex: sub index of the object you want to write
• diIntegerValue: value to be written in the object
• rFloatValue: value to be written in the object

In the next parameters the function returns the data type of writing and the actual value or the error if, for example, the object does not exist.

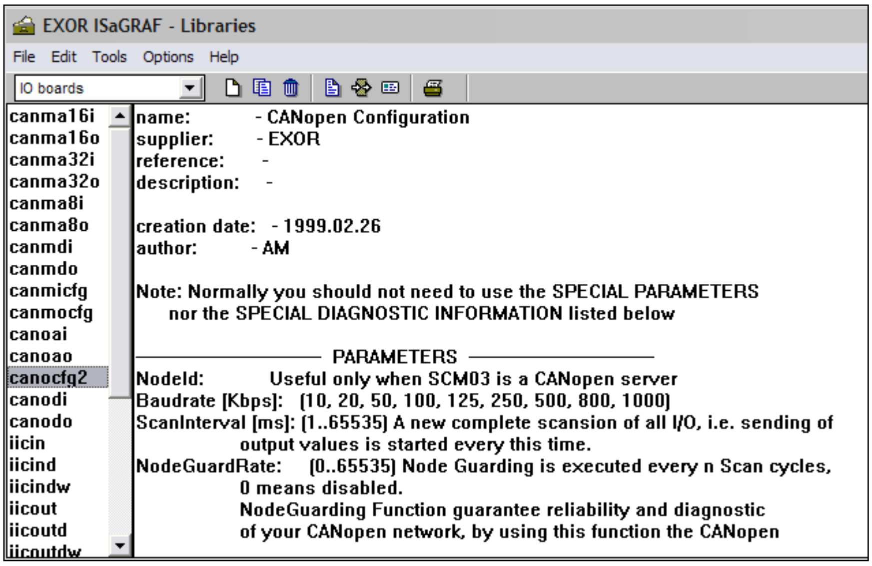
```
Indice_W:=16#6200;
Sub_Indice_W:=16#1;
wTxCOBID_W:=1539;      (*SDO_TX_MOD3*)
wRxCOBID_W:=1411;      (*SDO_RX_MOD3*)


EXOR_CAN_SDO_WR_1(
    bEnable:=Start_Write AND ENABLE_SCRITTURA_SDO ,
    wCanPort:=1,
    wTxCOBID:=wTxCOBID_W ,
    wRxCOBID:= wRxCOBID_W,
    wIndex:=Indice_W ,
    ucSubIndex:=Sub_Indice_W ,
    wDataType:= ,
    diIntegerValue:=DatoScrittura ,
    rFloatValue:= ,
    bDone=> ,
    diErrCod=> ,
    dwAbortCod=> );
```

### *Quick Start: CANopen with ISAGRAF*

This section describes the use of CANOpen in the ISaGRAF environment.

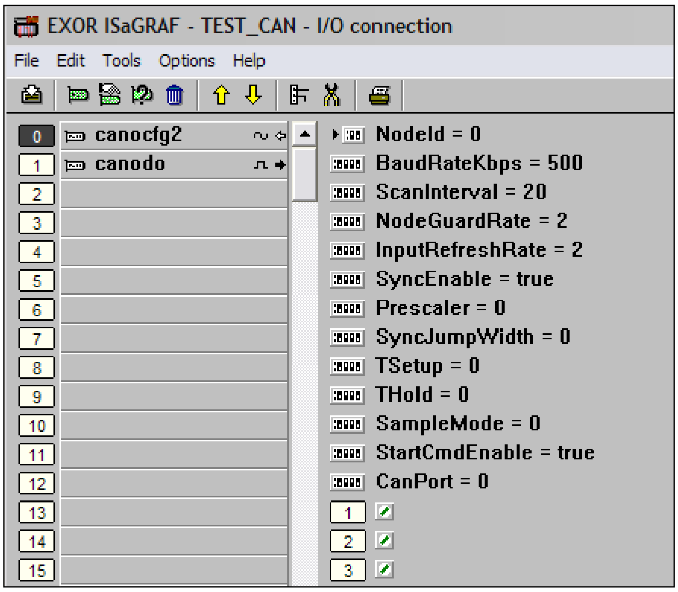
#### *Isagraf Library*

The use of CANopen in ISAGARF requires loading library for CANopen. In particular, it is necessary to load the library for the IO boards canocfg2, canodi, canodo and canao:




***Boards canocfg2***

The board canocfg2 is used to configure the communication via the TWS CANopen master. The integration of the board is done through the menu Project | IO Connection.

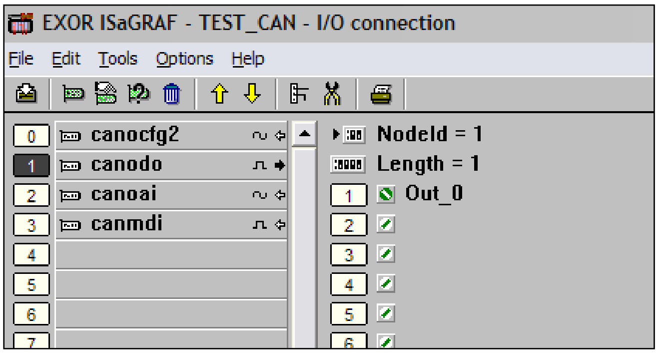



The fields of the IO Boards have the following meanings:
• Nodeid: identification of the CANOpen master node
• Baudrate: Select the speed of the network CANOpen. It must be the same as set by the DIP switch on the slave.
• ScanInterval: scan time of the inputs and outputs in milliseconds.
• NodeGuardRate: cycles number of to scan before sending the NodeGuard message. The value 0 means disabled.
• InputRefreshRate: request for inputs delivery through Remote Transmission Request (not supported by Z-PC CANopen slaves)

• SyncEnable: Enabling SYNC message from the master
• StartCmdEnable: If TRUE the NMT start network command is given at boot-up or in case of Node Guarding error .

The special parameters (prescaler (1 .. 64), SyncJumpWidth (1 .. 4), TSetup (1 .. 16) THold (1 .. 8), SampleMode (0 .. 1)) are used to select the speed of the network and have special meaning only if the parameter is Baudrate to zero. Normally should not be used.

Now you can point directly to the inputs and outputs of the slave stations using the appropriate boards. In the example below shows the use of a cando for to point to the first digital output of the slave with station number 1.




# Easy-SETUP

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

# Appendix

***EDS Files***

The EDS files for the Z-PC CANopen Slave stations can be downloaded directly from the site http://www.seneca.it on the CANopen section.

# The module of Seneca Z-PC line

The Seneca Z-PC Line is a component line developed for automation and industrial-processes control: it represents a effective and reliable mean used to manage machine automation and small-medium size plants.

### *The common strengths of Seneca Z-PC Line*

The modules of Seneca Z-PC Line have interesting strengths:

- **1500 Vac isolation between: inputs, outputs, RS485-bus communications, power supply**
- **Configuration of 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**
- **Switching automatically RS485 to RS232 or vice versa**
- **Diagnostic available on front-side panel**
- **Integrated ModBUS protocol (and/or CANopen protocol)**

Each module of Seneca Z-PC Line is compact, integrated and reliable; it allows:

- **the acquisition/generation of each industrial signal type;**
- **the data-processing by effective supervision and control systems.**

The wide range of modules allows to manage all I/O signal type: analog and digital, voltage and current, from thermocouple and thermo-resistance, relay and MOSFET. Moreover, these components provide PID controller, input filter, pulse counter, etc.. through bus communication (RS232 or RS485 serial interface), web-control, etc.…

### *The most common types of analog input*

Seneca Z-PC Line modules allow to acquire signals from

| | |
|---|---|
| **Voltage generator** | Continue voltage signal (up to 10 V) supplied by active sensors, proportional to the physical quantity to measure (flow, pressure, speed, etc…) |
| **Current generator** | Continue voltage signal (up to 20 mA) supplied by active or passive sensors, proportional to the physical quantity to measure (flow, pressure, speed, etc…) |
| **Potentiometer** | Voltage value between two limits; it is given as percent value |
| **Thermo-couple (TC)** | A TC is a couple of electric conductors with different material, united between them (hot junction). The connection with module causes another one (cold junction). Every junction causes a potential difference. These parameters allow to calculate hot junction absolute temperature |
| **Thermo-resistance (RTD)** | A RTD is a particular conductor material: its resistive value depends on the temperature change |
| **Load cell** | A load cell is a sensor that process a weight to obtain a mV signal |
| **Network parameters** | Voltage (up to 600 V), current, active power, reactive power, apparent power, cosΦ (for single/three phase network) |

### *The most common types of analog output*

Seneca Z-PC Line modules allow to supply voltage signal and current signal (active and passive).

| | |
|---|---|
| **Active signal** | Current loop is powered externally; to measure current value, a passive shunt (resistance) is used |
| **Passive signal** | Current loop is powered internally; to measure current value, the module supplies the sensor |

### *Common characteristics of Seneca Z-PC Line*

Each Seneca Z-PC Line module is designed to ensure an accurate measure: noises from field must affect the measures at minimum possible. Moreover, the module must be protected against the electrical discharge. To obtain these conditions, a galvanic isolation is required: each Seneca Z-PC Line module has a 1500 Vac isolation between most important internal circuits (inputs, outputs, RS485, power supply, etc…).

| **MODULE CASE** | |
|---|---|
| **Case-type** | PBT, black |
| **Dimensions** | Width W = 100 mm, Height H = 112 mm, Depth D = 17.5 mm ( Z-module)<br>Width W = 100 mm, Height H = 112 mm, Depth D = 35 mm (double Z-module) |
| **Terminal board** | Removable 3-way screw terminals:<br>pitch 5.08 mm, sections 2.5 $mm^2$ |
| **Protection class** | IP20 (International Protection) |
| **ENVIROMENTAL CONDITIONS** | |
| **Operating temperature** | -10°C ... +65°C |
| **Humidity** | 30 ... 90% to 40°C not condensing (during operation) |
| **Max environmental pollution degree** | 2 |
| **Storage temperature** | -20°C ... +85°C |

The Z-4RTD-2, Z-8TC, ZC-24DI, ZC-24DO, ZC-16DI8DO modules have removable 4-way screw terminals: pitch 3.5 mm, sections 1.5 $mm^2$.

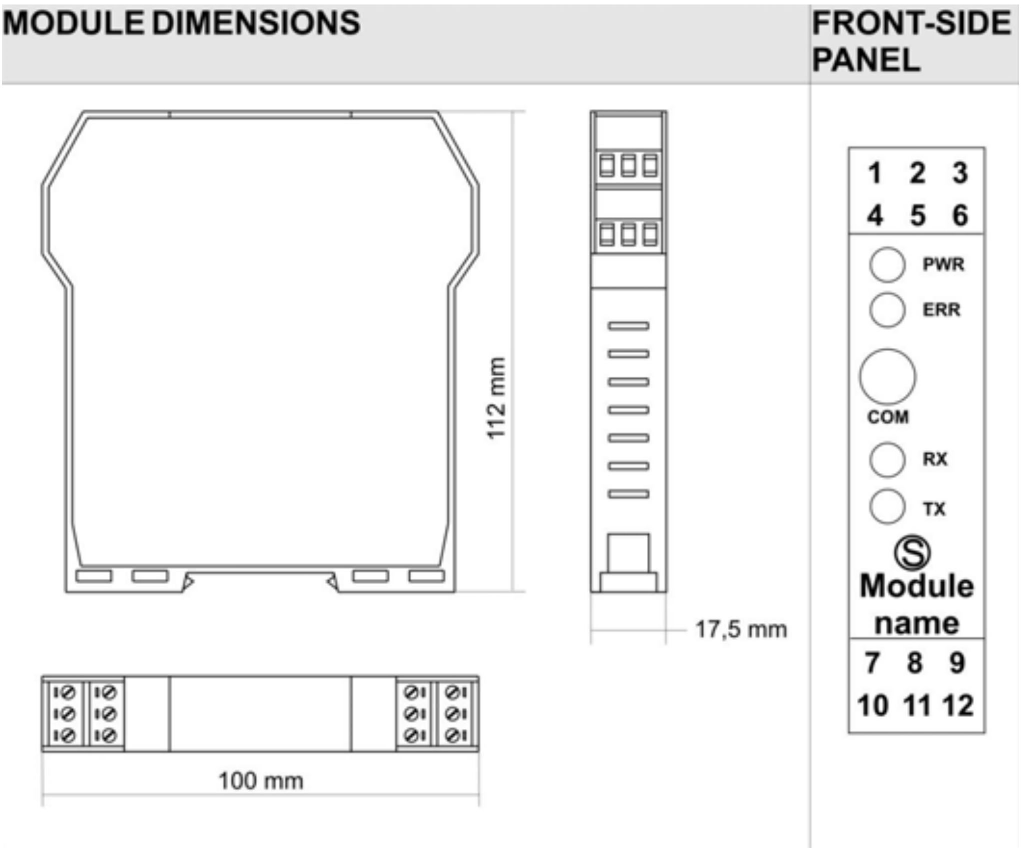
Protection class equal to IP20 (International Protection) means device protection degree against the external environmental factors. With reference to the “20” suffix, “2” is protection degree against solid and dust objects, “0” is protection degree against liquids.

In the following figure is shown the module dimensions and front-side panel for the most part of Seneca Z-PC Line modules. To know the meaning of the LEDs, see “Signalling LEDs” at the end of each module chapter.

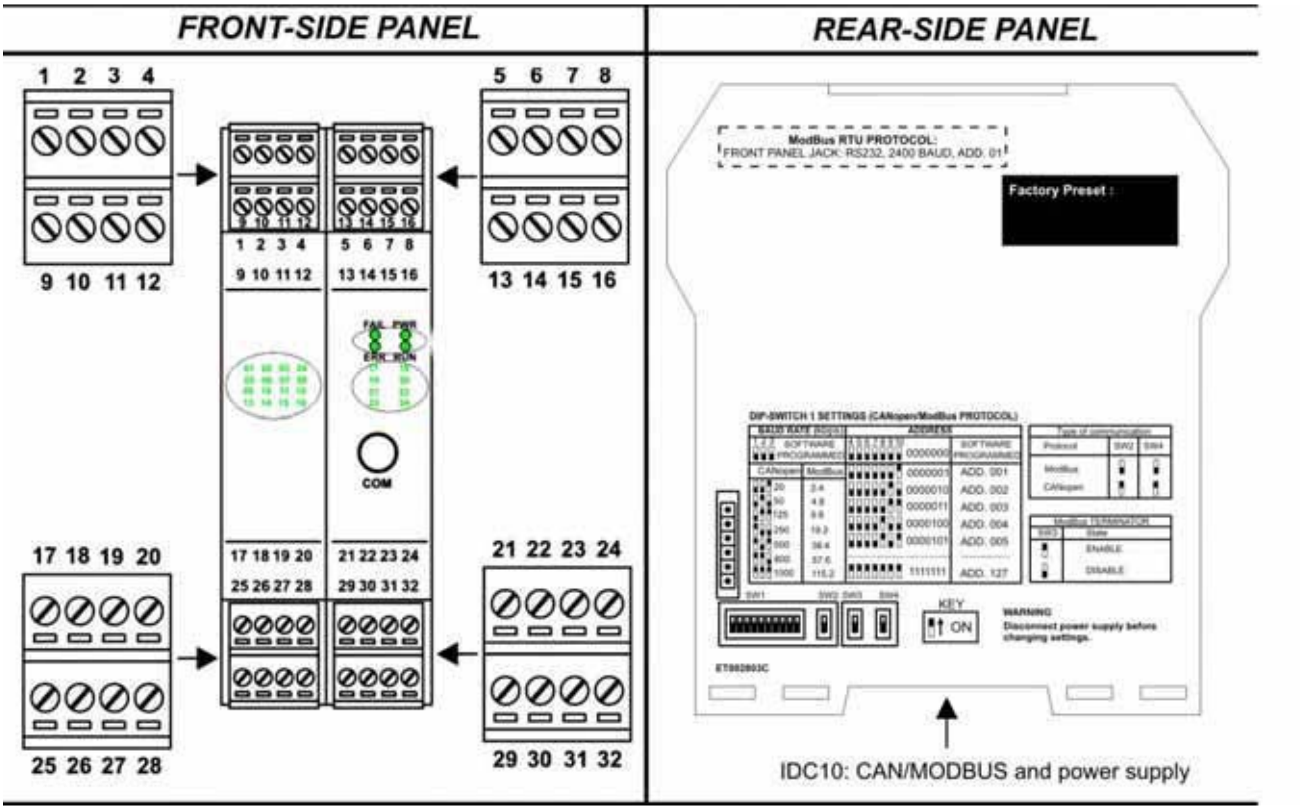
Some modules (for example: Z-10-D-IN) have LEDs for input/output state too.

Case type and module dimensions for S203T and S203TA modules are different.

In the following figure is shown the Z-module case.



In the following figure is shown an example of the double Z-module case.

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# Connections

To ensure a long duration and a proper functioning of the module, it's necessary to execute the following notes.

**WARNING**

**It is forbidden** to obstruct the module ventilation openings.

**It is forbidden** to install the module near heat-emitting devices.

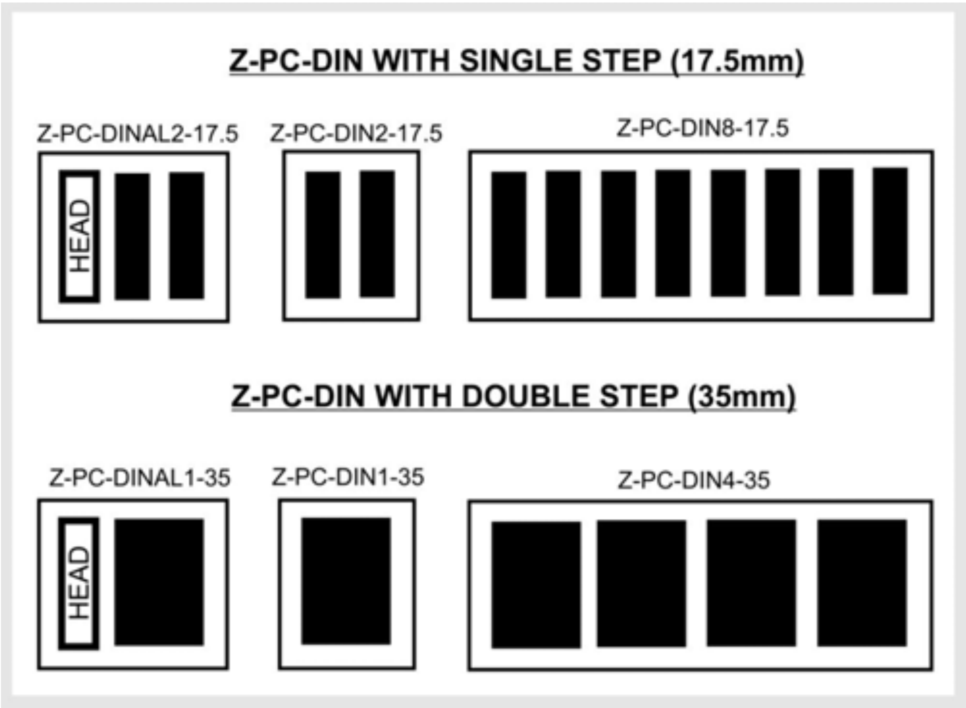
«Severe operating conditions» are defined as follows:
- high power supply voltage: exceed 30 Vcc or exceed 26 Vac;
- the module supplies the sensor;
- active current-type output (the output: has already powered on, needs to be connected to passive module).

**WARNING**

If the modules are installed side by side, **separate them by at least 5 mm** in the following cases:
- the operating temperature exceeds 45°C and at least one of the severe operating conditions exists; or
- the operating temperature exceeds 35°C and at least two of the severe operating conditions exist.

The module is designed to be installed on DIN 46277 rail in vertical position: in this way, ventilation and easy installation are guaranteed.

| Article | Unit | Versions | Purchase codes |
|---|---|---|---|
| Z-PC-DIN | Bus support for ModBUS and CANopen modules on DINrail (single pitch: 17.5mm) | Head + 2 slots with pitch 17.5mm | Z-PC-DINAL2-17.5 |
| | | 2 slots with pitch 17.5mm | Z-PC-DIN2-17.5 |
| | | 8 slots with pitch 17.5mm | Z-PC-DIN8-17.5 |
| | Bus support for ModBUS and CANopen modules on DINrail (double pitch: 35mm) | Head + 1 slot with pitch 35mm | Z-PC-DINAL1-35 |
| | | 1 slot with pitch 35mm | Z-PC-DIN1-35 |
| | | 4 slots with pitch 35mm | Z-PC-DIN4-35 |



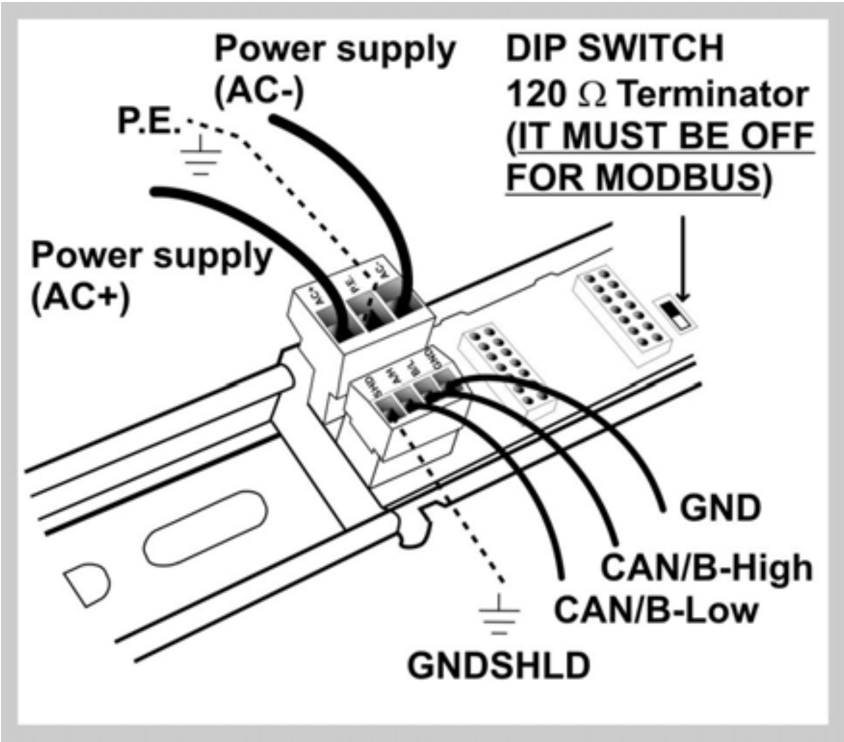

Head is the Z-PC-DIN unit with screw terminals: to power the modules and to connect the modules to RS485-bus communication.

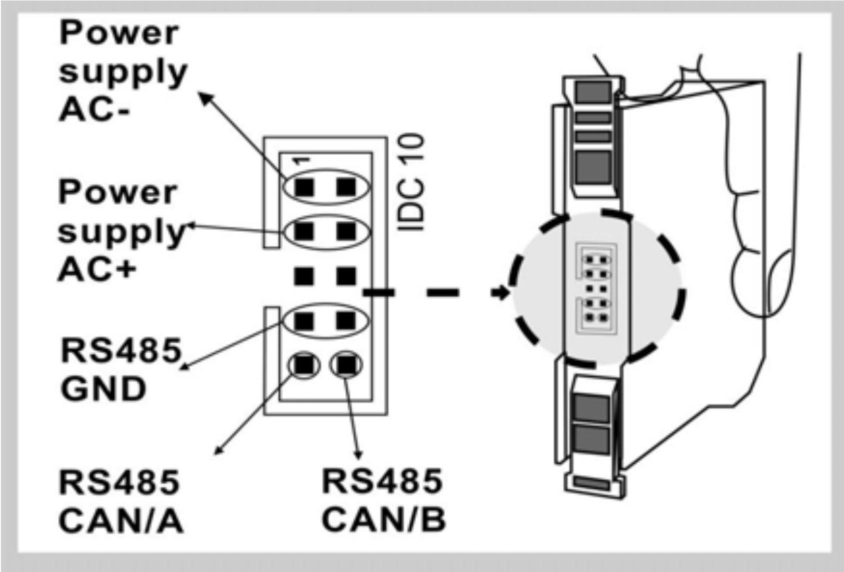
To power the module and to connect it to the RS485-bus communication (or CANopen) by screw terminals, connect to DIN rail the Z-PC-DINAL2-17,5 (or Z-PC-DINAL1-35) unit and the Z-PC-DIN2-17,5 units (or Z-PC-DIN1-35 units); use the screw terminals placed in Z-PC-DINAL2-17,5 unit (Z-PC-DINAL2-17,5 unit can be locked on DIN46277 rail).

The Z-PC-DIN units are constituted by PA6-Polyamide (Nylon) 6 with fiberglass at 30%; in particular, the Z-PC-DINAL2-17,5 and Z-PC-DIN2-17,5 units:

1) **to decrease the wiring time**, because there is no need to connect 5 cables (the same ones for each node): two cables for power supply (AC+, AC-) and three cables for RS485-bus communication (A, B, GND);
2) **to perform the hot swapping**: it is possible to add/remove the module to/from RS485-bus without disconnecting the communication or power supply;
3) **to respect the recommended distance between adjacent modules**: the ventilation slits is guaranteed.
4) **to ensure a easy connection.**

To power the module and to connect the module to RS485-bus (or CANopen), there is a connector (IDC10) in back-side panel.






To lock on DIN 46277 rail the module, execute in the order the following operations:

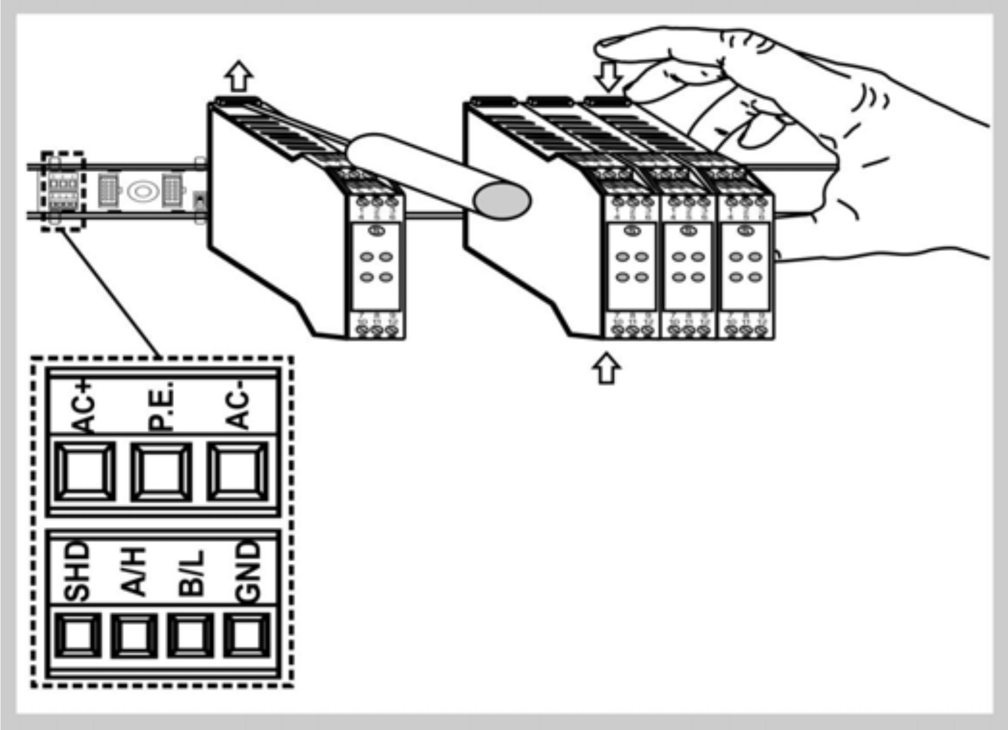
1) pull the two latchs outwards (latchs are placed in the back-side panel, near IDC10-connector);

2) insert the IDC10-connector in a DIN rail free slot;

3) make sure that the IDC10-connector pins are inserted on the slot correctly;

It's important insert the pins on the slot correctly because IDC10-connector is polarized; this connection is facilitated by use of a female/male insertion between IDC10 connector and DIN rail slot.

4) press the two latchs inwards.




**WARNING**

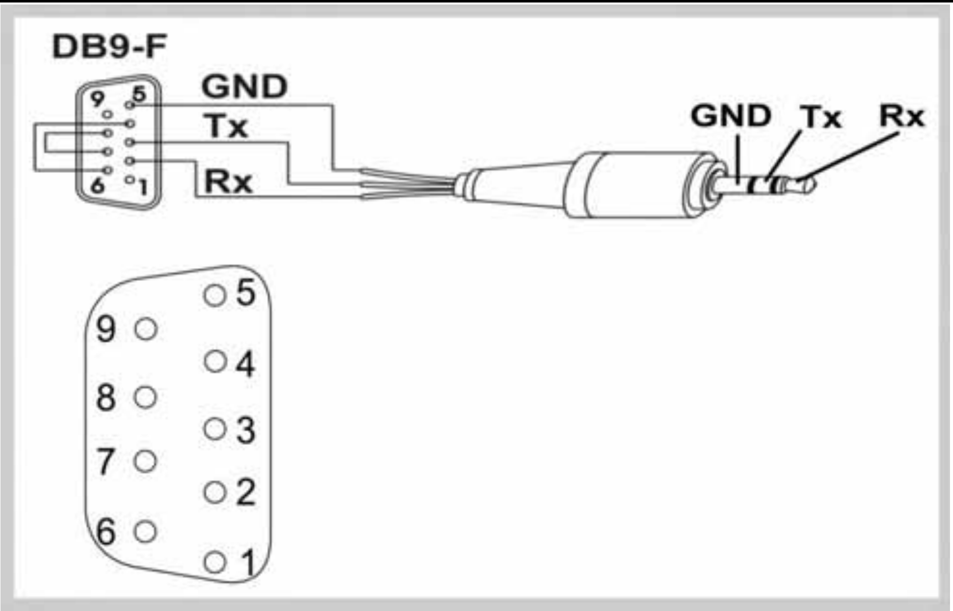
**Power off the module before connecting: RS232 serial interface, RS485 serial interface, input, output.**

To satisfy the electromagnetic compliance requirements:
- use shielded cables for signal transmission;
- connect the shield to a earth wire used specifically for instrumentation;
- insert space between these shielded cables and other cables used for power appliances (inverters, motors, induction ovens, etc...).

## *RS232 bus communication*

The module is designed to data interchange according to the ModBUS protocol rules, implemented by RS232 serial interface. The RS232 communication (with unchangeable parameters) has priority over the RS485 communication.

The module has a Jack stereo connector in order to connect its to RS232-bus communication.




| DB9 pin | Signal | Signal name | RS232 code | V.24 code |
|---|---|---|---|---|
| 1 | DCD | Data-Carrier Detection | CF | 109 |
| 2 | RD | Received Data | BB | 104 |
| 3 | TD | Transmitted Data | BA | 103 |
| 4 | DTR | Data Terminal Ready | CD | 108/2 |
| 5 | SG | Signal Ground | AB | 102 |
| 6 | DSR | Data Set Ready | CC | 107 |
| 7 | RTS | Request To Send | CA | 105 |
| 8 | CTS | Clear To Send | CB | 106 |
| 9 | RI | Ring Indicator | CE | 125 |

# Decommissioning and disposal

Disposal of Electrical & Electronic Equipment (Applicable throughout the European Union and other European countries with separate collections programs). This symbol, found on your product or on its packaging, indicates that this product should not be treated as household waste when you wish to dispose of it. Instead, it should be handed over to an applicable collection point for the recycling of electrical & electronic equipment. By ensuring this product is disposed of correctly, you will help prevent potential negative consequences to the environment and human health, which could otherwise be caused by inappropriate disposal of this product. The recycling of materials will help to conserve natural resources. For more detailed information about the recycling of the product, please contact your local city office, waste disposal service of the retail store where you purchased this product.

# Seneca Z-PC Line module: **Z-D-IN**

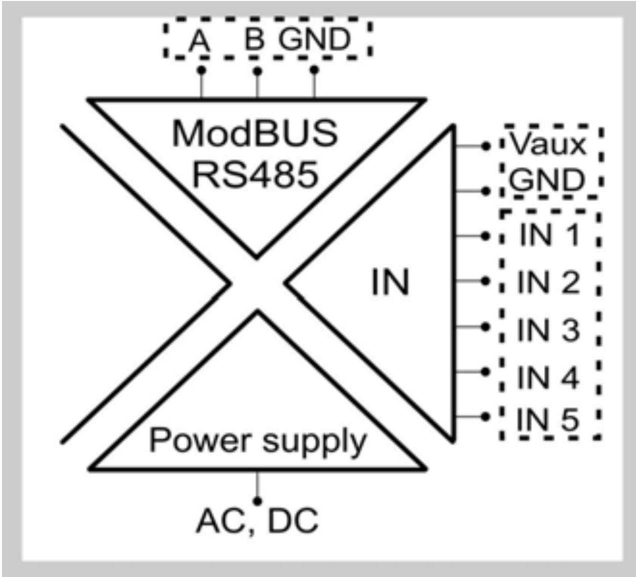
The Z-D-IN module acquires 5 single-ended digital signals, it converts them to a digital format (IN 1-5 state) and it counts the input-pulse number (pulse counter for IN 1-5).

## *General characteristics*

- Acquisition of digital signals from sensors: Reed,NPN,PNP,Proximity,contact,etc...
- Configuration of a filter applied to all input signals (Filter(1-254)) to attenuate the noise overlapped to the digital signals
- Pulse counters for IN1-5 digital signals, with max frequency equal to: 100 Hz (the signal is acquired from IN1-5); 10kHz (the signal is acquired from IN5)
- Power up to 5 sensors by 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

## *Features*

| **INPUT** | |
|---|---|
| **Number** | 5 |
| **Input filter** | Cut-off frequency: 100Hz (for IN1-5, if bit40009.7=0; for IN1-4 if bit40009.7=1); 10kHz (for IN5, if bit40009.7=1) |
| **Filter(1-254) to attenuate the noise** | Configurable between: 1[ms] and 254[ms] |
| **Protection** | This module provides inputs and power supply(Vaux) protection against the overvoltage surge transient by transient suppressor TVS (600W/ms); max current supplied from Vaux is 100mA (limited by internal series PTC) |
| **Sensor=closed** | The sensor is detected «closed» if: acquired signal voltage >12 Vdc and acquired signal current > 3 mA |
| **Sensor=open** | The sensor is detected «open» if: acquired signal voltage <10 Vdc and acquired signal current < 2 mA |
| **Internal supply Vaux** | The screw terminal 12 (Vaux) supplies 16 V with reference to the screw terminal 1 (GND) |
| **CONNECTIONS** | |
| **RS485 interface** | IDC10 connector for DIN 46277 rail (back-side panel) |
| **1500 Vac ISOLATIONS** | |
| | Between: power supply, ModBUS RS485, digital inputs |

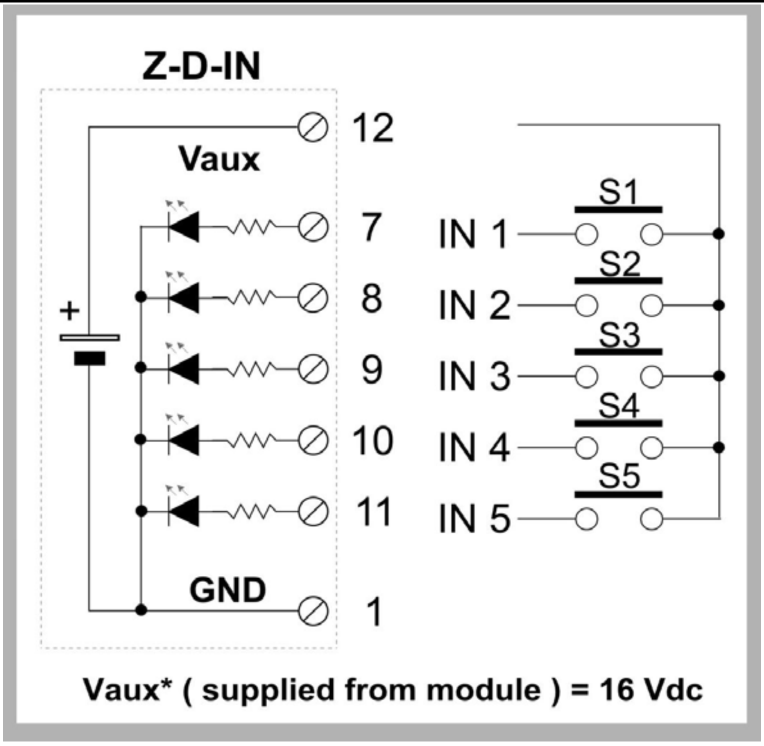



| POWER SUPPLY | |
|---|---|
| **Supply voltage** | 10 – 40 Vdc or 19 – 28 Vac ( 50Hz - 60Hz) |
| **Power consumption** | Min: 0.5W; Max: 2.5W (to power 5 sensors) |

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.

## *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 previous figure is shown the connection of the sensors S1-S5 to the 5 inputs of Z-D-IN 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 12 (Vaux=16V with reference to the screw terminal 1=GND) and one of the inputs IN1-5.

## Dip-switches table

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: DIP-SWITCH STATUS)** | | |
|---|---|---|
| 1 | 2 | Meaning |
| | | Baud-rate=9600 Baud |
| | ● | Baud-rate=19200 Baud |
| ● | | Baud-rate=38400 Baud |
| ● | ● | Baud-rate=57600 Baud |

| **ADDRESS (Dip-Switches: DIP-SWITCH STATUS)** | | | | | | |
|---|---|---|---|---|---|---|
| 3 | 4 | 5 | 6 | 7 | 8 | Meaning |
| | | | | | | **Address and Baud-Rate are acquired from memory(EEPROM)** |
| | | | | | ● | Address=1 |
| | | | | ● | | Address=2 |
| | | | | ● | ● | Address=3 |
| | | | ● | | | Address=4 |
| X | X | X | X | X | X | …………………… |
| ● | ● | ● | ● | ● | ● | Address=63 |

| **RS485 TERMINATOR (Dip-Switches: DIP-SWITCH STATUS)** | | |
|---|---|---|
| 9 | 10 | Meaning |
| | | RS485 terminator disabled |
| | ● | RS485 terminator enabled |

# *RS485 Register table*

| Name | Range | Interpretation of register | R/W | Default | Address |
|---|---|---|---|---|---|
| MachineID | / | MSB, LSB | R | | 40001 |
| | Id_Code (Module ID) | | | 0x01 | Bit [15:8] |
| | Ext_Rev (Module version) | | | | Bit [7:0] |
| FWREV | / | Word | R | | 40013 |
| | Firmware Code | | | | |
| Status | / | Bit | R/W | | 40011 |
| | These bits aren't used | | | / | Bit [15:2] |
| | Save configuration in memory (EEPROM). The content of 40008, 40009, 40010 registers is overwritten, respectively, in the 40072, 40073, 40074 registers (these ones are in memory EEPROM): 0=deactivated; 1=activated | | | 0 | Bit 1 |
| | Reset of module: 0=deactivated; 1=activated | | | 0 | Bit 0 |
| Eprflag | / | Bit | R/W | | 40009 (EEPROM 40073)(**) |
| | These bits aren't used | | | / | Bit[15:8] |
| | Acquisition modality of digital signal through IN5: 0=input filter(cut-off frequency=100Hz) with Filter(1-254); 1=input filter(cut-off frequency=10 kHz) without Filter(1-254) | | | 0 | Bit 7 |
| | These bits aren't used | | | / | Bit [6:5] |
| | Parity for RS485: 0=even; 1=odd | | | 0 | Bit 4 |
| | Parity for RS485: 0=there isn't; 1=there is | | | 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 | | | 0 | Bit 2 |
| | (*) Count modality with reference to the "pulse counter for IN1-5" to each pulse acquired through the respective inputs IN1-5: 0=increment of 1; 1=decrement of 1 | | | 0 | Bit 1 |
| | (*) Sensors-state representation logic for switches S1-S5, with reference to the "Input Status"-type registers 10001-10005, to the «Coil Status»-type registers 00001-00005 and to the bit40002.0-bit40002.4. If bit 40009.0=0: switch open(closed) corresponds to "0" ("1"); if bit 40009.0=1: switch open(closed) corresponds to "1"("0") | | | 0 | Bit 0 |

(*) To modify the bit 40009.0, 40009.1 e 40009.2 state, it isn't necessary to reset the module because the modification is immediate; to modify the other bit state, execute in the order the following operations:

-write the new configuration in the register;

-reset the module (switch bit 40011.0 to 1).

| | | | | | |
|---|---|---|---|---|---|
| Baudrate Address | / | MSB, LSB | R/W | | 40010 (EEPROM 40074)(**) |
| | 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 | | | 38400 | Bit [15:8] |
| | Address for RS485 (address of module/node if parameters are configurated by memory modality): from 0x01=1 to 0xFF=255 | | | 1 | Bit [7:0] |
| Filter1-254 | Between:1[ms]; 254[ms] | Word | R/W | | 40008 (EEPROM 40072)(**) |
| | Filter(1-254) applied to all input-signals (except IN5 if bit 40009.7=1). Limit values: if reg.40008=1[ms]=filtering action to attenuate noise with frequency<1kHz (period>1ms); if reg.40008=254[ms]=filtering action to attenuate noise with frequency<4Hz (period>254ms) | | | 3[ms] | |

(**) The content of the 40008, 40009 and 40010 registers is stored in the 40072, 40073 and 40074 respectively (memory EEPROM), too. The module writes the content of the register: 40072 in 40008, 40073 in 40009, 40074 in 40010 in one of the following cases:

-when the module is connected to the RS485-bus (registers initialization);

-when the module is resetted (bit 40011.0 switched to 1).

| | | | | | |
|---|---|---|---|---|---|
| PulseCounter IN1 | Between:0;65535 | Word | R | | 40003 |
| | 16-bit pulse counter for input 1. To know the overflow of PulseCounterIN1 register, see bit 40002.8 or register 00009 | | | / | |
| PulseCounter IN2 | Between:0;65535 | Word | R | | 40004 |
| | 16-bit pulse counter for input 2. To know the overflow of PulseCounterIN2 register, see bit 40002.9 or register 00010 | | | / | |
| PulseCounter IN3 | Between:0;65535 | Word | R | | 40005 |
| | 16-bit pulse counter for input 3. To know the overflow of PulseCounterIN3 register, see bit 40002.10 or register 00011 | | | / | |
| PulseCounter IN4 | Between:0;65535 | Word | R | | 40006 |
| | 16-bit pulse counter for input 4. To know the overflow of PulseCounterIN4 register, see bit 40002.11 or register 00012 | | | / | |
| PulseCounter IN5 | Between:0;65535 | Word | R | | 40007 |
| | 16-bit pulse counter for input 5. To know the overflow of PulseCounterIN5 register, see bit 40002.12 or register 00013 | | | / | |

| | | | | | |
|---|---|---|---|---|---|
| Overflow Inputs | | Word | R | | 40002 |
| | These bits aren’t used | | | / | Bit[15:13] |
| | PulseCounterIN5 overflow: 0=there isn’t; 1=there is. To reset, overwrite «0» from master | | | / | Bit 12 |
| | PulseCounterIN4 overflow: 0=there isn’t; 1=there is. To reset, overwrite «0» from master | | | / | Bit 11 |
| | PulseCounterIN3 overflow: 0=there isn’t; 1=there is. To reset, overwrite «0» from master | | | / | Bit 10 |
| | PulseCounterIN2 overflow: 0=there isn’t; 1=there is. To reset, overwrite «0» from master | | | / | Bit 9 |
| | PulseCounterIN1 overflow: 0=there isn’t; 1=there is. To reset, overwrite «0» from master | | | / | Bit 8 |
| | These bits aren’t used | | | / | Bit[7:5] |
| | IN5 state: 0=S5 open(closed); 1=S5 closed(open), if bit40009.0=0(1) | | | / | Bit 4 |
| | IN4 state: 0=S4 open(closed); 1=S4 closed(open), if bit40009.0=0(1) | | | / | Bit 3 |
| | IN3 state: 0=S3 open(closed); 1=S3 closed(open), if bit40009.0=0(1) | | | / | Bit 2 |
| | IN2 state: 0=S2 open(closed); 1=S2 closed(open), if bit40009.0=0(1) | | | / | Bit 1 |
| | IN1 state: 0=S1 open(closed); 1=S1 closed(open), if bit40009.0=0(1) | | | / | Bit 0 |

The «Input Status»-type registers used for Z-D-IN 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(closed); 1=S1 closed(open), if bit40009.0=0(1) | | | / | |
| State IN2 | 0-1 | Word | R | | 10002 |
| | IN2 state: 0=S2 open(closed); 1=S2 closed(open), if bit40009.0=0(1) | | | / | |
| State IN3 | 0-1 | Word | R | | 10003 |
| | IN3 state: 0=S3 open(closed); 1=S3 closed(open), if bit40009.0=0(1) | | | / | |
| State IN4 | 0-1 | Word | R | | 10004 |
| | IN4 state: 0=S4 open(closed); 1=S4 closed(open), if bit40009.0=0(1) | | | / | |
| State IN5 | 0-1 | Word | R | | 10005 |
| | IN5 state: 0=S5 open(closed); 1=S5 closed(open), if bit40009.0=0(1) | | | / | |

The «Coil Status»-type registers used for Z-D-IN module are shown in the following table:

| Name | Range | Interpretation of register | R/W | Default | Address |
|---|---|---|---|---|---|
| State IN1 | 0-1 | Word | R | | 00001 |
| | IN1 state: 0=S1 open(closed); 1=S1 closed(open), if bit40009.0=0(1) | | | / | |
| State IN2 | 0-1 | Word | R | | 00002 |
| | IN2 state: 0=S2 open(closed); 1=S2 closed(open), if bit40009.0=0(1) | | | / | |

| | | | | | |
|---|---|---|---|---|---|
| State IN3 | 0-1 | Word | R | | 00003 |
| | IN3 state: 0=S3 open(closed); 1=S3 closed(open), if bit40009.0=0(1) | | | / | |
| State IN4 | 0-1 | Word | R | | 00004 |
| | IN4 state: 0=S4 open(closed); 1=S4 closed(open), if bit40009.0=0(1) | | | / | |
| State IN5 | 0-1 | Word | R | | 00005 |
| | IN5 state: 0=S5 open(closed); 1=S5 closed(open), if bit40009.0=0(1) | | | / | |
| Overflow PulseCounter1 | 0-1 | Word | R | | 00009 |
| | PulseCounterIN1 overflow: 0=there isn’t; 1=there is. To reset, overwrite «0» from master | | | / | |
| Overflow PulseCounter2 | 0-1 | Word | R | | 00010 |
| | PulseCounterIN2 overflow: 0=there isn’t; 1=there is. To reset, overwrite «0» from master | | | / | |
| Overflow PulseCounter3 | 0-1 | Word | R | | 00011 |
| | PulseCounterIN3 overflow: 0=there isn’t; 1=there is. To reset, overwrite «0» from master | | | / | |
| Overflow_PulseCounter4 | 0-1 | Word | R | | 00012 |
| | PulseCounterIN4 overflow: 0=there isn’t; 1=there is. To reset, overwrite «0» from master | | | / | |
| Overflow PulseCounter5 | 0-1 | Word | R | | 00013 |
| | PulseCounterIN5 overflow: 0=there isn’t; 1=there is. To reset, overwrite «0» from master | | | / | |

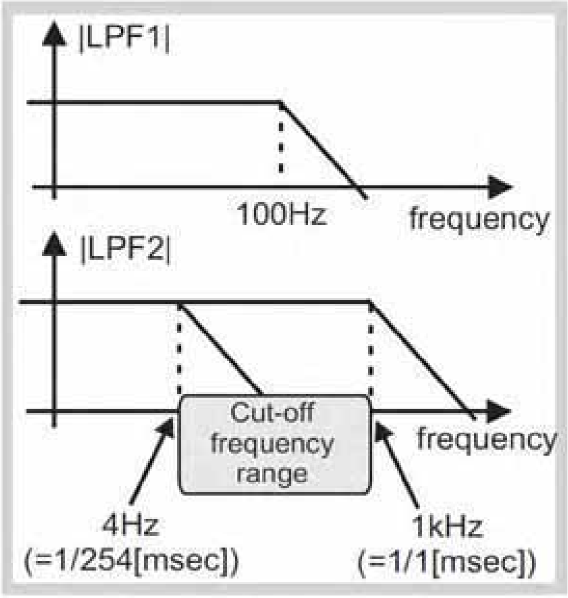
## *LEDs for signalling*

In the front-side panel there are 9 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/overflows described in RS485 Registers table |
| | Constant light | Module failure |
| 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 |
| | Constant light | Verify if the bus connection is corrected |
| 1-5 | Constant light | IN1-5 state equal to «1» |
| | No light | IN1-5 state equal to «0» (if the power is on) |

## *Filtering actions*

In the following figure is shown the filtering action applied to the digital signals IN1-4 and IN5 (if bit40009.7=0).




LPF1 action: Input filter

Cut-off frequency equal to 100Hz for IN1-5 (equal to 10kHz for IN5 with bypass Filter 1-254, if bit40009.7=1).

LPF2 action: Filter 1-254

Cut-off frequency range to attenuate lower-frequencies noise: from 4Hz to 1kHz. The noise is overlapped to the desired digital signal.

# Seneca Z-PC Line module: **Z-10-D-IN**

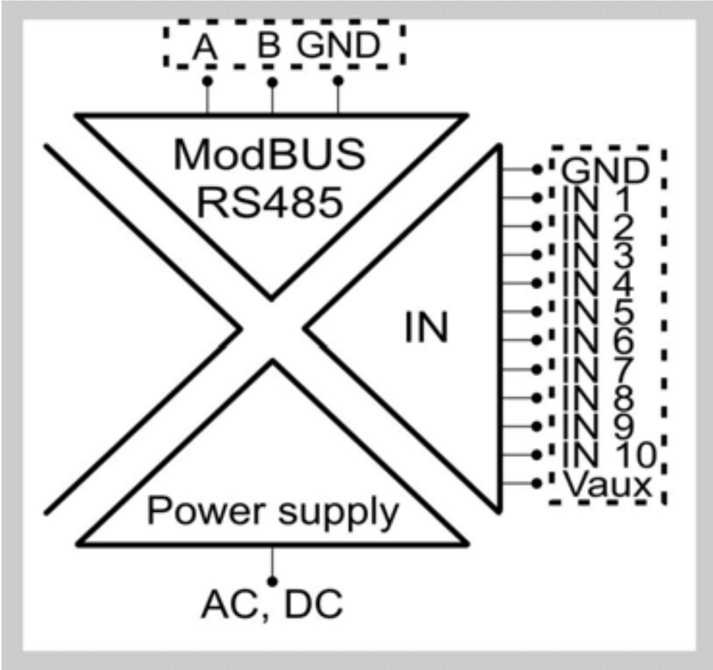
The Z-10-D-IN module acquires 10 single-ended digital signals, it converts them to a digital format (IN 1-10 state) and it counts the input-pulse number (pulse counter for IN 1-10).

## *General characteristics*

- Acquisition of digital signals from sensor: Reed, NPN, PNP, Proximity, contact, etc...
- Configuration of a filter applied to the input signals IN1-IN8 (Filter(1-254)) to attenuate the noise overlapped to the digital signals
- Pulse counters for digital signals, with max frequency equal to: 100 Hz, 16bit-registers (the signal is acquired from IN1-8); 10kHz, 32bit-registers (the signal is acquired from IN9-IN10)
- Advanced management of the pulse counters for digital signals IN9-IN10 (see table 1)
- Power of 10 sensors by 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

## *Features*

| **INPUT** | |
|---|---|
| **Number** | 10 |
| **Input filter** | Cut-off frequency: 100Hz (for IN1-8); 10kHz (for IN9-10) |
| **Filter(1-254) to attenuate the noise** | Configurable between: 1[ms] and 254[ms] |
| **Protection** | This module provides inputs and power supply(Vaux) protection against the overvoltage surge transient by transient suppressor TVS (600W/ms); max current supplied from Vaux is 100mA (limited by internal series PTC) |
| **Pulse min duration (ton)** | 4ms (for IN1-IN8); 50µs (for IN9-IN10) |
| **Sensor=closed** | The sensor is detected «closed» if: acquired signal voltage >12 Vdc and acquired signal current > 3 mA |
| **Sensor=open** | The sensor is detected «open» if: acquired signal voltage <10 Vdc and acquired signal current < 2 mA |
| **Internal supply Vaux** | The screw terminal 12 (Vaux) supplies 16 V with reference to the screw terminal 1 (GND) |
| Measure error for frequency: 2% of fmax (for IN1-IN8: ±2Hz; for IN9-IN10: ±200Hz)<br>Measure error for period, ton, toff: 1ms | |
| **CONNECTIONS** | |
| **RS485 interface** | IDC10 connector for DIN 46277 rail (back-side panel) |
| **1500 Vac ISOLATIONS** | |
| | Between: power supply, ModBUS RS485, digital inputs |



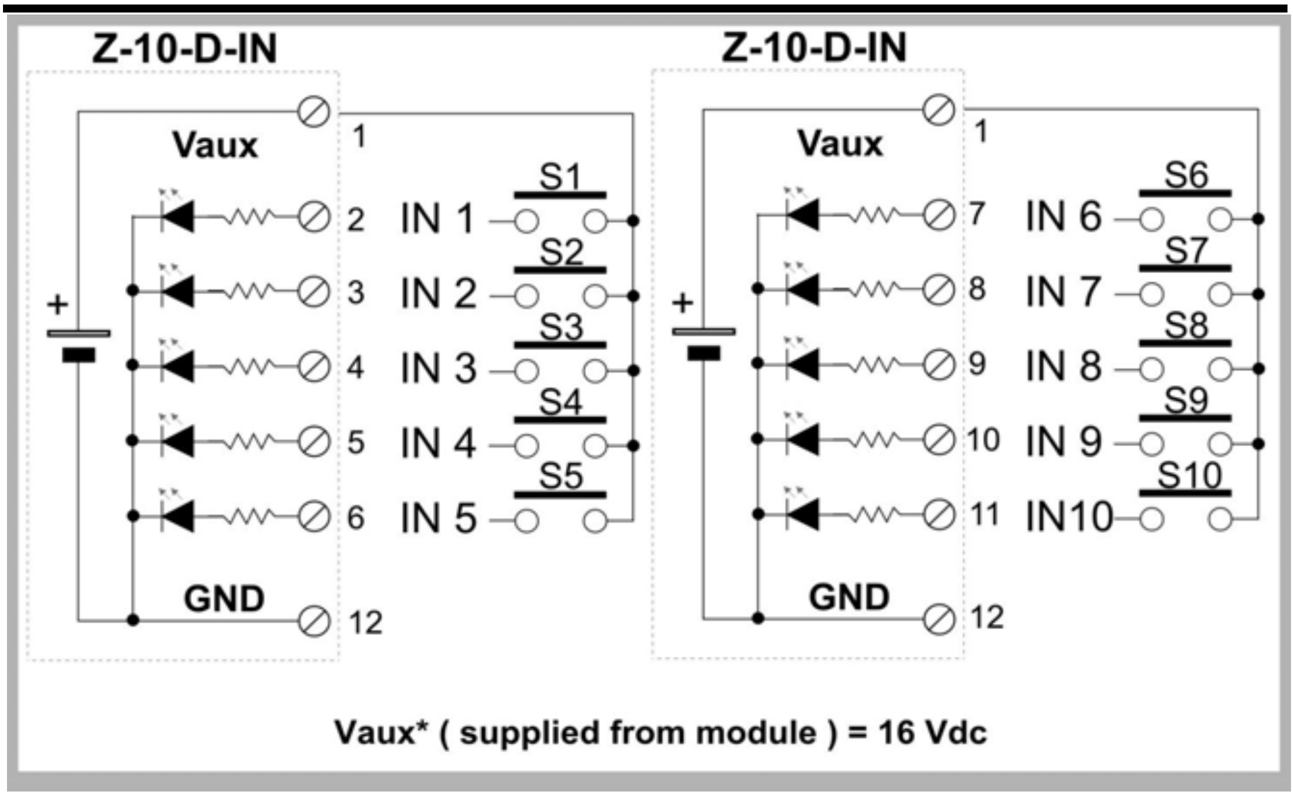

| POWER SUPPLY | |
|---|---|
| **Supply voltage** | 10 – 40 Vdc or 19 – 28 Vac ( 50Hz - 60Hz) |
| **Power consumption** | Min: 0.5W;  Max: 2.5W |

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.

## *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 figure is shown the connection of the sensors to the 10 inputs of Z-10-D-IN 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 1 (Vaux=16V with reference to the screw terminal 12=GND) and one of the inputs IN1-10.




## *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).

<table>
<tr><th colspan="7">BAUD-RATE (Dip-Switches: DIP-SWITCH STATUS)</th></tr>
<tr><td>1</td><td>2</td><td colspan="5">Meaning</td></tr>
<tr><td></td><td></td><td colspan="5">Baud-rate=9600 Baud</td></tr>
<tr><td></td><td>●</td><td colspan="5">Baud-rate=19200 Baud</td></tr>
<tr><td>●</td><td></td><td colspan="5">Baud-rate=38400 Baud</td></tr>
<tr><td>●</td><td>●</td><td colspan="5">Baud-rate=57600 Baud</td></tr>
<tr><th colspan="7">ADDRESS (Dip-Switches: DIP-SWITCH STATUS)</th></tr>
<tr><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>Meaning</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>Address and Baud-Rate are acquired from memory(EEPROM)</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td>●</td><td>Address=1</td></tr>
<tr><td></td><td></td><td></td><td></td><td>●</td><td></td><td>Address=2</td></tr>
<tr><td></td><td></td><td></td><td></td><td>●</td><td>●</td><td>Address=3</td></tr>
<tr><td></td><td></td><td></td><td>●</td><td></td><td></td><td>Address=4</td></tr>
<tr><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>……………………</td></tr>
<tr><td>●</td><td>●</td><td>●</td><td>●</td><td>●</td><td>●</td><td>Address=63</td></tr>
<tr><th colspan="7">RS485 TERMINATOR (Dip-Switches: DIP-SWITCH STATUS)</th></tr>
<tr><td>9</td><td>10</td><td colspan="5">Meaning</td></tr>
<tr><td></td><td></td><td colspan="5">RS485 terminator disabled</td></tr>
<tr><td></td><td>●</td><td colspan="5">RS485 terminator enabled</td></tr>
</table>

## *RS485 Register table*

| Name | Range | Interpretation of register | R/W | Default | Address |
|---|---|---|---|---|---|
| MachineID | / | MSB, LSB | R | | 40001 |
| | Id_Code (Module ID) | | | 0x0A | Bit [15:8] |
| | Ext_Rev (Module version) | | | | Bit [7:0] |
| FWREV | / | Word | R | | 40024 |
| | Firmware Code | | | | |
| Status | / | Bit | R/W | | 40022 |
| | These bits aren't used | | | / | Bit [15:2] |
| | Save configuration in memory (EEPROM). The content of 40018, 40019, 40020, 40021 registers is overwritten, respectively, in the 40082, 40083, 40084, 40085 registers (these ones are in memory EEPROM): 0=deactivated; 1=activated | | | 0 | Bit 1 |
| | Reset of module: 0=deactivated; 1=activated | | | 0 | Bit 0 |
| Eprflag | / | Bit | R/W | | 40020 (EEPROM 40084) |
| | These bits aren't used | | | / | Bit[15:13] |
| | Count modality of "pulse counter for IN9 and IN10" for each acquired pulse through inputs IN9 and IN10. To know the configurations of the bit 40020.[12:8], see table 1 | | | 0b00000 | Bit [12:8] |

| TABLE 1 - COUNT MODALITY OF PULSE COUNTERS FOR IN9 AND IN10 | | |
|---|---|---|
| Bit 40020.[12:8] | PulseCounter9 | PulseCounter10 |
| 0b00000 | +1 for each pulse acquired through IN9 | +1 for each pulse acquired through IN10 |
| 0b00001 | -1 for each pulse acquired through IN9 | +1 for each pulse acquired through IN10 |
| 0b00010 | +1 for each pulse acquired through IN9 | -1 for each pulse acquired through IN10 |
| 0b00100 | -1 for each pulse acquired through IN9 | -1 for each pulse acquired through IN10 |
| 0b01000 | +1 for each pulse acquired through IN9;-1 for each pulse acquired through IN10 | Deactivated |
| 0b10000 | if IN10=1, +1 for each pulse acquired through IN9; if IN10=0, -1 for each pulse acquired through IN9 | Deactivated |

| | | | |
|---|---|---|---|
| | These bits aren't used | / | Bit [7:5] |
| | Parity for RS485: 0=even; 1=odd | 0 | Bit 4 |
| | Parity for RS485: 0=there isn't; 1=there is | 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 | 0 | Bit 2 |
| | (*) Count modality of "pulse counter for IN1-8" for each acquired pulse through inputs IN1-8: 0=+1 for each pulse acquired through IN1-8; 1=-1 for each pulse acquired through IN1-8 | 0 | Bit 1 |
| | (*) Sensors-state representation logic for switches S1-S10, with reference to the «Input Status» registers 10001-10010, to the «Coil Status» registers 00001-00010 and to the bit40002.0-bit40002.9. If bit 40020.0=0: switch open (closed) corresponds to "0"("1"); if bit 40020.0=1: switch open(closed) corresponds to "1"("0") | 0 | Bit 0 |

(*) To modify the bit 40020.0, 40020.1 e 40020.2 state, it isn't necessary to reset the module because the modification is immediate; to modify the other bit state, execute in the order the following operations:

-write the new configuration in the register;

-reset the module (switch bit 40022.0 to 1).

| | | | | | |
|---|---|---|---|---|---|
| Baudrate Address | Address: from 0x01=1 to 0xFF=255 | MSB, LSB | R/W | | 40021 (EEPROM 40085) |
| | 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 | | | 38400 | Bit [15:8] |
| | Address for RS485 (address of module/node if parameters are configurated by memory modality) | | | 1 | Bit [7:0] |
| Filter1-254 | Between:1[ms]; 254[ms] | Word | R/W | | 40019 (EEPROM 40083) |
| | Filter(1-254) applied to all input-signals (except IN9 and IN10). Limiting values: if reg.40019=1[ms]=filtering action to attenuate noise with frequency<1kHz (period>1ms); if reg.40019=254[ms]=filtering action to attenuate noise with frequency<4Hz (period>254ms) | | | 3[ms] | |

(**) The content of the 40008, 40009 and 40010 registers is stored in the 40072, 40073 and 40074 respectively (memory EEPROM), too. The module writes the content of the register: 40072 in 40008, 40073 in 40009, 40074 in 40010 in one of the following cases:

-when the module is connected to the RS485-bus (registers initialization);

-when the module is resetted (bit 40011.0 switched to 1).

| | | | | | |
|---|---|---|---|---|---|
| Pulse Counter IN1 | Between:0; 32767 | Word | R | | 40003 |
| | 16-bit pulse counter for input 1. To know the overflow of Pulse CounterIN1 register, see bit 40015.0 or reg. 00017 | | | / | |
| Pulse Counter IN2 | Between:0; 32767 | Word | R | | 40004 |
| | 16-bit pulse counter for input 2. To know the overflow of Pulse CounterIN2 register, see bit 40015.1 or reg. 00018 | | | / | |
| Pulse Counter IN3 | Between:0; 32767 | Word | R | | 40005 |
| | 16-bit pulse counter for input 3. To know the overflow of Pulse CounterIN3 register, see bit 40015.2 or reg. 00019 | | | / | |
| Pulse Counter IN4 | Between:0; 32767 | Word | R | | 40006 |
| | 16-bit pulse counter for input 4. To know the overflow of Pulse CounterIN4 register, see bit 40015.3 or reg. 00020 | | | / | |
| Pulse Counter IN5 | Between:0; 32767 | Word | R | | 40007 |
| | 16-bit pulse counter for input 5. To know the overflow of Pulse Counter IN5 register, see bit 40015.4 or reg. 00021 | | | / | |

| | | | | | |
|---|---|---|---|---|---|
| Pulse Counter IN6 | Between:0; 32767 | Word | R | | 40008 |
| | 16-bit pulse counter for input 6. To know the overflow of Pulse Counter IN6 register, see bit 40015.5 or reg. 00022 | | | / | |
| Pulse Counter IN7 | Between:0; 32767 | Word | R | | 40009 |
| | 16-bit pulse counter for input 7. To know the overflow of Pulse Counter IN7 register, see bit 40015.6 or reg. 00023 | | | / | |
| Pulse Counter IN8 | Between:0; 32767 | Word | R | | 40010 |
| | 16-bit pulse counter for input 8. To know the overflow of Pulse Counter IN8 register, see bit 40015.7 or reg. 00024 | | | / | |
| PulseCounter9 MSW | Between:0; (2^31)-1 | FP32bit-MSW | R | | 40012 |
| PulseCounter9 LSW | | FP32bit-LSW | R | | 40011 |
| | 32-bit pulse counter for input 9 and input 10 (to configure it, see bit40020.[12:8]). To know the overflow of PulseCounter9 register, see bit 40015.8 or reg. 00025 | | | / | |
| Pulse Counter 10 MSW | Between:0; (2^31)-1 | FP32bit-MSW | R | | 40014 |
| Pulse Counter 10 LSW | | FP32bit-LSW | R | | 40013 |
| | 32-bit pulse counter for input 9 and input 10 (to configure it, see bit40020.[12:8]). To know the overflow of PulseCounter10 register, see bit 40015.9 or reg. 00026 | | | / | |
| Inputs | | Word | R | | 40002 |
| | These bits aren’t used | | | / | Bit[15:10] |
| | IN10 state: 0=S10 open(closed); 1=S10 closed(open), if bit40020.0=0(1) | | | / | Bit 9 |
| | IN9 state: 0=S9 open(closed); 1=S9 closed(open), if bit40020.0=0(1) | | | / | Bit 8 |
| | IN8 state: 0=S8 open(closed); 1=S8 closed(open), if bit40020.0=0(1) | | | / | Bit 7 |
| | IN7 state: 0=S7 open(closed); 1=S7 closed(open), if bit40020.0=0(1) | | | / | Bit 6 |
| | IN6 state: 0=S6 open(closed); 1=S6 closed(open), if bit40020.0=0(1) | | | / | Bit 5 |
| | IN5 state: 0=S5 open(closed); 1=S5 closed(open), if bit40020.0=0(1) | | | / | Bit 4 |
| | IN4 state: 0=S4 open(closed); 1=S4 closed(open), if bit40020.0=0(1) | | | / | Bit 3 |
| | IN3 state: 0=S3 open(closed); 1=S3 closed(open), if bit40020.0=0(1) | | | / | Bit 2 |
| | IN2 state: 0=S2 open(closed); 1=S2 closed(open), if bit40020.0=0(1) | | | / | Bit 1 |
| | IN1 state: 0=S1 open(closed); 1=S1 closed(open), if bit40020.0=0(1) | | | / | Bit 0 |
| Pulse Counters overflow | | Word | R | | 40015 |
| | These bits aren’t used | | | / | Bit[15:10] |
| | PulseCounter10 overflow: 0=there isn’t; 1=there is. To reset, overwrite "0" from master | | | / | Bit 9 |
| | PulseCounter9 overflow: 0=there isn’t; 1=there is. To reset, overwrite "0" from master | | | / | Bit 8 |
| | PulseCounter8 overflow: 0=there isn’t; 1=there is. To reset, overwrite "0" from master | | | / | Bit 7 |
| | PulseCounter7 overflow: 0=there isn’t; 1=there is. To reset, overwrite "0" from master | | | / | Bit 6 |

| | | | | | |
|---|---|---|---|---|---|
| | PulseCounter6 overflow: 0=there isn't; 1=there is. To reset, overwrite "0" from master | | | / | Bit 5 |
| | PulseCounter5 overflow: 0=there isn't; 1=there is. To reset, overwrite "0" from master | | | / | Bit 4 |
| | PulseCounter4 overflow: 0=there isn't; 1=there is. To reset, overwrite "0" from master | | | / | Bit 3 |
| | PulseCounter3 overflow: 0=there isn't; 1=there is. To reset, overwrite "0" from master | | | / | Bit 2 |
| | PulseCounter2 overflow: 0=there isn't; 1=there is. To reset, overwrite "0" from master | | | / | Bit 1 |
| | PulseCounter1 overflow: 0=there isn't; 1=there is. To reset, overwrite "0" from master | | | / | Bit 0 |
| Measure Type | | Bit | R/W | | 40018 (EEPROM 40082) |
| | Measure A performed on input A. If bit[15:12]=0b0000: frequency; if bit[15:12]=0b0001: period; if bit[15:12]=0b0010: ton; if bit[15:12]=0b0011: toff | | | 0b0001 | Bit[15:12] |
| | Acquired input A, with reference to bit40018.[15:12]. If bit[11:8]=0b0001: IN1; if bit[11:8]=0b0010: IN2; if bit[11:8]=0b0011: IN3; if bit[11:8]=0b0100: IN4; if bit[11:8]=0b0101: IN5; if bit[11:8]=0b0110: IN6; if bit[11:8]=0b0111: IN7; if bit[11:8]=0b1000: IN8; if bit[11:8]=0b1001: IN9 (only frequency); if bit[11:8]=0b1010: IN10 (only frequency) | | | 0b0001 | Bit[11:8] |
| | Measure B performed on input B. If bit[7:4]=0b0000: frequency; if bit[7:4]=0b0001: period; if bit[7:4]=0b0010: ton; if bit[7:4]=0b0011: toff | | | 0b0001 | Bit[7:4] |
| | Acquired input B, with reference to bit40018.[7:4]. If bit[3:0]=0b0001: IN1; if bit[3:0]=0b0010: IN2; if bit[3:0]=0b0011: IN3; if bit[3:0]=0b0100: IN4; if bit[3:0]=0b0101: IN5; if bit[3:0]=0b0110: IN6; if bit[3:0]=0b0111: IN7; if bit[3:0]=0b1000: IN8; if bit[3:0]=0b1001: IN9 (only frequency); if bit[3:0]=0b1010: IN10 (only frequency) | | | 0b0010 | Bit[3:0] |
| Measure A | / | Word | R | | 40017 |
| | Measure A value: to know the measure type, see bit40018.[15:12], to know the acquired input, see bit40018.[11:8] | | | / | |
| Measure B | / | Word | R | | 40016 |
| | Measure B value: to know the measure type, see bit40018.[7:4], to know the acquired input, see bit40018.[3:0] | | | / | |

The «Input Status»-type registers used for Z-10-D-IN 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(closed); 1=S1 closed(open), if bit40020.0=0(1) | | | / | |
| State IN2 | 0-1 | Word | R | | 10002 |
| | IN2 state: 0=S2 open(closed); 1=S2 closed(open), if bit40020.0=0(1) | | | / | |
| State IN3 | 0-1 | Word | R | | 10003 |
| | IN3 state: 0=S3 open(closed); 1=S3 closed(open), if bit40020.0=0(1) | | | / | |

| | | | | | |
|---|---|---|---|---|---|
| State IN4 | 0-1 | Word | R | | 10004 |
| | IN4 state: 0=S4 open(closed); 1=S4 closed(open), if bit40020.0=0(1) | | | / | |
| State IN5 | 0-1 | Word | R | | 10005 |
| | IN5 state: 0=S5 open(closed); 1=S5 closed(open), if bit40020.0=0(1) | | | / | |
| State IN6 | 0-1 | Word | R | | 10006 |
| | IN6 state: 0=S6 open(closed); 1=S6 closed(open), if bit40020.0=0(1) | | | / | |
| State IN7 | 0-1 | Word | R | | 10007 |
| | IN7 state: 0=S7 open(closed); 1=S7 closed(open), if bit40020.0=0(1) | | | / | |
| State IN8 | 0-1 | Word | R | | 10008 |
| | IN8 state: 0=S8 open(closed); 1=S8 closed(open), if bit40020.0=0(1) | | | / | |
| State IN9 | 0-1 | Word | R | | 10009 |
| | IN9 state: 0=S9 open(closed); 1=S9 closed(open), if bit40020.0=0(1) | | | / | |
| State IN10 | 0-1 | Word | R | | 10010 |
| | IN10 state: 0=S10 open(closed); 1=S10 closed(open), if bit40020.0=0(1) | | | / | |

The «Coil Status»-type registers used for Z-10-D-IN module are shown in the following table:

| Name | Range | Interpretation of register | R/W | Default | Address |
|---|---|---|---|---|---|
| Overflow PulseCounter1 | 0-1 | Word | R | | 00017 |
| | PulseCounter1 overflow: 0=there isn't; 1=there is | | | / | |
| Overflow PulseCounter2 | 0-1 | Word | R | | 00018 |
| | PulseCounter2 overflow: 0=there isn't; 1=there is | | | / | |
| Overflow PulseCounter3 | 0-1 | Word | R | | 00019 |
| | PulseCounter3 overflow: 0=there isn't; 1=there is | | | / | |
| Overflow PulseCounter4 | 0-1 | Word | R | | 00020 |
| | PulseCounter4 overflow: 0=there isn't; 1=there is | | | / | |
| Overflow PulseCounter5 | 0-1 | Word | R | | 00021 |
| | PulseCounter5 overflow: 0=there isn't; 1=there is | | | / | |
| Overflow PulseCounter6 | 0-1 | Word | R | | 00022 |
| | PulseCounter6 overflow: 0=there isn't; 1=there is | | | / | |
| Overflow PulseCounter7 | 0-1 | Word | R | | 00023 |
| | PulseCounter7 overflow: 0=there isn't; 1=there is | | | / | |
| Overflow PulseCounter8 | 0-1 | Word | R | | 00024 |
| | PulseCounter8 overflow: 0=there isn't; 1=there is | | | / | |
| Overflow PulseCounter9 | 0-1 | Word | R | | 00025 |
| | PulseCounter9 overflow: 0=there isn't; 1=there is | | | / | |
| Overflow Pulse Counter10 | 0-1 | Word | R | | 00026 |
| | PulseCounter10 overflow: 0=there isn't; 1=there is | | | / | |

## LEDs for signalling

In the front-side panel there are 14 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 has at least one of the errors/overflows described in RS485 Registers table |
| | Constant light | Module failure |
| 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 |
| | Constant light | Verify if the bus connection is corrected |
| 1-10 | Constant light | IN1-10 state equal to «1» |
| | No light | IN1-10 state equal to «0» (if the power is on) |

## Filtering actions

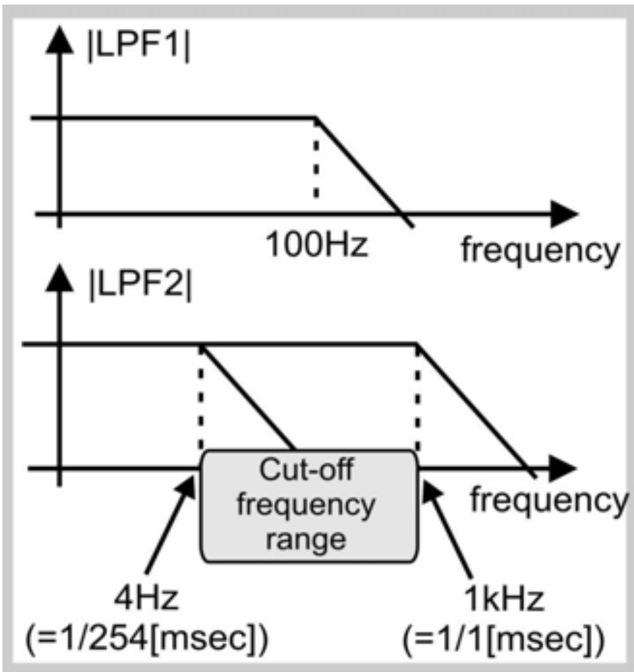
In the following figure is shown the filtering action applied to the digital signals IN1-IN10.

<u>LPF1 action: Input filter</u>

Cut-off frequency equal to 100Hz for IN1-8 (equal to 10kHz for IN9, IN10 with bypass Filter 1-254).

<u>LPF2 action: Filter 1-254</u>

Cut-off frequency range to attenuate lower-frequencies noise: from 4Hz to 1kHz. The noise is overlapped to the desired digital signal.



# Seneca Z-PC Line module: **Z-D-OUT**

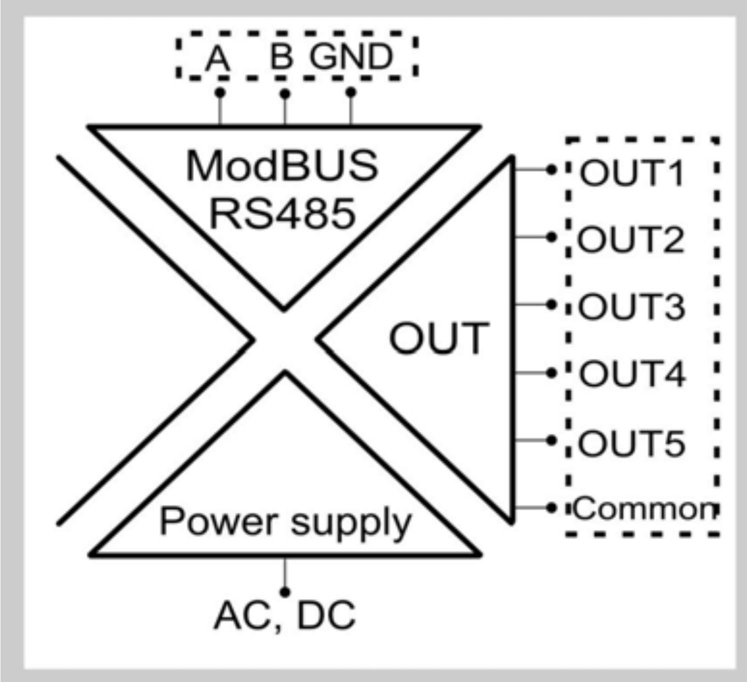
The module Z-D-OUT controls 5 relays digital output (OUT1-OUT5).

## General characteristics

- Management of the output state if the interval time of RS485-bus communication failure is greater than a configurable time (up to 25 sec)
- Configuration of 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

## Features

| **OUTPUT** | |
|---|---|
| **Number** | 5 |
| **Type** | Relays SPST (Single Pole Single Throw) normally open, with common |
| **Max current through screw terminals** | Screw terminals 7,8,9,10,11: 5A with 250Vac(if resistive load); 2A (if inductive load). Screw terminal 12: 12A |
| **Max relay switching frequency** | 6 cycles/min(with resistive load); 1200 cycles/min(with no load) |
| **Pick-up relay voltage** | 18V |
| **Drop-out relay voltage** | 2.4V |
| **Relay internal supply** | With reference to the screw terminal 12 (GND), the relays are supplied with 24Vdc internally |
| **No-load adsorbed current by a relay** | 9mA |
| **Relay response time** | 5/2ms |
| **CONNECTIONS** | |
| **RS485 interface** | IDC10 connector for DIN 46277 rail (back-side panel) or screw terminals: 4 (GND), 5(B), 6(A) |
| **1500 Vac ISOLATIONS** | |
| | Between: power supply, ModBUS RS485, digital output |

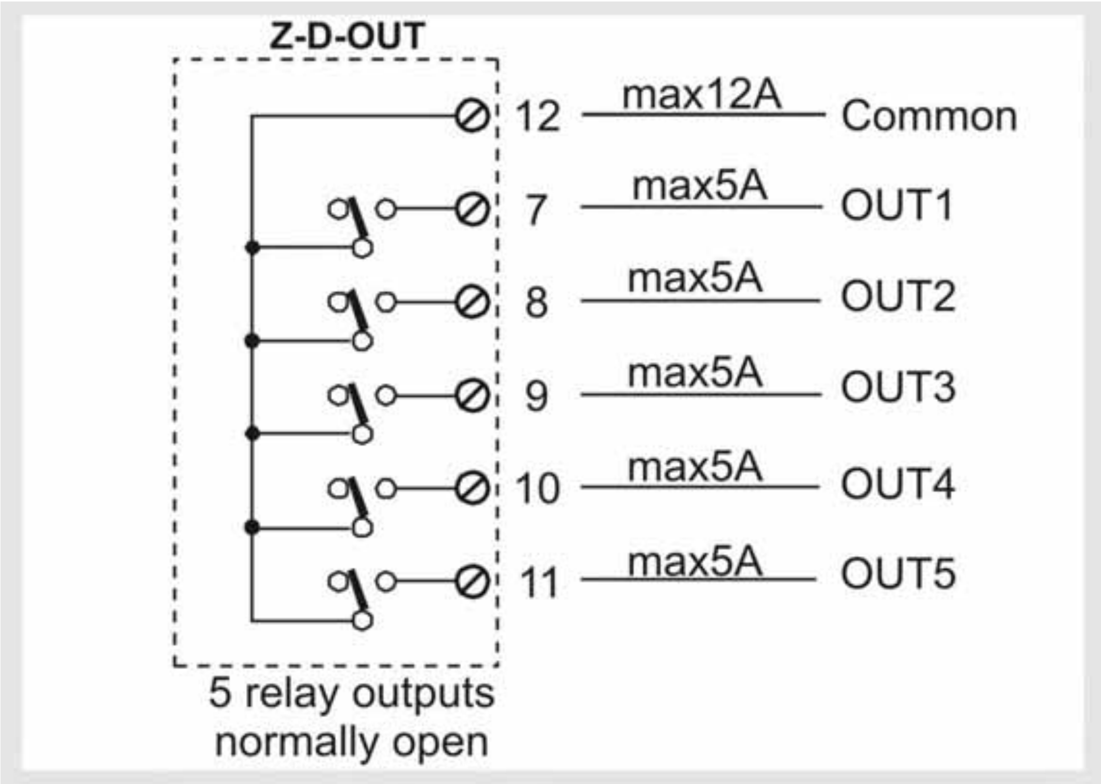



| POWER SUPPLY | |
|---|---|
| **Supply voltage** | 10 – 40 Vdc or 19 – 28 Vac ( 50Hz - 60Hz) |
| **Power consumption** | Min: 0.5W;  Max: 2.5W |

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.

# Output 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.**




**It’s forbidden** that the current through the screw terminal 12 (common) is greater than 12A.
**It’s forbidden** that the current through the screw terminals 7,8,9,10,11 is greater than 5A.

## Dip-switches table

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: DIP-SWITCH STATUS) | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 2 | Meaning | | | | |
| | | Baud-rate=9600 Baud | | | | |
| | ● | Baud-rate=19200 Baud | | | | |
| ● | | Baud-rate=38400 Baud | | | | |
| ● | ● | Baud-rate=57600 Baud | | | | |
| **ADDRESS (Dip-Switches: DIP-SWITCH STATUS)** | | | | | | |
| 3 | 4 | 5 | 6 | 7 | 8 | Meaning |
| | | | | | | **Address and Baud-Rate are acquired from memory(EEPROM)** |
| | | | | | ● | Address=1 |
| | | | | ● | | Address=2 |
| | | | | ● | ● | Address=3 |
| | | | ● | | | Address=4 |
| X | X | X | X | X | X | …………………… |
| ● | ● | ● | ● | ● | ● | Address=63 |
| **RS485 TERMINATOR (Dip-Switches: DIP-SWITCH STATUS)** | | | | | | |
| 9 | 10 | Meaning | | | | |
| | | RS485 terminator disabled | | | | |
| | ● | RS485 terminator enabled | | | | |

## *RS485 register table*

| Name | Range | Interpretation of register | R/W | Default | Address |
|---|---|---|---|---|---|
| MachineID | / | MSB, LSB | R | | 40001 |
| | Id_Code (Module ID) | | | 0x02 | Bit [15:8] |
| | Ext_Rev (Module version) | | | | Bit [7:0] |
| FWREV | / | Word | R | | 40009 |
| | Firmware Code | | | | |
| Status | 0-1 | Bit | R/W | | 40007 |
| | These bits aren't used | | | / | Bit [15:2] |
| | Reset of module: 0=deactivated; 1=activated | | | 0 | Bit 1 |
| | Save configuration in memory (EEPROM). The content of 40003, 40004, 40005, 40006 registers is overwritten, respectively, in the 40067, 40068, 40069, 40070 registers (these ones are in memory EEPROM): 0=deactivated; 1=activated | | | 0 | Bit 0 |
| Eprflag | 0-1 | Bit | R/W | | 40005 (EEPROM 40069) |
| | These bits aren't used | | | / | Bit [15:8] |
| | (*)Fault state enabling.<br>If bit40005.7=1 and if the interval time of RS485-bus communication failure **is greater than Timeout/10** [sec], the relays 1-5 and the LEDs1-5 will have the configuration that correspond to bit40003.X.<br>If bit40005.7=1 and if the module is connected to RS485-bus communication **for the first time**, the relays 1-5 and the LEDs1-5 will have the configuration that correspond to bit40003.X and the bit 40003.X is overwritten to bit 40002.X, with X=0;4.<br>0=deactivated; 1=activated | | | 1 | Bit 7 |

| | | | |
|---|---|---|---|
| | (*)Timer reset type. The module has a timer: if the interval time of RS485-bus communication failure is greater than Timeout/10[sec], the module overwrites the content of Fault Output (bits 40003.[0:4]) to Output (bits 40002.[0:4] and registers 00001-00005)<br>It's possible to reset this timer (the timer returns to «Timeout/10[sec]» automatically) when one of the following event occurs: 1) event=the Z-D-OUT module receives a valid message within Timeout/10[sec] (if bit 40005.6=1); 2) event=any module connected to the bus RS485 receives a valid message within Timeout/10[sec] (if bit 40005.6=0) | 0 | Bit 6 |
| | This bit isn't used | / | Bit 5 |
| | Parity for RS485: 0=even parity; 1=odd parity | 0 | Bit 4 |
| | Parity for RS485: 0=deactivated; 1=activated | 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 | 0 | Bit 2 |
| | This bit isn't used | / | Bit 1 |
| | (*) With reference to the «Coil Status» ModBUS registers 00001-00005 and to the bit40002.0-bit40002.4, it is the state of the relay 1-5. If bit 40005.0=0: relay 1-5 open(closed) corresponds to "0"("1") and LED1-5 turned off(on); if bit 40005.0=1: relay 1-5 open(closed) corresponds to "1"("0") and LED1-5 turned on (off) | 0 | Bit 0 |

(*) To modify the bit 40005.0, 40005.2, 40005.6 and 40005.7 state, it isn't necessary to reset the module because the modification is immediate; to modify the other bit state, execute in the order the following operations: write the new configuration in the register and reset the module (switch bit 40007.0 to 1).

| | | | | | |
|---|---|---|---|---|---|
| Dip-Switch state | 0-1 | Bit | R | | 40008 |
| | These bits aren't used | | | / | Bit [15:8] |
| | Dip-Switches [1:2] state. They correspond to module address for RS485 | | | / | Bit [7:6] |
| | Dip-Switches [3:8] state. They correspond to module baud-rate for RS485 | | | / | Bit [5:0] |
| Baudrate Address | Address: from 0x01=1 to 0xFF=255 | MSB, LSB | R/W | | 40006 (EEPROM 40070) |
| | Baudrate 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 | | | 38400 | Bit [15:8] |
| | Address for RS485 (address of module/node if parameters are configurated by memory modality) | | | 1 | Bit [7:0] |
| Output | 0-1 | Bit | R/W | | 40002 |
| | These bits aren't used | | | / | Bit [15:5] |
| | Output OUT5 state:0=relay5 deactivated and LED5 turned off (there is no current through relay5); 1=relay5 activated and LED5 turned on (there is current through relay5) | | | 0 | Bit 4 |
| | Output OUT4 state:0=relay4 deactivated and LED4 turned off (there is no current through relay4); 1=relay4 activated and LED4 turned on (there is current through relay4) | | | 0 | Bit 3 |

| | | | | | |
|---|---|---|---|---|---|
| | Output OUT3 state:0=relay3 deactivated and LED3 turned off (there is no current through relay3); 1=relay3 activated and LED3 turned on (there is current through relay3) | | | 0 | Bit 2 |
| | Output OUT2 state:0=relay2 deactivated and LED2 turned off (there is no current through relay2); 1=relay2 activated and LED2 turned on (there is current through relay2) | | | 0 | Bit 1 |
| | Output OUT1 state:0=relay1 deactivated and LED1 turned off (there is no current through relay4); 1=relay1 activated and LED1 turned on (there is current through relay1) | | | 0 | Bit 0 |
| Fault Output | 0-1 | Bit | R/W | | 40003 (EEPROM 40067) |
| | These bits aren't used | | | / | Bit [15:5] |
| | Fault value of Output OUT5 state:0=relay5 deactivated and LED5 turned off (there is no current through relay5); 1=relay5 activated and LED5 turned on (there is current through relay5) | | | 0 | Bit 4 |
| | Fault value of Output OUT4 state:0=relay4 deactivated and LED4 turned off (there is no current through relay4); 1=relay4 activated and LED4 turned on (there is current through relay4) | | | 0 | Bit 3 |
| | Fault value of Output OUT3 state:0=relay3 deactivated and LED3 turned off (there is no current through relay3); 1=relay3 activated and LED3 turned on (there is current through relay3) | | | 0 | Bit 2 |
| | Fault value of Output OUT2 state:0=relay2 deactivated and LED2 turned off (there is no current through relay2); 1=relay2 activated and LED2 turned on (there is current through relay2) | | | 0 | Bit 1 |
| | Fault value of Output OUT1 state:0=relay1 deactivated and LED1 turned off (there is no current through relay1); 1=relay1 activated and LED1 turned on (there is current through relay1) | | | 0 | Bit 0 |
| Timeout | Between: 5 (=0.5[sec]); 250 (=25[sec]) | Word | R/W | | 40004 (EEPROM 40068) |
| | Timeout [sec/10] (if bit40005.7=1, it is the interval time of RS485-bus communication failure, after which the bit 40003.X is overwritten to bit 40002.X, with X=0;4) | | | 100 (=10[sec]) | |

The «Coil Status»-type registers are shown in the following table:

| Name | Range | Interpretation of register | R/W | Default | Address |
|---|---|---|---|---|---|
| State OUT1 | 0-1 | Word | R/W | | 00001 |
| | Output OUT1 state:0=relay1 deactivated and LED1 turned off (there is no current through relay1); 1=relay1 activated and LED1 turned on (there is current through relay1) | | | 0 | |
| State OUT2 | 0-1 | Word | R/W | | 00002 |
| | Output OUT2 state:0=relay2 deactivated and LED2 turned off (there is no current through relay2); 1=relay2 activated and LED2 turned on (there is current through relay2) | | | / | |
| State OUT3 | 0-1 | Word | R/W | | 00003 |
| | Output OUT3 state:0=relay3 deactivated and LED3 turned off (there is no current through relay3); 1=relay3 activated and LED3 turned on (there is current through relay3) | | | / | |

| | | | | | |
|---|---|---|---|---|---|
| State OUT4 | 0-1 | Word | R/W | | 00004 |
| | Output OUT4 state:0=relay4 deactivated and LED4 turned off (there is no current through relay4); 1=relay4 activated and LED4 turned on (there is current through relay4) | | | / | |
| State OUT5 | 0-1 | Word | R/W | | 00005 |
| | Output OUT5 state:0=relay5 deactivated and LED5 turned off (there is no current through relay5); 1=relay5 activated and LED5 turned on (there is current through relay5) | | | / | |

## *LEDs for signalling*

In the front-side panel there are 9 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 has at least one of the errors/overflows described in RS485 Registers table |
| | Constant light | Module failure |
| 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 |
| | Constant light | Verify if the bus connection is corrected |
| 1-5 | Constant light | OUT1-5 state equal to «1» |
| | No light | OUT1-5 state equal to «0» (if the power is on) |

# Seneca Z-PC Line module: **Z-10-D-OUT**

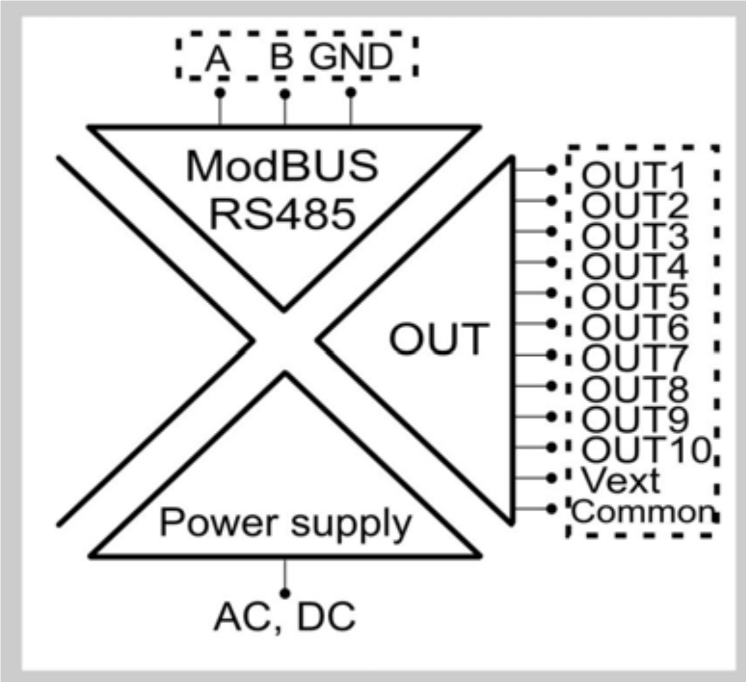
The module Z-10-D-OUT controls 10 digital outputs (OUT1-OUT10), each of them (by MOSFET) actives/deactivates a output load (LOAD1-LOAD10).

## *General characteristics*

- It is possible to manage the output state if the interval time of RS485-bus communication failure is greater than a configurable time (up to 2000sec)
- Management of the output state if the interval time of a load short-circuited is greater than a configurable time (up to 8sec)
- It is possible to measure and control the outputs supply Vext
- Configuration of 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

## *Features*

| **OUTPUT** | |
|---|---|
| **Number** | 10 (type: MOSFET with negative common) |
| **Max current through each load** | 0.5 A (if resistive load); 0.5 A (if inductive load). The supplied currents sum through all loads (these currents are inwards with reference to the screw terminal 1): <5 A (see «Output connections»). For each MOSFET: max0.5 A |
| **Max state-switching frequency for each load** | 2Hz |
| **MOSFET protection** | The MOSFETs are protected against: load short-circuited, over-temperature |
| **MOSFET supply** | With reference to the screw terminal 12 (common), power the MOSFETs by screw terminal 1 (Vext): min 6 V, max 30 V |
| **MOSFET max energy** | 40 mJ with inductive load |
| **MOSFET response time** | 5/2 ms |
| **$R_{DSON}$** | 0.75 Ω |
| **Switching delay** | 1 ms (max) |
| **CONNECTIONS** | |
| **RS485 interface** | IDC10 connector for DIN 46277 rail (back-side panel) |
| **1500 Vac ISOLATIONS** | |
| | Between: power supply, ModBUS RS485, digital outputs |

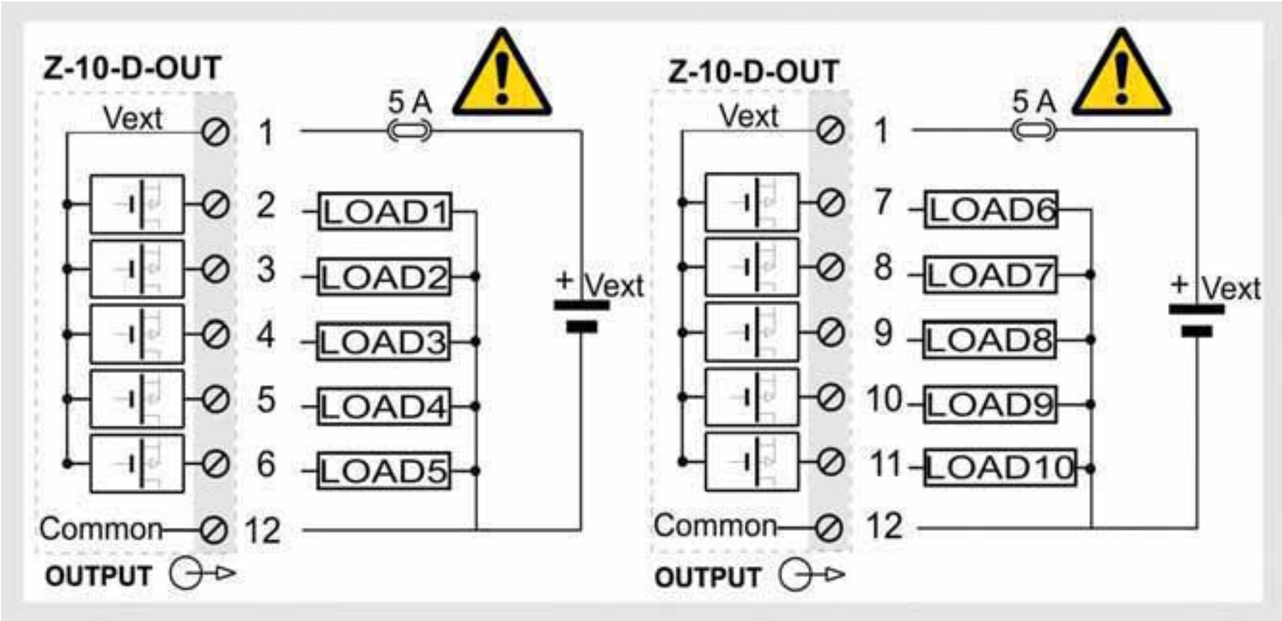



| POWER SUPPLY | |
|---|---|
| **Supply voltage** | 10 – 40 Vdc or 19 – 28 Vac (50Hz - 60Hz) |
| **Power consumption** | Min: 0.5 W;  Max: 2.5 W |

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.

## *Output 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.**




**It's forbidden** that the current through the screw terminal 1 (Vext) is greater than 5A.

## *Dip-switches table*

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: DIP-SWITCH STATUS)** | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 2 | Meaning | | | | |
| | | Baud-rate=9600 Baud | | | | |
| | ● | Baud-rate=19200 Baud | | | | |
| ● | | Baud-rate=38400 Baud | | | | |
| ● | ● | Baud-rate=57600 Baud | | | | |
| **ADDRESS (Dip-Switches: DIP-SWITCH STATUS)** | | | | | | |
| 3 | 4 | 5 | 6 | 7 | 8 | Meaning |
| | | | | | | **Address and Baud-Rate are acquired from memory(EEPROM)** |
| | | | | | ● | Address=1 |
| | | | | ● | | Address=2 |
| | | | | ● | ● | Address=3 |
| | | | ● | | | Address=4 |
| X | X | X | X | X | X | …………………… |
| ● | ● | ● | ● | ● | ● | Address=63 |
| **RS485 TERMINATOR (Dip-Switches: DIP-SWITCH STATUS)** | | | | | | |
| 9 | 10 | Meaning | | | | |
| | | RS485 terminator disabled | | | | |
| | ● | RS485 terminator enabled | | | | |

## *RS485 registers table*

| Name | Range | Interpretation of register | R/W | Default | Address |
|---|---|---|---|---|---|
| MachineID | / | MSB, LSB | R | | 40001 |
| | Id_Code (Module ID) | | | 0x0D | Bit [15:8] |
| | Ext_Rev (Module version) | | | | Bit [7:0] |
| FWREV | / | Word | R | | 40023 |
| | Firmware Code | | | | |
| Errors | 0-1 | Bit | R | | 40002 |
| | These bits aren’t used | | | / | Bit [15:7] |
| | Output supply voltage Vext (applied to screw terminal 1, with reference to screw terminal 12) (if bit40012.1=1): 0=the outputs are correctly supplied (Vext>VextTh); 1=the outputs aren’t correctly supplied (Vext<VextTh) | | | / | Bit 6 |
| | These bits aren’t used | | | / | Bit [5:4] |
| | Outputs OUT1-OUT10 error: 0=no one output has an error; 1=at least one output has an error | | | / | Bit 3 |
| | These bits aren’t used | | | / | Bit [2:1] |
| | Loads short-circuited error: 0=no one load short-circuited; 1=at least one load short-circuited (see reg.40007) | | | / | Bit 0 |
| Diagnostics Enabling | 0-1 | Bit | R/W | | 40015 |
| | These bits aren’t used | | | / | Bit [15:10] |
| | Output OUT10 diagnostics: 0=deactivated; 1=activated (if bit40015.9=1, bit40004.9 is enabled) | | | 1 | Bit 9 |
| | Output OUT9 diagnostics: 0=deactivated; 1=activated (if bit40015.8=1, bit40004.8 is enabled) | | | 1 | Bit 8 |
| | Output OUT8 diagnostics: 0=deactivated; 1=activated (if bit40015.7=1, bit40004.7 is enabled) | | | 1 | Bit 7 |
| | Output OUT7 diagnostics: 0=deactivated; 1=activated (if bit40015.6=1, bit40004.6 is enabled) | | | 1 | Bit 6 |
| | Output OUT6 diagnostics: 0=deactivated; 1=activated (if bit40015.5=1, bit40004.5 is enabled) | | | 1 | Bit 5 |
| | Output OUT5 diagnostics: 0=deactivated; 1=activated (if bit40015.4=1, bit40004.4 is enabled) | | | 1 | Bit 4 |
| | Output OUT4 diagnostics: 0=deactivated; 1=activated (if bit40015.3=1, bit40004.3 is enabled) | | | 1 | Bit 3 |
| | Output OUT3 diagnostics: 0=deactivated; 1=activated (if bit40015.2=1, bit40004.2 is enabled) | | | 1 | Bit 2 |
| | Output OUT2 diagnostics: 0=deactivated; 1=activated (if bit40015.1=1, bit40004.1 is enabled) | | | 1 | Bit 1 |
| | Output OUT1 diagnostics: 0=deactivated; 1=activated (if bit40015.0=1, bit40004.0 is enabled) | | | 1 | Bit 0 |
| Diagnostics | 0-1 | Bit | R/W | | 40004 |
| | These bits aren’t used | | | / | Bit [15:10] |
| | Output OUT10 error (if bit 40015.9=1): 0=there isn’t; 1=there is. To reset, overwrite “0” from master | | | / | Bit 9 |
| | Output OUT9 error (if bit 40015.8=1): 0=there isn’t; 1=there is. To reset, overwrite “0” from master | | | / | Bit 8 |
| | Output OUT8 error (if bit 40015.7=1): 0=there isn’t; 1=there is. To reset, overwrite “0” from master | | | / | Bit 7 |
| | Output OUT7 error (if bit 40015.6=1): 0=there isn’t; 1=there is. To reset, overwrite “0” from master | | | / | Bit 6 |
| | Output OUT6 error (if bit 40015.5=1): 0=there isn’t; 1=there is. To reset, overwrite “0” from master | | | / | Bit 5 |

| | | | |
|---|---|---|---|
| | Output OUT5 error (if bit 40015.4=1): 0=there isn't; 1=there is. To reset, overwrite "0" from master | / | Bit 4 |
| | Output OUT4 error (if bit 40015.3=1): 0=there isn't; 1=there is. To reset, overwrite "0" from master | / | Bit 3 |
| | Output OUT3 error (if bit 40015.2=1): 0=there isn't; 1=there is. To reset, overwrite "0" from master | / | Bit 2 |
| | Output OUT2 error (if bit 40015.1=1): 0=there isn't; 1=there is. To reset, overwrite "0" from master | / | Bit 1 |
| | Output OUT1 error (if bit 40015.0=1): 0=there isn't; 1=there is. To reset, overwrite "0" from master | / | Bit 0 |

If at least one bit 40004.X (X=0;9) is equal to «1», the bit 40002.3 switches to «1». To reset the bit 40002.3 (bit40002.3=0), overwrite «0» to all the bits 40004.X.

| | | | | | |
|---|---|---|---|---|---|
| Shorted Outputs | 0-1 | Bit | R | | 40007 |
| | These bits aren't used | | | / | Bit [15:10] |
| | LOAD10 short-circuited error: 0=there isn't; 1=there is (if bit40007.9=1 then bit 40002.0=1) | | | / | Bit 9 |
| | LOAD9 short-circuited error: 0=there isn't; 1=there is (if bit40007.8=1 then bit 40002.0=1) | | | / | Bit 8 |
| | LOAD8 short-circuited error: 0=there isn't; 1=there is (if bit40007.7=1 then bit 40002.0=1) | | | / | Bit 7 |
| | LOAD7 short-circuited error: 0=there isn't; 1=there is (if bit40007.6=1 then bit 40002.0=1) | | | / | Bit 6 |
| | LOAD6 short-circuited error: 0=there isn't; 1=there is (if bit40007.5=1 then bit 40002.0=1) | | | / | Bit 5 |
| | LOAD5 short-circuited error: 0=there isn't; 1=there is (if bit40007.4=1 then bit 40002.0=1) | | | / | Bit 4 |
| | LOAD4 short-circuited error: 0=there isn't; 1=there is (if bit40007.3=1 then bit 40002.0=1) | | | / | Bit 3 |
| | LOAD3 short-circuited error: 0=there isn't; 1=there is (if bit40007.2=1 then bit 40002.0=1) | | | / | Bit 2 |
| | LOAD2 short-circuited error: 0=there isn't; 1=there is (if bit40007.1=1 then bit 40002.0=1) | | | / | Bit 1 |
| | LOAD1 short-circuited error: 0=there isn't; 1=there is (if bit40007.0=1 then bit 40002.0=1) | | | / | Bit 0 |
| Address Parity | | MSB, LSB | R/W | | 40010 |
| | Address for RS485 (address of module/node if parameters are configurated by memory modality): from 0x01=1 to 0xFF=255 | | | 1 | Bit [15:8] |
| | Parity for RS485: 0=there isn't; 1=even parity; 2=odd parity | | | 0 | Bit [7:0] |
| Baudrate Delay | Delay: from 0x00=0 to 0xFF=255 | MSB, LSB | R/W | | 40011 |
| | Baudrate 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 | | | 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] |
| Command | 0xC1A0; 0xBDAC | Word | R/W | | 40024 |
| | Module reset, if reg.40024=0xC1A0; the module writes the Dip-Switch state in reg.40025, if reg.40024=0xBDAC | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Command aux | / | Word | R | | 40025 |
| | These bits aren't used | | | / | Bit [15:8] |
| | Dip-Switch [1:2] state. They correspond to the module address (if reg.40024=0xBDAC) | | | / | Bit [7:6] |
| | Dip-Switch [3:8] state. They correspond to the module baud-rate (if reg.40024=0xBDAC) | | | / | Bit [5:0] |
| Vext measure | / | Bit | R | | 40009 |
| | Output supply voltage (Vext) measure (screw terminals 1-12) [V/10]. If Vext < VextTh (see bit40016.[7:0]) and if bit40012.1=1, then the LED FAIL is on | | | / | |
| Outputs | 0-1 | Bit | R/W | | 40003 |
| | These bits aren't used | | | / | Bit [15:10] |
| | Output OUT10 state: 0=LOAD10 is deactivated (there is no current through LOAD10); 1=LOAD10 is activated (there is current through LOAD10) | | | / | Bit 9 |
| | Output OUT9 state: 0=LOAD9 is deactivated (there is no current through LOAD9); 1=LOAD9 is activated (there is current through LOAD9) | | | / | Bit 8 |
| | Output OUT8 state: 0=LOAD8 is deactivated (there is no current through LOAD8); 1=LOAD8 is activated (there is current through LOAD8) | | | / | Bit 7 |
| | Output OUT7 state: 0=LOAD7 is deactivated (there is no current through LOAD7); 1=LOAD7 is activated (there is current through LOAD7) | | | / | Bit 6 |
| | Output OUT6 state: 0=LOAD6 is deactivated (there is no current through LOAD6); 1=LOAD6 is activated (there is current through LOAD6) | | | / | Bit 5 |
| | Output OUT5 state: 0=LOAD5 is deactivated (there is no current through LOAD5); 1=LOAD5 is activated (there is current through LOAD5) | | | / | Bit 4 |
| | Output OUT4 state: 0=LOAD4 is deactivated (there is no current through LOAD4); 1=LOAD4 is activated (there is current through LOAD4) | | | / | Bit 3 |
| | Output OUT3 state: 0=LOAD3 is deactivated (there is no current through LOAD3); 1=LOAD3 is activated (there is current through LOAD3) | | | / | Bit 2 |
| | Output OUT2 state: 0=LOAD2 is deactivated (there is no current through LOAD2); 1=LOAD2 is activated (there is current through LOAD2) | | | / | Bit 1 |
| | Output OUT1 state: 0=LOAD1 is deactivated (there is no current through LOAD1); 1=LOAD1 is activated (there is current through LOAD1) | | | / | Bit 0 |

If one of the bits40003.X (or one "Input Status" register) is equal to «1», it's possible to detect if the corresponding load is short-circuited after TimeoutShort/30[sec]. In this case: bit40002.0=1, bit40002.3=1, bit40004.X=1, bit 40007.X=1 (X=[0;9]) and the LED FAIL is on (see reg.40012). If one of the bits40003.X (or one "Input Status" register) is equal to «0», it isn't possible to detect if the corresponding load is short-circuited, though bit 40003.X switches from «0» to «1». In this case, reset the bit 40004.X.

| | | | | | |
|---|---|---|---|---|---|
| Fault Outputs | 0-1 | Bit | R/W | | 40005 |
| | These bits aren't used | | | / | Bit [15:10] |
| | Fault value for output OUT10 state: 0=LOAD10 is deactivated (there is no current through LOAD10); 1=LOAD10 is activated (there is current through LOAD10) | | | 0 | Bit 9 |
| | Fault value for output OUT9 state: 0=LOAD9 is deactivated (there is no current through LOAD9); 1=LOAD9 is activated (there is current through LOAD9) | | | 0 | Bit 8 |
| | Fault value for output OUT8 state: 0=LOAD8 is deactivated (there is no current through LOAD8); 1=LOAD8 is activated (there is current through LOAD8) | | | 0 | Bit 7 |
| | Fault value for output OUT7 state: 0=LOAD7 is deactivated (there is no current through LOAD7); 1=LOAD7 is activated (there is current through LOAD7) | | | 0 | Bit 6 |
| | Fault value for output OUT6 state: 0=LOAD6 is deactivated (there is no current through LOAD6); 1=LOAD6 is activated (there is current through LOAD6) | | | 0 | Bit 5 |
| | Fault value for output OUT5 state: 0=LOAD5 is deactivated (there is no current through LOAD5); 1=LOAD5 is activated (there is current through LOAD5) | | | 0 | Bit 4 |
| | Fault value for output OUT4 state: 0=LOAD4 is deactivated (there is no current through LOAD4); 1=LOAD4 is activated (there is current through LOAD4) | | | 0 | Bit 3 |
| | Fault value for output OUT3 state: 0=LOAD3 is deactivated (there is no current through LOAD3); 1=LOAD3 is activated (there is current through LOAD3) | | | 0 | Bit 2 |
| | Fault value for output OUT2 state: 0=LOAD2 is deactivated (there is no current through LOAD2); 1=LOAD2 is activated (there is current through LOAD2) | | | 0 | Bit 1 |
| | Fault value for output OUT1 state: 0=LOAD1 is deactivated (there is no current through LOAD1); 1=LOAD1 is activated (there is current through LOAD1) | | | 0 | Bit 0 |

Fault state. If the interval time of RS485-bus communication failure is greater than Timeout/30 [sec], the outputs OUT1-OUT10 and LED1-10 have the bit40005.X configuration. If the module is connected to the RS485-bus for the first time, the outputs OUT1-OUT10 and LED1-10 have the bit40005.X configuration and the bits40005.X are overwritten to the bits40003.X, with X=0;9.

| | | | | | |
|---|---|---|---|---|---|
| Timeout | 0=timeout deactivated; between: 1 (=1/30[sec]); 60000 (=2000[sec]) | Word | R/W | | 40013 |
| | Timeout [sec/30] (if reg.40013 is different to 0: it is interval time of RS485-bus communication failure, after which the bit 40005.X is overwritten in the bit 40003.X, with X=0;9) | | | 150 (=5[sec]) | |
| Reset Timer Timeout | | Word | R/W | | 40012 |
| | These bits aren't used | | | / | Bit [15:10] |
| | LED FAIL state to signal if there is a error (see reg.40002): 0b00=constant light; 0b01=slow blinking light; 0b10=quick blinking light; 0b11=double blinking light | | | 0b00 | Bit [9:8] |
| | These bits aren't used | | | / | Bit [7:2] |
| | Voltage Vext detection through LED FAIL. If bit 40012.1=0: LED FAIL is Vext-value indipendent. If bit40012.1=1: LED FAIL «off» means that Vext>VextTh; LED FAIL «on» means that Vext<VextTh (see bit40016.[7:0]) | | | 0 | Bit 1 |

| | | | | | |
|---|---|---|---|---|---|
| | Timer reset type. The module has a timer: if the interval time of RS485-bus communication failure is greater than Timeout/30[sec], the module overwrites the content of FaultOutputs (bits 40015.[0:9]) to Outputs (bits 40003.[0:9]). It's possible to reset this timer (the timer returns to «Timeout/30[sec]» automatically) when one of the following event occurs: 1) event=writing of an output within Timeout/30[sec] (if bit 40012.0=1); 2) event=sending of any command through RS485-bus within Timeout/30[sec] (if bit 40012.0=0) | | | 0 | Bit 0 |
| TimeoutShort LowPower | TimeoutShort: from 1(=1/30[sec]) to 240(=8[sec]) | MSB, LSB | R/W | | 40016 |
| | Short-circuited timeout [sec/30] (interval time of short-circuited load, after which the corresponding bit in reg.40007 switches to «1») | | | 30 (=1[sec]) | Bit [15:8] |
| | Output supply threshold voltage (VextTh) for screw terminals 1-12 [V/10] (see bit40012.1) | | | 60 (=6[V]) | Bit [7:0] |

The «Input Status» registers used are shown in the following table:

| | | | | | |
|---|---|---|---|---|---|
| State OUT1 | 0-1 | Word | R | | 10001 |
| | Output OUT1 state: 0=LOAD1 is deactivated (there is no current through LOAD1); 1=LOAD1 is activated (there is current through LOAD1) | | | / | |
| State OUT2 | 0-1 | Word | R | | 10002 |
| | Output OUT2 state: 0=LOAD2 is deactivated (there is no current through LOAD2); 1=LOAD2 is activated (there is current through LOAD2) | | | / | |
| State OUT3 | 0-1 | Word | R | | 10003 |
| | Output OUT3 state: 0=LOAD3 is deactivated (there is no current through LOAD3); 1=LOAD3 is activated (there is current through LOAD3) | | | / | |
| State OUT4 | 0-1 | Word | R | | 10004 |
| | Output OUT4 state: 0=LOAD4 is deactivated (there is no current through LOAD4); 1=LOAD4 is activated (there is current through LOAD4) | | | / | |
| State OUT5 | 0-1 | Word | R | | 10005 |
| | Output OUT5 state: 0=LOAD5 is deactivated (there is no current through LOAD5); 1=LOAD5 is activated (there is current through LOAD5) | | | / | |
| State OUT6 | 0-1 | Word | R | | 10006 |
| | Output OUT6 state: 0=LOAD6 is deactivated (there is no current through LOAD6); 1=LOAD6 is activated (there is current through LOAD6) | | | / | |
| State OUT7 | 0-1 | Word | R | | 10007 |
| | Output OUT7 state: 0=LOAD7 is deactivated (there is no current through LOAD7); 1=LOAD7 is activated (there is current through LOAD7) | | | / | |
| State OUT8 | 0-1 | Word | R | | 10008 |
| | Output OUT8 state: 0=LOAD8 is deactivated (there is no current through LOAD8); 1=LOAD8 is activated (there is current through LOAD8) | | | / | |
| State OUT9 | 0-1 | Word | R | | 10009 |
| | Output OUT9 state: 0=LOAD9 is deactivated (there is no current through LOAD9); 1=LOAD9 is activated (there is current through LOAD9) | | | / | |

| | | | | | |
|---|---|---|---|---|---|
| State OUT10 | 0-1 | Word | R | | 10010 |
| | Output OUT10 state: 0=LOAD10 is deactivated (there is no current through LOAD10); 1=LOAD10 is activated (there is current through LOAD10) | | | / | |

## *LEDs for signalling*

In the front-side panel there are 14 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 has at least one of the errors/overflows described in RS485 Registers table |
| | Constant light | Module failure |
| 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 |
| | Constant light | Verify if the bus connection is corrected |
| 1-10 | Constant light | OUT1-10 state equal to «1» |
| | No light | OUT1-10 state equal to «0» (if the power is on and the outputs are supplied) |

# Seneca Z-PC Line module: **Z-D-IO**

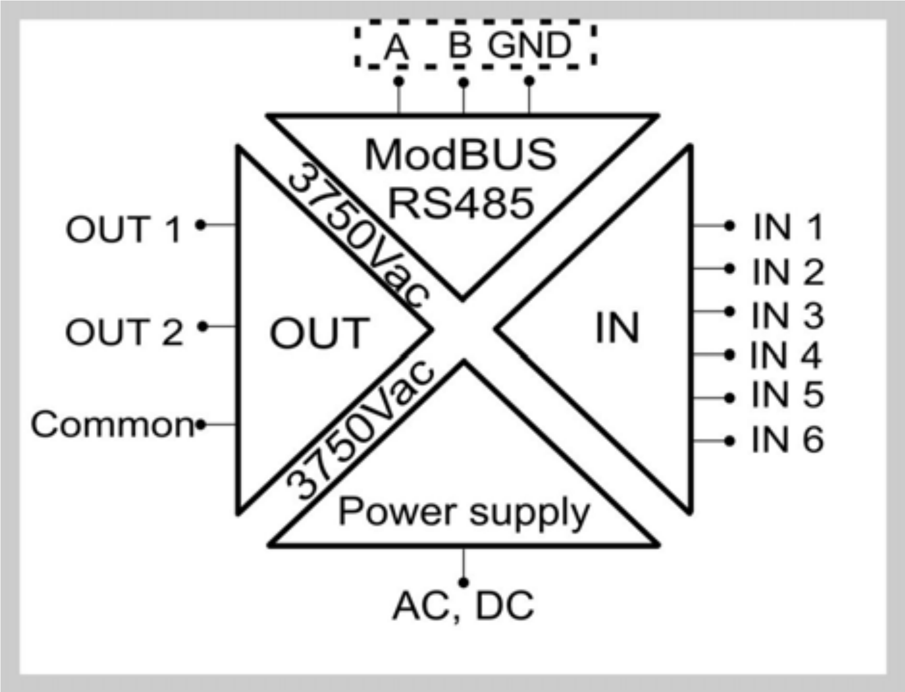
The Z-D-IO module acquires up to 6 single-ended digital signals (IN1…IN6) and controls up to 2 relay digital signals (OUT1 and OUT2). It also allows to perform three alternative functioning modalities: pneumatic valve command modality, motor control modality, motorized valve command modality.

## General characteristics

- It is possible to choose the Z-D-IO functioning modality by Dip-Switches
- Internal logic to control the motors, pneumatic valve, motorized valve
- Configuration of 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

## Features

| | |
|---|---|
| **INPUT** | |
| **Number** | 6 |
| **Type** | REED, PROXIMITY PNP, NPN, contact, etc… |
| **Protection** | This module provides inputs and power supply (Vaux) protection against the overvoltage surge transient by transient suppressor TVS (600W/ms) |
| **Sensor=closed** | The sensor is detected «closed» if: acquired signal voltage >12 Vdc and acquired signal current > 3 mA. Minimum pulse width: 20ms |
| **Sensor=open** | The sensor is detected «open» if: acquired signal voltage <10 Vdc and acquired signal current < 2 mA |
| **Discrimination limits** | According to IEC1131.2 type 1 |
| **Internal supply Vaux** | The #1 screw terminal: powers 24V with reference to a internal ground (if J1 jumper is in “Int”) |
| **OUTPUT** | |
| **Number** | 2 |
| **Type** | Relays SPST (Single Pole Single Throw) normally open with common contact |
| **Max current through screw terminals** | Screw terminals 10,11: $2A_{AC1}$ with 250Vac |
| **Max relay switching frequency** | 6 cycles/min(with resistive load); 1200 cycles/min(with no load) |
| **Pick-up relay voltage** | 18V |
| **Drop-out relay voltage** | 2.4V |
| **No-load adsorbed current by a relay** | 9mA |
| **Relay response time** | 5/2ms |
| **CONNECTIONS** | |
| **RS485 interface** | IDC10 connector |
| **ISOLATIONS** | |
| | 1500Vac isolations between: power supply, ModBUS RS485, input.<br>3750Vac isolations between: output and other parts |




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

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.

# Functioning

## I/O MODALITY

I/O functioning modality allows to have 6 digital inputs and 2 relay digital outputs.

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<table>
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<tr><td>Screw terminals</td><td>Meaning</td><td>Default</td></tr>
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<tr><th colspan="3">OUTPUT</th></tr>
<tr><td>Screw terminals</td><td>Meaning</td><td>Default</td></tr>
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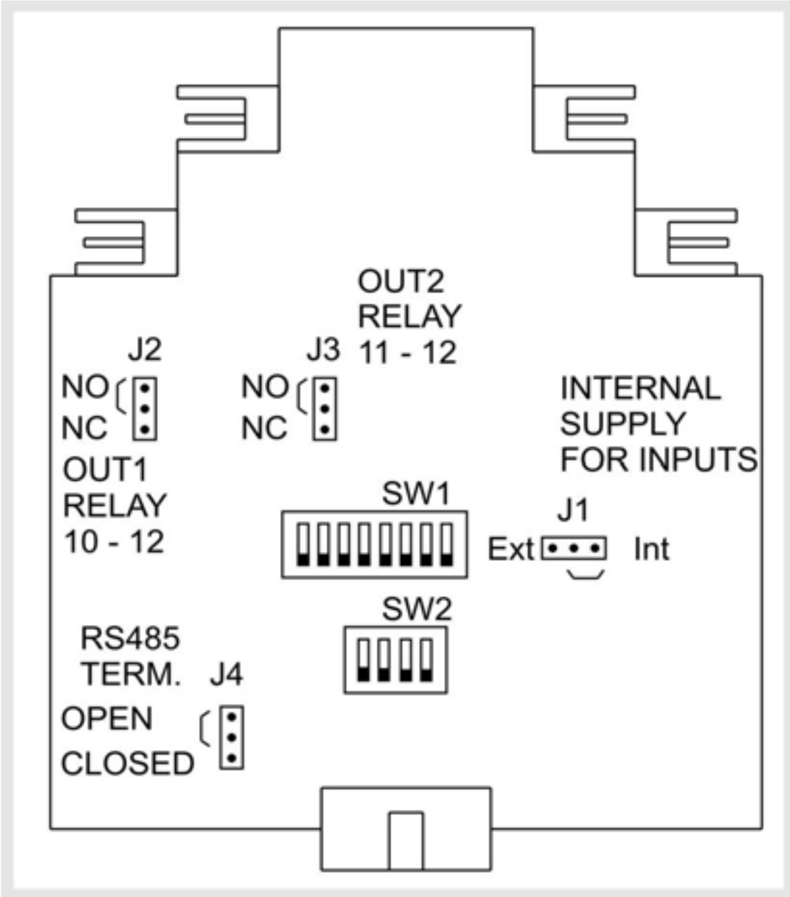
</table>

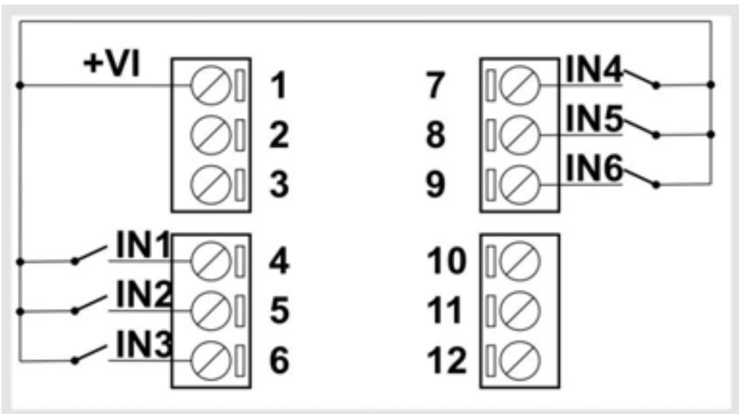
To set Z-D-IO module it is necessary open the lateral panel of module case to modify Jumpers position.

In the following figure are shown the J1, J2, J3, J4 jumpers in default position: J1 in “Int” position, J2 in “NO” position, J3 in “NO” position, J4 in “OPEN” position.

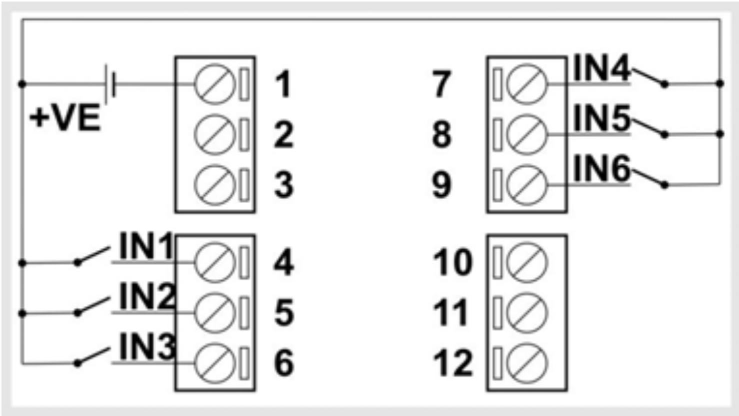



It is possible to connect the following type of sensors: REED, PROXIMITY PNP, NPN, contact, etc… To supply these inputs, a internal supply is available (if Jumper J1 is in “Int” position).

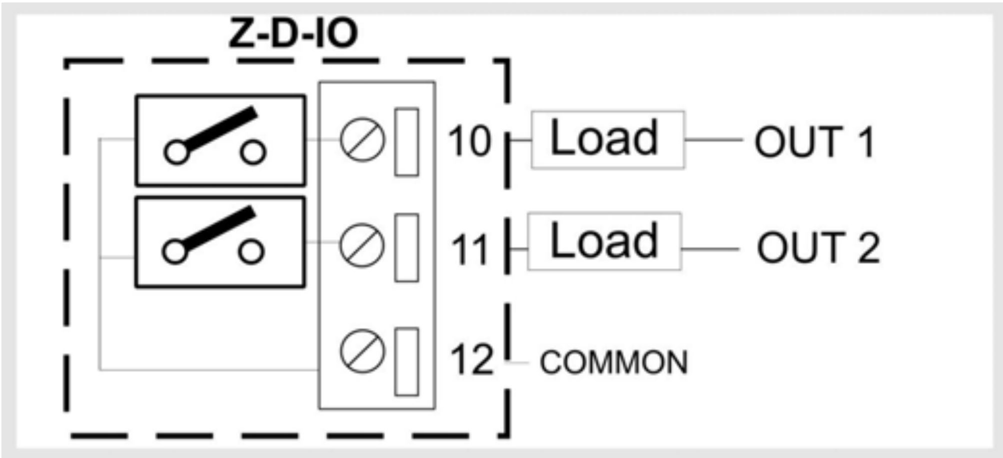
If jumper J1 is in “Int” position, input screw terminals configuration is shown in the following figure.




If jumper J1 is in “Ext” position, input screw terminals configuration is shown in the following figure. In this configuration, **a external voltage supply is necessary**.




To configure output1 and output2, set J2 and J3 jumpers.

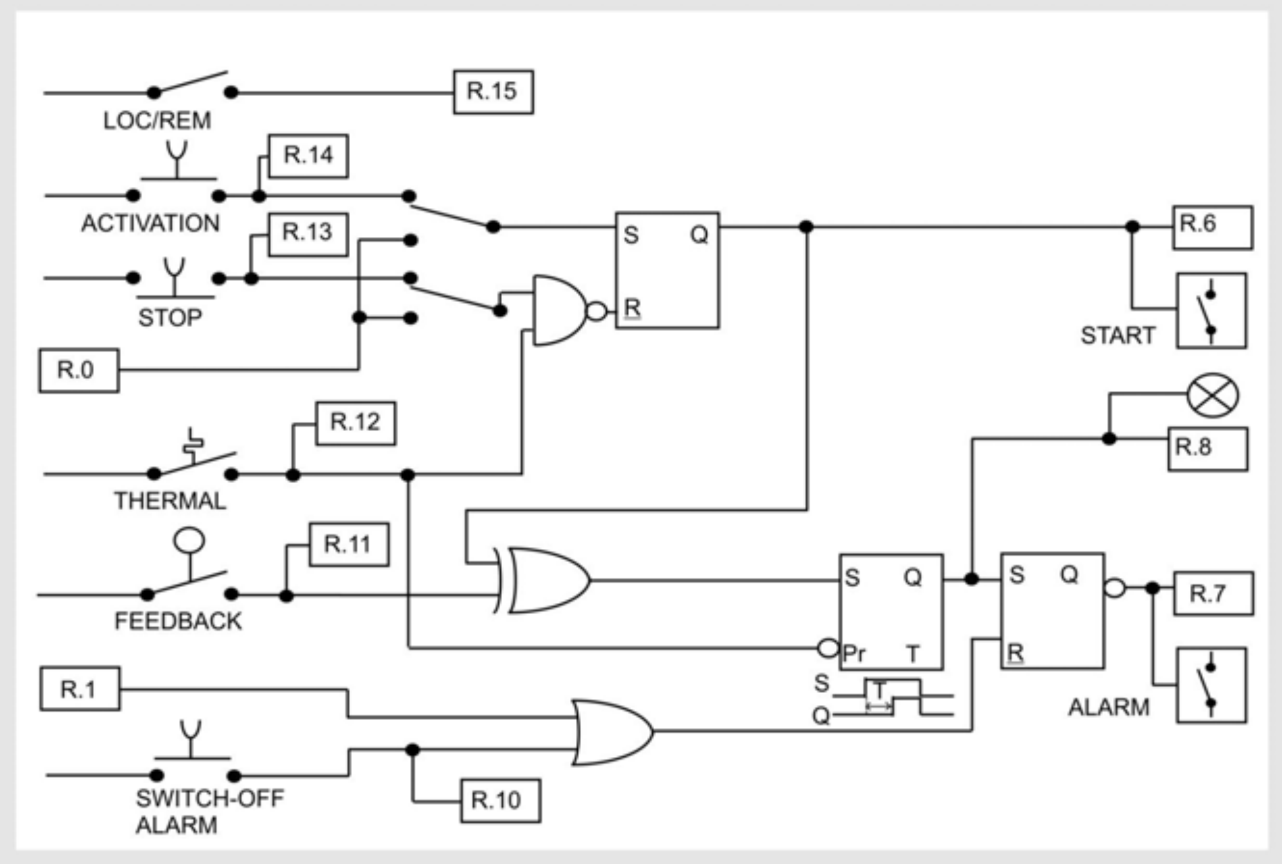



**MOTOR CONTROL MODALITY**

Before using Z-D-IO in motor control modality, set motor control delay (through reg.40005 or Dip-Switches SW2-3 and SW2-4).

| FUNCTIONING MODALITY (Dip-Switches: SW2) | | | | |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | Meaning |
| ● | | | | Motor command modality |

| INPUT | | |
|---|---|---|
| Screw terminals | Meaning | Default |
| 4-1 | Local/Remote | Normally open |
| 5-1 | Start | Normally open |
| 6-1 | Stop | Normally closed |
| 7-1 | Thermal protection | Normally closed |
| 8-1 | Feedback | Normally open |
| 9-1 | Switch off alarm | Normally open |
| **OUTPUT** | | |
| Screw terminals | Meaning | Default |
| 10-12 | Alarm | Normally excited |
| 11-12 | Start | Normally no-excited |




To start the motor, close “Start” input. Module controls the “Thermal protection” input and “Stop” input closing.

If “Thermal protection” input and “Stop” input are closed, Z-D-IO enables “Start” output. After motor command delay (see Dip-Switches SW2-3 and SW2-4 or reg.40005), closure of “Feedback” input is verified. If it is still open, “Alarm” output is enabled by module (“Start” output remains enabled).

If “Thermal protection” input opens during operation, “Alarm” output is enabled immediately, and “Start” output is disabled.

To switch off alarm, close “Switch off alarm” input.

To stop motor, open “Stop” input: the module disables “Start” output.

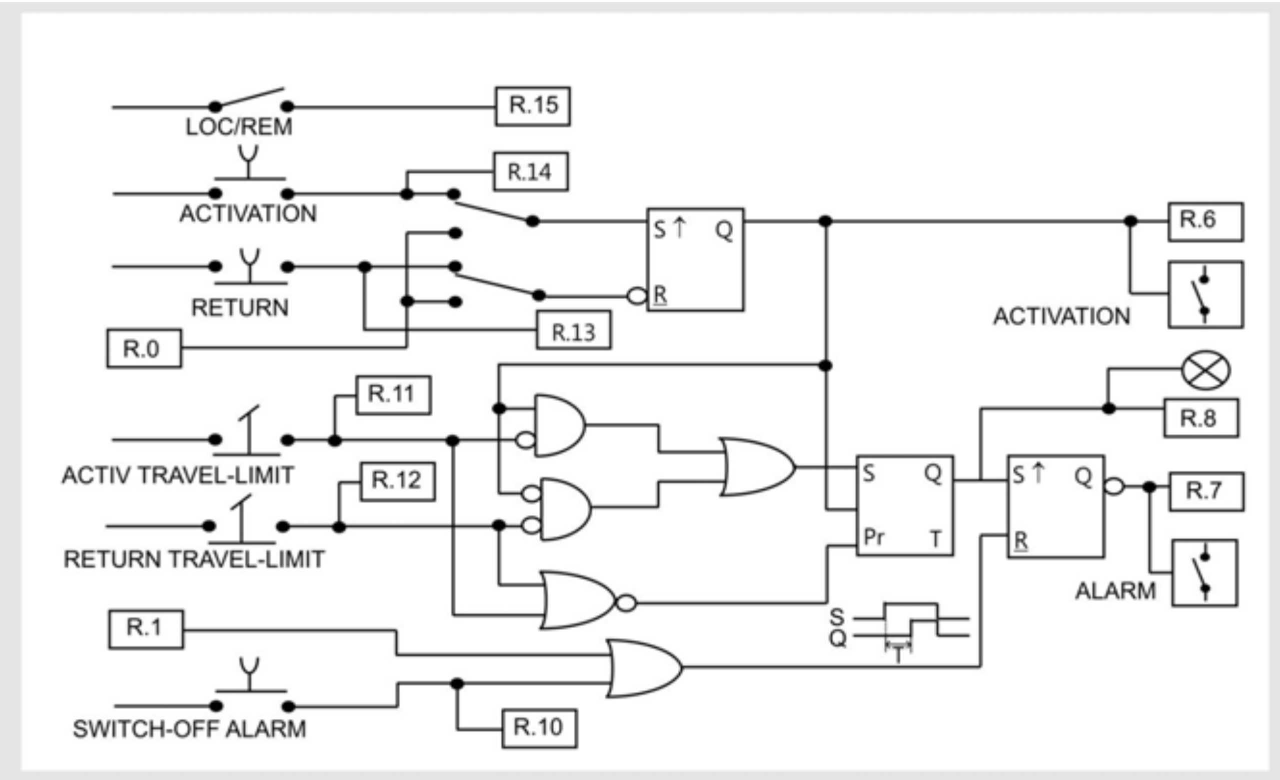
The “Feedback” input must open within motor command delay, otherwise the module enables “Alarm” output.

## PNEUMATIC VALVE COMMAND MODALITY

Before using Z-D-IO in pneumatic valve command modality, set pneumatic valve delay (through reg.40006 or Dip-Switches SW2-3 and SW2-4).

| FUNCTIONING MODALITY (Dip-Switches: SW2) | | | | |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | Meaning |
| | ● | | | Pneumatic valve command modality |

| INPUT | | |
|---|---|---|
| Screw terminals | Meaning | Default |
| 4-1 | Local/Remote | Normally open |
| 5-1 | Activation | Normally open |
| 6-1 | Return | Normally closed |
| 7-1 | Return travel-limit | Closed in position |
| 8-1 | Activation travel-limit | Closed in position |
| 9-1 | #9 Screw terminal isn't used | / |
| **OUTPUT** | | |
| Screw terminals | Meaning | Default |
| 10-12 | Alarm | Normally excited |
| 11-12 | Activation | Normally no-excited |



To enable the pneumatic valve, close “Activation” input. Module controls the “Return” input closing.

If “Return” input is closed, Z-D-IO enables “Activation” output. After pneumatic valve command delay (see Dip-Switches SW2-3 and SW2-4 or reg.40006), opening of “Activation travel-limit” input is verified. If it is still closed, “Alarm” output is enabled by module (“Activation” output remains enabled).

To switch off alarm, close “Switch off alarm” input.

If you open “Return” input, Z-D-IO disables “Activation” output.

“Return travel-limit” input must open within pneumatic valve command delay, otherwise the module enables “Alarm” output.

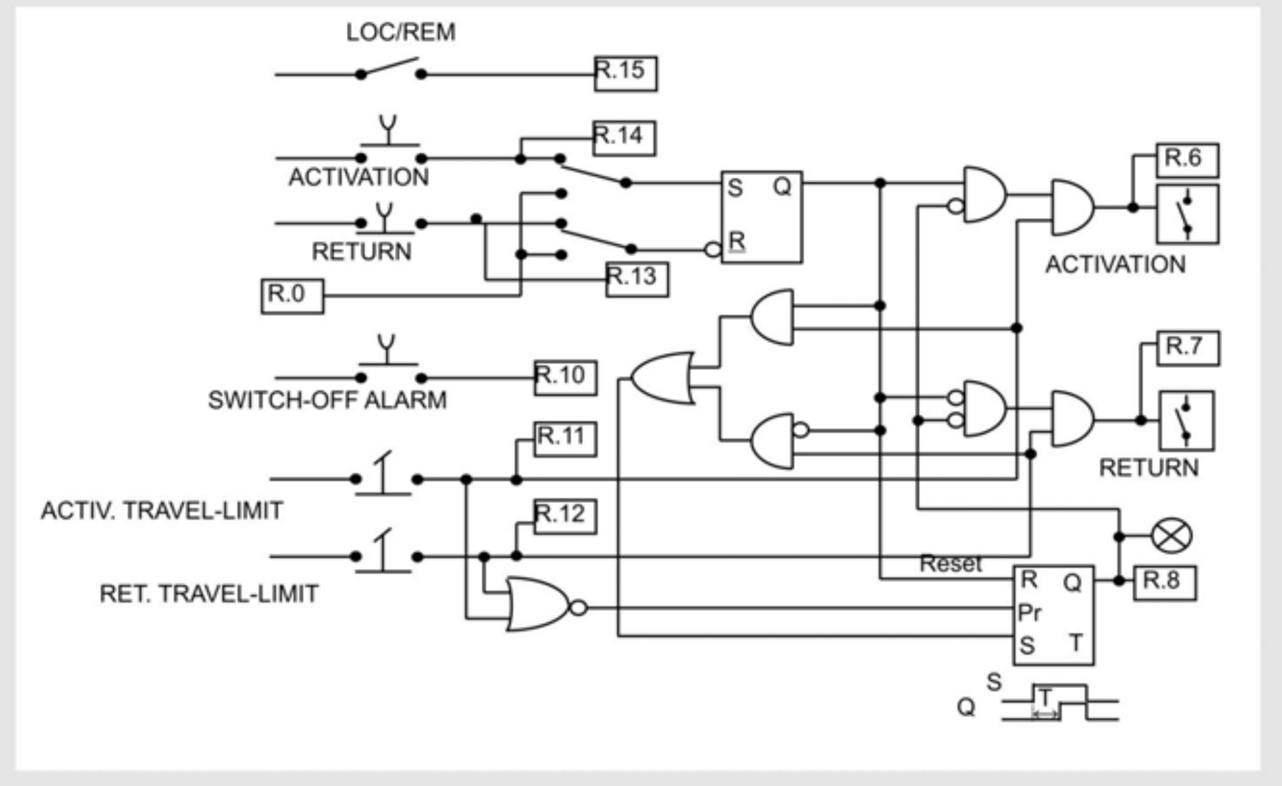
If “Activation travel-limit” and “Return travel-limit” inputs are opened at the same time, “Alarm” output is activated and LED FAIL is on.

## MOTORIZED VALVE COMMAND MODALITY

Before using Z-D-IO in pneumatic valve command modality, set motorized valve delay (through reg.40007 or Dip-Switches SW2-3 and SW2-4).

| FUNCTIONING MODALITY (Dip-Switches: SW2) | | | | |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | Meaning |
| ● | ● | | | Motorized command valve command modality |

| INPUT | | |
|---|---|---|
| Screw terminals | Meaning | Default |
| 4-1 | Local/Remote | Normally open |
| 5-1 | Activation | Normally open |
| 6-1 | Return | Normally closed |
| 7-1 | Return travel-limit | Closed in position |
| 8-1 | Activation travel-limit | Closed in position |
| 9-1 | #9 Screw terminal isn’t used | / |
| **OUTPUT** | | |
| Screw terminals | Meaning | Default |
| 10-12 | Return | Normally no-excited |
| 11-12 | Activation | Normally no-excited |




To enable the motorized valve, close “Activation” input. Module controls the “Return” input closing.

If “Return” input is closed, Z-D-IO disables “Return” output (if it was enabled) and enables “Activation” output. After motorized valve command delay (see Dip-Switches SW2-3 and SW2-4 or reg.40007), opening of “Activation travel-limit” input is verified. If it is still closed, “Activation” output is disabled and LED FAIL in on.

If you open “Return” input, Z-D-IO disables “Activation” output (if it was enabled) and enables “Return” output.

After motorized valve command delay, opening of “Return travel-limit is verified” (if it is closed), module enables the alarm.

If “Activation travel-limit” and “Return travel-limit” inputs are opened at the same time, LED FAIL is on.

## *Dip-switches table*

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

In the following tables: to change jumper status, it is necessary to open lateral panel because J1, J2, J3, J4 jumpers are placed into the module.

| **BAUD-RATE (Dip-Switches: SW1)** | | |
|---|---|---|
| 1 | 2 | Meaning |
| | | Baud-rate=9600 Baud |
| | ● | Baud-rate=19200 Baud |
| ● | | Baud-rate=38400 Baud |
| ● | ● | Baud-rate=57600 Baud |

| **ADDRESS (Dip-Switches: SW1)** | | | | | | |
|---|---|---|---|---|---|---|
| 3 | 4 | 5 | 6 | 7 | 8 | Meaning |
| | | | | | | **Address and Baud-Rate are acquired from memory(EEPROM)** |
| | | | | | ● | Address=1 |
| | | | | ● | | Address=2 |
| | | | | ● | ● | Address=3 |
| | | | ● | | | Address=4 |
| X | X | X | X | X | X | …………………… |
| ● | ● | ● | ● | ● | ● | Address=63 |

| **RS485 TERMINATOR (J4 JUMPER)** | | |
|---|---|---|
| Open | Closed | Meaning |
| ● | | RS485 terminator disabled |
| | ● | RS485 terminator enabled |

| **FUNCTIONING MODALITY (Dip-Switches: SW2)** | | | | |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | Meaning |
| | | | | I/O modality |
| | ● | | | Pneumatic valve modality |
| ● | | | | Motor command modality |
| ● | ● | | | Motorized valve command modality |

| **ALARM DELAY (Dip-Switches: SW2)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | Meaning | **Motor command modality** | **Pneumatic valve modality** | **Motorized valve comm. modality** |
| | | | | **Delay is acquired from EEPROM memory** | See reg. 40005 | See reg.40006 | See reg.40007 |
| | | | ● | Short alarm delay | 2 sec | 4 sec | 15 sec |
| | | ● | | Average alarm delay | 5 sec | 30 sec | 120 sec |
| | | ● | ● | Long alarm delay | 30 sec | 120 sec | 300 sec |

| **INTERNAL SUPPLY VAUX: screw terminal 1 (J1 JUMPER)** | | |
|---|---|---|
| Int | Ext | Meaning |
| ● | | Internal supply Vaux enabled (to power digital inputs) |
| | ● | Internal supply Vaux disabled ( to power digital inputs, use a external voltage Vext) |

| OUT1 TYPE: screw terminals 10-12 (J2 JUMPER) | | |
|---|---|---|
| NO | NC | Meaning |
| ● | | OUT1 is normally open |
| | ● | OUT1 is normally closed |

| OUT2 TYPE: screw terminals 11-12 (J3 JUMPER) | | |
|---|---|---|
| NO | NC | Meaning |
| ● | | OUT2 is normally open |
| | ● | OUT2 is normally closed |

## *RS485 Register table*

The function codes supported by Z-D-IO are shown in the following table.

| Functional code | First register address | Name | Functional code | Name |
|---|---|---|---|---|
| 01 | 00001 | Read Coil Status | 05 | Force Single Coil |
| 02 | 10001 | Read Input Status | 06 | Preset Single Register |
| 03 | 40001 | Read Holding Register | 15 | Write Multiple Coils |
| 04 | 30001 | Read Input Register | 16 | Write Multiple Registers |

| Name | Range | Interpretation of register | R/W | Default | Address |
|---|---|---|---|---|---|
| MachineID | / | MSB, LSB | R | | 40001 |
| | Id_Code (Module ID) | | | 0x10 | Bit [15:8] |
| | Ext_Rev (Module version) | | | | Bit [7:0] |
| Dip Switches status | / | Bit | R | | 40003 |
| | Switch1 of “SW2” state. Bit40003.15=0 corresponds to Switch1=”0”, bit40003.15=1 corresponds to Switch1=”1” | | | / | Bit 15 |
| | Switch2 of “SW2” state. Bit40003.14=0 corresponds to Switch2=”0”, bit40003.15=1 corresponds to Switch2=”1” | | | / | Bit 14 |
| | Switch3 of “SW2” state. Bit40003.13=0 corresponds to Switch3=”0”, bit40003.13=1 corresponds to Switch3=”1” | | | / | Bit 13 |
| | Switch4 of “SW2” state. Bit40003.12=0 corresponds to Switch4=”0”, bit40003.12=1 corresponds to Switch4=”1” | | | / | Bit 12 |
| | These bits aren’t used | | | / | Bit [11:8] |
| | Switch1 of “SW1” state. Bit40003.7=0 corresponds to Switch1=”0”, bit40003.7=1 corresponds to Switch1=”1” | | | / | Bit 7 |
| | Switch2 of “SW1” state. Bit40003.6=0 corresponds to Switch2=”0”, bit40003.6=1 corresponds to Switch2=”1” | | | / | Bit 6 |
| | Switch3 of “SW1” state. Bit40003.5=0 corresponds to Switch3=”0”, bit40003.5=1 corresponds to Switch3=”1” | | | / | Bit 5 |
| | Switch4 of “SW1” state. Bit40003.4=0 corresponds to Switch4=”0”, bit40003.4=1 corresponds to Switch4=”1” | | | / | Bit 4 |
| | Switch5 of “SW1” state. Bit40003.3=0 corresponds to Switch5=”0”, bit40003.3=1 corresponds to Switch5=”1” | | | / | Bit 3 |
| | Switch6 of “SW1” state. Bit40003.2=0 corresponds to Switch6=”0”, bit40003.2=1 corresponds to Switch6=”1” | | | / | Bit 2 |

| | | | | | |
|---|---|---|---|---|---|
| | Switch7 of "SW1" state. Bit40003.1=0 corresponds to Switch7="0", bit40003.1=1 corresponds to Switch7="1" | | | / | Bit 1 |
| | Switch8 of "SW1" state. Bit40003.0=0 corresponds to Switch8="0", bit40003.0=1 corresponds to Switch8="1" | | | / | Bit 0 |
| Address Parity | / | MSB, LSB | R/W | | 40008 |
| | Address for RS485 (address of module/node if parameters are configurated by memory modality): from 0x01=1 to 0xFF=255 | | | 1 | Bit [15:8] |
| | Parity for RS485: 0=there isn't; 1=even; 2=odd | | | 0 | Bit [7:0] |
| Baudrate Delay | / | MSB, LSB | R/W | | 40009 |
| | 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 | | | 38400 | Bit [15:8] |
| | Delay for RS485 (delay of communication response: it represents the number of the pauses(*) between the end of Rx message and the start of Tx message): from 0x00=0 to 0xFF=255<br>(*)1 pause=6 characters | | | 0 | Bit [7:0] |
| IN and OUT | / | Bit | R/W | | 40002 |
| | Input1 state (if I/O modality): 0=open; 1=closed<br>Local/remote state (if motor control modality, motorized valve command modality, pneumatic valve command modality): 0=local control; 1=remote control | | | See note below | Bit 15 |
| | Input2 state (if I/O modality): 0=open; 1=closed<br>Start state (if motor control modality): 0=open; 1=closed<br>Activation state (if motorized valve command modality, pneumatic valve command modality): 0=open; 1=closed | | | See note below | Bit 14 |
| | Input3 state (if I/O modality): 0=open; 1=closed<br>Stop state (if motor control modality): 0=open; 1=closed<br>Return state (if motorized valve command modality, pneumatic valve command modality): 0=open; 1=closed | | | See note below | Bit 13 |
| | Input4 state (if I/O modality): 0=open; 1=closed<br>Thermal protection state (if motor control modality): 0=open; 1=closed<br>Return travel-limit state (if motorized valve command modality, pneumatic valve command modality): 0=open; 1=closed | | | See note below | Bit 12 |
| | Input5 state (if I/O modality): 0=open; 1=closed<br>Feedback (if motor control modality): 0=open; 1=closed<br>Activation travel-limit (if motorized valve command modality, pneumatic valve command modality): 0=open; 1=closed | | | See note below | Bit 11 |
| | Input6 state (if I/O modality): 0=open; 1=closed<br>Switch off alarm state (if motor control modality, motorized valve command modality, pneumatic valve command modality): 0=open; 1=closed | | | See note below | Bit 10 |
| | These bits aren't used | | | / | Bit 9 |
| | Alarm: 0=there isn't; 1=there is | | | See note below | Bit 8 |
| | Alarm output state (if motor control modality, pneumatic valve command modality): 0=deactivated; 1=activated<br>Return output state (if motorized valve command modality): 0=deactivated; 1=activated | | | See note below | Bit 7 |
| | Start output state (if motor control modality): 0=deactivated; 1=activated<br>Activation output state (if motorized valve command modality, pneumatic valve command modality): 0=deactivated; 1=activated | | | See note below | Bit 6 |

| | | | |
|---|---|---|---|
| | These bits aren't used | / | Bit [5:2] |
| | Output1 state (if I/O modality): 0=OFF; 1=ON<br>Alarm (if motor command modality, pneumatic valve command modality)<br>Return (if motorized valve command modality) | / | Bit 1 |
| | Output2 state (if I/O modality): 0=OFF; 1=ON<br>Alarm (if motor command modality)<br>Return (if motorized valve command modality, pneumatic valve command modality) | / | Bit 0 |

To know default values, see "Functioning" for selected functioning modality.

| IN and OUT state | / | Bit | R | | 40014 |
|---|---|---|---|---|---|
| | Input1 state (if I/O modality): 0=open; 1=closed<br>Local/remote state (if motor control modality, motorized valve command modality, pneumatic valve command modality): 0=local control; 1=remote control | | | See note below | Bit 15 |
| | Input2 state (if I/O modality): 0=open; 1=closed<br>Start state (if motor control modality): 0=open; 1=closed<br>Activation state (if motorized valve command modality, pneumatic valve command modality): 0=open; 1=closed | | | See note below | Bit 14 |
| | Input3 state (if I/O modality): 0=open; 1=closed<br>Stop state (if motor control modality): 0=open; 1=closed<br>Return state (if motorized valve command modality, pneumatic valve command modality): 0=open; 1=closed | | | See note below | Bit 13 |
| | Input4 state (if I/O modality): 0=open; 1=closed<br>Thermal protection state (if motor control modality): 0=open; 1=closed<br>Return travel-limit state (if motorized valve command modality, pneumatic valve command modality): 0=open; 1=closed | | | See note below | Bit 12 |
| | Input5 state (if I/O modality): 0=open; 1=closed<br>Feedback (if motor control modality): 0=open; 1=closed<br>Activation travel-limit (if motorized valve command modality, pneumatic valve command modality): 0=open; 1=closed | | | See note below | Bit 11 |
| | Input6 state (if I/O modality): 0=open; 1=closed<br>Switch off alarm state (if motor control modality, motorized valve command modality, pneumatic valve command modality): 0=open; 1=closed | | | See note below | Bit 10 |
| | These bits aren't used | | | / | Bit 9 |
| | Alarm: 0=there isn't; 1=there is | | | See note below | Bit 8 |
| | Output1 state (if I/O modality): 0=OFF; 1=ON<br>Alarm output state (if motor control modality, pneumatic valve command modality): 0=OFF; 1=ON<br>Return output state (if motorized valve command modality): 0=OFF; 1=ON | | | See note below | Bit 7 |
| | Output2 state (if I/O modality)<br>Start output state (if motor control modality): 0=OFF; 1=ON<br>Activation output state (if motorized valve command modality, pneumatic valve command modality): 0=OFF; 1=ON | | | See note below | Bit 6 |
| | These bits aren't used | | | / | Bit [5:0] |

To know default values, see “Functioning” for selected functioning modality.

| | | | | | |
|---|---|---|---|---|---|
| Command state | / | Bit | R/W | | 40015 |
| | These bits aren’t used | | | / | Bit [15:2] |
| | Output1 state (if I/O modality): 0=OFF; 1=ON<br>Alarm command (if motor command modality, pneumatic valve command modality): 0=OFF; 1=ON<br>Return command (if motorized valve command modality): 0=OFF; 1=ON | | | / | Bit 1 |
| | Output2 state (if I/O modality): 0=OFF; 1=ON<br>Alarm (if motor command modality): 0=OFF; 1=ON<br>Return (if motorized valve command modality, pneumatic valve command modality): 0=OFF; 1=ON | | | / | Bit 0 |

To know default values, see “Functioning” for selected functioning modality.

| | | | | | |
|---|---|---|---|---|---|
| Delay DipSw | / | Word | R | | 40004 |
| | Delay between input action and corresponding output effect [sec/10] (if delay is configurated by Dip-Switches) | | | / | |
| Motor control delay | / | Word | R/W | | 40005 |
| | Delay between input action and corresponding output effect [sec/10] (if motor control modality) | | | 100 (10sec) | |
| Pneumatic valve comm. delay | / | Word | R/W | | 40006 |
| | Delay between input action and corresponding output effect [sec/10] (if pneumatic valve command modality) | | | 100 (10sec) | |
| Motorized valve comm. delay | / | Word | R/W | | 40007 |
| | Delay between input action and corresponding output effect [sec/10] ( if motorized valve command modality ) | | | 100 (10sec) | |

The «Input Status»-type registers used for Z-D-IO module are shown in the following table:

| Name | Range | Interpretation of register | R/W | Default | Address |
|---|---|---|---|---|---|
| IN1 state | 0-1 | Word | R | | 10001 |
| | Input1 state (if I/O modality): 0=open; 1=closed<br>Local/remote state (if motor control modality, motorized valve command modality, pneumatic valve command modality): 0=local control; 1=remote control | | | / | |
| IN2 state | 0-1 | Word | R | | 10002 |
| | Input2 state (if I/O modality): 0=open; 1=closed<br>Start state (if motor control modality): 0=open; 1=closed<br>Activation state (if motorized valve command modality, pneumatic valve command modality): 0=open; 1=closed | | | / | |
| IN3 state | 0-1 | Word | R | | 10003 |
| | Input3 state (if I/O modality): 0=open; 1=closed<br>Stop state (if motor control modality): 0=open; 1=closed<br>Return state (if motorized valve command modality, pneumatic valve command modality): 0=open; 1=closed | | | / | |

| | | | | | |
|---|---|---|---|---|---|
| IN4 state | 0-1 | Word | R | | 10004 |
| | Input4 state (if I/O modality): 0=open; 1=closed<br>Thermal protection state (if motor control modality): 0=open; 1=closed<br>Return travel-limit state (if motorized valve command modality, pneumatic valve command modality): 0=open; 1=closed | | | / | |
| IN5 state | 0-1 | Word | R | | 10005 |
| | Input5 state (if I/O modality): 0=open; 1=closed<br>Feedback (if motor control modality): 0=open; 1=closed<br>Activation travel-limit (if motorized valve command modality, pneumatic valve command modality): 0=open; 1=closed | | | / | |
| IN6 state | 0-1 | Word | R | | 10006 |
| | Input6 state (if I/O modality): 0=open; 1=closed<br>Switch off alarm state (if motor control modality, motorized valve command modality, pneumatic valve command modality): 0=open; 1=closed | | | / | |
| Alarm | 0-1 | Word | R | | 10008 |
| | Alarm: 0=there isn't; 1=there is | | | / | |
| OUT1 state | 0-1 | Word | R | | 10009 |
| | Output1 state (if I/O modality) : 0=OFF; 1=ON<br>Alarm output state (if motor control modality, pneumatic valve command modality): 0=OFF; 1=ON<br>Return output state (if motorized valve command modality): 0=OFF; 1=ON | | | / | |
| OUT2 state | 0-1 | Word | R | | 10010 |
| | Output2 state (if I/O modality): 0=OFF; 1=ON<br>Start output state (if motor control modality): 0=OFF; 1=ON<br>Activation output state (if motorized valve command modality, pneumatic valve command modality): 0=OFF; 1=ON | | | / | |

The «Coil Status»-type registers used for Z-D-IO module are shown in the following table:

| Name | Range | Interpretation of register | R/W | Default | Address |
|---|---|---|---|---|---|
| OUT1 command | 0-1 | Word | R/W | | 00002 |
| | Output1 state (if I/O modality) : 0=OFF; 1=ON<br>Alarm output state (if motor control modality, pneumatic valve command modality): 0=OFF; 1=ON<br>Return output state (if motorized valve command modality): 0=OFF; 1=ON | | | / | |
| OUT2 command | 0-1 | Word | R/W | | 00003 |
| | Output2 state (if I/O modality): 0=OFF; 1=ON<br>Alarm (if motor command modality): 0=OFF; 1=ON<br>Return (if motorized valve command modality, pneumatic valve command modality): 0=OFF; 1=ON | | | / | |

## LEDs for signalling

In the front-side panel there are 12 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 |
| IN 1-6 | Constant light | IN1-6 state equal to «1» |
| | No light | IN1-6 state equal to «0» (if the power is on) |
| OUT 1-2 | Constant light | OUT1-2 state equal to «1» |
| | No light | OUT1-2 state equal to «0» (if the power is on) |

# 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).

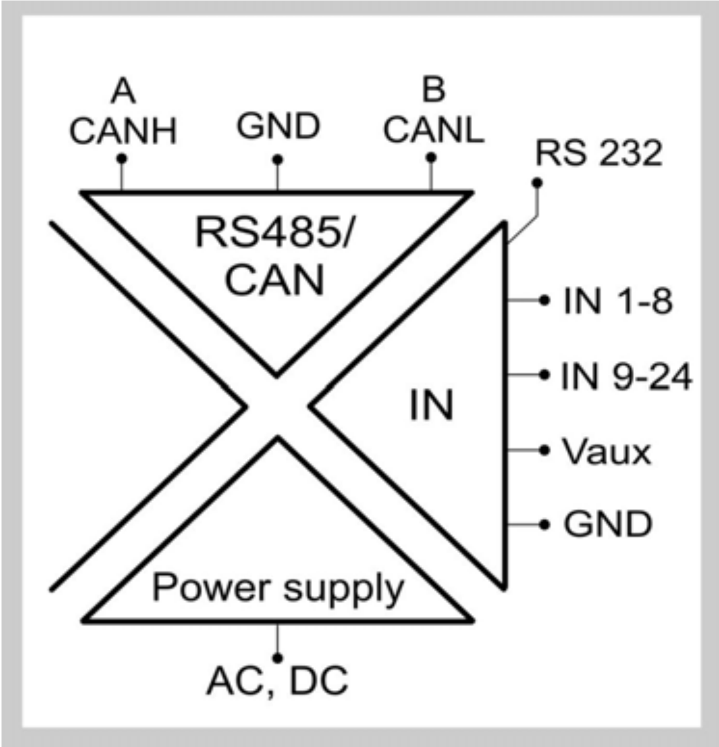
## *General characteristics*

- 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 |

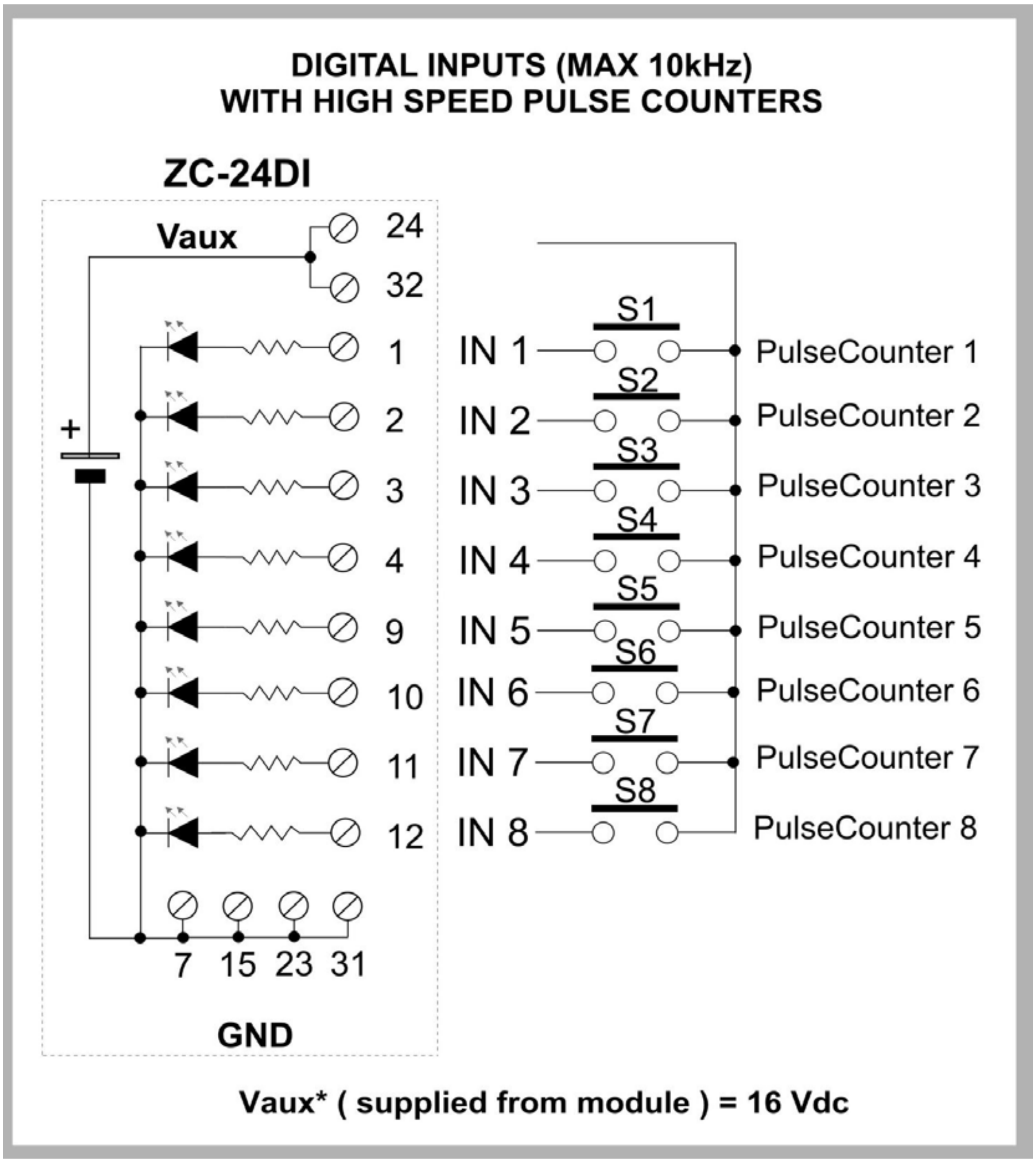
The power supply transformer necessary to supply the module must comply with EN60742 (Isolated transformers and safety transformers requirements). To protect the power supply, it is recommended to install a fuse.

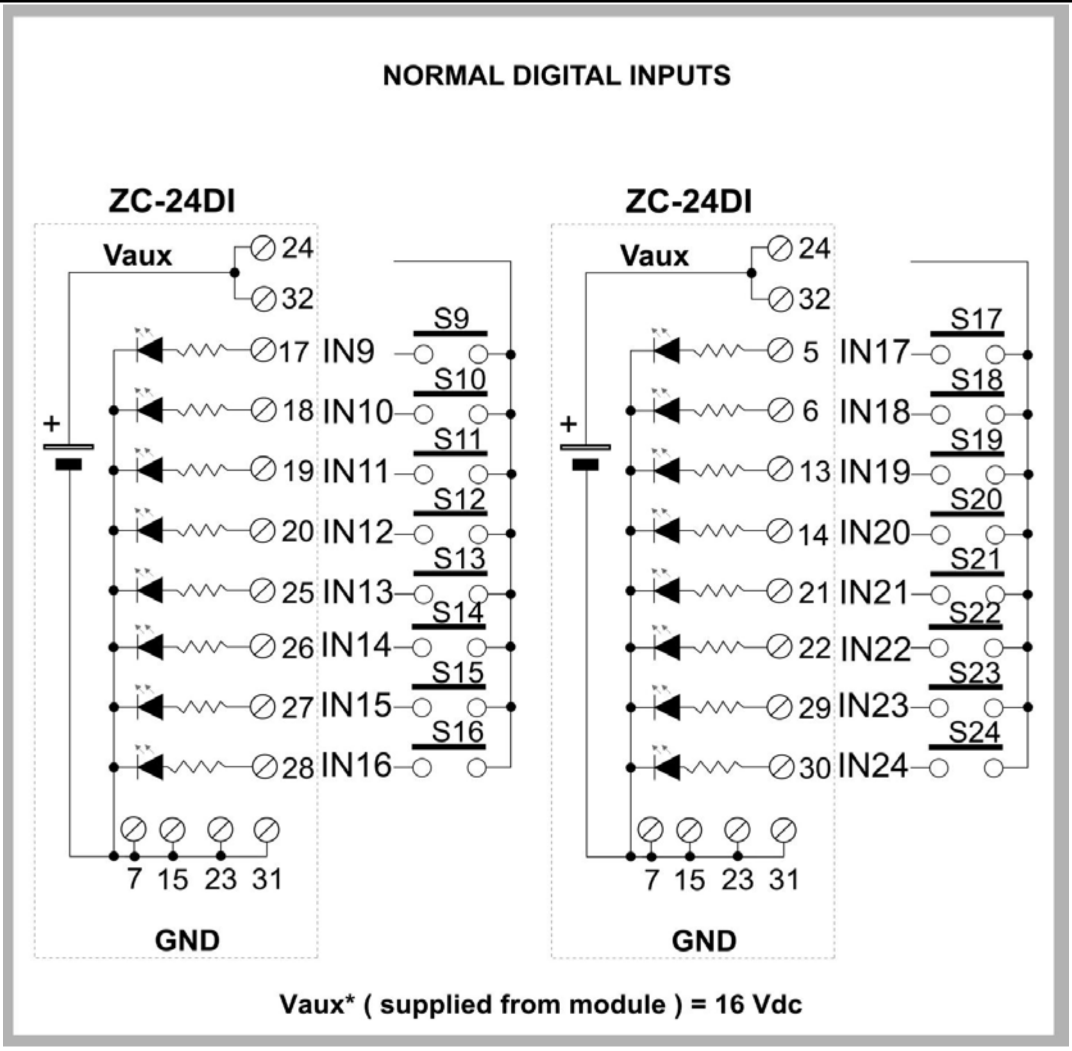
| MODULE CASE | |
|---|---|
| **Case-type** | PBT, black |
| **Dimensions** | Width W = 100 mm, Height H = 112mm, Depth D = 35 mm |
| **Terminal board** | Removable 4-way screw terminals:<br>pitch 3.5mm, sections 2.5mm$^2$ |
| **Protection class** | IP20 (International Protection) |

## *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.


DIGITAL INPUTS (MAX 10kHz)
WITH HIGH SPEED PULSE COUNTERS
ZC-24DI
Vaux
24
32
1
2
3
4
9
10
11
12
+
IN 1
IN 2
IN 3
IN 4
IN 5
IN 6
IN 7
IN 8
S1
S2
S3
S4
S5
S6
S7
S8
PulseCounter 1
PulseCounter 2
PulseCounter 3
PulseCounter 4
PulseCounter 5
PulseCounter 6
PulseCounter 7
PulseCounter 8
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.<br>Examples:<br>0x5C01 allows to load PresetCounter1 into PulseCounter1<br>0x5C02 allows to load PresetCounter2 into PulseCounter2<br>0x5C03 allows to load PresetCounter1 into PulseCounter1 **and** PresetCounter2 into PulseCounter2 (**not** PresetCounter3 into PulseCounter3) and so on<br>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)<br>Examples:<br>0x5D01 allows to load PulseCounter1 with zero value<br>0x5D02 allows to load PulseCounter2 with zero value<br>0x5D03 allows to load PulseCounter1 **and** PresetCounter2 with zero value (**not** PresetCounter3 with zero value) and so on<br>0x5DFF allows to load every PulseCounter with zero value | | | | | |
| **Reg.40201=0x5Enn** (counter overflows reset, using a bit interpretation to mask the inputs)<br>Examples:<br>0x5E01 allows to reset PulseCounter1 overflow<br>0x5E02 allows to reset PulseCounter2 overflow<br>0x5E03 allows to reset PulseCounter2 overflow **and** to reset PulseCounter2 overflow (**not** to reset PulseCounter3 overflow) and so on<br>0x5EFF allows to reset every PulseCounter overflow | | | | | |
| **Reg.40201=0x6BAC** (the module writes the Dip-Switches-state in reg.40202) | | | | | |
| **Reg.40201=0xBCD0** (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] |
| | Filter activation for inputs IN1-IN8 using a bit interpretation to mask the inputs | | | 0xFF | Bit [7:0] |
| Filter [IN9-16] masked | / | Word | R/W | | 40025 |
| | These bits aren't used | | | / | Bit [15:8] |
| | Filter activation for inputs IN9-IN16 using a bit interpretation to mask the inputs | | | 0xFF | Bit [7:0] |
| Filter [IN17-24] masked | / | Word | R/W | | 40026 |
| | These bits aren't used | | | / | Bit [15:8] |
| | Filter activation for inputs IN17-IN24 using a bit interpretation to mask the inputs | | | 0xFF | Bit [7:0] |

Examples (with reference to reg.40024; at the same way, these examples can be applied to reg.40025 and reg.40026):

0x01 allows to activate filter on IN1

0x02 allows to activate filter on IN2

0x03 allows to activate filter on IN1 **and** to activate filter on IN2 (**not** to activate filter on IN3) and so on

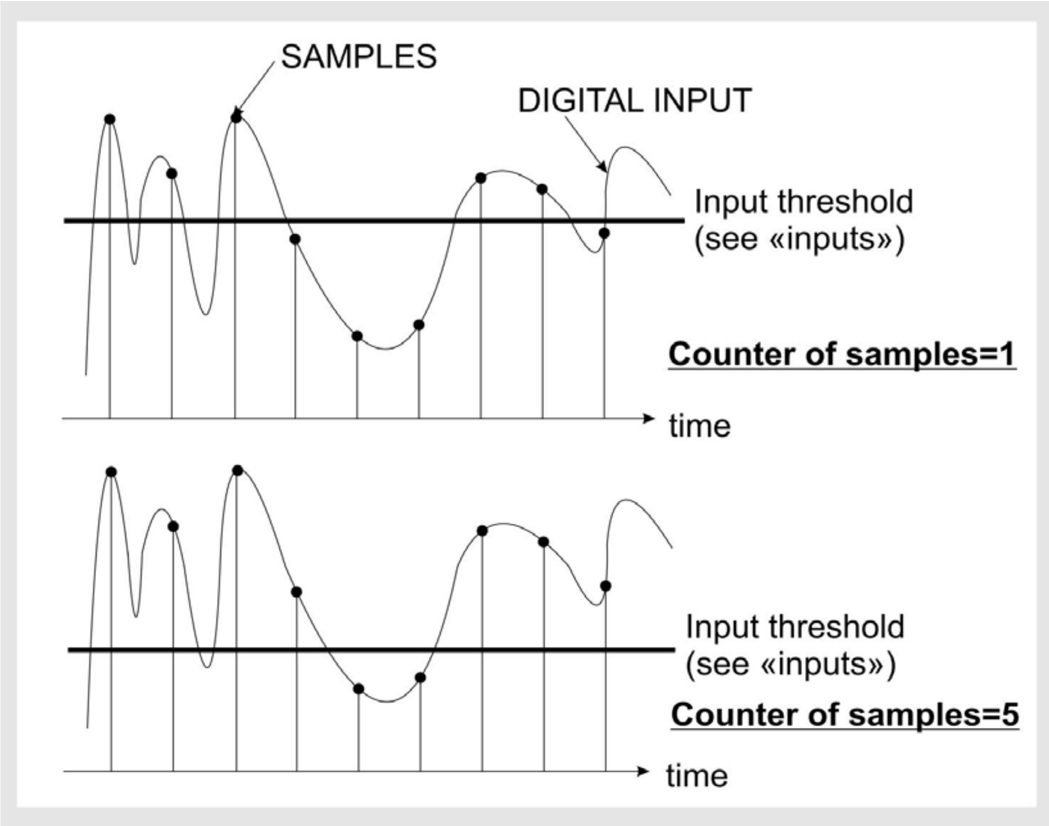
0xFF allows to activate filter on IN1…IN8

| | | | | | |
|---|---|---|---|---|---|
| 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.

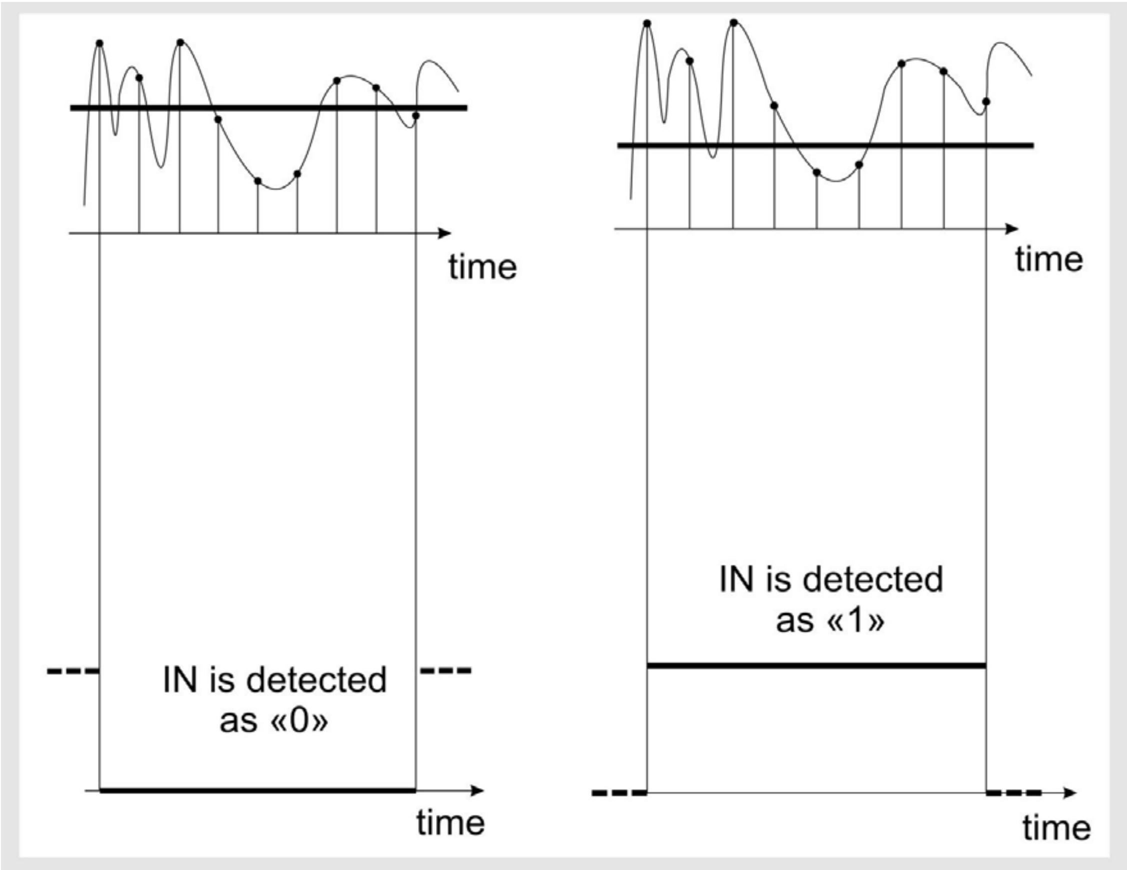
<u>Example</u>: with reference to the previous figure

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 | | | | |

| | | | | | |
|---|---|---|---|---|---|
| PresetCounter 6_MSW | Between:0; (2^31)-1 | FP32bit-MSW | R/W | | 40040 |
| PresetCounter 6_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 | | | | |
| PresetCounter 7_MSW | Between:0; (2^31)-1 | FP32bit-MSW | R/W | | 40042 |
| PresetCounter 7_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 | | | | |
| PresetCounter 8_MSW | Between:0; (2^31)-1 | FP32bit-MSW | R/W | | 40044 |
| PresetCounter 8_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) |

# Seneca Z-PC Line module: **ZC-24DO**

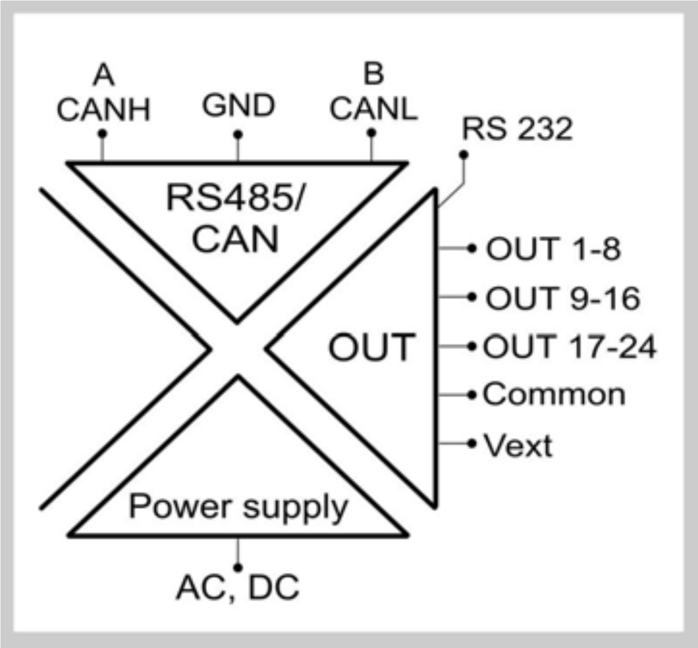
The module ZC-24DO controls 24 digital outputs (OUT1-OUT24), each of them (by MOSFET) actives/deactivates a output load.

## General characteristics

- Outputs are available on 24 screw terminals or IDC 10/IDC 20 connectors, to facilitate the connection of 24V-relays
- It is possible to manage the output state if the interval time of RS485-bus communication failure is greater than a configurable time (up to 25.5sec): output is kept at the previous value or output is overwritten on register
- It is possible to manage the output state if there is a over-temperature or short-circuited (towards ground)
- Configuration of 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*

| **OUTPUT** | |
|---|---|
| **Number** | 24 |
| **Type** | MOSFET (Open source) |
| **Max current through each load** | 0.5A. The supplied currents sum through all loads (these currents are inwards with reference to the screw terminals 8-16):<12A, using a fuse or equivalent protection (**if the connection is performed through screw terminals**) |
| | 25mA. The supplied currents sum through all loads (these currents are inwards with reference to the screw terminals 8-16):<0.6A, using a fuse or equivalent protection (**if the connection is performed through IDC10, IDC20 connectors**).<br>This solution is recommended to power 24V-relays |
| **Max state-switching frequency for each load** | 2Hz |
| **MOSFET protection** | The MOSFETs are protected against: load short-circuited, overtemperature |
| **MOSFET supply** | With reference to the screw terminals 7-15-23-32 (GND), power the MOSFETs by screw terminals 8 or 16 (Vext): min5V, max30V |
| **MOSFET max energy** | 40mJ with inductive load |
| **MOSFET response time** | 5/2ms |
| **$R_{DSON}$** | 0.75Ω |
| **Switching delay** | 1ms (max) |
| **CONNECTIONS** | |
| **RS485 interface** | IDC10 connector for DIN 46277 rail (back-side panel) |
| **1500 Vac ISOLATIONS** | |
| | Between: power supply, ModBUS RS485, digital output |



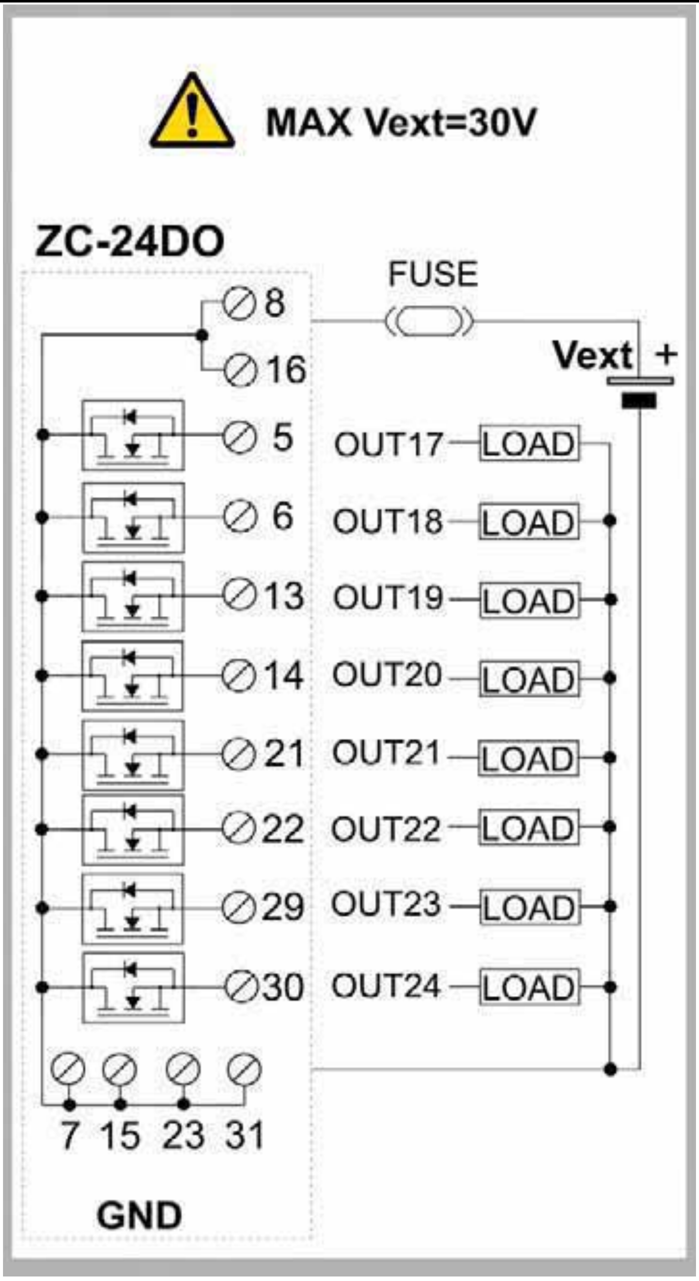

| POWER SUPPLY | |
|---|---|
| **Supply voltage** | 10 – 40 Vdc or 19 – 28 Vac ( 50Hz - 60Hz) |
| **Power consumption** | Typical: 1.5W; Max: 2.5W |

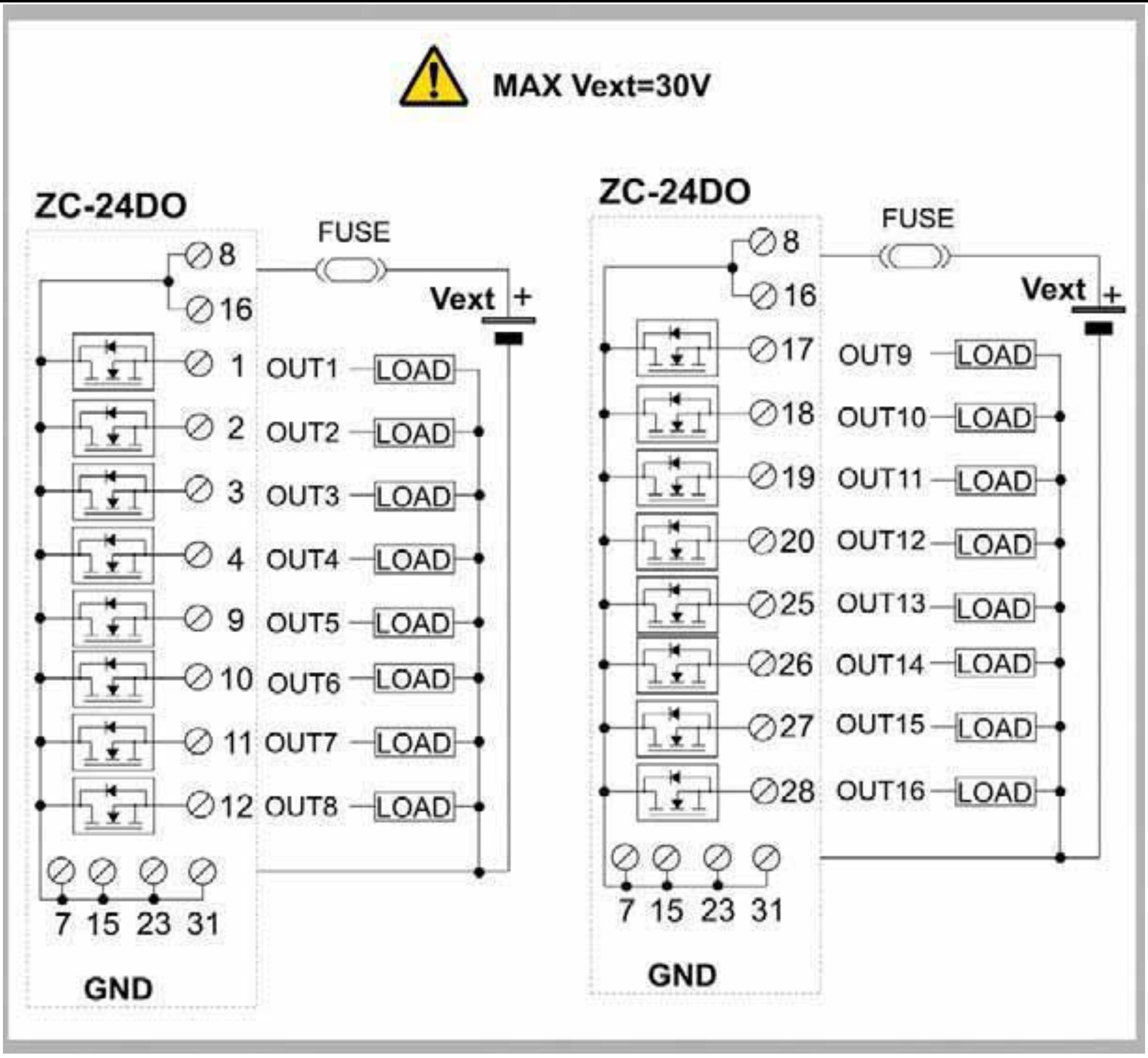
The power supply transformer necessary to supply the module must comply with EN60742 (Isolated transformers and safety transformers requirements). To protect the power supply, it is recommended to install a fuse.

| 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:<br>pitch 3.5mm, sections 2.5mm$^2$ |
| **Protection class** | IP20 (International Protection) |

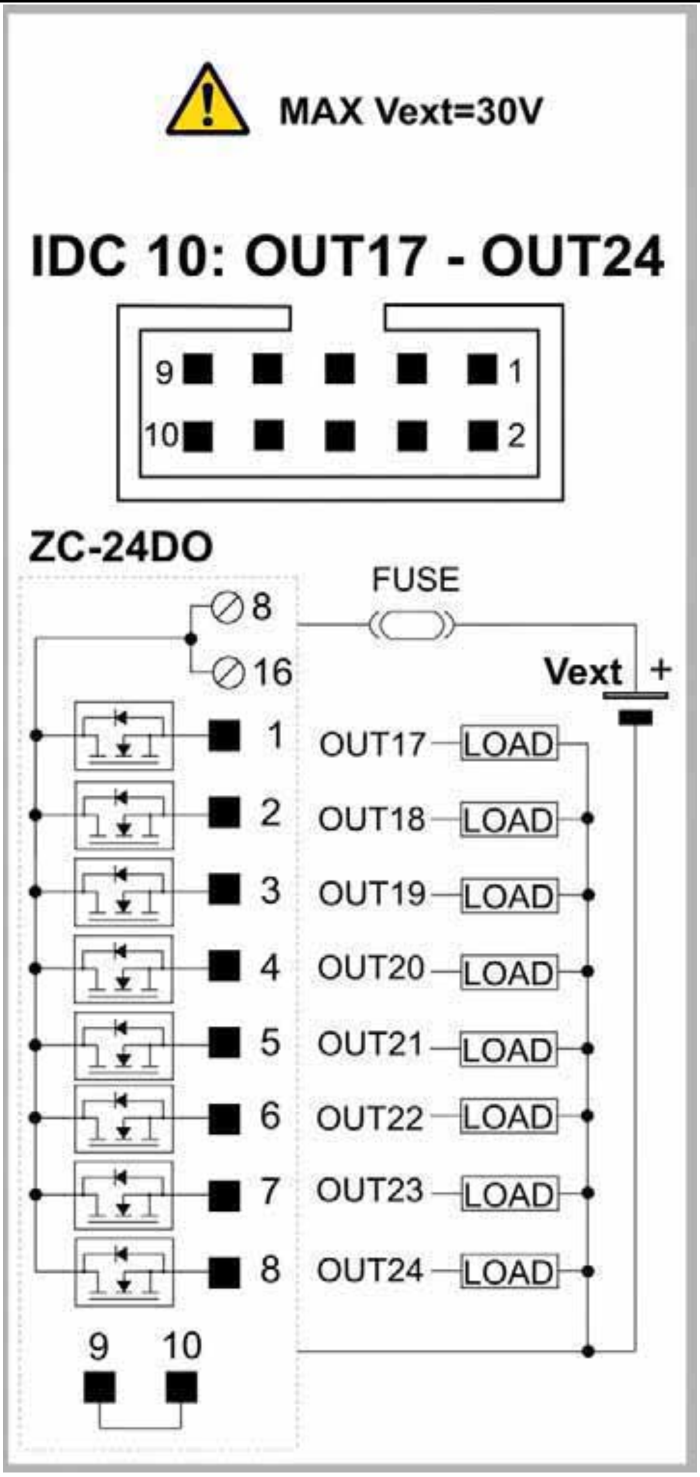
## *Output connections*

**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.**

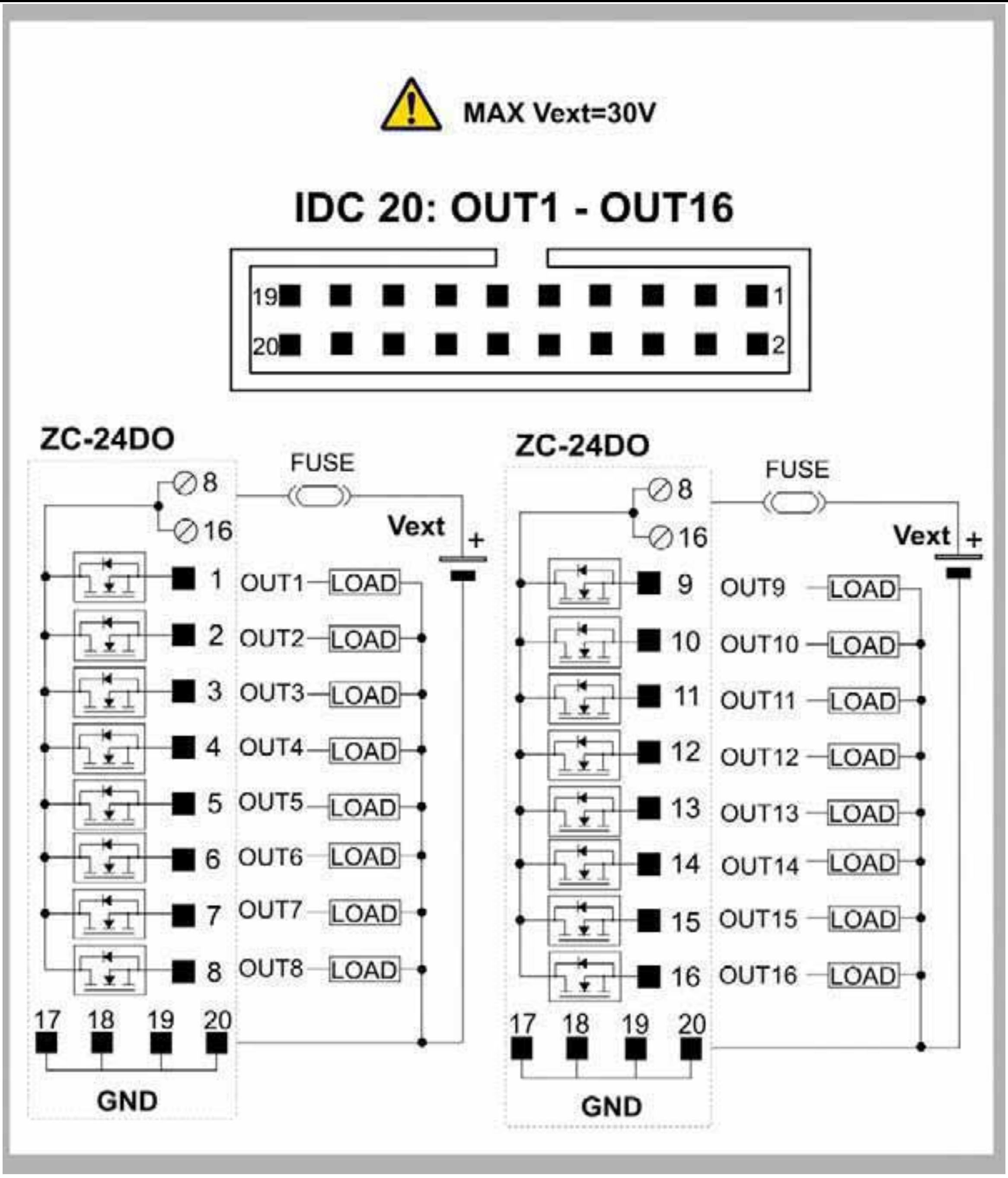

MAX Vext=30V
ZC-24DO
FUSE
8
16
Vext +
5
6
13
14
21
22
29
30
OUT17
OUT18
OUT19
OUT20
OUT21
OUT22
OUT23
OUT24
LOAD
7 15 23 31
GND



MAX Vext=30V
ZC-24DO
FUSE
Vext
+
8
16
1 OUT1 LOAD
2 OUT2 LOAD
3 OUT3 LOAD
4 OUT4 LOAD
9 OUT5 LOAD
10 OUT6 LOAD
11 OUT7 LOAD
12 OUT8 LOAD
7 15 23 31
GND
ZC-24DO
FUSE
Vext
+
8
16
17 OUT9 LOAD
18 OUT10 LOAD
19 OUT11 LOAD
20 OUT12 LOAD
25 OUT13 LOAD
26 OUT14 LOAD
27 OUT15 LOAD
28 OUT16 LOAD
7 15 23 31
GND


MAX Vext=30V
IDC 10: OUT17 - OUT24
9
1
10
2
ZC-24DO
FUSE
8
16
Vext
+
1
2
3
4
5
6
7
8
OUT17
OUT18
OUT19
OUT20
OUT21
OUT22
OUT23
OUT24
LOAD
9
10


IDC 10 CONNECTOR PIN
SCREW TERMINAL


MAX Vext=30V
IDC 20: OUT1 - OUT16
19
20
1
2
ZC-24DO
FUSE
8
16
Vext
+
1 OUT1 LOAD
2 OUT2 LOAD
3 OUT3 LOAD
4 OUT4 LOAD
5 OUT5 LOAD
6 OUT6 LOAD
7 OUT7 LOAD
8 OUT8 LOAD
17 18 19 20
GND
ZC-24DO
FUSE
8
16
Vext
+
9 OUT9 LOAD
10 OUT10 LOAD
11 OUT11 LOAD
12 OUT12 LOAD
13 OUT13 LOAD
14 OUT14 LOAD
15 OUT15 LOAD
16 OUT16 LOAD
17 18 19 20
GND


IDC 20 CONNECTOR PIN
SCREW TERMINAL

## *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 |
|---|---|---|---|---|---|
| MachineID | / | MSB, LSB | R | | 40001 |
| | Id_Code (Module ID) | | | 0x21 (33 decimal) | Bit [15:8] |
| | Ext_Rev (Module version) | | | | Bit [7:0] |
| FWREV | / | Word | R | | 40002 |
| | Firmware Code | | | | |
| **OUTPUT 1-8 ERROR MANAGEMENT** | | | | | |
| Errors Out1-8 | / | Bit | R | | 40006 |
| | These bits aren’t used | | | / | Bit [15:8] |
| | Output 8 over-temperature error or short-circuited: 0=there isn’t; 1=there is | | | / | Bit 7 |
| | Output 7 over-temperature error or short-circuited: 0=there isn’t; 1=there is | | | / | Bit 6 |
| | Output 6 over-temperature error or short-circuited: 0=there isn’t; 1=there is | | | / | Bit 5 |
| | Output 5 over-temperature error or short-circuited: 0=there isn’t; 1=there is | | | / | Bit 4 |
| | Output 4 over-temperature error or short-circuited: 0=there isn’t; 1=there is | | | / | Bit 3 |
| | Output 3 over-temperature error or short-circuited: 0=there isn’t; 1=there is | | | / | Bit 2 |
| | Output 2 over-temperature error or short-circuited: 0=there isn’t; 1=there is | | | / | Bit 1 |
| | Output 1 over-temperature error or short-circuited: 0=there isn’t; 1=there is | | | / | Bit 0 |
| Errors Out1-8 behavior | / | Bit | R/W | | 40009 |
| | These bits aren’t used | | | / | Bit [15:8] |
| | Output 8 behavior if bit40006.7=1: 0=output is kept at the previous value; 1=bit40012.7 is overwritten on bit40003.7, bit 40301.7 and reg.00008 | | | 1 | Bit 7 |
| | Output 7 behavior if bit40006.6=1: 0=output is kept at the previous value; 1=bit40012.6 is overwritten on bit40003.6, bit 40301.6 and reg.00007 | | | 1 | Bit 6 |
| | Output 6 behavior if bit40006.5=1: 0=output is kept at the previous value; 1=bit40012.5 is overwritten on bit40003.5, bit 40301.5 and reg.00006 | | | 1 | Bit 5 |
| | Output 5 behavior if bit40006.4=1: 0=output is kept at the previous value; 1=bit40012.4 is overwritten on bit40003.4, bit 40301.4 and reg.00005 | | | 1 | Bit 4 |
| | Output 4 behavior if bit40006.3=1: 0=output is kept at the previous value; 1=bit40012.3 is overwritten on bit40003.3, bit 40301.3 and reg.00004 | | | 1 | Bit 3 |
| | Output 3 behavior if bit40006.2=1: 0=output is kept at the previous value; 1=bit40012.2 is overwritten on bit40003.2, bit 40301.2 and reg.00003 | | | 1 | Bit 2 |
| | Output 2 behavior if bit40006.1=1: 0=output is kept at the previous value; 1=bit40012.1 is overwritten on bit40003.1, bit 40301.1 and reg.00002 | | | 1 | Bit 1 |

| | | | | | |
|---|---|---|---|---|---|
| | Output 1 behavior if bit40006.0=1: 0=output is kept at the previous value; 1=bit40012.0 is overwritten on bit40003.0, bit 40301.0 and reg.00001 | | | 1 | Bit 0 |
| Errors Out1-8 safe values | / | Bit | R/W | | 40012 |
| | These bits aren't used | | | / | Bit [15:8] |
| | Output 8 safe value: 0; 1 | | | 0 | Bit 7 |
| | Output 7 safe value: 0; 1 | | | 0 | Bit 6 |
| | Output 6 safe value: 0; 1 | | | 0 | Bit 5 |
| | Output 5 safe value: 0; 1 | | | 0 | Bit 4 |
| | Output 4 safe value: 0; 1 | | | 0 | Bit 3 |
| | Output 3 safe value: 0; 1 | | | 0 | Bit 2 |
| | Output 2 safe value: 0; 1 | | | 0 | Bit 1 |
| | Output 1 safe value: 0; 1 | | | 0 | Bit 0 |
| **OUTPUT 9-16 ERROR MANAGEMENT** | | | | | |
| Errors Out9-16 | / | Bit | R | | 40007 |
| | These bits aren't used | | | / | Bit [15:8] |
| | Output 16 over-temperature error or short-circuited: 0=there isn't; 1=there is | | | / | Bit 7 |
| | Output 15 over-temperature error or short-circuited: 0=there isn't; 1=there is | | | / | Bit 6 |
| | Output 14 over-temperature error or short-circuited: 0=there isn't; 1=there is | | | / | Bit 5 |
| | Output 13 over-temperature error or short-circuited: 0=there isn't; 1=there is | | | / | Bit 4 |
| | Output 12 over-temperature error or short-circuited: 0=there isn't; 1=there is | | | / | Bit 3 |
| | Output 11 over-temperature error or short-circuited: 0=there isn't; 1=there is | | | / | Bit 2 |
| | Output 10 over-temperature error or short-circuited: 0=there isn't; 1=there is | | | / | Bit 1 |
| | Output 9 over-temperature error or short-circuited: 0=there isn't; 1=there is | | | / | Bit 0 |
| Errors Out9-16 behavior | / | Bit | R/W | | 40010 |
| | These bits aren't used | | | / | Bit [15:8] |
| | Output 16 behavior if bit40007.7=1: 0=output is kept at the previous value; 1=bit40013.7 is overwritten on bit40004.7, bit 40301.15 and reg.00016 | | | 1 | Bit 7 |
| | Output 15 behavior if bit40007.6=1: 0=output is kept at the previous value; 1=bit40013.6 is overwritten on bit40004.6, bit 40301.14 and reg.00015 | | | 1 | Bit 6 |
| | Output 14 behavior if bit40007.5=1: 0=output is kept at the previous value; 1=bit40013.5 is overwritten on bit40004.5, bit 40301.13 and reg.00014 | | | 1 | Bit 5 |
| | Output 13 behavior if bit40007.4=1: 0=output is kept at the previous value; 1=bit40013.4 is overwritten on bit40004.4, bit 40301.12 and reg.00013 | | | 1 | Bit 4 |
| | Output 12 behavior if bit40007.3=1: 0=output is kept at the previous value; 1=bit40013.3 is overwritten on bit40004.3, bit 40301.11 and reg.00012 | | | 1 | Bit 3 |
| | Output 11 behavior if bit40007.2=1: 0=output is kept at the previous value; 1=bit40013.2 is overwritten on bit40004.2, bit 40301.10 and reg.00011 | | | 1 | Bit 2 |
| | Output 10 behavior if bit40007.1=1: 0=output is kept at the previous value; 1=bit40013.1 is overwritten on bit40004.1, bit 40301.9 and reg.00010 | | | 1 | Bit 1 |
| | Output 9 behavior if bit40007.0=1: 0=output is kept at the previous value; 1=bit40013.0 is overwritten on bit40004.0, bit 40301.8 and reg.00009 | | | 1 | Bit 0 |

| | | | | | |
|---|---|---|---|---|---|
| Errors Out9-16 safe values | / | Bit | R/W | | 40013 |
| | These bits aren't used | | | / | Bit [15:8] |
| | Output 16 safe value: 0; 1 | | | 0 | Bit 7 |
| | Output 15 safe value: 0; 1 | | | 0 | Bit 6 |
| | Output 14 safe value: 0; 1 | | | 0 | Bit 5 |
| | Output 13 safe value: 0; 1 | | | 0 | Bit 4 |
| | Output 12 safe value: 0; 1 | | | 0 | Bit 3 |
| | Output 11 safe value: 0; 1 | | | 0 | Bit 2 |
| | Output 10 safe value: 0; 1 | | | 0 | Bit 1 |
| | Output 9 safe value: 0; 1 | | | 0 | Bit 0 |
| **OUTPUT 17-24 ERROR MANAGEMENT** | | | | | |
| Errors Out17-24 | / | Bit | R | | 40008 |
| | These bits aren't used | | | / | Bit [15:8] |
| | Output 24 over-temperature error or short-circuited: 0=there isn't; 1=there is | | | / | Bit 7 |
| | Output 23 over-temperature error or short-circuited: 0=there isn't; 1=there is | | | / | Bit 6 |
| | Output 22 over-temperature error or short-circuited: 0=there isn't; 1=there is | | | / | Bit 5 |
| | Output 21 over-temperature error or short-circuited: 0=there isn't; 1=there is | | | / | Bit 4 |
| | Output 20 over-temperature error or short-circuited: 0=there isn't; 1=there is | | | / | Bit 3 |
| | Output 19 over-temperature error or short-circuited: 0=there isn't; 1=there is | | | / | Bit 2 |
| | Output 18 over-temperature error or short-circuited: 0=there isn't; 1=there is | | | / | Bit 1 |
| | Output 17 over-temperature error or short-circuited: 0=there isn't; 1=there is | | | / | Bit 0 |
| Errors Out17-24 behavior | / | Bit | R/W | | 40011 |
| | These bits aren't used | | | / | Bit [15:8] |
| | Output 24 behavior if bit40008.7=1: 0=output is kept at the previous value; 1=bit40014.7 is overwritten on bit40005.7, bit 40302.7 and reg.00024 | | | 1 | Bit 7 |
| | Output 23 behavior if bit40008.6=1: 0=output is kept at the previous value; 1=bit40014.6 is overwritten on bit40005.6, bit 40302.6 and reg.00023 | | | 1 | Bit 6 |
| | Output 22 behavior if bit40008.5=1: 0=output is kept at the previous value; 1=bit40014.5 is overwritten on bit40005.5, bit 40302.5 and reg.00022 | | | 1 | Bit 5 |
| | Output 21 behavior if bit40008.4=1: 0=output is kept at the previous value; 1=bit40014.4 is overwritten on bit40005.4, bit 40302.4 and reg.00021 | | | 1 | Bit 4 |
| | Output 20 behavior if bit40008.3=1: 0=output is kept at the previous value; 1=bit40014.3 is overwritten on bit40005.3, bit 40302.3 and reg.00020 | | | 1 | Bit 3 |
| | Output 19 behavior if bit40008.2=1: 0=output is kept at the previous value; 1=bit40014.2 is overwritten on bit40005.2, bit 40302.2 and reg.00019 | | | 1 | Bit 2 |
| | Output 18 behavior if bit40008.1=1: 0=output is kept at the previous value; 1=bit40014.1 is overwritten on bit40005.1, bit 40302.1 and reg.00018 | | | 1 | Bit 1 |
| | Output 17 behavior if bit40008.0=1: 0=output is kept at the previous value; 1=bit40014.0 is overwritten on bit40005.0, bit 40302.0 and reg.00017 | | | 1 | Bit 0 |

| | | | | | |
|---|---|---|---|---|---|
| Errors Out17-24 safe values | / | Bit | R/W | | 40014 |
| | These bits aren’t used | | | / | Bit [15:8] |
| | Output 24 safe value: 0; 1 | | | 0 | Bit 7 |
| | Output 23 safe value: 0; 1 | | | 0 | Bit 6 |
| | Output 22 safe value: 0; 1 | | | 0 | Bit 5 |
| | Output 21 safe value: 0; 1 | | | 0 | Bit 4 |
| | Output 20 safe value: 0; 1 | | | 0 | Bit 3 |
| | Output 19 safe value: 0; 1 | | | 0 | Bit 2 |
| | Output 18 safe value: 0; 1 | | | 0 | Bit 1 |
| | Output 17 safe value: 0; 1 | | | 0 | Bit 0 |

| | | | | | |
|---|---|---|---|---|---|
| Command | / | Word | R/W | | 40201 |
| | Reg.40201=0xBCD0 (save data in EEPROM memory)<br>Reg.40201=0xC1A0 (module reset)<br>Reg.40201=0x6BAC (the module writes the Dip-Switches-state in reg.40202) | | | | |
| 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] |

| | | | | | |
|---|---|---|---|---|---|
| Address Parity | Address: from 0x01=1 to 0xFF=255 | MSB, LSB | R/W | | 40017 |
| | 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 | | 40018 |
| | 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 OUT1-OUT8 | | Bit | R/W | | 40003 |
| | These bits aren’t used | | | / | Bit [15:8] |
| | Output OUT8 state: 0=LOAD8 is deactivated (there is no current through LOAD8); 1=LOAD8 is activated (there is current through LOAD8) | | | 0 | Bit 7 |
| | Output OUT7 state: 0=LOAD7 is deactivated (there is no current through LOAD7); 1=LOAD7 is activated (there is current through LOAD7) | | | 0 | Bit 6 |
| | Output OUT6 state: 0=LOAD6 is deactivated (there is no current through LOAD6); 1=LOAD6 is activated (there is current through LOAD6) | | | 0 | Bit 5 |
| | Output OUT5 state: 0=LOAD5 is deactivated (there is no current through LOAD5); 1=LOAD5 is activated (there is current through LOAD5) | | | 0 | Bit 4 |
| | Output OUT4 state: 0=LOAD4 is deactivated (there is no current through LOAD4); 1=LOAD4 is activated (there is current through LOAD4) | | | 0 | Bit 3 |

| | | | | | |
|---|---|---|---|---|---|
| | Output OUT3 state: 0=LOAD3 is deactivated (there is no current through LOAD3); 1=LOAD3 is activated (there is current through LOAD3) | | | 0 | Bit 2 |
| | Output OUT2 state: 0=LOAD2 is deactivated (there is no current through LOAD2); 1=LOAD2 is activated (there is current through LOAD2) | | | 0 | Bit 1 |
| | Output OUT1 state: 0=LOAD1 is deactivated (there is no current through LOAD1); 1=LOAD1 is activated (there is current through LOAD1) | | | 0 | Bit 0 |
| State OUT9-OUT16 | | Bit | R/W | | 40004 |
| | These bits aren't used | | | / | Bit [15:8] |
| | Output OUT16 state: 0=LOAD16 is deactivated (there is no current through LOAD16); 1=LOAD16 is activated (there is current through LOAD16) | | | 0 | Bit 7 |
| | Output OUT15 state: 0=LOAD15 is deactivated (there is no current through LOAD15); 1=LOAD15 is activated (there is current through LOAD15) | | | 0 | Bit 6 |
| | Output OUT14 state: 0=LOAD14 is deactivated (there is no current through LOAD14); 1=LOAD14 is activated (there is current through LOAD14) | | | 0 | Bit 5 |
| | Output OUT13 state: 0=LOAD13 is deactivated (there is no current through LOAD13); 1=LOAD13 is activated (there is current through LOAD13) | | | 0 | Bit 4 |
| | Output OUT12 state: 0=LOAD12 is deactivated (there is no current through LOAD12); 1=LOAD12 is activated (there is current through LOAD12) | | | 0 | Bit 3 |
| | Output OUT11 state: 0=LOAD11 is deactivated (there is no current through LOAD11); 1=LOAD11 is activated (there is current through LOAD11) | | | 0 | Bit 2 |
| | Output OUT10 state: 0=LOAD10 is deactivated (there is no current through LOAD10); 1=LOAD10 is activated (there is current through LOAD10) | | | 0 | Bit 1 |
| | Output OUT9 state: 0=LOAD9 is deactivated (there is no current through LOAD9); 1=LOAD9 is activated (there is current through LOAD9) | | | 0 | Bit 0 |
| State OUT17-OUT24 | | Bit | R/W | | 40005 |
| | These bits aren't used | | | / | Bit [15:8] |
| | Output OUT24 state: 0=LOAD24 is deactivated (there is no current through LOAD24); 1=LOAD24 is activated (there is current through LOAD24) | | | 0 | Bit 7 |
| | Output OUT23 state: 0=LOAD23 is deactivated (there is no current through LOAD23); 1=LOAD23 is activated (there is current through LOAD23) | | | 0 | Bit 6 |
| | Output OUT22 state: 0=LOAD22 is deactivated (there is no current through LOAD22); 1=LOAD22 is activated (there is current through LOAD22) | | | 0 | Bit 5 |
| | Output OUT21 state: 0=LOAD21 is deactivated (there is no current through LOAD21); 1=LOAD21 is activated (there is current through LOAD21) | | | 0 | Bit 4 |
| | Output OUT20 state: 0=LOAD20 is deactivated (there is no current through LOAD20); 1=LOAD20 is activated (there is current through LOAD20) | | | 0 | Bit 3 |
| | Output OUT19 state: 0=LOAD19 is deactivated (there is no current through LOAD19); 1=LOAD19 is activated (there is current through LOAD19) | | | 0 | Bit 2 |
| | Output OUT18 state: 0=LOAD18 is deactivated (there is no current through LOAD18); 1=LOAD18 is activated (there is current through LOAD18) | | | 0 | Bit 1 |

| | | | | | |
|---|---|---|---|---|---|
| | Output OUT17 state: 0=LOAD17 is deactivated (there is no current through LOAD17); 1=LOAD17 is activated (there is current through LOAD17) | | | 0 | Bit 0 |
| State OUT1-OUT16 | | Bit | R/W | | 40301 |
| | Output OUT16 state: 0=LOAD16 is deactivated (there is no current through LOAD16); 1=LOAD16 is activated (there is current through LOAD16) | | | 0 | Bit 15 |
| | Output OUT15 state: 0=LOAD15 is deactivated (there is no current through LOAD15); 1=LOAD15 is activated (there is current through LOAD15) | | | 0 | Bit 14 |
| | Output OUT14 state: 0=LOAD14 is deactivated (there is no current through LOAD14); 1=LOAD14 is activated (there is current through LOAD14) | | | 0 | Bit 13 |
| | Output OUT13 state: 0=LOAD13 is deactivated (there is no current through LOAD13); 1=LOAD13 is activated (there is current through LOAD13) | | | 0 | Bit 12 |
| | Output OUT12 state: 0=LOAD12 is deactivated (there is no current through LOAD12); 1=LOAD12 is activated (there is current through LOAD12) | | | 0 | Bit 11 |
| | Output OUT11 state: 0=LOAD11 is deactivated (there is no current through LOAD11); 1=LOAD11 is activated (there is current through LOAD11) | | | 0 | Bit 10 |
| | Output OUT10 state: 0=LOAD10 is deactivated (there is no current through LOAD10); 1=LOAD10 is activated (there is current through LOAD10) | | | 0 | Bit 9 |
| | Output OUT9 state: 0=LOAD9 is deactivated (there is no current through LOAD9); 1=LOAD9 is activated (there is current through LOAD9) | | | 0 | Bit 8 |
| | Output OUT8 state: 0=LOAD8 is deactivated (there is no current through LOAD8); 1=LOAD8 is activated (there is current through LOAD8) | | | 0 | Bit 7 |
| | Output OUT7 state: 0=LOAD7 is deactivated (there is no current through LOAD7); 1=LOAD7 is activated (there is current through LOAD7) | | | 0 | Bit 6 |
| | Output OUT6 state: 0=LOAD6 is deactivated (there is no current through LOAD6); 1=LOAD6 is activated (there is current through LOAD6) | | | 0 | Bit 5 |
| | Output OUT5 state: 0=LOAD5 is deactivated (there is no current through LOAD5); 1=LOAD5 is activated (there is current through LOAD5) | | | 0 | Bit 4 |
| | Output OUT4 state: 0=LOAD4 is deactivated (there is no current through LOAD4); 1=LOAD4 is activated (there is current through LOAD4) | | | 0 | Bit 3 |
| | Output OUT3 state: 0=LOAD3 is deactivated (there is no current through LOAD3); 1=LOAD3 is activated (there is current through LOAD3) | | | 0 | Bit 2 |
| | Output OUT2 state: 0=LOAD2 is deactivated (there is no current through LOAD2); 1=LOAD2 is activated (there is current through LOAD2) | | | 0 | Bit 1 |
| | Output OUT1 state: 0=LOAD1 is deactivated (there is no current through LOAD1); 1=LOAD1 is activated (there is current through LOAD1) | | | 0 | Bit 0 |
| State OUT17-OUT24 | | Bit | R/W | | 40302 |
| | These bits aren't used | | | / | Bit [15:8] |
| | Output OUT24 state: 0=LOAD24 is deactivated (there is no current through LOAD24); 1=LOAD24 is activated (there is current through LOAD24) | | | 0 | Bit 7 |

| | | | | | |
|---|---|---|---|---|---|
| | Output OUT23 state: 0=LOAD23 is deactivated (there is no current through LOAD23); 1=LOAD23 is activated (there is current through LOAD23) | | | 0 | Bit 6 |
| | Output OUT22 state: 0=LOAD22 is deactivated (there is no current through LOAD22); 1=LOAD22 is activated (there is current through LOAD22) | | | 0 | Bit 5 |
| | Output OUT21 state: 0=LOAD21 is deactivated (there is no current through LOAD21); 1=LOAD21 is activated (there is current through LOAD21) | | | 0 | Bit 4 |
| | Output OUT20 state: 0=LOAD20 is deactivated (there is no current through LOAD20); 1=LOAD20 is activated (there is current through LOAD20) | | | 0 | Bit 3 |
| | Output OUT19 state: 0=LOAD19 is deactivated (there is no current through LOAD19); 1=LOAD19 is activated (there is current through LOAD19) | | | 0 | Bit 2 |
| | Output OUT18 state: 0=LOAD18 is deactivated (there is no current through LOAD18); 1=LOAD18 is activated (there is current through LOAD18) | | | 0 | Bit 1 |
| | Output OUT17 state: 0=LOAD17 is deactivated (there is no current through LOAD17); 1=LOAD17 is activated (there is current through LOAD17) | | | 0 | Bit 0 |
| Timeout enabling | | Bit | R/W | | 40019 |
| | These bits aren’t used | | | / | Bit [15:1] |
| | RS485-bus communication failure diagnostics: 0=deactivated; 1=activated | | | 0 | Bit 0 |
| Timeout | From 0x00=0 to 0xFF=255 (=25.5 sec) | Bit | R/W | | 40020 |
| | These bits aren’t used | | | / | Bit [15:8] |
| | Timeout [sec/10] (if reg.40019 is “1”): it is the interval time of RS485-bus communication failure, after which:<br>- the bit 40012.X is overwritten in the bit 40003.X<br>- the bit 40013.X is overwritten in the bit 40004.X<br>- the bit 40014.X is overwritten in the bit 40005.X<br>with X=0;7 | | | 100 (=10sec) | Bit [7:0] |

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

| Name | Range | Interpretation of register | R/W | Default | Address |
|---|---|---|---|---|---|
| State OUT1 | 0-1 | Word | R/W | | 00001 |
| | Output OUT1 state: 0=LOAD1 is deactivated (there is no current through LOAD1); 1=LOAD1 is activated (there is current through LOAD1) | | | 0 | |
| State OUT2 | 0-1 | | R/W | | 00002 |
| | Output OUT2 state: 0=LOAD2 is deactivated (there is no current through LOAD2); 1=LOAD2 is activated (there is current through LOAD2) | | | 0 | |
| State OUT3 | 0-1 | | R/W | | 00003 |
| | Output OUT3 state: 0=LOAD3 is deactivated (there is no current through LOAD3); 1=LOAD3 is activated (there is current through LOAD3) | | | 0 | |
| State OUT4 | 0-1 | | R/W | | 00004 |
| | Output OUT4 state: 0=LOAD4 is deactivated (there is no current through LOAD4); 1=LOAD4 is activated (there is current through LOAD4) | | | 0 | |

| | | | | | |
|---|---|---|---|---|---|
| State OUT5 | 0-1 | | R/W | | 00005 |
| | Output OUT5 state: 0=LOAD5 is deactivated (there is no current through LOAD5); 1=LOAD5 is activated (there is current through LOAD5) | | | 0 | |
| State OUT6 | 0-1 | | R/W | | 00006 |
| | Output OUT6 state: 0=LOAD6 is deactivated (there is no current through LOAD6); 1=LOAD6 is activated (there is current through LOAD6) | | | 0 | |
| State OUT7 | 0-1 | | R/W | | 00007 |
| | Output OUT7 state: 0=LOAD7 is deactivated (there is no current through LOAD7); 1=LOAD7 is activated (there is current through LOAD7) | | | 0 | |
| State OUT8 | 0-1 | | R/W | | 00008 |
| | Output OUT8 state: 0=LOAD8 is deactivated (there is no current through LOAD8); 1=LOAD8 is activated (there is current through LOAD8) | | | 0 | |
| State OUT9 | 0-1 | | R/W | | 00009 |
| | Output OUT9 state: 0=LOAD9 is deactivated (there is no current through LOAD9); 1=LOAD9 is activated (there is current through LOAD9) | | | 0 | |
| State OUT10 | 0-1 | | R/W | | 00010 |
| | Output OUT10 state: 0=LOAD10 is deactivated (there is no current through LOAD10); 1=LOAD10 is activated (there is current through LOAD10) | | | 0 | |
| State OUT11 | 0-1 | | R/W | | 00011 |
| | Output OUT11 state: 0=LOAD11 is deactivated (there is no current through LOAD11); 1=LOAD11 is activated (there is current through LOAD11) | | | 0 | |
| State OUT12 | 0-1 | | R/W | | 00012 |
| | Output OUT12 state: 0=LOAD12 is deactivated (there is no current through LOAD12); 1=LOAD12 is activated (there is current through LOAD12) | | | 0 | |
| State OUT13 | 0-1 | | R/W | | 00013 |
| | Output OUT13 state: 0=LOAD13 is deactivated (there is no current through LOAD13); 1=LOAD13 is activated (there is current through LOAD13) | | | 0 | |
| State OUT14 | 0-1 | | R/W | | 00014 |
| | Output OUT14 state: 0=LOAD14 is deactivated (there is no current through LOAD14); 1=LOAD14 is activated (there is current through LOAD14) | | | 0 | |
| State OUT15 | 0-1 | | R/W | | 00015 |
| | Output OUT15 state: 0=LOAD15 is deactivated (there is no current through LOAD15); 1=LOAD15 is activated (there is current through LOAD15) | | | 0 | |
| State OUT16 | 0-1 | | R/W | | 00016 |
| | Output OUT16 state: 0=LOAD16 is deactivated (there is no current through LOAD16); 1=LOAD16 is activated (there is current through LOAD16) | | | 0 | |
| State OUT17 | 0-1 | | R/W | | 00017 |
| | Output OUT17 state: 0=LOAD17 is deactivated (there is no current through LOAD17); 1=LOAD17 is activated (there is current through LOAD17) | | | 0 | |
| State OUT18 | 0-1 | | R/W | | 00018 |
| | Output OUT18 state: 0=LOAD18 is deactivated (there is no current through LOAD18); 1=LOAD18 is activated (there is current through LOAD18) | | | 0 | |
| State OUT19 | 0-1 | | R/W | | 00019 |
| | Output OUT19 state: 0=LOAD19 is deactivated (there is no current through LOAD19); 1=LOAD19 is activated (there is current through LOAD19) | | | 0 | |

| | | | | | |
|---|---|---|---|---|---|
| State OUT20 | 0-1 | | R/W | | 00020 |
| | Output OUT20 state: 0=LOAD20 is deactivated (there is no current through LOAD20); 1=LOAD20 is activated (there is current through LOAD20) | | | 0 | |
| State OUT21 | 0-1 | | R/W | | 00021 |
| | Output OUT21 state: 0=LOAD21 is deactivated (there is no current through LOAD21); 1=LOAD21 is activated (there is current through LOAD21) | | | 0 | |
| State OUT22 | 0-1 | | R/W | | 00022 |
| | Output OUT22 state: 0=LOAD22 is deactivated (there is no current through LOAD22); 1=LOAD22 is activated (there is current through LOAD22) | | | 0 | |
| State OUT23 | 0-1 | | R/W | | 00023 |
| | Output OUT23 state: 0=LOAD23 is deactivated (there is no current through LOAD23); 1=LOAD23 is activated (there is current through LOAD23) | | | 0 | |
| State OUT24 | 0-1 | | R/W | | 00024 |
| | Output OUT24 state: 0=LOAD24 is deactivated (there is no current through LOAD24); 1=LOAD24 is activated (there is current through LOAD24) | | | 0 | |

## *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 | Constant light | The module received a data packet through RS232 port |
| | Blinking light | The module has at least one of the errors described in RS485 Registers table (at least one output over-temperature error or short-circuited) |
| 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 | OUT1-24 state equal to «1» |
| | No light | OUT1-24 state equal to «0» (if the power is on and the outputs are supplied) |

# Seneca Z-PC Line module: **ZC-16DI-8DO**

The module ZC-16DI-8DO:

- acquires 16 single-ended digital signals, it converts them to a digital format (IN 1-16 state) and it counts the input-pulse number (pulse counter for IN 1-8);

- controls 8 digital outputs (OUT1-OUT8), each of them (by MOSFET) actives/deactivates a output load.

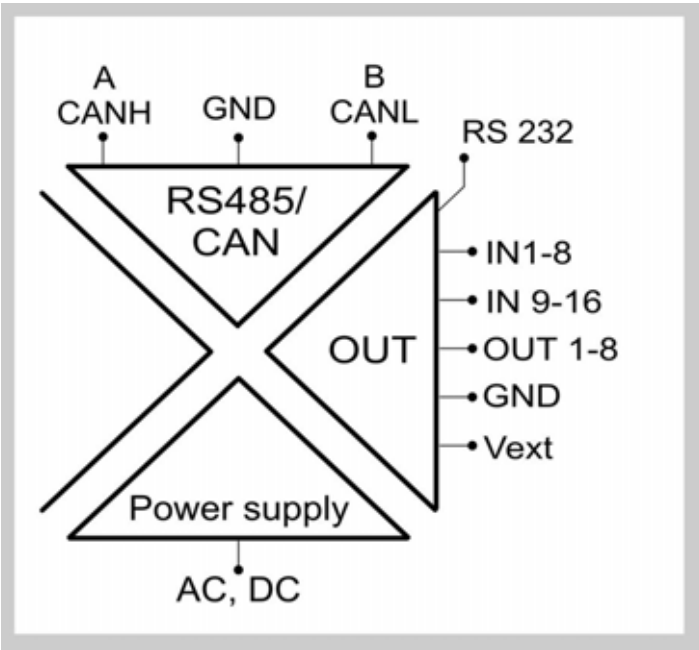
## General characteristics

- 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 16 sensors using internal supply voltage (Vaux=16V)
- Outputs are available on 8 screw terminals or IDC 10 connectors, to facilitate the connection of 24V-relays
- It is possible to manage the output state if the interval time of RS485-bus communication failure is greater than a configurable time (up to 25.5sec): output is kept at the previous value or output is overwritten on register
- It is possible to manage the output state if there is a over-temperature or short-circuited (towards ground)
- Configuration of 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** | 16 |
| **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)** | 350µs |
| **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) |

| OUTPUT | |
|---|---|
| **Number** | 8 |
| **Type** | MOSFET (Open source) |
| **Max current through each load** | 0.5A. The supplied currents sum through all loads (these currents are inwards with reference to the screw terminals 8-16):<4A, using a fuse or equivalent protection (if the connection is performed through screw terminals) |
| | 25mA. The supplied currents sum through all loads (these currents are inwards with reference to the screw terminals 8-16):<0.2A, using a fuse or equivalent protection (if the connection is performed through IDC10 connector) |
| **Max state-switching frequency for each load** | 2Hz |
| **MOSFET protection** | The MOSFETs are protected against: load short-circuited, over-temperature |
| **MOSFET supply** | With reference to the screw terminals 7-15-23-32 (GND), power the MOSFETs by screw terminals 8 or 16 (Vext): min5V, max30V |
| **MOSFET max energy** | 40mJ with inductive load |
| **MOSFET response time** | 5/2ms |
| **$R_{DSON}$** | 0.75Ω |
| **Switching delay** | 1ms (max) |
| **CONNECTIONS** | |
| **RS485 interface** | IDC10 connector for DIN 46277 rail (back-side panel) |
| **1500 Vac ISOLATIONS** | |
| | Between: power supply, ModBUS RS485, digital outputs |



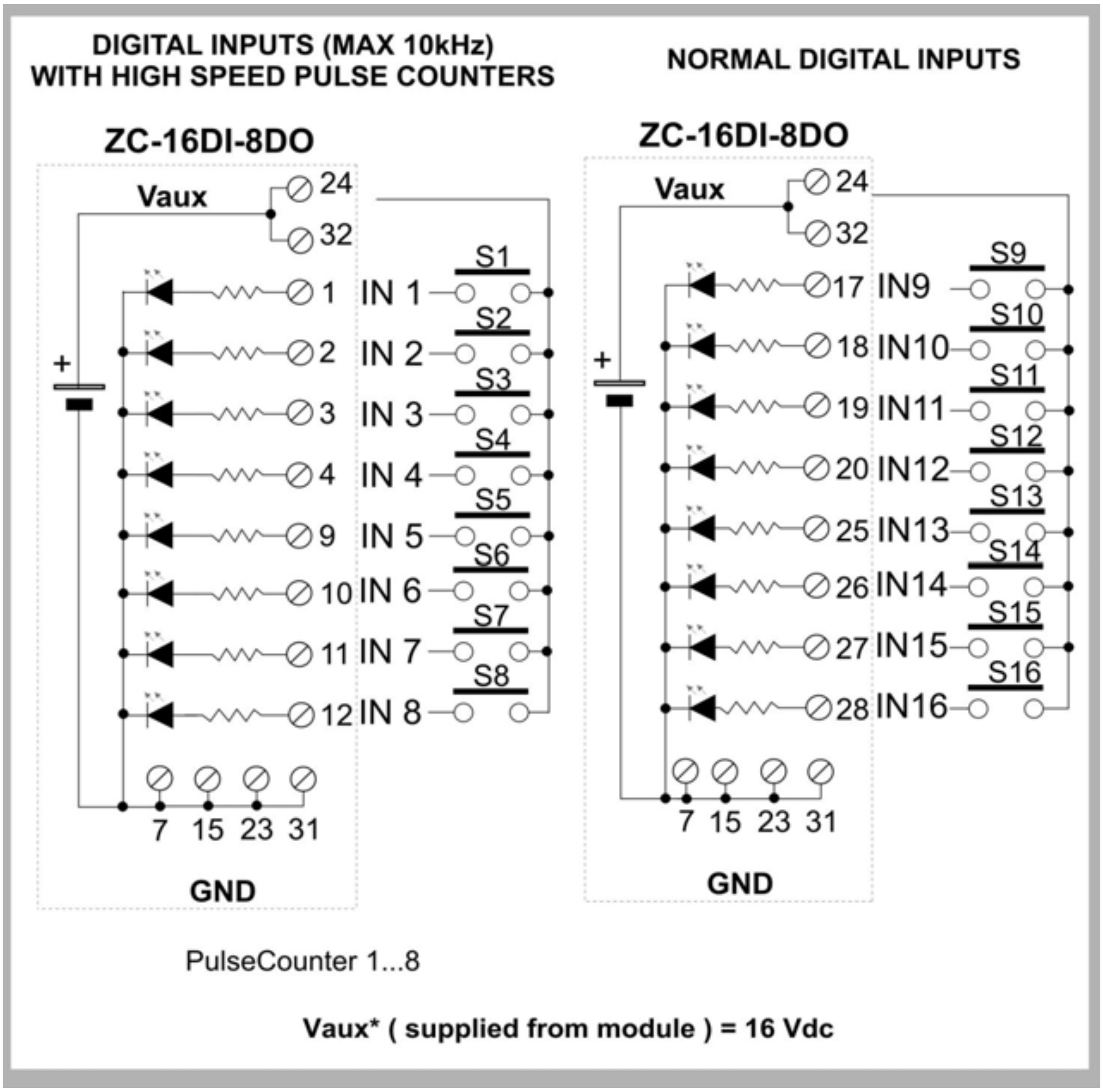

| POWER SUPPLY | |
|---|---|
| **Supply voltage** | 10 – 40 Vdc or 19 – 28 Vac ( 50Hz - 60Hz) |
| **Power consumption** | Typical: 1.5W;  Max: 2.5W |

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.

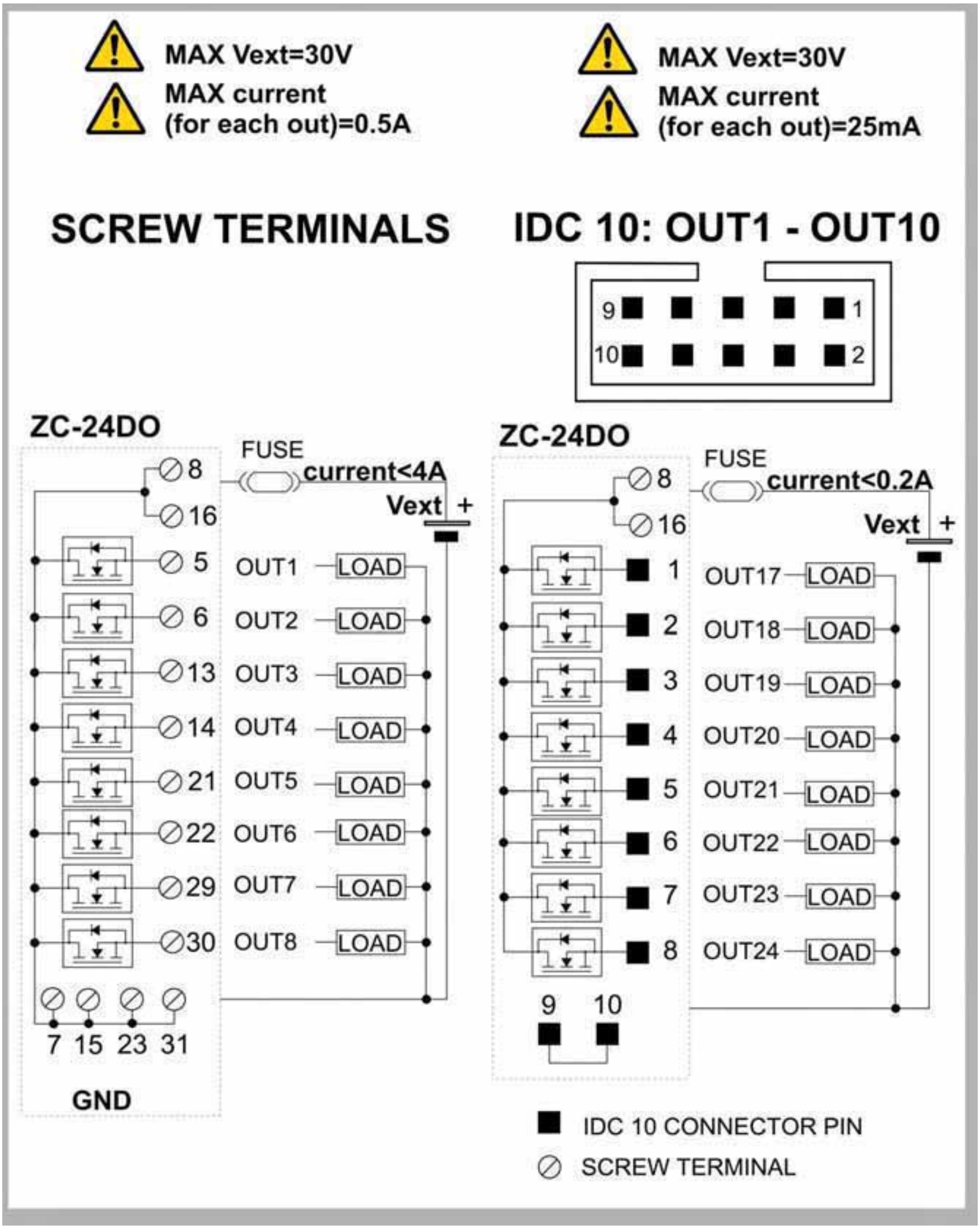
| MODULE CASE | |
|---|---|
| **Case-type** | PBT, black |
| **Dimensions** | Width W = 100 mm, Height H = 112mm, Depth D = 35 mm |
| **Terminal board** | Removable 4-way screw terminals:<br>pitch 3.5mm, sections 2.5mm$^2$ |
| **Protection class** | IP20 (International Protection) |

## *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.**



## *Output connections*



# *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

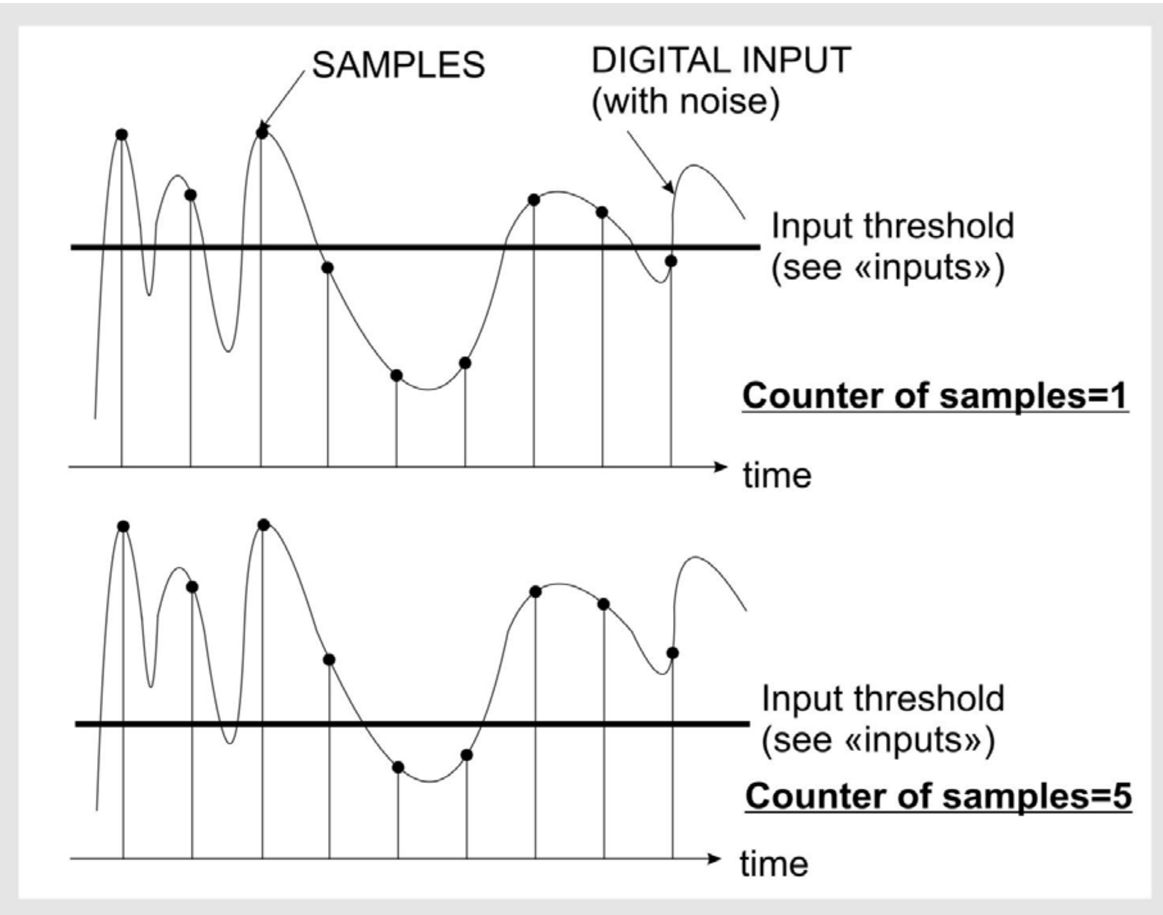
<table>
<tr><th>Name</th><th>Range</th><th>Interpretation of register</th><th>R/W</th><th>Default</th><th>Address</th></tr>
<tr><td>MachineID</td><td>/</td><td>MSB, LSB</td><td>R</td><td></td><td>40001</td></tr>
<tr><td></td><td colspan="3">Id_Code (Module ID)</td><td>0x22 (34 decimal)</td><td>Bit [15:8]</td></tr>
<tr><td></td><td colspan="3">Ext_Rev (Module version)</td><td></td><td>Bit [7:0]</td></tr>
<tr><td>FWREV</td><td>/</td><td>Word</td><td>R</td><td></td><td>40002</td></tr>
<tr><td></td><td colspan="3">Firmware Code</td><td></td><td></td></tr>
<tr><td>Command</td><td>/</td><td>Word</td><td>R/W</td><td></td><td>40201</td></tr>
<tr><td colspan="6">**Reg.40201=0x5Cnn** (preset counter values are loaded into pulse counters, using a bit interpretation to mask the inputs): load 40025,40026…40039,40040 into 40009, 40010…40023,40024.<br>Examples:<br>0x5C01 allows to load PresetCounter1 into PulseCounter1<br>0x5C02 allows to load PresetCounter2 into PulseCounter2<br>0x5C03 allows to load PresetCounter1 into PulseCounter1 **and** PresetCounter2 into PulseCounter2 (**not** PresetCounter3 into PulseCounter3) and so on<br>0x5CFF allows to load every PresetCounter into corresponding PulseCounter</td></tr>
<tr><td colspan="6">**Reg.40201=0x5Dnn** (pulse counters value are loaded with zero values, using a bit interpretation to mask the inputs)<br>Examples:<br>0x5D01 allows to load PulseCounter1 with zero value<br>0x5D02 allows to load PulseCounter2 with zero value<br>0x5D03 allows to load PulseCounter1 **and** PresetCounter2 with zero value (**not** PresetCounter3 with zero value) and so on<br>0x5DFF allows to load every PulseCounter with zero value</td></tr>
<tr><td colspan="6">**Reg.40201=0x5Enn** (counter overflows reset, using a bit interpretation to mask the inputs)<br>Examples:<br>0x5E01 allows to reset PulseCounter1 overflow<br>0x5E02 allows to reset PulseCounter2 overflow<br>0x5E03 allows to reset PulseCounter2 overflow **and** to reset PulseCounter2 overflow (**not** to reset PulseCounter3 overflow) and so on<br>0x5EFF allows to reset every PulseCounter overflow</td></tr>
<tr><td colspan="6">**Reg.40201=0xBAB0** (save data in EEPROM memory)</td></tr>
<tr><td colspan="6">**Reg.40201=0xC1A0** (module reset)</td></tr>
<tr><td colspan="6">**Reg.40201=0x6BAC** (the module writes the Dip-Switches-state in reg.40202)</td></tr>
<tr><td>Command aux</td><td></td><td>Bit</td><td>R</td><td></td><td>40202</td></tr>
<tr><td></td><td colspan="3">These bits aren’t used</td><td>/</td><td>Bit [15:10]</td></tr>
<tr><td></td><td colspan="3">Dip-Switches "SW1 [4:10]" state. They correspond to the module baud-rate</td><td>/</td><td>Bit [9:3]</td></tr>
<tr><td></td><td colspan="3">Dip-Switches "SW1 [1:3]" state. They correspond to the module address</td><td>/</td><td>Bit [2:0]</td></tr>
<tr><td>Errors</td><td>/</td><td>Word</td><td>R</td><td></td><td>40006</td></tr>
<tr><td></td><td colspan="3">These bits aren’t used</td><td>/</td><td>Bit [15:8]</td></tr>
<tr><td></td><td colspan="3">Memory error (EEPROM): 0=there isn’t; 1=there is</td><td>/</td><td>Bit 7</td></tr>
<tr><td></td><td colspan="3">These bits aren’t used</td><td>/</td><td>Bit [6:4]</td></tr>
<tr><td></td><td colspan="3">Over-temperature error: 0=there isn’t; 1=there is</td><td>/</td><td>Bit 3</td></tr>
<tr><td></td><td colspan="3">These bits aren’t used</td><td>/</td><td>Bit [2:0]</td></tr>
<tr><td>Filter[IN1-8] masked</td><td>/</td><td>Word</td><td>R/W</td><td></td><td>40043</td></tr>
<tr><td></td><td colspan="3">These bits aren’t used</td><td>/</td><td>Bit [15:8]</td></tr>
<tr><td></td><td colspan="3">Filter activation for inputs IN1-IN8 using a bit interpretation to mask the inputs: 0=filter is deactivated; 1=filter is activated (for each input)</td><td>0xFF</td><td>Bit [7:0]</td></tr>
</table>

| | | | | | |
|---|---|---|---|---|---|
| Filter[IN9-16] masked | / | Word | R/W | | 40044 |
| | These bits aren't used | | | / | Bit [15:8] |
| | Filter activation for inputs IN9-IN16 using a bit interpretation to mask the inputs: 0=filter is deactivated; 1=filter is activated (for each input) | | | 0xFF | Bit [7:0] |
| Filter Number Of Samples | From 0 to 255 | Word | R/W | | 40045 |
| | 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 | | 40046 |
| | 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 | | 40047 |
| | 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 module samples the digital input with a frequency equal to 20kHz, and some samples are captured (in the following figure there are 9 samples).



If counter of samples is greater than (or equal to) reg.40046 (Filter Sup), input signal is detected as “1”.

If counter of samples is less than (or equal to) reg.40047 (Filter Inf), input signal is detected as “0”.

If counter of samples is between reg.40047 (Filter Inf) and reg.40046 (Filter Sup), filter value is kept stored at the previous value.

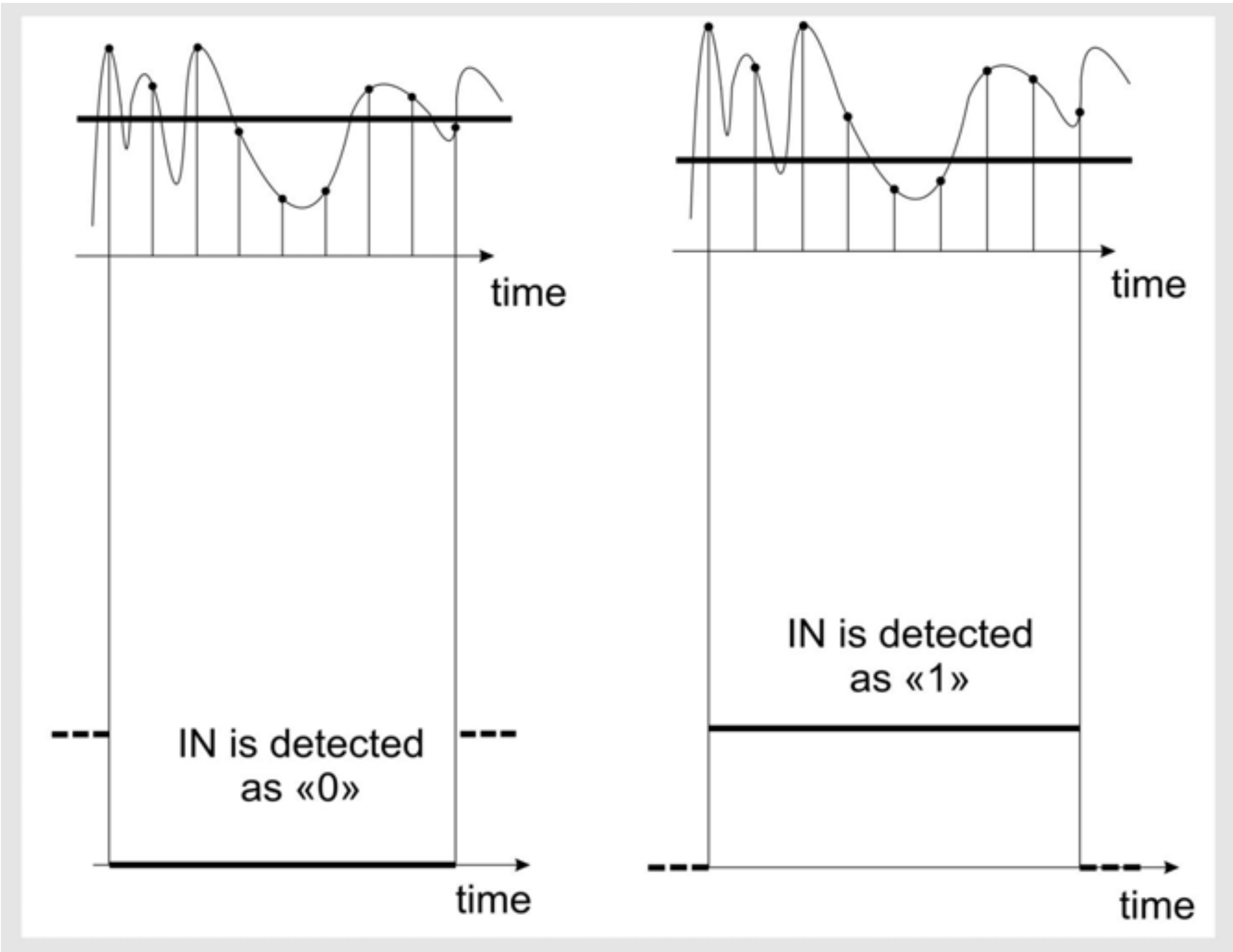
Example: with reference to the previous figure

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 $\geq$ 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+1=**5**

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




**To deactivate the filter, write: reg.40045=0x01, reg.40046=0x00, reg.40047=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 | | 40050 |
| | 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 | | 40051 |
| | 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-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 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 |
| PulseCounter1 MSW | Between:0; (2^31)-1 | FP32bit-MSW | R | | 40009 |
| PulseCounter1 LSW | | FP32bit-LSW | R | | 40010 |
| | 32-bit pulse counter for input 1 | | | | |

| | | | | | |
|---|---|---|---|---|---|
| PresetCounter 1 MSW | Between:0; (2^31)-1 | FP32bit-MSW | R/W | | 40025 |
| PresetCounter 1 LSW | | FP32bit-LSW | R/W | | 40026 |
| | Preset counter value of PulseCounter1 | | | 0 | |
| PulseCounter2 MSW | Between:0; (2^31)-1 | FP32bit-MSW | R | | 40011 |
| PulseCounter2 LSW | | FP32bit-LSW | R | | 40012 |
| | 32-bit pulse counter for input 2 | | | | |
| PresetCounter 2 MSW | Between:0; (2^31)-1 | FP32bit-MSW | R/W | | 40027 |
| PresetCounter 2 LSW | | FP32bit-LSW | R/W | | 40028 |
| | Preset counter value of PulseCounter2 | | | 0 | |
| PulseCounter3 MSW | Between:0; (2^31)-1 | FP32bit-MSW | R | | 40013 |
| PulseCounter3 LSW | | FP32bit-LSW | R | | 40014 |
| | 32-bit pulse counter for input 3 | | | | |
| PresetCounter 3 MSW | Between:0; (2^31)-1 | FP32bit-MSW | R/W | | 40029 |
| PresetCounter 3 LSW | | FP32bit-LSW | R/W | | 40030 |
| | Preset counter value of PulseCounter3 | | | 0 | |
| PulseCounter4 MSW | Between:0; (2^31)-1 | FP32bit-MSW | R | | 40015 |
| PulseCounter4 LSW | | FP32bit-LSW | R | | 40016 |
| | 32-bit pulse counter for input 4 | | | | |
| PresetCounter 4_MSW | Between:0; (2^31)-1 | FP32bit-MSW | R/W | | 40031 |
| PresetCounter 4_LSW | | FP32bit-LSW | R/W | | 40032 |
| | Preset counter value of PulseCounter4 | | | 0 | |
| PulseCounter5 MSW | Between:0; (2^31)-1 | FP32bit-MSW | R | | 40017 |
| PulseCounter5 LSW | | FP32bit-LSW | R | | 40018 |
| | 32-bit pulse counter for input 5 | | | | |
| PresetCounter 5 MSW | Between:0; (2^31)-1 | FP32bit-MSW | R/W | | 40033 |
| PresetCounter 5 LSW | | FP32bit-LSW | R/W | | 40034 |
| | Preset counter value of PulseCounter5 | | | 0 | |
| PulseCounter6 MSW | Between:0; (2^31)-1 | FP32bit-MSW | R | | 40019 |
| PulseCounter6 LSW | | FP32bit-LSW | R | | 40020 |
| | 32-bit pulse counter for input 6 | | | | |
| PresetCounter 6 MSW | Between:0; (2^31)-1 | FP32bit-MSW | R/W | | 40035 |
| PresetCounter 6 LSW | | FP32bit-LSW | R/W | | 40036 |
| | Preset counter value of PulseCounter6 | | | 0 | |
| PulseCounter7 MSW | Between:0; (2^31)-1 | FP32bit-MSW | R | | 40021 |
| PulseCounter7 LSW | | FP32bit-LSW | R | | 40022 |
| | 32-bit pulse counter for input 7 | | | | |

| | | | | | |
|---|---|---|---|---|---|
| PresetCounter 7 MSW | Between:0; (2^31)-1 | FP32bit-MSW | R/W | | 40037 |
| PresetCounter 7 LSW | | FP32bit-LSW | R/W | | 40038 |
| | Preset counter value of PulseCounter7 | | | 0 | |
| PulseCounter8 MSW | Between:0; (2^31)-1 | FP32bit-MSW | R | | 40023 |
| PulseCounter8 LSW | | FP32bit-LSW | R | | 40024 |
| | 32-bit pulse counter for input 8 | | | | |
| PresetCounter 8 MSW | Between:0; (2^31)-1 | FP32bit-MSW | R/W | | 40039 |
| PresetCounter 8 LSW | | FP32bit-LSW | R/W | | 40040 |
| | Preset counter value of PulseCounter8 | | | 0 | |
| Overflow | | Bit | R | | 40008 |
| | 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 | | | / | |

| | | | | | |
|---|---|---|---|---|---|
| Errors Out1-8 | / | Bit | R | | 40007 |
| | These bits aren't used | | | / | Bit [15:8] |
| | Output 8 over-temperature error or short-circuited: 0=there isn't; 1=there is | | | / | Bit 7 |
| | Output 7 over-temperature error or short-circuited: 0=there isn't; 1=there is | | | / | Bit 6 |
| | Output 6 over-temperature error or short-circuited: 0=there isn't; 1=there is | | | / | Bit 5 |
| | Output 5 over-temperature error or short-circuited: 0=there isn't; 1=there is | | | / | Bit 4 |
| | Output 4 over-temperature error or short-circuited: 0=there isn't; 1=there is | | | / | Bit 3 |
| | Output 3 over-temperature error or short-circuited: 0=there isn't; 1=there is | | | / | Bit 2 |
| | Output 2 over-temperature error or short-circuited: 0=there isn't; 1=there is | | | / | Bit 1 |
| | Output 1 over-temperature error or short-circuited: 0=there isn't; 1=there is | | | / | Bit 0 |
| Errors Out1-8 behavior | / | Bit | R/W | | 40041 |
| | These bits aren't used | | | / | Bit [15:8] |
| | Output 8 behavior if bit40007.7=1: 0=output is kept at the previous value; 1=bit40042.7 is overwritten on bit40005.7 and reg.00024 | | | 1 | Bit 7 |
| | Output 7 behavior if bit40007.6=1: 0=output is kept at the previous value; 1=bit40042.6 is overwritten on bit40005.6 and reg.00023 | | | 1 | Bit 6 |
| | Output 6 behavior if bit40007.5=1: 0=output is kept at the previous value; 1=bit40042.5 is overwritten on bit40005.5 and reg.00022 | | | 1 | Bit 5 |

| | | | | | |
|---|---|---|---|---|---|
| | Output 5 behavior if bit40007.4=1: 0=output is kept at the previous value; 1=bit40042.4 is overwritten on bit40005.4 and reg.00021 | | | 1 | Bit 4 |
| | Output 4 behavior if bit40007.3=1: 0=output is kept at the previous value; 1=bit40042.3 is overwritten on bit40005.3 and reg.00020 | | | 1 | Bit 3 |
| | Output 3 behavior if bit40007.2=1: 0=output is kept at the previous value; 1=bit40042.2 is overwritten on bit40005.2 and reg.00019 | | | 1 | Bit 2 |
| | Output 2 behavior if bit40007.1=1: 0=output is kept at the previous value; 1=bit40042.1 is overwritten on bit40005.1 and reg.00018 | | | 1 | Bit 1 |
| | Output 1 behavior if bit40007.0=1: 0=output is kept at the previous value; 1=bit40042.0 is overwritten on bit40005.0 and reg.00017 | | | 1 | Bit 0 |
| Errors Out1-8 safe values | / | Bit | R/W | | 40042 |
| | These bits aren't used | | | / | Bit [15:8] |
| | Output 8 safe value: 0; 1 | | | 0 | Bit 7 |
| | Output 7 safe value: 0; 1 | | | 0 | Bit 6 |
| | Output 6 safe value: 0; 1 | | | 0 | Bit 5 |
| | Output 5 safe value: 0; 1 | | | 0 | Bit 4 |
| | Output 4 safe value: 0; 1 | | | 0 | Bit 3 |
| | Output 3 safe value: 0; 1 | | | 0 | Bit 2 |
| | Output 2 safe value: 0; 1 | | | 0 | Bit 1 |
| | Output 1 safe value: 0; 1 | | | 0 | Bit 0 |

| State OUT1-OUT8 | | Bit | R/W | | 40005 |
|---|---|---|---|---|---|
| | These bits aren't used | | | / | Bit [15:8] |
| | Output OUT8 state: 0=LOAD8 is deactivated (there is no current through LOAD8); 1=LOAD8 is activated (there is current through LOAD8) | | | 0 | Bit 7 |
| | Output OUT7 state: 0=LOAD7 is deactivated (there is no current through LOAD7); 1=LOAD7 is activated (there is current through LOAD7) | | | 0 | Bit 6 |
| | Output OUT6 state: 0=LOAD6 is deactivated (there is no current through LOAD6); 1=LOAD6 is activated (there is current through LOAD6) | | | 0 | Bit 5 |
| | Output OUT5 state: 0=LOAD5 is deactivated (there is no current through LOAD5); 1=LOAD5 is activated (there is current through LOAD5) | | | 0 | Bit 4 |
| | Output OUT4 state: 0=LOAD4 is deactivated (there is no current through LOAD4); 1=LOAD4 is activated (there is current through LOAD4) | | | 0 | Bit 3 |
| | Output OUT3 state: 0=LOAD3 is deactivated (there is no current through LOAD3); 1=LOAD3 is activated (there is current through LOAD3) | | | 0 | Bit 2 |
| | Output OUT2 state: 0=LOAD2 is deactivated (there is no current through LOAD2); 1=LOAD2 is activated (there is current through LOAD2) | | | 0 | Bit 1 |
| | Output OUT1 state: 0=LOAD1 is deactivated (there is no current through LOAD1); 1=LOAD1 is activated (there is current through LOAD1) | | | 0 | Bit 0 |
| Timeout enabling | | Bit | R/W | | 40052 |
| | These bits aren't used | | | / | Bit [15:1] |
| | RS485-bus communication failure diagnostics: 0=deactivated; 1=activated | | | 0 | Bit 0 |

| | | | | | |
|---|---|---|---|---|---|
| Timeout | From 0x00=0 to 0xFF=255 (=25.5 sec) | Bit | R/W | | 40053 |
| | These bits aren't used | | | / | Bit [15:8] |
| | Timeout [sec/10] (if reg.40052 is "1"): it is the interval time of RS485-bus communication failure, after which the bit 40042.X is overwritten in the bit 40005.X (with X=0;7) | | | 100 (=10sec) | Bit [7:0] |

The «Coil Status»-type registers used for ZC-16DI-8DO module are shown in the following table:

| Name | Range | Interpretation of register | R/W | Default | Address |
|---|---|---|---|---|---|
| State IN1 | 0-1 | Bit | R | | 00001 |
| | IN1 state: 0=S1 open; 1=S1 closed | | | / | |
| State IN2 | 0-1 | Bit | R | | 00002 |
| | IN2 state: 0=S2 open; 1=S2 closed | | | / | |
| State IN3 | 0-1 | Bit | R | | 00003 |
| | IN3 state: 0=S3 open; 1=S3 closed | | | / | |
| State IN4 | 0-1 | Bit | R | | 00004 |
| | IN4 state: 0=S4 open; 1=S4 closed | | | / | |
| State IN5 | 0-1 | Bit | R | | 00005 |
| | IN5 state: 0=S5 open; 1=S5 closed | | | / | |
| State IN6 | 0-1 | Bit | R | | 00006 |
| | IN6 state: 0=S6 open; 1=S6 closed | | | / | |
| State IN7 | 0-1 | Bit | R | | 00007 |
| | IN7 state: 0=S7 open; 1=S7 closed | | | / | |
| State IN8 | 0-1 | Bit | R | | 00008 |
| | IN8 state: 0=S8 open; 1=S8 closed | | | / | |
| State IN9 | 0-1 | Bit | R | | 00009 |
| | IN9 state: 0=S9 open; 1=S9 closed | | | / | |
| State IN10 | 0-1 | Bit | R | | 00010 |
| | IN10 state: 0=S10 open; 1=S10 closed | | | / | |
| State IN11 | 0-1 | Bit | R | | 00011 |
| | IN11 state: 0=S11 open; 1=S11 closed | | | / | |
| State IN12 | 0-1 | Bit | R | | 00012 |
| | IN12 state: 0=S12 open; 1=S12 closed | | | / | |
| State IN13 | 0-1 | Bit | R | | 00013 |
| | IN13 state: 0=S13 open; 1=S13 closed | | | / | |
| State IN14 | 0-1 | Bit | R | | 00014 |
| | IN14 state: 0=S14 open; 1=S14 closed | | | / | |
| State IN15 | 0-1 | Bit | R | | 00015 |
| | IN15 state: 0=S15 open; 1=S15 closed | | | / | |
| State IN16 | 0-1 | Bit | R | | 00016 |
| | IN16 state: 0=S16 open; 1=S16 closed | | | / | |
| State OUT1 | 0-1 | Bit | R/W | | 00017 |
| | Output OUT1 state: 0=LOAD1 is deactivated (there is no current through LOAD1); 1=LOAD1 is activated (there is current through LOAD1) | | | 0 | |
| State OUT2 | 0-1 | Bit | R/W | | 00018 |
| | Output OUT2 state: 0=LOAD2 is deactivated (there is no current through LOAD2); 1=LOAD2 is activated (there is current through LOAD2) | | | 0 | |
| State OUT3 | 0-1 | Bit | R/W | | 00019 |
| | Output OUT3 state: 0=LOAD3 is deactivated (there is no current through LOAD3); 1=LOAD3 is activated (there is current through LOAD3) | | | 0 | |

| | | | | | |
|---|---|---|---|---|---|
| State OUT4 | 0-1 | Bit | R/W | | 00020 |
| | Output OUT4 state: 0=LOAD4 is deactivated (there is no current through LOAD4); 1=LOAD4 is activated (there is current through LOAD4) | | | 0 | |
| State OUT5 | 0-1 | Bit | R/W | | 00021 |
| | Output OUT5 state: 0=LOAD5 is deactivated (there is no current through LOAD5); 1=LOAD5 is activated (there is current through LOAD5) | | | 0 | |
| State OUT6 | 0-1 | Bit | R/W | | 00022 |
| | Output OUT6 state: 0=LOAD6 is deactivated (there is no current through LOAD6); 1=LOAD6 is activated (there is current through LOAD6) | | | 0 | |
| State OUT7 | 0-1 | Bit | R/W | | 00023 |
| | Output OUT7 state: 0=LOAD7 is deactivated (there is no current through LOAD7); 1=LOAD7 is activated (there is current through LOAD7) | | | 0 | |
| State OUT8 | 0-1 | Bit | R/W | | 00024 |
| | Output OUT8 state: 0=LOAD8 is deactivated (there is no current through LOAD8); 1=LOAD8 is activated (there is current through LOAD8) | | | 0 | |

## *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 | Constant light | The module received a data packet through RS232 port |
| | Blinking light | The module has at least one of the errors described in RS485 Registers table (at least one output over-temperature error or short-circuited) |
| 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 |
| 1-16 | Constant light | IN1-16 state equal to «1» |
| | No light | IN1-16 state equal to «0» (if the power is on) |
| 1O-8O | Constant light | OUT1-8 state equal to «1» |
| | No light | OUT1-8 state equal to «0» (if the power is on and the outputs are supplied) |

# Seneca Z-PC Line module: **Z-4AI**

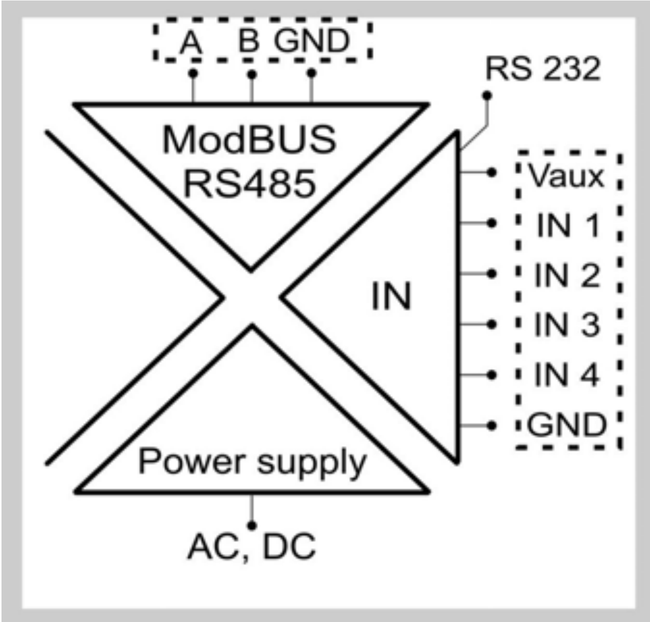
The Z-4AI module acquires up to 4 single-ended input signals (voltage or current type) and it converts them to a digital format (normalized measure).

## General characteristics

- It is possible to choose if each input is voltage or current type
- It is possible to enable/disable each input
- It is possible to change: the electrical start/end scale between ± 10 V, ± 20 mA, the normalized start/end scale between ± 32000
- Configuration of 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

## Features

| **INPUT** | |
|---|---|
| **Number** | 4 |
| **Resolution** | 16 bits (15+1 sign). If Electrical End-Scale (E.E.S.)<2V, resolution=60µV; se 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) |
| **RS232 interface** | Jack stereo 3.5mm connector: plugs into COM port |
| **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) |

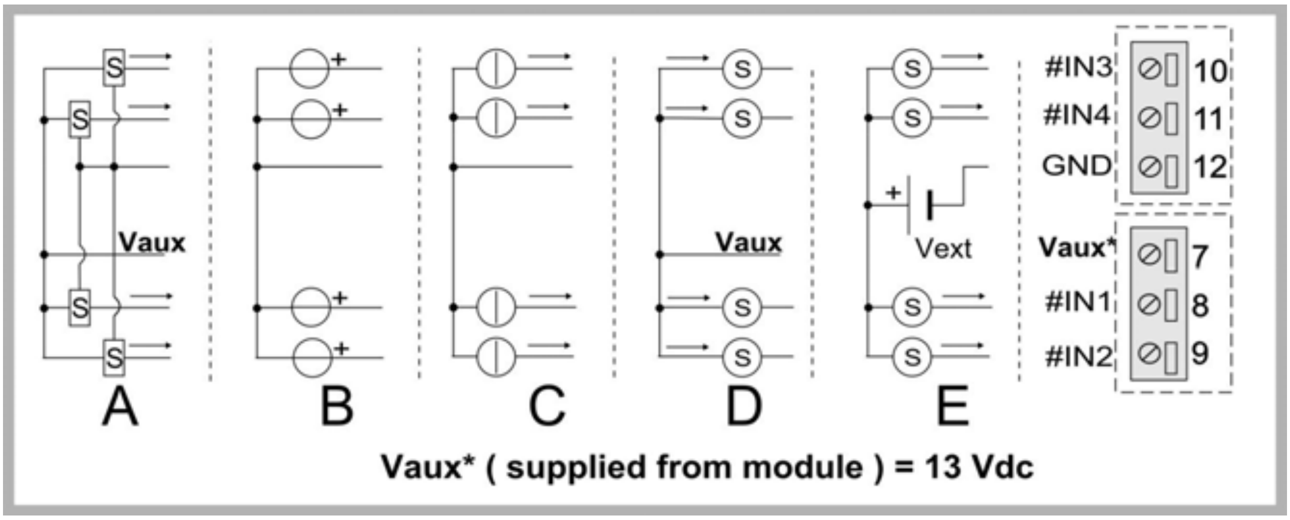
The power supply transformer necessary to supply the module must comply with EN60742 (Isolated transformers and safety transformers requirements). To protect the power supply, it is recommended to install a fuse.

## *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 supplied).

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 passive sensors | 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.**

## *Dip-switches table*

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: DIP-SWITCH STATUS) | | |
|---|---|---|
| 1 | 2 | Meaning |
| | | Baud-rate=9600 Baud |
| | ● | Baud-rate=19200 Baud |
| ● | | Baud-rate=38400 Baud |
| ● | ● | Baud-rate=57600 Baud |

| ADDRESS (Dip-Switches: DIP-SWITCH STATUS) | | | | | | |
|---|---|---|---|---|---|---|
| 3 | 4 | 5 | 6 | 7 | 8 | Meaning |
| | | | | | | **Address and Baud-Rate are acquired from memory(EEPROM)** |
| | | | | | ● | Address=1 |
| | | | | ● | | Address=2 |
| | | | | ● | ● | Address=3 |
| | | | ● | | | Address=4 |
| X | X | X | X | X | X | …………………… |
| ● | ● | ● | ● | ● | ● | Address=63 |

| RS485 TERMINATOR (Dip-Switches: DIP-SWITCH STATUS) | | |
|---|---|---|
| 9 | 10 | Meaning |
| | | RS485 terminator disabled |
| | ● | RS485 terminator enabled |

| INPUT TYPE (Dip-Switches: ANALOG INPUTS) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Meaning |
| | | | | | | | | IN 1=voltage |
| ● | | | | | | | | IN 1=current |
| | | | | | | | | IN 2=voltage |
| | ● | | | | | | | IN 2=current |
| | | | | | | | | IN 3=voltage |
| | | ● | | | | | | IN 3=current |
| | | | | | | | | IN 4=voltage |
| | | | ● | | | | | IN 4=current |

## *RS485 Register table*

| Name | Range | Interpretation of register | R/W | Default | Address |
|---|---|---|---|---|---|
| MachineID | / | MSB, LSB | R | | 40001 |
| | Id_Code (Module ID) | | | 0x07 | Bit [15:8] |
| | Ext_Rev (Module version) | | | | Bit [7:0] |
| FWREV | / | Word | R | | 40035 |
| | Firmware Code | | | | |
| Status | / | Bit | R/W | | 40016 |
| | Input 4 underflow: 0=there isn't; 1=there is | | | / | Bit 15 |
| | Input 4 overflow: 0=there isn't; 1=there is | | | / | Bit 14 |
| | Input 3 underflow: 0=there isn't; 1=there is | | | / | Bit 13 |
| | Input 3 overflow: 0=there isn't; 1=there is | | | / | Bit 12 |
| | Input 2 underflow: 0=there isn't; 1=there is | | | / | Bit 11 |
| | Input 2 overflow: 0=there isn't; 1=there is | | | / | Bit 10 |

| | | | | | |
|---|---|---|---|---|---|
| | Input 1 underflow: 0=there isn't; 1=there is | | | / | Bit 9 |
| | Input 1 overflow: 0=there isn't; 1=there is | | | / | Bit 8 |
| | Save configuration in memory (EEPROM): 0=deactivated; 1=activated | | | 0 | Bit 7 |
| | These bits aren't used | | | / | Bit [6:2] |
| | Reset of filter: 0=deactivated; 1=activated | | | 0 | Bit 1 |
| | Reset of module: 0=deactivated; 1=activated | | | 0 | Bit 0 |
| Errors | / | Bit | R | | 40036 |
| | These bits aren't used | | | / | Bit[15:10] |
| | Setting error (in memory): 0=there isn't; 1=there is | | | / | Bit 9 |
| | Calibration error (in memory): 0=there isn't;1=there is | | | / | Bit 8 |
| | These bits aren't used | | | / | Bit [7:1] |
| | ADC error: 0=there isn't; 1=there is | | | / | Bit 0 |
| Eprflag | / | MSB, LSB | R/W | | 40003 |
| | These bits aren't used | | | / | Bit [15:5] |
| | Parity for RS485: 0=even parity; 1=odd parity | | | 0 | Bit 4 |
| | Parity for RS485: 0=there isn't; 1=there is | | | 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 | | | 0 | Bit 2 |
| | Sampling time: 0=120 ms; 1=60 ms | | | 0 | Bit 1 |
| | Compatibility with: 0=Z-4AI-0; 1=Z-4AI-1 | | | 1 | Bit 0 |
| Baudrate Address | / | MSB, LSB | R/W | | 40002 |
| | 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 | | | 38400 | Bit [15:8] |
| | Address for RS485(address of module if parameters are configurated by memory modality):from 0x01=1 to 0xFF=255 | | | 1 | Bit [7:0] |
| INType | / | Bit | R/W | | 40025 |
| | These bits aren't used | | | / | Bit [15:4] |
| | Input 4-type: 0=voltage; 1=current | | | 0 | Bit 3 |
| | Input 3-type: 0=voltage; 1=current | | | 0 | Bit 2 |
| | Input 2-type: 0=voltage; 1=current | | | 0 | Bit 1 |
| | Input 1-type: 0=voltage; 1=current | | | 0 | Bit 0 |
| **INPUT 1** | | | | | |
| IN 1 | Between: IN 1-NSS, IN 1-NES (if bit 40003.0=0); unchangeable between: 0,10000 (if bit40003.0=1) | Word | R | | 40017 |
| | Normalized measure of input 1 | | | / | |
| IN1-FILTER | Between: 0, 6 | Word | R/W | | 40004 |
| | Filter applied to input 1 signal: 0=deactivated; 1=filtering min-value; 6=filtering max-value | | | 0 | |
| IN 1-ESS | ±10000 [mV] (if voltage), ±20000 [µA] (if current) | Word | R/W | | 40012 |
| | Electrical Start Scale (E.S.S.) of input 1 [mV or µA] | | | 0 [mV] | |
| IN 1-EES | ±10000 [mV] (if voltage), ±20000 [µA] (if current) | Word | R/W | | 40008 |
| | Electrical End Scale (E.E.S.) of input 1 [mV or µA] | | | 10000 [mV] | |
| IN 1-NSS | ±32000 | Word | R/W | | 40030 |
| | Normalized Start Scale (N.S.S.) of input 1 | | | 0 | |
| IN 1-NES | ±32000 | Word | R/W | | 40026 |
| | Normalized End Scale (N.E.S.) of input 1 | | | 10000 | |

| | | | | | |
|---|---|---|---|---|---|
| | **INPUT 2** | | | | |
| IN 2 | Between: IN 2-NSS, IN 2-NES (if bit 40003.0=0); unchangeable between: 0,10000 (if bit40003.0=1) | Word | R | | 40018 |
| | Normalized measure of input 2 | | | | |
| IN2-FILTER | Between: 0, 6 | Word | R/W | | 40005 |
| | Filter applied to input 2 signal: 0=deactivated; 1=filtering min-value; 6=filtering max-value | | | / | |
| IN 2-ESS | ±10000 [mV] (if voltage), ±20000 [µA] (if current) | Word | R/W | | 40013 |
| | Electrical Start Scale (E.S.S.) of input 2 [mV or µA] | | | 0 [mV] | |
| IN 2-EES | ±10000 [mV] (if voltage), ±20000 [µA] (if current) | Word | R/W | | 40009 |
| | Electrical End Scale (E.E.S.) of input 2 [mV or µA] | | | 10000 [mV] | |
| IN 2-NSS | ±32000 | Word | R/W | | 40031 |
| | Normalized Start Scale (N.S.S.) of input 2 | | | 0 | |
| IN 2-NES | ±32000 | Word | R/W | | 40027 |
| | Normalized End Scale (N.E.S.) of input 2 | | | 10000 | |
| | **INPUT 3** | | | | |
| IN 3 | Between: IN 3-NSS, IN 3-NES (if bit 40003.0=0); unchangeable between: 0,10000 (if bit40003.0=1) | Word | R | | 40019 |
| | Normalized measure of input 3 | | | | |
| IN3-FILTER | Between: 0, 6 | Word | R/W | | 40006 |
| | Filter applied to input 3 signal: 0=deactivated; 1=filtering min-value; 6=filtering max-value | | | / | |
| IN 3-ESS | ±10000 [mV] (if voltage), ±20000 [µA] (if current) | Word | R/W | | 40014 |
| | Electrical Start Scale (E.S.S.) of input 3 [mV or µA] | | | 0 [mV] | |
| IN 3-EES | ±10000 [mV] (if voltage), ±20000 [µA] (if current) | Word | R/W | | 40010 |
| | Electrical End Scale (E.E.S.) of input 3 [mV or µA] | | | 10000 [mV] | |
| IN 3-NSS | ±32000 | Word | R/W | | 40032 |
| | Normalized Start Scale (N.S.S.) of input 3 | | | 0 | |
| IN 3-NES | ±32000 | Word | R/W | | 40028 |
| | Normalized End Scale (N.E.S.) of input 3 | | | 10000 | |
| | **INPUT 4** | | | | |
| IN 4 | Between: IN 4-NSS, IN 4-NES (if bit 40003.0=0); unchangeable between: 0,10000 (if bit40003.0=1) | Word | R | | 40020 |
| | Normalized measure of input 4 | | | | |
| IN4-FILTER | Between: 0, 6 | Word | R/W | | 40007 |
| | Filter applied to input 4 signal: 0=deactivated; 1=filtering min-value; 6=filtering max-value | | | / | |
| IN 4-ESS | ±10000 [mV] (if voltage), ±20000 [µA] (if current) | Word | R/W | | 40015 |
| | Electrical Start Scale (E.S.S.) of input 4 [mV or µA] | | | 0 [mV] | |
| IN 4-EES | ±10000 [mV] (if voltage), ±20000 [µA] (if current) | Word | R/W | | 40011 |
| | Electrical End Scale (E.E.S.) of input 4 [mV or µA] | | | 10000 [mV] | |
| IN 4-NSS | ±32000 | Word | R/W | | 40033 |
| | Normalized Start Scale (N.S.S.) of input 4 | | | 0 | |
| IN 4-NES | ±32000 | Word | R/W | | 40029 |
| | Normalized End Scale (N.E.S.) of input 4 | | | 10000 | |

## LEDs 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 |

# Seneca Z-PC Line module: **Z-8AI**

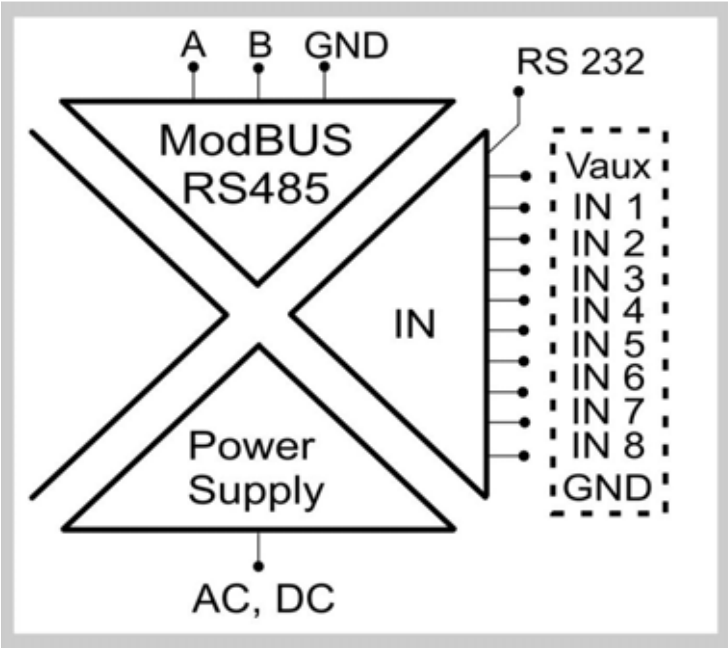
The Z-8AI module acquires up to 8 single-ended input signals (voltage or current type) and it converts them to a digital format (normalized measure).

## General characteristics

- It is possible to choose if each input is voltage or current type
- It is possible to enable/disable each input
- It is possible to change: the electrical start/end scale between ± 10 V, ± 20 mA, the normalized start/end scale between ± 32000
- Configuration of 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

## Features

| | |
|---|---|
| **INPUT** | |
| **Number** | 8 |
| **Resolution** | 16 bits (15+1 sign). If Electrical End-Scale (E.E.S.)<2.5V, resolution=80µV; se 2.5V<E.E.S.<10V, resolution=300µV |
| **Sampling time** | Configurable between: 10, 20, 40 or 120 ms |
| **Accuracy** | Initial: 0.1% of E.E.S.. If E.E.S.<2.5V, accuracy=2.5mV; if 2.5V<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 #4 and #7 screw terminals: power 13V to max180mA (figure10) |
| **CONNECTIONS** | |
| **RS485 interface** | IDC10 connector |
| **RS232 interface** | Jack stereo 3.5mm connector: plugs into COM port |
| **1500 Vac ISOLATIONS** | |
| | Between: power supply, ModBUS RS485, analog inputs |




| POWER SUPPLY | |
|---|---|
| **Supply voltage** | 10 – 40 Vdc or 19 – 28 Vac ( 50Hz - 60Hz) |
| **Power consumption** | Min: 0.5W; Max: 3.5W (to power 8 current loop) |

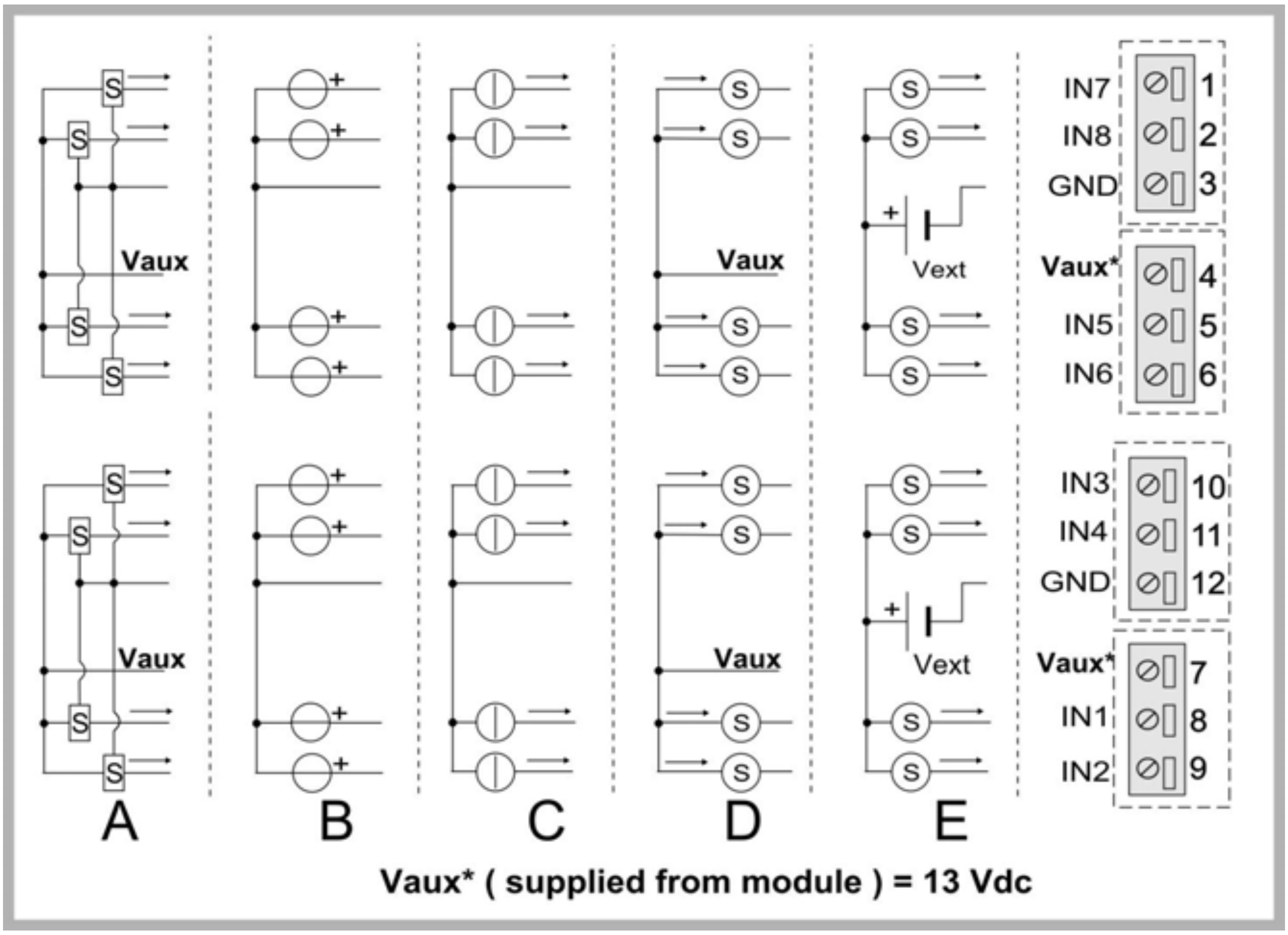
The power supply transformer necessary to supply the module must comply with EN60742 (Isolated transformers and safety transformers requirements). To protect the power supply, it is recommended to install a fuse.

## *Input connections*

It is possible to connect to the Z-8AI module two types of sensors:

- **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 supplied).

In the following figure are shown five possible sensor connections.




| | Acquired signal | Up to | Connection modality | Sensors power supply |
|---|---|---|---|---|
| **A** | Voltage or current type | 8 passive sensors | 3-wire | Vaux (*) |
| **B** | Voltage type | 8 sensors as voltage generator | 2-wire | / |
| **C** | Current type | 8 sensors as current generator | 2-wire | / |
| **D** | Current-active type | 8 passive sensors | 2-wire | Vaux (*) |
| **E** | Current-passive type | 8 passive sensors | 2-wire | Vext (connect "-" to GND) |

(*) **A and D connections are possible only if the absorbed currents sum from all sensors: <180mA.**

## *Dip-switches table*

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: DIP-SWITCH STATUS)** | | |
|---|---|---|
| 1 | 2 | Meaning |
| | | Baud-rate=9600 Baud |
| | ● | Baud-rate=19200 Baud |
| ● | | Baud-rate=38400 Baud |
| ● | ● | Baud-rate=57600 Baud |

| **ADDRESS (Dip-Switches: DIP-SWITCH STATUS)** | | | | | | |
|---|---|---|---|---|---|---|
| 3 | 4 | 5 | 6 | 7 | 8 | Meaning |
| | | | | | | **Address and Baud-Rate are acquired from memory(EEPROM)** |
| | | | | | ● | Address=1 |
| | | | | ● | | Address=2 |
| | | | | ● | ● | Address=3 |
| | | | ● | | | Address=4 |
| X | X | X | X | X | X | …………………… |
| ● | ● | ● | ● | ● | ● | Address=63 |

| **RS485 TERMINATOR (Dip-Switches: DIP-SWITCH STATUS)** | | |
|---|---|---|
| 9 | 10 | Meaning |
| | | RS485 terminator disabled |
| | ● | RS485 terminator enabled |

| **INPUT TYPE (Dip-Switches: ANALOG INPUTS)** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Meaning |
| | | | | | | | | IN 1=voltage |
| ● | | | | | | | | IN 1=current |
| | | | | | | | | IN 2=voltage |
| | ● | | | | | | | IN 2=current |
| | | | | | | | | IN 3=voltage |
| | | ● | | | | | | IN 3=current |
| | | | | | | | | IN 4=voltage |
| | | | ● | | | | | IN 4=current |

| **INPUT TYPE (Dip-Switches: ANALOG INPUTS)** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Meaning |
| | | | | | | | | IN 5=voltage |
| | | | | ● | | | | IN 5=current |
| | | | | | | | | IN 6=voltage |
| | | | | | ● | | | IN 6=current |
| | | | | | | | | IN 7=voltage |
| | | | | | | ● | | IN 7=current |
| | | | | | | | | IN 8=voltage |
| | | | | | | | ● | IN 8=current |

# *RS485 Register table*

| Name | Range | Interpretation of register | R/W | Default | Address |
|---|---|---|---|---|---|
| MachineID | / | MSB, LSB | R | | 40001 |
| | Id_Code (Module ID) | | | 0x0E | Bit [15:8] |
| | Ext_Rev (Module version) | | | | Bit [7:0] |
| FWREV | / | Word | R | | 40062 |
| | Firmware Code | | | | |
| Status | / | Bit | R/W | | 40002 |
| | Generic error: 0=there isn't; 1=there is | | | / | Bit 15 |
| | Configuration error: 0=there isn't; 1=there is | | | / | Bit 14 |
| | Memory error (EEPROM): 0=there isn't; 1=there is | | | / | Bit 13 |
| | Save configuration in memory (EEPROM): 0=deactivated; 1=activated | | | / | Bit 12 |
| | These bits aren't used | | | / | Bit [11:9] |
| | Reset of module: 0=deactivated; 1=activated | | | / | Bit 8 |
| | These bits aren't used | | | / | Bit [7:0] |
| Errors | / | Bit | R | | 40063 |
| | These bits aren't used | | | / | Bit[15:10] |
| | Setting error (in memory): 0=there isn't; 1=there is | | | / | Bit 9 |
| | Calibration error (in memory): 0=there isn't;1=there is | | | / | Bit 8 |
| | These bits aren't used | | | / | Bit [7:1] |
| | ADC error: 0=there isn't; 1=there is | | | / | Bit 0 |
| Address Parity | / | MSB, LSB | R/W | | 40012 |
| | Address for RS485 (address of module/node if parameters are configurated by memory modality): from 0x01=1 to 0xFF=255 | | | 1 | Bit [15:8] |
| | Parity for RS485: 0=there isn't; 1=even parity; 2=odd parity | | | 0 | Bit [7:0] |
| Baudrate Delay | / | MSB, LSB | R/W | | 40013 |
| | 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 | | | 38400 | Bit [15:8] |
| | Delay for RS485 (delay of communication response: it represents the number of the pauses(*) between the end of Rx message and the start of Tx message): from 0x00=0 to 0xFF=255<br>(*)1 pause=6 characters | | | 0 | Bit [7:0] |
| **INPUT 1** | | | | | |
| IN1 | Between: IN 1-NSS, IN 1-NES | Word | R | | 40003 |
| | Normalized measure of input 1 | | | / | |
| IN 1-ESS | ±10000 [mV] (if voltage), ±20000 [µA] (if current) | Word | R/W | | 40014 |
| | Electrical Start Scale (E.S.S.) of input 1 [mV or µA] | | | 0 [mV] | |

| | | | | | |
|---|---|---|---|---|---|
| IN 1-EES | ±10000 [mV] (if voltage), ±20000 [µA] (if current) | Word | R/W | | 40015 |
| | Electrical End Scale (E.E.S.) of input 1 [mV or µA] | | | 10000 [mV] | |
| IN 1-NSS | ±32000 | Word | R/W | | 40016 |
| | Normalized Start Scale (N.S.S.) of input 1 | | | 0 | |
| IN 1-NES | ±32000 | Word | R/W | | 40017 |
| | Normalized End Scale (N.E.S.) of input 1 | | | 10000 | |
| IN 1-FLAGS | / | Bit | R/W | | 40019 |
| | These bits aren't used | | | / | Bit [15:8] |
| | Input enabling: 0=deactivated; 1=activated | | | 1 | Bit 7 |
| | These bits aren't used | | | / | Bit [6:4] |
| | Sampling time: 0b00=10 ms; 0b01=30 ms; 0b10=40 ms; 0b11=120 ms | | | 10 [ms] | Bit [3:2] |
| | This bit isn't used | | | / | Bit 1 |
| | Acquired-input type: 0=voltage; 1=current | | | 0 | Bit 0 |
| **INPUT 2** | | | | | |
| IN 2 | Between: IN 2-NSS, IN 2-NES | Word | R | | 40004 |
| | Normalized measure of input 2 | | | / | |
| IN 2-ESS | ±10000 [mV] (if voltage), ±20000 [µA] (if current) | Word | R/W | | 40020 |
| | Electrical Start Scale (E.S.S.) of input 2 [mV or µA] | | | 0 [mV] | |
| IN 2-EES | ±10000 [mV] (if voltage), ±20000 [µA] (if current) | Word | R/W | | 40021 |
| | Electrical End Scale (E.E.S.) of input 2 [mV or µA] | | | 10000 [mV] | |
| IN 2-NSS | ±32000 | Word | R/W | | 40022 |
| | Normalized Start Scale (N.S.S.) of input 2 | | | 0 | |
| IN 2-NES | ±32000 | Word | R/W | | 40023 |
| | Normalized End Scale (N.E.S.) of input 2 | | | 10000 | |
| IN 2-FLAGS | / | Bit | R/W | | 40025 |
| | See IN 1-FLAGS register (40019) | | | / | |
| **INPUT 3** | | | | | |
| IN 3 | Between: IN 3-NSS, IN 3-NES | Word | R | | 40005 |
| | Normalized measure of input 3 | | | / | |
| IN 3-ESS | ±10000 [mV] (if voltage), ±20000 [µA] (if current) | Word | R/W | | 40026 |
| | Electrical Start Scale (E.S.S.) of input 3 [mV or µA] | | | 0 [mV] | |
| IN 3-EES | ±10000 [mV] (if voltage), ±20000 [µA] (if current) | Word | R/W | | 40027 |
| | Electrical End Scale (E.E.S.) of input 3 [mV or µA] | | | 10000 [mV] | |
| IN 3-NSS | ±32000 | Word | R/W | | 40028 |
| | Normalized Start Scale (N.S.S.) of input 3 | | | 0 | |
| IN 3-NES | ±32000 | Word | R/W | | 40029 |
| | Normalized End Scale (N.E.S.) of input 3 | | | 10000 | |
| IN 3-FLAGS | / | Bit | R/W | | 40031 |
| | See IN 1-FLAGS register (40019) | | | / | |
| **INPUT 4** | | | | | |
| IN 4 | Between: IN 4-NSS, IN 4-NES | Word | R | | 40006 |
| | Normalized measure of input 4 | | | / | |
| IN 4-ESS | ±10000 [mV] (if voltage), ±20000 [µA] (if current) | Word | R/W | | 40032 |
| | Electrical Start Scale (E.S.S.) of input 4 [mV or µA] | | | 0 [mV] | |

| | | | | | |
|---|---|---|---|---|---|
| IN 4-EES | ±10000 [mV] (if voltage), ±20000 [µA] (if current) | Word | R/W | | 40033 |
| | Electrical End Scale (E.E.S.) of input 4 [mV or µA] | | | 10000 [mV] | |
| IN 4-NSS | ±32000 | Word | R/W | | 40034 |
| | Normalized Start Scale (N.S.S.) of input 4 | | | 0 | |
| IN 4-NES | ±32000 | Word | R/W | | 40035 |
| | Normalized End Scale (N.E.S.) of input 4 | | | 10000 | |
| IN 4-FLAGS | / | Bit | R/W | | 40037 |
| | See IN 1-FLAGS register (40019) | | | / | |
| **INPUT 5** | | | | | |
| IN 5 | Between: IN 5-NSS, IN 5-NES | Word | R | | 40007 |
| | Normalized measure of input 5 | | | / | |
| IN 5-ESS | ±10000 [mV] (if voltage), ±20000 [µA] (if current) | Word | R/W | | 40038 |
| | Electrical Start Scale (E.S.S.) of input 5 [mV or µA] | | | 0 [mV] | |
| IN 5-EES | ±10000 [mV] (if voltage), ±20000 [µA] (if current) | Word | R/W | | 40039 |
| | Electrical End Scale (E.E.S.) of input 5 [mV or µA] | | | 10000 [mV] | |
| IN 5-NSS | ±32000 | Word | R/W | | 40040 |
| | Normalized Start Scale (N.S.S.) of input 5 | | | 0 | |
| IN 5-NES | ±32000 | Word | R/W | | 40041 |
| | Normalized End Scale (N.E.S.) of input 5 | | | 10000 | |
| IN 5-FLAGS | / | Bit | R/W | | 40043 |
| | See IN 1-FLAGS register (40019) | | | / | |
| **INPUT 6** | | | | | |
| IN 6 | Between: IN 6-NSS, IN 6-NES | Word | R | | 40008 |
| | Normalized measure of input 6 | | | / | |
| IN 6-ESS | ±10000 [mV] (if voltage), ±20000 [µA] (if current) | Word | R/W | | 40044 |
| | Electrical Start Scale (E.S.S.) of input 6 [mV or µA] | | | 0 [mV] | |
| IN 6-EES | ±10000 [mV] (if voltage), ±20000 [µA] (if current) | Word | R/W | | 40045 |
| | Electrical End Scale (E.E.S.) of input 6 [mV or µA] | | | 10000 [mV] | |
| IN 6-NSS | ±32000 | Word | R/W | | 40046 |
| | Normalized Start Scale (N.S.S.) of input 6 | | | 0 | |
| IN 6-NES | ±32000 | Word | R/W | | 40047 |
| | Normalized End Scale (N.E.S.) of input 6 | | | 10000 | |
| IN 6-FLAGS | / | Bit | R/W | | 40049 |
| | See IN 1-FLAGS register (40019) | | | / | |
| **INPUT 7** | | | | | |
| IN 7 | Between: IN 7-NSS, IN 7-NES | Word | R | | 40009 |
| | Normalized measure of input 7 | | | / | |
| IN 7-ESS | ±10000 [mV] (if voltage), ±20000 [µA] (if current) | Word | R/W | | 40050 |
| | Electrical Start Scale (E.S.S.) of input 7 [mV or µA] | | | 0 [mV] | |
| IN 7-EES | ±10000 [mV] (if voltage), ±20000 [µA] (if current) | Word | R/W | | 40051 |
| | Electrical End Scale (E.E.S.) of input 7 [mV or µA] | | | 10000 [mV] | |
| IN 7-NSS | ±32000 | Word | R/W | | 40052 |
| | Normalized Start Scale (N.S.S.) of input 7 | | | 0 | |
| IN 7-NES | ±32000 | Word | R/W | | 40053 |
| | Normalized End Scale (N.E.S.) of input 7 | | | 10000 | |

| | | | | | |
|---|---|---|---|---|---|
| IN 7-FLAGS | / | Bit | R/W | | 40055 |
| | See IN 1-FLAGS register (40019) | | | / | |
| **INPUT 8** | | | | | |
| IN 8 | Between: IN 8-NSS, IN 8-NES | Word | R | | 40010 |
| | Normalized measure of input 8 | | | / | |
| IN 8-ESS | ±10000 [mV] (if voltage), ±20000 [µA] (if current) | Word | R/W | | 40056 |
| | Electrical Start Scale (E.S.S.) of input 8 [mV or µA] | | | 0 [mV] | |
| IN 8-EES | ±10000 [mV] (if voltage), ±20000 [µA] (if current) | Word | R/W | | 40057 |
| | Electrical End Scale (E.E.S.) of input 8 [mV or µA] | | | 10000 [mV] | |
| IN 8-NSS | ±32000 | Word | R/W | | 40058 |
| | Normalized Start Scale (N.S.S.) of input 8 | | | 0 | |
| IN 8-NES | ±32000 | Word | R/W | | 40059 |
| | Normalized End Scale (N.E.S.) of input 8 | | | 10000 | |
| IN 8-FLAGS | / | Bit | R/W | | 40061 |
| | See IN 1-FLAGS register (40019) | | | / | |

## *LEDs 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 |

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

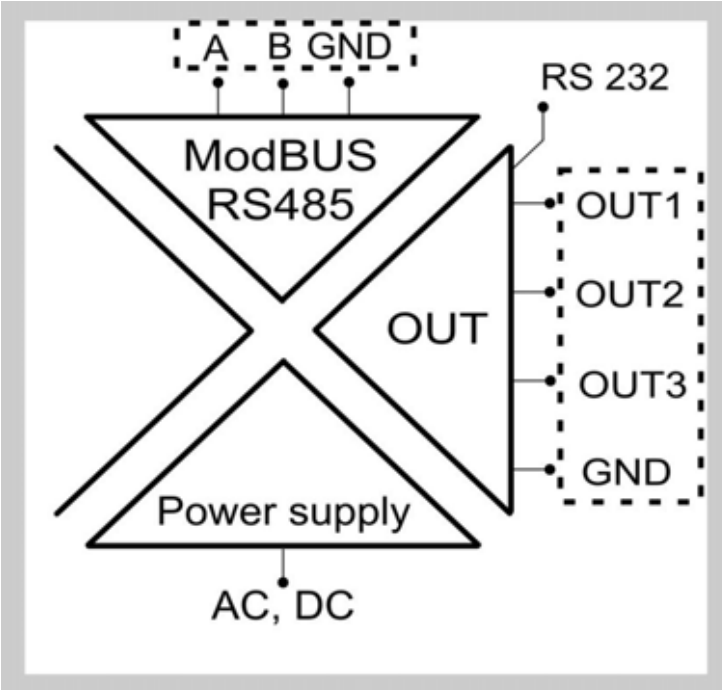
The Z-3AO module supplies 3 single-ended analog signals (voltage or current type).

## General characteristics

- It is possible to choose if each output is voltage or current type
- It is possible to change the electrical start/end scale between ± 10 V, 0-20 mA
- It's possible to manage the electrical values (for each output) if the interval time of RS485-bus communication failure is greater than a configurable time (see Timeout register)
- Output protection against the overvoltage surge transients and short-circuits
- Configuration of the module (node) address, baud-rate and output-type (voltage or current) 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

## Features

| **OUTPUT** | |
|---|---|
| **Number** | 3 |
| **Resolution** | 12 bit. If output is voltage-type, resolution=5mV; if output is current-type, resolution=5µA |
| **Response time** | < 50 ms (step response, 10%-90%) |
| **Accuracy** | Initial: 0.1% of Electrical End Scale (E.E.S.) |
| | Linearity: 0.05% of E.E.S. |
| | Calibration: 0.2% of E.E.S. |
| | Thermal stability: 0.01%/°C |
| | EMI: < 1% |
| **Protection** | Protection against the overvoltage surge transients by transient suppressor (400W/ms); protection against the output short-circuits by internal series PTC |
| **Voltage-type OUT** | Bipolar with E.S.S./E.E.S.(Electrical Start/End Scale) configurable between: ± 10Vdc. Output impedance: > 600 Ω |
| **Current-type OUT** | Unipolar with E.S.S./E.E.S.(Electrical Start/End Scale) configurable between: 0-20mA. Output impedance: < 600 Ω |
| **Internal supply Vaux** | The #4 and #7 screw terminals: power 13V to max180mA |
| **CONNECTIONS** | |
| **RS485 interface** | IDC10 connector for DIN 46277 rail (back-side panel) or (alternative) the screw terminals: 4(GND), 5(B), 6(A) |
| **RS232 interface** | Jack stereo 3.5mm connector:plugs into COMport(front-side panel) |
| **1500 Vac ISOLATIONS** | |
| | Between: power supply, ModBUS RS485, analog output |

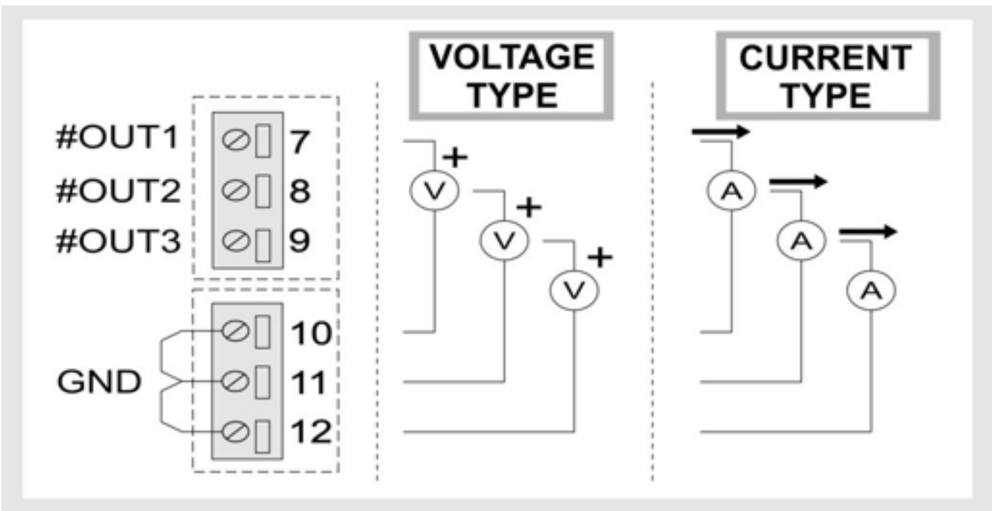



| POWER SUPPLY | |
|---|---|
| **Supply voltage** | 10 – 40 Vdc or 19 – 28 Vac ( 50Hz - 60Hz) |
| **Power consumption** | Min: 0.5W;  Max: 3.2W |

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.

## *Output connections*

The 3 analog outputs (voltage or current type) are avaliable at the screw terminals 7, 8, 9 and their refer to the equipotential screw terminals 10, 11, 12 (GND) (connected internally).



## Dip-switches table

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: DIP-SWITCH STATUS) | | |
|---|---|---|
| 1 | 2 | Meaning |
| | | Baud-rate=9600 Baud |
| | ● | Baud-rate=19200 Baud |
| ● | | Baud-rate=38400 Baud |
| ● | ● | Baud-rate=57600 Baud |

| ADDRESS (Dip-Switches: DIP-SWITCH STATUS) | | | | | | |
|---|---|---|---|---|---|---|
| 3 | 4 | 5 | 6 | 7 | 8 | Meaning |
| | | | | | | **Address and Baud-Rate are acquired from memory(EEPROM)** |
| | | | | | ● | Address=1 |
| | | | | ● | | Address=2 |
| | | | | ● | ● | Address=3 |
| | | | ● | | | Address=4 |
| X | X | X | X | X | X | …………………… |
| ● | ● | ● | ● | ● | ● | Address=63 |

| RS485 TERMINATOR (Dip-Switch: TERM) | |
|---|---|
| 1 | Meaning |
| | RS485 terminator disabled |
| ● | RS485 terminator enabled |

| OUTPUT TYPE (Dip-Switches: ANALOG OUTPUT) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | Meaning | 1 | 2 | 3 | Meaning | 1 | 2 | 3 | Meaning |
| | | | OUT1=voltage | | | | OUT2=voltage | | | | OUT3=voltage |
| ● | | | OUT1=current | | ● | | OUT2=current | | | ● | OUT3=current |

## RS485 Register table

| Name | Range | Interpretation of register | R/W | Default | Address |
|---|---|---|---|---|---|
| MachineID | / | MSB, LSB | R | | 40001 |
| | Id_Code (Module ID) | | | 0x0F (=15 decimal) | Bit [15:8] |
| | Ext_Rev (Module version) | | | | Bit [7:0] |
| FWREV | / | Word | R | | 40011 |
| | Firmware Code | | | | |
| Errors | / | Bit | R | | 40008 |
| | These bits aren't used | | | / | Bit [15:5] |
| | Memory loss of data (in EEPROM): 0=there isn't;1=there is | | | / | Bit 4 |
| | This bit isn't used | | | / | Bit 3 |

| | | | | | |
|---|---|---|---|---|---|
| | Fault error (there is if the interval time of RS485-bus communication failure is greater than Timeout/10 [sec]): 0=there isn't; 1=there is | | | / | Bit 2 |
| | These bits aren't used | | | / | Bit [1:0] |
| Eprflag | / | Bit | R/W | | 40004 |
| | These bits aren't used | | | / | Bit[15:8] |
| | Module behavior if there is a fault error: 0=no operation; 1=the module overwrites the content of the register: 40069 in 40005, 40070 in 40006, 40071 in 40007). See register 40003 | | | 0 | Bit 7 |
| | These bits aren't used | | | / | Bit [6:5] |
| | Parity for RS485: 0=even parity; 1=odd parity | | | 0 | Bit 4 |
| | Parity for RS485: 0=deactivated; 1=activated | | | 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 | | | 0 | Bit 2 |
| | These bits aren't used | | | / | Bit [1:0] |
| Baudrate Address | Address: from 0x01=1 to 0xFF=255 | MSB, LSB | R/W | | 40002 |
| | 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 | | | 38400 | Bit [15:8] |
| | Address for RS485 (address of module if parameters are configurated by memory modality) | | | 1 | Bit [7:0] |
| Command | 0xBAB0, 0xCAC0, 0xC1A0 | Word | R/W | | 40009 |
| | Save configuration in memory (EEPROM), if reg.40009=0xBAB0<br>The module writes the Dip-Switches-state in reg.40010, if reg.40009=0xCAC0<br>Module reset, if reg.40009=0xC1A0 | | | 0 | |
| Command aux | | Bit | R | | 40010 |
| | These bits aren't used | | | / | Bit [15:11] |
| | Dip-Switch "Analog Output 3" state. It corresponds to the selected output3-type. Bit40010.10=0 corresponds to the current-type output, bit40010.10=1 corresponds to the voltage-type output (if reg.40009=0xCAC0) | | | / | Bit 10 |
| | Dip-Switch "Analog Output 2" state. It corresponds to the selected output2-type. Bit40010.9=0 corresponds to the current-type output, bit40010.9=1 corresponds to the voltage-type output (if reg.40009=0xCAC0) | | | / | Bit 9 |
| | Dip-Switch "Analog Output 1" state. It corresponds to the selected output1-type. Bit40010.8=0 corresponds to the current-type output, bit40010.8=1 corresponds to the voltage-type output (if reg.40009=0xCAC0) | | | / | Bit 8 |
| | Dip-Switches "DipSwitchStatus [1:2]" state. They correspond to the module baud-rate (if reg.40009=0xCAC0) | | | / | Bit [7:6] |
| | Dip-Switches "DipSwitchStatus [3:8]" state. They correspond to the module address (if reg.40009=0xCAC0) | | | / | Bit [5:0] |
| Timeout | Between: 10(=1msec); 2500(=250msec) | Word | R/W | | 40003 |
| | Timeout [sec/10] (if bit40004.7=1: it is interval time of RS485-bus communication failure, after which the bit40008.2 switches to 1 and the module overwrites the content of the register: 40069 in 40005, 40070 in 40006, 40071 in 40007) | | | 100 (=10sec) | |

| | | | | | |
|---|---|---|---|---|---|
| **OUTPUT 1** | | | | | |
| OUT1 | Between:-10000; 10000 (if voltage), 0;10000 (if current) | Word | R/W | | 40005 |
| | Normalized value of output1. The corresponding electric value is the voltage or current-type value available at the screw terminals 7-GND (see figure 1 and 2) | | | OUT1 Fault | |
| OUT1-mV 0 | Between: -11000[mV]; +11000[mV] | Word | R/W | | 40012 |
| | Electrical value of output 1 [mV] corresponding to the normalized value OUT1=0 (if output 1 is voltage-type) (see figure 1 and 2) | | | 0 [mV] | |
| OUT1-mV 10000 | Between: -11000[mV]; +11000[mV] | Word | R/W | | 40013 |
| | Electrical value of output 1 [mV] corresponding to the normalized value OUT1=10000 (if output 1 is voltage-type). This value coincides with the Electrical End Scale (E.E.S.) of the output1 (see figure 1 and 2) | | | 10000 [mV] | |
| OUT1-µA 0 | Between: 0[µA]; +22000[µA] | Word | R/W | | 40018 |
| | Electrical value 1 [µA] corresponding to the normalized value OUT1=0 (if output 1 is current-type) (see figure 1 and 2) | | | 4000 [µA] | |
| OUT1-µA 10000 | Between: 0[µA]; +22000[µA] | Word | R/W | | 40019 |
| | Electrical value 1 [µA] corresponding to the normalized value OUT1=10000 (if output 1 is current-type). This value coincides with the Electrical End Scale (E.E.S.) of the output1 (see figure 1 and 2) | | | 20000 [µA] | |
| OUT1 Fault | Between:-10000; 10000 (if voltage), 0;10000 (if current) | Word | R/W | | 40069 |
| | Normalized fault value of output 1. The corresponding electric value is the voltage or current-type value available at the screw terminals 7-GND (see figure 1 and 2). This register is overwritten in the reg.40005: if the module is connected to the RS485 bus communication (to initialize it) or if: bit 40008.2=1 and bit40004.7=1 | | | 0 | |
| **OUTPUT 2** | | | | | |
| OUT2 | Between:-10000; 10000 (if voltage), 0;10000 (if current) | Word | R/W | | 40006 |
| | Normalized value of output2. The corresponding electric value is the voltage or current-type value available at the screw terminals 8-GND (see figure 1 and 2) | | | OUT1 Fault | |
| OUT2-mV 0 | Between: -11000[mV]; +11000[mV] | Word | R/W | | 40014 |
| | Electrical value of the output 2 [mV] corresponding to the normalized value OUT2=0 (if output 2 is voltage-type) (see figure 1 and 2) | | | 0[mV] | |
| OUT2-mV 10000 | Between: -11000[mV]; +11000[mV] | Word | R/W | | 40015 |
| | Electrical value of output 2 [mV] corresponding to the normalized value OUT2=10000 (if output 2 is voltage-type). This value coincides with the Electrical End Scale (E.E.S.) of the output1 (see figure 1 and 2) | | | 10000 [mV] | |
| OUT2-µA 0 | Between: 0[µA]; +22000[µA] | Word | R/W | | 40020 |
| | Electrical value 2 [µA] corresponding to the normalized value OUT2=0 (if output 2 is current-type) (see figure 1 and 2) | | | 4000 [µA] | |

| | | | | | |
|---|---|---|---|---|---|
| OUT2-µA 10000 | Between: 0[µA]; +22000[µA] | Word | R/W | | 40021 |
| | Electrical value 2 [µA] corresponding to the normalized value OUT2=10000 (if output 2 is current-type). This value coincides with the Electrical End Scale (E.E.S.) of the output2 (see figure 1 and 2) | | | 20000 [µA] | |
| OUT2 Fault | Between: -10000; 10000 (if voltage), 0;10000 (if current) | Word | R/W | | 40070 |
| | Normalized fault value of output 2. The corresponding electric value is the voltage or current-type value available at the screw terminals 8-GND (see figure 1 and 2). This register is overwritten in the reg.40006: if the module is connected to the RS485 bus communication (to initialize it) or if: bit 40008.2=1 and bit40004.7=1 | | | 0 | |
| **OUTPUT3** | | | | | |
| OUT3 | Between:-10000; 10000 (if voltage), 0;10000 (if current) | Word | R/W | | 40007 |
| | Normalized value of output3. The corresponding electric value is the voltage or current-type value available at the screw terminals 9-GND (see figure 1 and 2) | | | OUT3 Fault | |
| OUT3-mV 0 | Between: -11000[mV]; +11000[mV] | Word | R/W | | 40016 |
| | Electrical value of the output 3 [mV] corresponding to the normalized value OUT3=0 (if output 3 is voltage-type) (see figure 1 and 2) | | | 0[mV] | |
| OUT3-mV 10000 | Between: -11000[mV]; +11000[mV] | Word | R/W | | 40017 |
| | Electrical value of output 3 [mV] corresponding to the normalized value OUT1=10000 (if output 3 is voltage-type). This value coincides with the Electrical End Scale (E.E.S.) of the output3 (see figure 1 and 2) | | | 10000 [mV] | |
| OUT3-µA 0 | Between: 0[µA]; +22000[µA] | Word | R/W | | 40022 |
| | Electrical value 3 [µA] corresponding to the normalized value OUT3=0 (if output 3 is current-type) (see figure 1 and 2) | | | 4000 [µA] | |
| OUT3-µA 10000 | Between: 0[µA]; +22000[µA] | Word | R/W | | 40023 |
| | Electrical value 3 [µA] corresponding to the normalized value OUT3=10000 (if output 3 is current-type). This value coincides with the Electrical End Scale (E.E.S.) of the output3 (see figure 1 and 2) | | | 20000 [µA] | |
| OUT3 Fault | Between:-10000; 10000 (if voltage), 0;10000 (if current) | Word | R/W | | 40071 |
| | Normalized fault value of output 3. The corresponding electric value is the voltage or current-type value available at the screw terminals 9-GND (see figure 1 and 2). This register is overwritten in the reg.40007: if the module is connected to the RS485 bus communication (to initialize it) or if: bit 40008.2=1 and bit40004.7=1 | | | 0 | |

**With reference to the output1 (and, in the same way, to the output2 and output3), the electrical value “OUT1-mV 0” (“OUT1-µA 0”) is NOT the Electrical Start Scale (E.S.S.), if output is voltage (current)-type. The Electrical Start Scale is the electrical value corresponding to the normalized value=-10000 (unchangeable).**

In the following lines is described the register configuration of the output1 to obtain the desired electrical value; the register configuration of the output 2 and 3 is similar.

To configure the analog output 1 in voltage (current)-type, execute the following operations:

1) configure the register “OUT1-mV 0” (“OUT1-µA 0”) corresponding to the normalized value=0 and “OUT1-mV 10000” (“OUT1-µA 10000”) corresponding to the normalized value=10000 (figure 1);
2) configure the register OUT1: it is the normalized value corresponding to the desired electrical value available at the screw terminals (mV or µA) (figure 1);

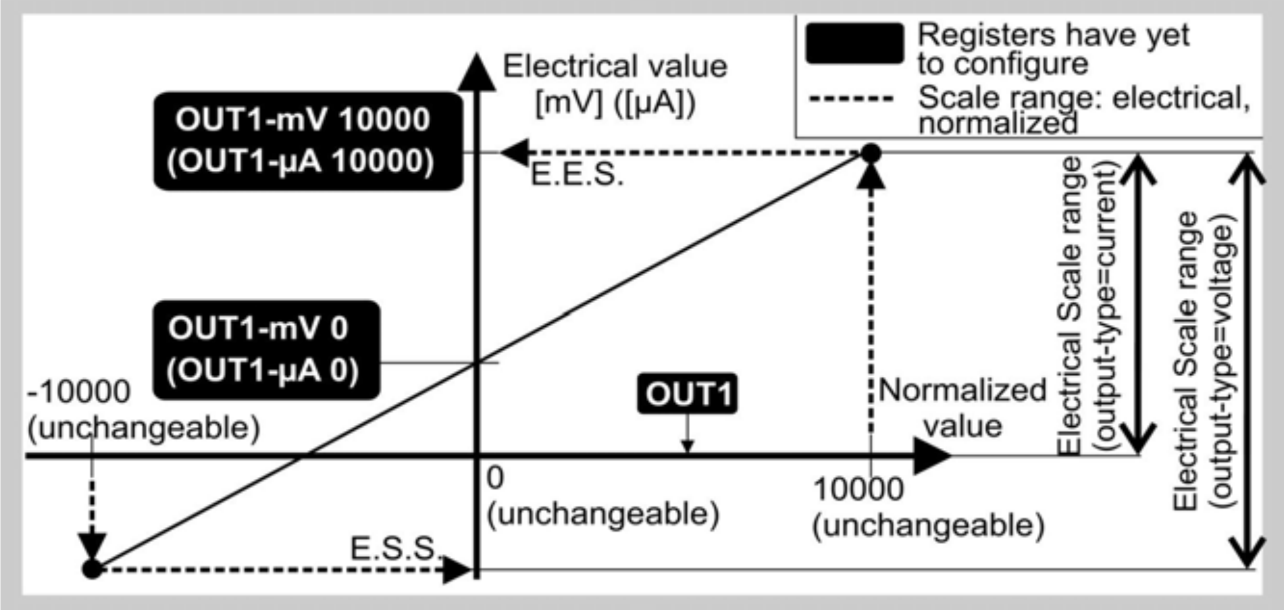



Fig.1 – Description of output configuration (step 1 and step 2)

The content of the register “OUT1-mV 10000” (“OUT1-µA 10000”) coincides with the Electrical End Scale (E.E.S.); the Electrical Start Scale (E.S.S.) is the electrical value corresponding to the normalized value=-10000, and it isn’t a register.

3) it’s possible to read the electrical value through the screw terminals (7-GND for output 1) corresponding to the normalized value=OUT1. If the output is current-type and if OUT1=[-10000;0], E.S.S.=0µA.

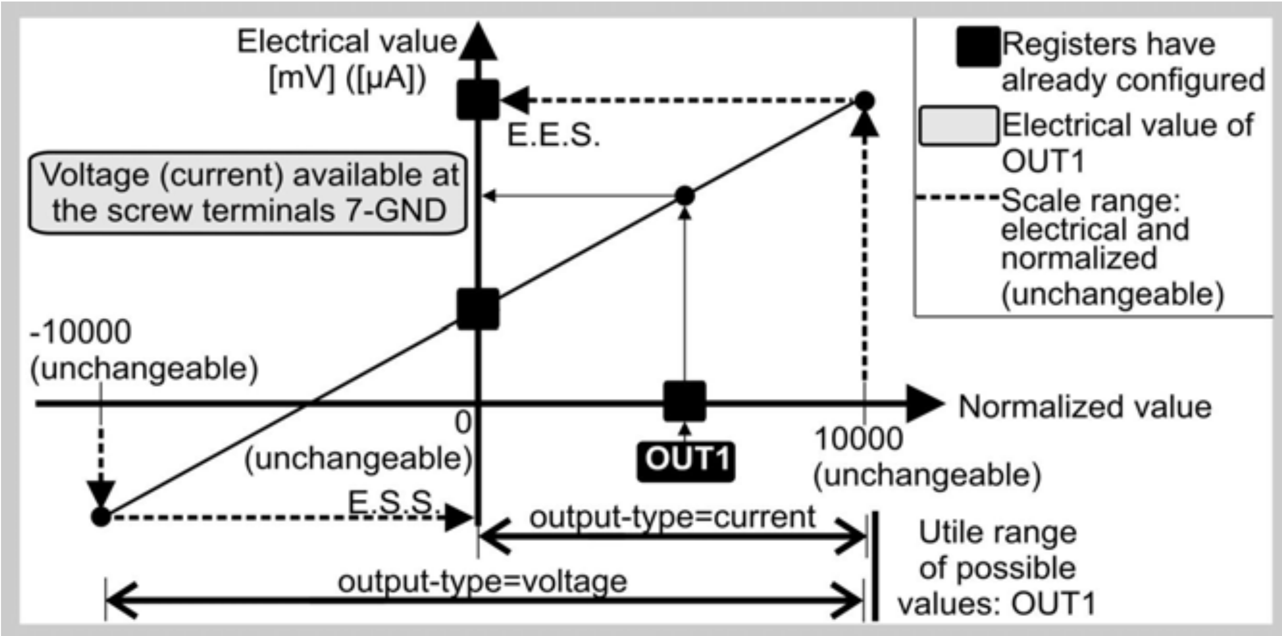



Fig.2 - Description of output configuration (step 3)

## *LEDs 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 module power is on |
| ERR | Blinking light | The module has at least one of the errors described in RS485 Registers table |
| | Constant light | Module failure or there is a fault error (bit40008.2=1) |
| 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 |

# Seneca Z-PC Line module: **Z-4TC**

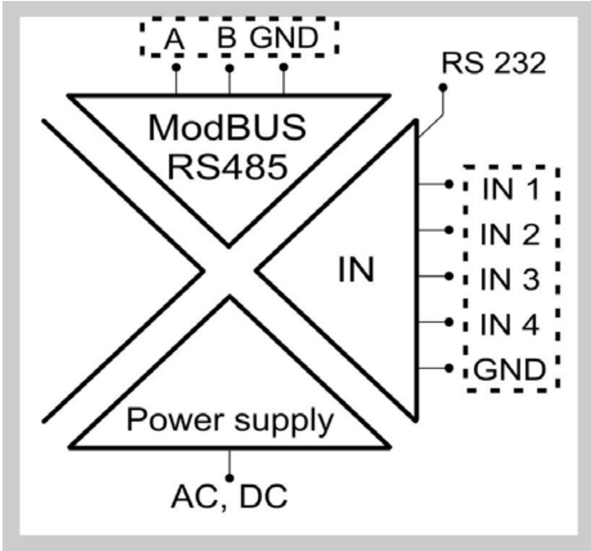
The Z-4TC module acquires up to 4 single-ended signals (voltage-type, from the: signal generator or thermocouple) and it converts them to a digital format (normalized measure).

## *General characteristics*

- Capture of each voltage-type input from the: generator or thermocouple
- Configuration of a filter applied to each input signal
- It is possible to disable the automatic detection of thermocouple interruptions (to decrease the measure error of the acquired signals from the thermocouples)
- Configuration of 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

## *Features*

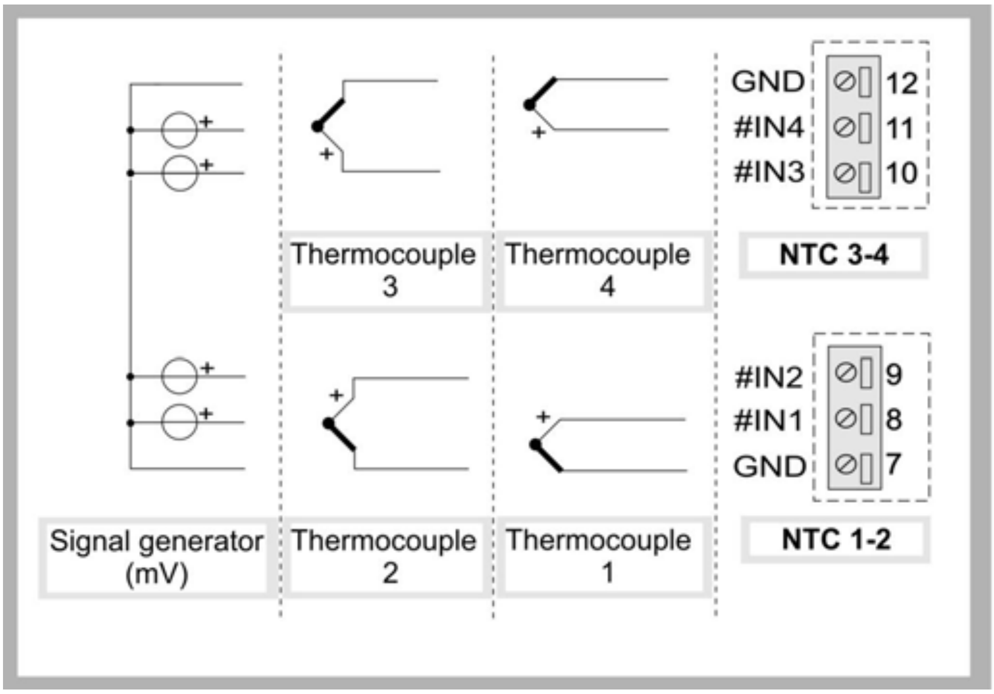
| **INPUT** | |
|---|---|
| **Number** | 4 |
| **Resolution** | 16 bits (15+1 sign). If input is acquired: from the generator, resolution=5µV; from the thermocouple, resolution=0.1°C |
| **Sampling time** | Configurable between: 120 ms or 60 ms |
| **Filter** | Configurable between: 0(no filter is applied), from 1(min) to 6(max)(*) |
| **Accuracy** | Initial: 0.1% of E.E.S.(Electrical End Scale) |
| | Linearity: 0.05°C (if TC J, TC K); 0.04°C (if TC N, TC T); 0.03°C (if TC B); 0.02°C (if TC E, TC S, TC R) |
| | Thermal stability: < 50 ppm/°K |
| | EMI: < 1% |
| | Cold-junction compensation (for TC-type input):<2°C (0-50°C) |
| **Protection** | ± 30Vdc and 25mA |
| **Voltage-type IN (from the generator)** | Bipolar with E.S.S./E.E.S.(Electrical Start/End Scale) unchangeable between: ± 160mV. Input impedance: > 10 MΩ |
| **Voltage-type IN (from the thermocouple)** | TC-type: J, K, R, S, T, B, E, N. Automatic detection if a TC interruption occurs: if this option is enabled, test current:<200nA. Input impedance: > 10 MΩ |
| **CONNECTIONS** | |
| **RS485 interface** | IDC10 connector for DIN 46277 rail (back-side panel) or (alternative) the screw terminals: 4(GND), 5(B), 6(A) |
| **RS232 interface** | Jack stereo 3.5mm connector: plugs into COM port |
| **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: 1W |

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.

## *Input connections*




The term «NTC 1-2» means the NTC sensor related to the thermocouple 1 and 2 cold-junctions, instead the term «NTC 3-4» means the NTC sensor related to the thermocouple 3 and 4 cold-junctions.

The four voltage-type analog inputs (from the signal generator or from the thermocouple) refer to the ground GND; GND can be found at the screw terminals 7 and 12 (they are equipotentials because internally connected).

To decrease the signal-acquisition errors due to noise effects, short-circuit each unused TC-type input (screw terminals 8, 9, 10 or 11) to the GND (equipotential screw terminals: 7 or 12).

In the following figure are shown the cable colors for each type of thermocouple.

| THERMOCOUPLE | ALLOY | ANSI MC96.1 (USA) | | DIN43710 (D) | | IEC 584-3 (EUROPE) | |
|---|---|---|---|---|---|---|---|
| | | - | + | - | + | - | + |
| TC J | Fe-Co | red | white | blue | red | white | black |
| TC K | Cr-Al | red | yellow | green | red | white | green |
| TC R | Pt13%Rh-Pt | red | black | white | red | white | orange |
| TC S | Pt10%Rh-Pt | red | black | white | red | white | orange |
| TC T | Cu-Co | red | blue | brown | red | white | brown |
| TC E | Cr-Co | red | purple | black | red | white | purple |
| TC B | Pt30%Rh-Pt6%Rh | red | grey | red | grey | white | grey |
| TC N | Nicrosil-Nisil | red | brown | / | / | white | pink |

## *Dip-switches table*

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: DIP-SWITCH STATUS)** | | |
|---|---|---|
| 1 | 2 | Meaning |
| | | Baud-rate=9600 Baud |
| | ● | Baud-rate=19200 Baud |
| ● | | Baud-rate=38400 Baud |
| ● | ● | Baud-rate=57600 Baud |

| **ADDRESS (Dip-Switches: DIP-SWITCH STATUS)** | | | | | | |
|---|---|---|---|---|---|---|
| 3 | 4 | 5 | 6 | 7 | 8 | Meaning |
| | | | | | | **Address and Baud-Rate are acquired from memory(EEPROM)** |
| | | | | | ● | Address=1 |
| | | | | ● | | Address=2 |
| | | | | ● | ● | Address=3 |
| | | | ● | | | Address=4 |
| X | X | X | X | X | X | …………………… |
| ● | ● | ● | ● | ● | ● | Address=63 |

| **RS485 TERMINATOR (Dip-Switches: DIP-SWITCH STATUS)** | | |
|---|---|---|
| 9 | 10 | Meaning |
| | | RS485 terminator disabled |
| | ● | RS485 terminator enabled |

The module is designed to configure each input depending on whether the voltage-type signal is acquired from the: generator or thermocouple. In particular the input scale range values, for thermocouple-type input selected, are shown in the following table.

| TC-type | Scale range | TC-type | Scale range |
|---|---|---|---|
| J | -210°C..1200°C | S | -50°C..1768°C |
| K | -200°C..1372°C | R | -50°C..1768°C |
| E | -200°C..1000°C | B | 250°C..1820°C |
| N | -210°C..1300°C | T | -200°C..400°C |

## *RS485 Register table*

| Name | Range | Interpretation of register | R/W | Default | Address |
|---|---|---|---|---|---|
| MachineID | / | MSB, LSB | R | | 40001 |
| | Id_Code (Module ID) | | | 0x06 | Bit [15:8] |
| | Ext_Rev (Module version) | | | | Bit [7:0] |
| FWREV | / | Word | R | | 40017 |
| | Firmware Code | | | | |
| Status | / | Bit | R/W | | 40012 |
| | Input 4 burn-out error (if TC-type input): 0=there isn't; 1=there is | | | / | Bit 15 |
| | Input 3 burn-out error (if TC-type input): 0=there isn't; 1=there is | | | / | Bit 14 |
| | Input 2 burn-out error (if TC-type input): 0=there isn't; 1=there is | | | / | Bit 13 |
| | Input 1 burn-out error (if TC-type input): 0=there isn't; 1=there is | | | / | Bit 12 |
| | Input 4 temperature-acquired error (if TC-type input): 0=there isn't; 1=there is | | | / | Bit 11 |
| | Input 3 temperature-acquired error (if TC-type input): 0=there isn't; 1=there is | | | / | Bit 10 |
| | Input 2 temperature-acquired error (if TC-type input): 0=there isn't; 1=there is | | | / | Bit 9 |
| | Input 1 temperature-acquired error (if TC-type input): 0=there isn't; 1=there is | | | / | Bit 8 |
| | Save configuration in memory (EEPROM): 0=deactivated; 1=activated | | | 0 | Bit 7 |
| | These bits aren't used | | | / | Bit [6:4] |
| | Configuration error: 0=there isn't; 1=there is | | | / | Bit 3 |
| | Data-configuration acquisition error: 0=there isn't; 1=there is | | | / | Bit 2 |
| | Generic error: 0=there isn't; 1=there is (bit 40012.1=1 corresponds to LED ERR=blinking light) | | | / | Bit 1 |
| | Reset of module: 0=deactivated; 1=activated | | | 0 | Bit 0 |
| Errors | / | Bit | R | | 40019 |
| | These bits aren't used | | | / | Bit[15:12] |
| | Zero ADC error: 0=there isn't; 1=there is | | | / | Bit 11 |
| | This bit isn't used | | | / | Bit 10 |

| | | | | | |
|---|---|---|---|---|---|
| | Setting error (in memory): 0=there isn't; 1=there is | | | / | Bit 9 |
| | Calibration error (in memory): 0=there isn't; 1=there is | | | / | Bit 8 |
| | These bits aren't used | | | / | Bit [7:3] |
| | Temperature acquisition error in the thermocouple 3 and 4 cold-junctions (if TC-type input, see input connections): 0=there isn't; 1=there is | | | / | Bit 2 |
| | Temperature acquisition error in the thermocouple 1 and 2 cold-junctions (if TC-type input, see input connections): 0=there isn't; 1=there is | | | / | Bit 1 |
| | ADC error: 0=there isn't; 1=there is | | | / | Bit 0 |
| Eprflag | / | MSB, LSB | R/W | | 40003 |
| | These bits aren't used | | | / | Bit [15:5] |
| | Parity for RS485: 0=even parity; 1=odd parity | | | 0 | Bit 4 |
| | Parity for RS485: 0=there isn't; 1=there is | | | 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 | | | 0 | Bit 2 |
| | Sampling time: 0=120 ms; 1=60 ms | | | 0 | Bit 1 |
| | Automatic detection if a TC interruption occurs (damaged): 0=activated; 1=deactivated | | | 0 | Bit 0 |
| Baudrate Address | / | MSB, LSB | R/W | | 40002 |
| | 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 | | | 38400 | Bit [15:8] |
| | Address for RS485(address of module if parameters are configurated by memory modality): from 0x01=1 to 0xFF=255 | | | 1 | Bit [7:0] |
| **INPUT 1** | | | | | |
| IN1-Type | Between:0,8 | Word | R/W | | 40004 |
| | Input 1-type: 0=from the voltage generator (±160mV); 1=from TC J; 2=from TC K; 3=from TC R; 4=from TC S; 5= from TC T; 6=from TC B; 7=from TC E; 8=from TC N | | | 0 | |
| IN 1 | Between: ± 32000 | Word | R | | 40013 |
| | Normalized measure of input 1 (1bit=5µV if input from the voltage generator; 1bit=0.1°C if input from the TC) | | | / | |
| IN1-FILTER | Between: 0, 6 | Word | R/W | | 40008 |
| | Filter applied to input 1 signal: 0=deactivated; 1=filtering min-value; 6=filtering max-value | | | 0 | |
| **INPUT 2** | | | | | |
| IN2-Type | Between:0,8 | Word | R/W | | 40005 |
| | Input 2-type: 0=from the voltage generator (±160mV); 1=from TC J; 2=from TC K; 3=from TC R; 4=from TC S; 5= from TC T; 6=from TC B; 7=from TC E; 8=from TC N | | | 0 | |
| IN 2 | Between: ± 32000 | Word | R | | 40014 |
| | Normalized measure of input 2 (1bit=5µV if input from the voltage generator; 1bit=0.1°C if input from the TC) | | | / | |
| IN2-FILTER | Between: 0, 6 | Word | R/W | | 40009 |
| | Filter applied to input 2 signal: 0=deactivated; 1=filtering min-value; 6=filtering max-value | | | 0 | |
| **INPUT 3** | | | | | |
| IN3-Type | Between:0,8 | Word | R/W | | 40006 |
| | Input 3-type: 0=from the voltage generator (±160mV); 1=from TC J; 2=from TC K; 3=from TC R; 4=from TC S; 5= from TC T; 6=from TC B; 7=from TC E; 8=from TC N | | | 0 | |
| IN 3 | Between: ± 32000 | Word | R | | 40015 |
| | Normalized measure of input 3 (1bit=5µV if input from the voltage generator; 1bit=0.1°C if input from the TC) | | | / | |

| | | | | | |
|---|---|---|---|---|---|
| IN3-FILTER | Between: 0, 6 | Word | R/W | | 40010 |
| | Filter applied to input 3 signal: 0=deactivated; 1=filtering min-value; 6=filtering max-value | | | 0 | |
| **INPUT 4** | | | | | |
| IN4-Type | Between:0,8 | Word | R/W | | 40007 |
| | Input 4-type: 0=from the voltage generator (±160mV); 1=from TC J; 2=from TC K; 3=from TC R; 4=from TC S; 5= from TC T; 6=from TC B; 7=from TC E; 8=from TC N | | | 0 | |
| IN 4 | Between: ± 32000 | Word | R | | 40016 |
| | Normalized measure of input 4 (1bit=5µV if input from the voltage generator; 1bit=0.1°C if input from the TC) | | | / | |
| IN4-FILTER | Between: 0, 6 | Word | R/W | | 40011 |
| | Filter applied to input 4 signal: 0=deactivated; 1=filtering min-value; 6=filtering max-value | | | 0 | |

(*) Corrispondence between filter-levels and filter time constants: 1=1[sec]; 2=2[sec]; 3=5[sec]; 4=10[sec];5=20[sec]; 6=60[sec].

## *LEDs 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 |
| | Constant light | Module failure |
| 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 |
| | Constant light | Module failure |

# Seneca Z-PC Line module: **Z-8TC**

The Z-8TC module acquires up to 8 single-ended signals (voltage-type, from the: signal generator or thermocouple) and it converts them to a digital format (normalized measure).

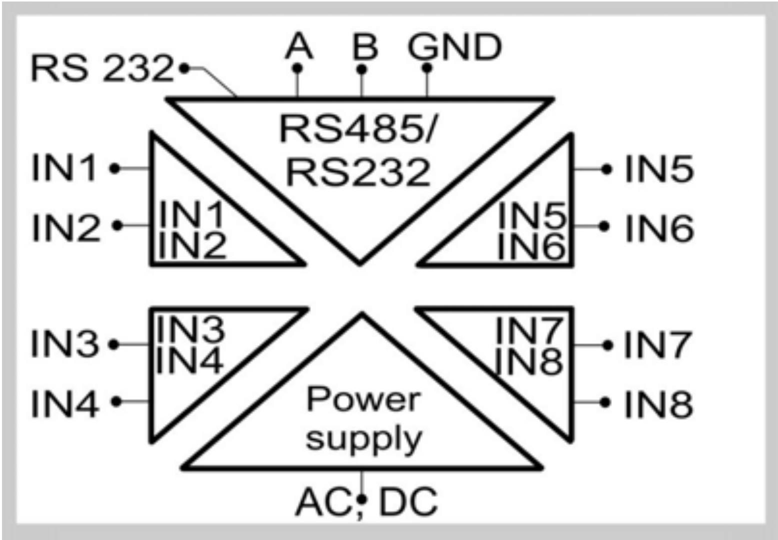
## *General characteristics*

- It is possible to choose if measure is voltage (mV) or temperature (°C) type, for each couple of input signals: IN1 and IN2, IN3 and IN4, IN5 and IN6, IN7 and IN8
- It is possible to enable/disable each input
- Configuration of a filter applied to each couple of input signals
- It is possible to enable/disable cold-junction compensation, for each couple of input signals
- It is possible to configure 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

## *Features*

| **INPUT** | |
|---|---|
| **Number** | 8 |
| **Resolution** | 14bits (if filter=0-1); 15 bits (if filter=2-7) |
| **Sampling frequency** | Configurable between: 48Hz (if the filter is deactivated), 20Hz (if filter=1), 11Hz (if filter=2-7) |
| **Rejection** | 50Hz or 60 Hz |
| **Filter (0-7)** | IIR and FIR; configurable between: 0 (deactivated), from 1(min) to 7(max) |
| **Accuracy** | Initial: 0.1% of E.E.S. (Electrical End Scale) |
| | Thermal stability: < 100 ppm/°K |
| | EMI: < 1% |
| **Protection** | This module provides inputs protection against the ESD (up to 4kV) |
| **Voltage-type IN (from the thermocouple)** | Bipolar with E.S.S./E.E.S. (Electrical Start/End Scale) unchangeable between: -10.1mV..+81.4mV. TC-type: J, K, R, S, T, B, E, N. Automatic detection if a TC interruption occurs: if this option is enabled, test current:<50nA. Input impedance: > 10 MΩ |

| **CONNECTIONS** | |
|---|---|
| **RS485 interface** | IDC10 connector for DIN 46277 rail (back-side panel) |
| **RS232 interface** | Jack stereo 3.5mm connector: plugs into COM port |
| **1500 Vac ISOLATIONS** | |
| | Between: power supply, ModBUS RS485/RS232, inputs 1/2, inputs 3/4, inputs 5/6, inputs 7/8 |




| POWER SUPPLY | |
|---|---|
| **Supply voltage** | 10 – 40 Vdc or 19 – 28 Vac ( 50Hz - 60Hz) |
| **Power consumption** | Max: 0.6W |

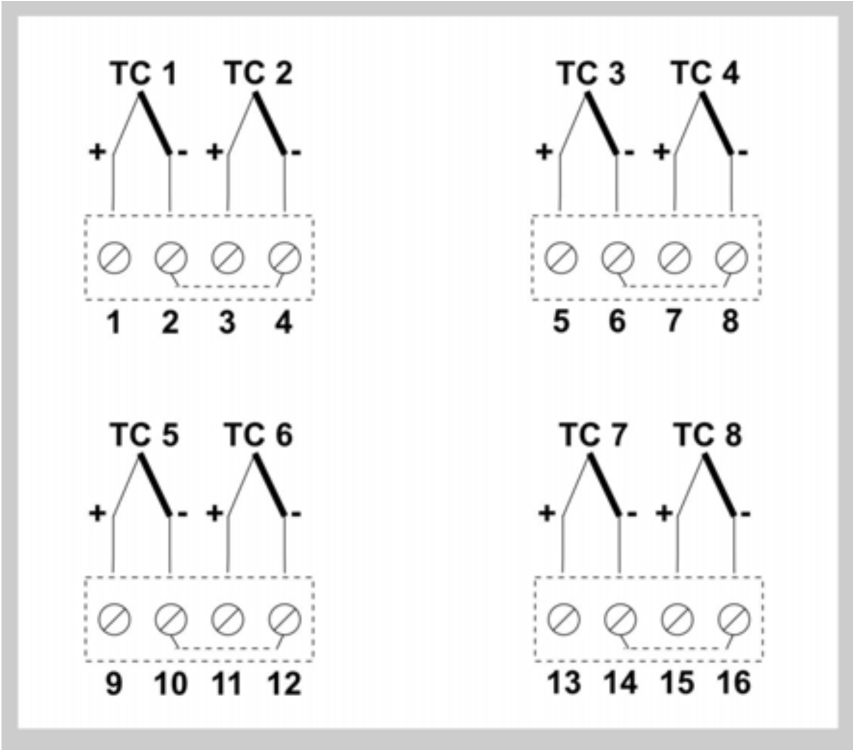
The power supply transformer necessary to supply the module must comply with EN60742 (Isolated transformers and safety transformers requirements). To protect the power supply, it is recommended to install a fuse.

## *Input connections*

The Z-8TC module has a digital thermometer (DT sensor) internally to compensate the cold-junction effect, if a thermocouple is connected to input.

 To decrease the signal-acquisition errors due to noise effects, short-circuit each unused TC-type input to the GND, for each couple of inputs. In particular:

- unused screw terminal 1 and/or 3 to the screw terminal 2 or 4 (GND for input 1 and input 2);
- unused screw terminal 5 and/or 7 to the screw terminal 6 or 8 (GND for input 3 and input 4);
- unused screw terminal 9 and/or 11 to the screw terminal 10 or 12 (GND for input 5 and input 6);
- unused screw terminal 13 and/or 15 to the screw terminal 14 or 16 (GND for input 7 and input 8).




In the following figure are shown the cable colors for each type of thermocouple.

| THERMOCOUPLE | ALLOY | ANSI MC96.1 (USA) | | DIN43710 (D) | | IEC 584-3 (EUROPE) | |
|---|---|---|---|---|---|---|---|
| | | - | + | - | + | - | + |
| TC J | Fe-Co | red | white | blue | red | white | black |
| TC K | Cr-Al | red | yellow | green | red | white | green |
| TC R | Pt13%Rh-Pt | red | black | white | red | white | orange |
| TC S | Pt10%Rh-Pt | red | black | white | red | white | orange |
| TC T | Cu-Co | red | blue | brown | red | white | brown |
| TC E | Cr-Co | red | purple | black | red | white | purple |
| TC B | Pt30%Rh-Pt6%Rh | red | grey | red | grey | white | grey |
| TC N | Nicrosil-Nisil | red | brown | / | / | white | pink |

The input scale range values, for selected thermocouple-type input, are shown in the following table.

| TC-type | Scale range | TC-type | Scale range |
|---|---|---|---|
| J | -210°C..1200°C | S | -50°C..1768°C |
| K | -200°C..1372°C | R | -50°C..1768°C |
| E | -200°C..1000°C | B | 250°C..1820°C |
| N | -210°C..1300°C | T | -200°C..400°C |

## Dip-switches table

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: DIP-SWITCH STATUS)** | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 2 | Meaning | | | | |
| | | Baud-rate=9600 Baud | | | | |
| | ● | Baud-rate=19200 Baud | | | | |
| ● | | Baud-rate=38400 Baud | | | | |
| ● | ● | Baud-rate=57600 Baud | | | | |
| **ADDRESS (Dip-Switches: DIP-SWITCH STATUS)** | | | | | | |
| 3 | 4 | 5 | 6 | 7 | 8 | Meaning |
| | | | | | | **Address and Baud-Rate are acquired from memory(EEPROM)** |
| | | | | | ● | Address=1 |
| | | | | ● | | Address=2 |
| | | | | ● | ● | Address=3 |
| | | | ● | | | Address=4 |
| X | X | X | X | X | X | …………………… |
| ● | ● | ● | ● | ● | ● | Address=63 |
| **RS485 TERMINATOR (Dip-Switches: DIP-SWITCH STATUS)** | | | | | | |
| 9 | 10 | Meaning | | | | |
| | | RS485 terminator disabled | | | | |
| | ● | RS485 terminator enabled | | | | |

## RS485 Register table

| Name | Range | Interpretation of register | R/W | Default | Address |
|---|---|---|---|---|---|
| MachineID | / | MSB, LSB | R | | 40001 |
| | Id_Code (Module ID) | | | 0x18 (24 decimal) | Bit [15:8] |
| | Ext_Rev (Module version) | | | | Bit [7:0] |
| Errors | / | Bit | R | | 40002 |
| | Input 1 and input 2 error: 0=there isn't; 1=there is | | | / | Bit 15 |
| | Input 3 and input 4 error: 0=there isn't; 1=there is | | | / | Bit 14 |
| | Input 5 and input 6 error: 0=there isn't; 1=there is | | | / | Bit 13 |
| | Input 7 and input 8 error: 0=there isn't; 1=there is | | | / | Bit 12 |
| | Input 1 burn-out error (if TC-type input): 0=there isn't; 1=there is | | | / | Bit 11 |
| | Input 2 burn-out error (if TC-type input): 0=there isn't; 1=there is | | | / | Bit 10 |
| | Input 3 burn-out error (if TC-type input): 0=there isn't; 1=there is | | | / | Bit 9 |
| | Input 4 burn-out error (if TC-type input): 0=there isn't; 1=there is | | | / | Bit 8 |

| | | | | | |
|---|---|---|---|---|---|
| | Input 5 burn-out error (if TC-type input): 0=there isn't; 1=there is | | | / | Bit 7 |
| | Input 6 burn-out error (if TC-type input): 0=there isn't; 1=there is | | | / | Bit 6 |
| | Input 7 burn-out error (if TC-type input): 0=there isn't; 1=there is | | | / | Bit 5 |
| | Input 8 burn-out error (if TC-type input): 0=there isn't; 1=there is | | | / | Bit 4 |
| | Input 1 and input 2 communication error: 0=there isn't; 1=there is | | | / | Bit 3 |
| | Input 3 and input 4 communication error: 0=there isn't; 1=there is | | | / | Bit 2 |
| | Input 5 and input 6 communication error: 0=there isn't; 1=there is | | | / | Bit 1 |
| | Input 7 and input 8 communication error: 0=there isn't; 1=there is | | | / | Bit 0 |
| Errors IN1-2 IN3-4 | / | Bit | R | | 40037 |
| | Supply-voltage error for input 1 and input 2: 0=there isn't; 1=there is | | | / | Bit 15 |
| | RS485-reception error for input 1 and input 2: 0=there isn't; 1=there is | | | / | Bit 14 |
| | Memory error (EEPROM) for input 1 and input 2: 0=there isn't; 1=there is | | | / | Bit 13 |
| | These bits aren't used | | | / | Bit [12:9] |
| | CRC EEPROM error for input 1 and input 2: 0=there isn't; 1=there is. If "1", it is not possible to save in memory (EEPROM) | | | / | Bit 8 |
| | Supply-voltage error for input 3 and input 4: 0=there isn't; 1=there is | | | / | Bit 7 |
| | RS485-reception error for input 3 and input 4: 0=there isn't; 1=there is | | | / | Bit 6 |
| | Memory error (EEPROM) for input 3 and input 4: 0=there isn't; 1=there is | | | / | Bit 5 |
| | These bits aren't used | | | / | Bit [4:1] |
| | CRC EEPROM error for input 3 and input 4: 0=there isn't; 1=there is. If "1", it is not possible to save in memory (EEPROM) | | | / | Bit 0 |
| Errors IN5-6 IN7-8 | / | Bit | R | | 40038 |
| | Supply-voltage error for input 5 and input 6: 0=there isn't; 1=there is | | | / | Bit 15 |
| | RS485-reception error for input 5 and input 6: 0=there isn't; 1=there is | | | / | Bit 14 |
| | Memory error (EEPROM) for input 5 and input 6: 0=there isn't; 1=there is | | | / | Bit 13 |
| | These bits aren't used | | | / | Bit [12:9] |
| | CRC EEPROM error for input 5 and input 6: 0=there isn't; 1=there is. If "1", it is not possible to save in memory (EEPROM) | | | / | Bit 8 |
| | Supply-voltage error for input 7 and input 8: 0=there isn't; 1=there is | | | / | Bit 7 |
| | RS485-reception error for input 7 and input 8: 0=there isn't; 1=there is | | | / | Bit 6 |
| | Memory error (EEPROM) for input 7 and input 8: 0=there isn't; 1=there is | | | / | Bit 5 |
| | These bits aren't used | | | / | Bit [4:1] |
| | CRC EEPROM error for input 7 and input 8: 0=there isn't; 1=there is. If "1", it is not possible to save in memory (EEPROM) | | | / | Bit 0 |

| | | | | | |
|---|---|---|---|---|---|
| Config IN1-2 | / | Bit | R/W | | 40054 |
| | Input1 enabling: 0=deactivated; 1=activated | | | 1 | Bit 15 |
| | Input2 enabling: 0=deactivated; 1=activated | | | 1 | Bit 14 |
| | Input1 and input 2 measure type: 1=voltage [mV]; 0=temperature [°C] | | | 0 | Bit 13 |
| | Cold-junction compensation for input 1 and input2: 0=deactivated; 1=activated | | | 1 | Bit 12 |
| | Rejection: 0=50Hz; 1=60Hz | | | 0 | Bit 11 |
| | Filter applied to acquired input1 and input2. To know the configurations of bit40054.[10:8], see table1 | | | 0b010 | Bit [10:8] |
| | Thermocouple type of input 1. To know the configurations of bit40054.[7:4], see table 2 | | | 0b0000 (TC J) | Bit [7:4] |
| | Thermocouple type of input 2. To know the configurations of bit40054.[3:0], see table 2 | | | 0b0000 (TC J) | Bit [3:0] |
| Config IN3-4 | / | Bit | R/W | | 40055 |
| | Input3 enabling: 0=deactivated; 1=activated | | | 1 | Bit 15 |
| | Input4 enabling: 0=deactivated; 1=activated | | | 1 | Bit 14 |
| | Input3 and input 4 measure type: 1=voltage [mV]; 0=temperature [°C] | | | 0 | Bit 13 |
| | Cold-junction compensation for input 3 and input4: 0=deactivated; 1=activated | | | 1 | Bit 12 |
| | Rejection: 0=50Hz; 1=60Hz | | | 0 | Bit 11 |
| | Filter applied to acquired input3 and input4. To know the configurations of bit40055.[10:8], see table1 | | | 0b010 | Bit [10:8] |
| | Thermocouple type of input 3. To know the configurations of bit40055.[7:4], see table 2 | | | 0b0000 (TC J) | Bit [7:4] |
| | Thermocouple type of input 4. To know the configurations of bit40055.[3:0], see table 2 | | | 0b0000 (TC J) | Bit [3:0] |
| Config IN5-6 | / | Bit | R/W | | 40056 |
| | Input5 enabling: 0=deactivated; 1=activated | | | 1 | Bit 15 |
| | Input6 enabling: 0=deactivated; 1=activated | | | 1 | Bit 14 |
| | Input5 and input 6 measure type: 1=voltage [mV]; 0=temperature [°C] | | | 0 | Bit 13 |
| | Cold-junction compensation for input 5 and input6: 0=deactivated; 1=activated | | | 1 | Bit 12 |
| | Rejection: 0=50Hz; 1=60Hz | | | 0 | Bit 11 |
| | Filter applied to acquired input5 and input6. To know the configurations of bit40055.[10:8], see table1 | | | 0b010 | Bit [10:8] |
| | Thermocouple type of input 5. To know the configurations of bit40056.[7:4], see table 2 | | | 0b0000 (TC J) | Bit [7:4] |
| | Thermocouple type of input 6. To know the configurations of bit40056.[3:0], see table 2 | | | 0b0000 (TC J) | Bit [3:0] |
| Config IN7-8 | / | Bit | R/W | | 40057 |
| | Input7 enabling: 0=deactivated; 1=activated | | | 1 | Bit 15 |
| | Input8 enabling: 0=deactivated; 1=activated | | | 1 | Bit 14 |
| | Input7 and input 8 measure type: 1=voltage [mV]; 0=temperature [°C] | | | 0 | Bit 13 |
| | Cold-junction compensation for input 7 and input8: 0=deactivated; 1=activated | | | 1 | Bit 12 |
| | Rejection: 0=50Hz; 1=60Hz | | | 0 | Bit 11 |
| | Filter applied to acquired input7 and input8. To know the configurations of bit40057.[10:8], see table1 | | | 0b010 | Bit [10:8] |
| | Thermocouple type of input 7. To know the configurations of bit40057.[7:4], see table 2 | | | 0b0000 (TC J) | Bit [7:4] |
| | Thermocouple type of input 8. To know the configurations of bit40057.[3:0], see table 2 | | | 0b0000 (TC J) | Bit [3:0] |

| | | | | | |
|---|---|---|---|---|---|
| Configuration aux | / | Bit | R/W | | 40058 |
| | Floating point (32bits) registers interpretation. If bit 40058.15=0, FP32bit_MSW is most significant word of 32bits registers and FP32bit_LSW is less significant word of 32bit registers; if bit40058.15=1, FP32bit_LSW is most significant word of 32bits registers and FP32bit_MSW is less significant word of 32bit registers | | | 0 | Bit 15 |
| | These bits aren't used | | | / | Bit [14:8] |
| | Module behavior if there is input 1 error: 0=register 40059 is overwritten in 40003 (word register) and in 40011,40012(floating point register); 1= content of register 40003 (word) and 40011, 40012 (FP) is the last measure acquired through input 1 correctly | | | 0 | Bit 7 |
| | Module behavior if there is input 2 error: 0=register 40060 is overwritten in 40004 (word register) and in 40013,40014(floating point register); 1= content of register 40004 (word) and 40013, 40014 (FP) is the last measure acquired through input 2 correctly | | | 0 | Bit 6 |
| | Module behavior if there is input 3 error: 0=register 40061 is overwritten in 40005 (word register) and in 40015,40016(floating point register); 1= content of register 40005 (word) and 40015, 40016 (FP) is the last measure acquired through input 3 correctly | | | 0 | Bit 5 |
| | Module behavior if there is input 4 error: 0=register 40062 is overwritten in 40006 (word register) and in 40017,40018(floating point register); 1= content of register 40006 (word) and 40017, 40018 (FP) is the last measure acquired through input 4 correctly | | | 0 | Bit 4 |
| | Module behavior if there is input 5 error: 0=register 40063 is overwritten in 40007 (word register) and in 40019,40020(floating point register); 1= content of register 40007 (word) and 40019, 40020 (FP) is the last measure acquired through input 5 correctly | | | 0 | Bit 3 |
| | Module behavior if there is input 6 error: 0=register 40064 is overwritten in 40008 (word register) and in 40021,40022(floating point register); 1= content of register 40008 (word) and 40021,40022(FP) is the last measure acquired through input 6 correctly | | | 0 | Bit 2 |
| | Module behavior if there is input 7 error: 0=register 40065 is overwritten in 40009 (word register) and in 40023,40024(floating point register); 1= content of register 40009 (word) and 40023,40024(FP) is the last measure acquired through input 7 correctly | | | 0 | Bit 1 |
| | Module behavior if there is input 8 error: 0=register 40066 is overwritten in 40010 (word register) and in 40025,40026(floating point register); 1= content of register 40010 (word) and 40025,40026(FP) is the last measure acquired through input 8 correctly | | | 0 | Bit 0 |
| Baudrate Delay | Delay: from 0x00=0 to 0xFF=255 | MSB, LSB | R/W | | 40053 |
| | 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 | | | 38400 | Bit [15:8] |
| | Delay for RS485 (delay of communication response: pauses between the end of Rx message and the start of Tx message). 1 pause=6 characters | | | 0 | Bit [7:0] |

| | | | | | |
|---|---|---|---|---|---|
| Address Parity | Address: from 0x01=1 to 0xFF=255 | MSB, LSB | R/W | | 40052 |
| | Address for RS485 (baud-rate of module/node if parameters are configurated by memory modality) | | | 1 | Bit [15:8] |
| | Parity for RS485: 0=there isn't; 1=even parity; 2=odd parity | | | 0 | Bit [7:0] |
| Reset | 0xCCCC | Word | R/W | | 40041 |
| | Reset of module, if reg.40041=0xCCCC | | | / | |
| | | **INPUT 1** | | | |
| IN1 | / | Bit | R/W | | 40003 |
| | Measure of input 1 [°C/10] (if bit 40054.13=0), [10·mV] (if bit 40054.13=1) | | | / | |
| IN1 MSW | | FP32bit_MSW | R | | 40011 |
| IN1 LSW | | FP32bit_LSW | R | | 40012 |
| | Floating point measure of input 1 [°C] (if bit40054.13=0), [mV] (if bit40054.13=1). To interpret the FP32bit register, see bit40058.15 | | | / | |
| IN1 Fault | Between: -32000, 32000 | Word | R/W | | 40059 |
| | Fault value of input 1 [°C/10] (if bit40054.13=0), [mV/100] (if bit40054.13=1) | | | 20000 | |
| | | | | | |
| | | | | | |
| | | **INPUT 2** | | | |
| IN2 | / | Bit | R/W | | 40004 |
| | Measure of input 1 [°C/10] (if bit 40054.13=0), [10·mV] (if bit 40054.13=1) | | | / | |
| IN2 MSW | | FP32bit_MSW | R | | 40013 |
| IN2 LSW | | FP32bit_LSW | R | | 40014 |
| | Floating point measure of input 2 [°C] (if bit40054.13=0), [mV] (if bit40054.13=1). To interpret the FP32bit register, see bit40058.15 | | | / | |
| IN2 Fault | Between: -32000, 32000 | Word | R/W | | 40060 |
| | Fault value of input 1 [°C/10] (if bit40054.13=0), [mV/100] (if bit40054.13=1) | | | 20000 | |
| | | | | | |
| IN1-2 ColdJunction | | Word | R | | 40028 |
| | Input 1-2 cold junction temperature [°C/10] | | | / | |
| | | **INPUT 3** | | | |
| IN3 | / | Bit | R/W | | 40005 |
| | Measure of input 3 [°C/10] (if bit 40055.13=0), [10·mV] (if bit 40055.13=1) | | | / | |
| IN3 MSW | | FP32bit_MSW | R | | 40015 |
| IN3 LSW | | FP32bit_LSW | R | | 40016 |
| | Floating point measure of input 1 [°C] (if bit40055.13=0), [mV] (if bit40055.13=1). To interpret the FP32bit register, see bit40058.15 | | | / | |
| IN3 Fault | Between: -32000, 32000 | Word | R/W | | 40061 |
| | Fault value of input 3 [°C/10] (if bit40055.13=0), [mV/100] (if bit40055.13=1) | | | 20000 | |
| | | | | | |
| | | **INPUT 4** | | | |
| IN4 | / | Bit | R/W | | 40006 |
| | Measure of input 4 [°C/10] (if bit 40055.13=0), [10·mV] (if bit 40055.13=1) | | | / | |
| IN4 MSW | | FP32bit_MSW | R | | 40017 |
| IN4 LSW | | FP32bit_LSW | R | | 40018 |
| | Floating point measure of input 4 [°C] (if bit40055.13=0), [mV] (if bit40055.13=1). To interpret the FP32bit register, see bit40058.15 | | | / | |

| | | | | | |
|---|---|---|---|---|---|
| IN4 Fault | Between: -32000, 32000 | Word | R/W | | 40062 |
| | Fault value of input 4 [°C/10] (if bit40055.13=0), [mV/100] (if bit40055.13=1) | | | 20000 | |
| | | | | | |
| IN3-4 ColdJunction | | Word | R | | 40029 |
| | Input 3-4 cold junction temperature [°C/10] | | | / | |
| **INPUT 5** | | | | | |
| IN5 | / | Bit | R/W | | 40007 |
| | Measure of input 5 [°C/10] (if bit 40056.13=0), [10·mV] (if bit 40056.13=1) | | | / | |
| IN5 MSW | | FP32bit_MSW | R | | 40019 |
| IN5 LSW | | FP32bit_LSW | R | | 40020 |
| | Floating point measure of input 5 [°C] (if bit40056.13=0), [mV] (if bit40056.13=1). To interpret the FP32bit register, see bit40058.15 | | | / | |
| IN5 Fault | Between: -32000, 32000 | Word | R/W | | 40063 |
| | Fault value of input 5 [°C/10] (if bit40056.13=0), [mV/100] (if bit40056.13=1) | | | 20000 | |
| | | | | | |
| **INPUT 6** | | | | | |
| IN6 | / | Bit | R/W | | 40008 |
| | Measure of input 6 [°C/10] (if bit 40056.13=0), [10·mV] (if bit 40056.13=1) | | | / | |
| IN6 MSW | | FP32bit_MSW | R | | 40021 |
| IN6 LSW | | FP32bit_LSW | R | | 40022 |
| | Floating point measure of input 6 [°C] (if bit40056.13=0), [mV] (if bit40056.13=1). To interpret the FP32bit register, see bit40058.15 | | | / | |
| IN6 Fault | Between: -32000, 32000 | Word | R/W | | 40064 |
| | Fault value of input 6 [°C/10] (if bit40056.13=0), [mV/100] (if bit40056.13=1) | | | 20000 | |
| | | | | | |
| IN5-6ColdJunction | | Word | R | | 40030 |
| | Input 5-6 cold junction temperature [°C/10] | | | / | |
| **INPUT 7** | | | | | |
| IN7 | / | Bit | R/W | | 40009 |
| | Measure of input 7 [°C/10] (if bit 40057.13=0), [10·mV] (if bit 40057.13=1) | | | / | |
| IN7 MSW | | FP32bit_MSW | R | | 40023 |
| IN7 LSW | | FP32bit_LSW | R | | 40024 |
| | Floating point measure of input 7 [°C] (if bit40057.13=0), [mV] (if bit40057.13=1). To interpret the FP32bit register, see bit40058.15 | | | / | |
| IN7 Fault | Between: -32000, 32000 | Word | R/W | | 40065 |
| | Fault value of input 7 [°C/10] (if bit40057.13=0), [mV/100] (if bit40057.13=1) | | | 20000 | |
| | | | | | |
| **INPUT 8** | | | | | |
| IN8 | / | Bit | R/W | | 40010 |
| | Measure of input 8 [°C/10] (if bit 40057.13=0), [10·mV] (if bit 40057.13=1) | | | / | |
| IN8 MSW | | FP32bit_MSW | R | | 40025 |
| IN8 LSW | | FP32bit_LSW | R | | 40026 |
| | Floating point measure of input 8 [°C] (if bit40057.13=0), [mV] (if bit40057.13=1). To interpret the FP32bit register, see bit40058.15 | | | / | |

| | | | | | |
|---|---|---|---|---|---|
| IN8 Fault | Between: -32000, 32000 | Word | R/W | | 40066 |
| | Fault value of input 8 [°C/10] (if bit40057.13=0), [mV/100] (if bit40057.13=1) | | | 20000 | |
| IN7-8 ColdJunction | | Word | R | | 40031 |
| | Input 7-8 cold junction temperature [°C/10] | | | / | |

| **TABLE 1 – CONFIGURATIONS FOR FILTER APPLIED TO ACQUIRED INPUTS IN1 and IN2 (bit40054.[10:8]), IN3 and IN4 (bit40055.[10:8]), IN5 and IN6 (bit40056.[10:8]), IN7 and IN8 (bit40057.[10:8])** | | | |
|---|---|---|---|
| Bit[10:8] | Filter type | Propagation time (if IN<T) | Propagation time (if IN>T) |
| 0b000 | Deactivated | 45ms | 45ms |
| 0b001 | Average (14bits) | 236ms | 103ms |
| 0b010 | Average (15bits) | 405ms | 179ms |
| 0b011 | Average + exp (15bits) | 1s | 179ms |
| 0b100 | Average + exp (15bits) | 3s | 179ms |
| 0b101 | Average + exp (15bits) | 8s | 179ms |
| 0b110 | Average + exp (15bits) | 24s | 179ms |
| 0b111 | Average + exp (15bits) | 72s | 179ms |

Threshold value: T=0.75mV

Propagation time: interval time between a step change of input electrical signal and corresponding change of measure in register (at 115kBaud). The propagation times shown in table 1 refer to 50Hz rejection; to obtain the propagation times refer to 60Hz rejection, divide them for 1.2.

| **TABLE 2 – THERMOCOUPLE TYPE OF INPUT IN 1 (bit40054.[7:4]), IN 2 (bit40054.[3:0]), IN 3 (bit40055.[7:4]), IN 4 (bit40055.[3:0]) IN 5 (bit40056.[7:4]), IN 6 (bit40056.[3:0]), IN 7 (bit40057.[7:4]), IN 8 (bit40057.[3:0])** | | | |
|---|---|---|---|
| Bit [7:4] | TC for IN1, IN3, IN5, IN7 | Bit [3:0] | TC for IN2, IN4, IN6, IN8 |
| 0b0000 | TC J | 0b0000 | TC J |
| 0b0001 | TC K | 0b0001 | TC K |
| 0b0010 | TC R | 0b0010 | TC R |
| 0b0011 | TC S | 0b0011 | TC S |
| 0b0100 | TC T | 0b0100 | TC T |
| 0b0101 | TC B | 0b0101 | TC B |
| 0b0110 | TC E | 0b0110 | TC E |
| 0b0111 | TC N | 0b0111 | TC N |

## *LEDs 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 module power is on |
| ERR | Constant light | The module has at least one of the errors described in RS485 Registers table |
| | Blinking light | Module failure |
| 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 |
| | Constant light | Module failure |

# Seneca Z-PC Line module: **Z203**

The Z203 module is a single-phase network analyzer for electric-network voltage up to 500Vac and electric-network current up to 5A (50 Hz or 60 Hz). The module have an output, electrical value directly proportional to selected input: voltage-type out or current-type out. The electrical value (output) is available on screw terminals and the normalized value is available on RS485 registers.

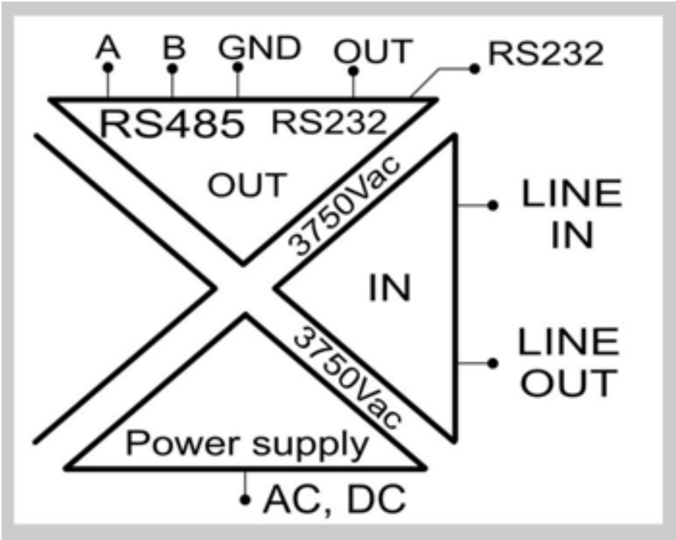
## *General characteristics*

- It is possible to detect, with reference to the electric network and load connected to its: RMS voltage, RMS current, active power, reactive power, cosΦ, frequency
- It is possible to change electrical start/end scale (see table 1, for each measure)
- Normalized start/end scale is between 0..+10000 (for RMS voltage, RMS current, active power) or between ± 10000 (for reactive power, cosΦ)
- Management of the connections with current transformer for high power devices
- Configuration of the module (node) address and baud-rate by Dip-Switches
- Configuration of the electrical-network frequency, output (electrical value), rescaled-input type and input rescale 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

## *Features*

| | |
|---|---|
| **INPUT** | |
| **Number** | 1 |
| **Accuracy** | 0.5% of E.E.S. (Voltmeter, ampere-meter, watt-meter, frequency-meter) |
| | Thermal stability: < 100 ppm/°K |
| | EMI: < 1% |
| **Protection** | This module provides inputs protection against the ESD (up to 4kV) |
| **Voltage-type IN** | E.S.S./E.E.S.(Electrical Start/End Scale) configurable between: 0..125Vac; 0..250Vac; 0..500Vac. Input impedance: 600 kΩ |
| **Current-type IN** | E.S.S./E.E.S.(Electrical Start/End Scale) configurable between: 0..1.25A; 0..2.5A; 0..5A. Peak factor: 3; rated power: 5Arms; max current: 15A. Input impedance: 3.3 mΩ |
| **OUTPUT** | |
| **Number** | 1 |
| **Resolution** | 12 bits |
| **Accuracy** | 0.1% of output scale range |
| **Voltage-type OUT** | Output scale range configurable between: 0-10 V or 0-5V (minimum resistance that can be connected: 2 kΩ). Saturation if voltage>11V |
| **Current-type OUT** | Output scale range configurable between: 0-20 mA or 4-20mA (max resistance that can be connected: 500Ω). Saturation if current>21mA |
| **CONNECTIONS** | |
| **RS485 interface** | IDC10 connector |
| **RS232 interface** | Jack stereo 3.5mm connector: plugs into COM port |

| ISOLATIONS | |
|---|---|
| | 1500Vac isolation between: power supply, ModBUS RS485/RS232 + output<br>3750Vac isolation between: input (electric network) and other parts |

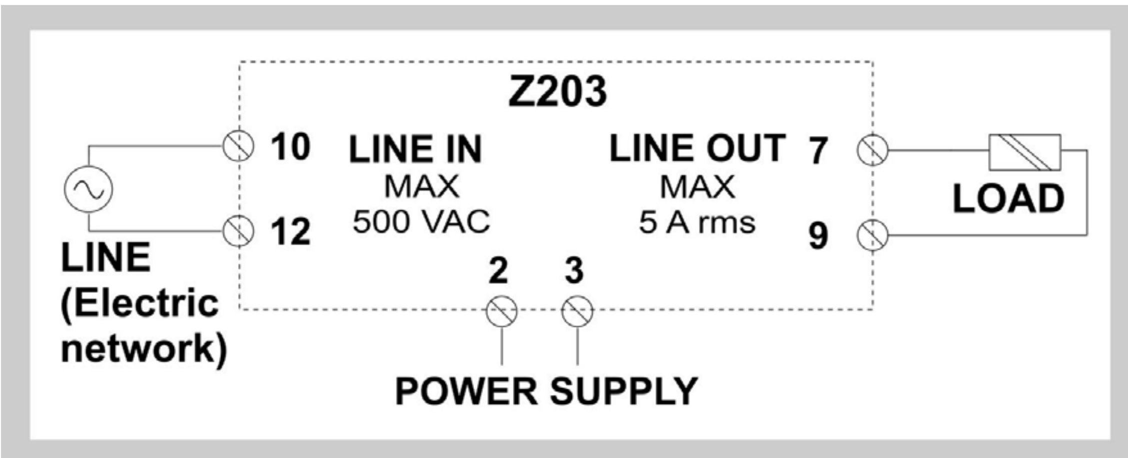



| POWER SUPPLY | |
|---|---|
| **Supply voltage** | 10 – 40 Vdc or 19 – 28 Vac ( 50Hz - 60Hz) |
| **Power consumption** | Max: 2 W |

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.

## *Connections*

Input connection




Connect to the screw terminals 10 and 12 the electric network.
Connect to the screw terminals 7 and 9 the load to analyze.

Output connection


 Shielded cables are recommended to connect the outputs (through screw terminals: 5, 6 if voltage-type output; 4, 5 if current-type output).

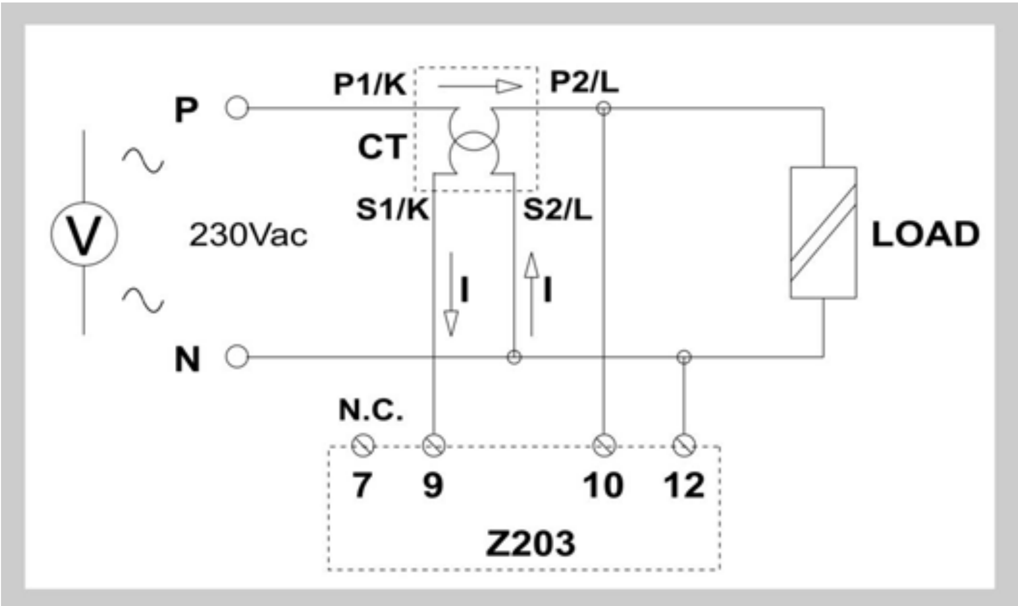
 It is not possible to obtain an output (electric value) directly proportional to the electric-network frequency.

Connection with current transformer

The Z203 module allows to control a single-phase load connected to the electric network. To use the Z203 for high power devices, it is possible to connect a current transformer.

 **WARNING**

**Only the connection shown in the following figure is allowed if a current transformer need to be connected.**




 Screw terminal 7 is open.

Parameters of current transformer CT are shown in the following table.

| | |
|---|---|
| **P1/K** | Primary wound input |
| **P2/L** | Primary wound output |
| **S2/K** | Secondary wound input |
| **S2/L** | Secondary wound output |

## *Dip-switches table*

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 | Meaning |
| | | Baud-rate=9600 Baud |
| | ● | Baud-rate=19200 Baud |
| ● | | Baud-rate=38400 Baud |
| ● | ● | Baud-rate=57600 Baud |

| **ADDRESS (Dip-Switches: SW1)** | | | | | | |
|---|---|---|---|---|---|---|
| 3 | 4 | 5 | 6 | 7 | 8 | Meaning |
| | | | | | | **Address and Baud-Rate are acquired from memory(EEPROM)** |
| | | | | | ● | Address=1 |
| | | | | ● | | Address=2 |
| | | | | ● | ● | Address=3 |
| | | | ● | | | Address=4 |
| X | X | X | X | X | X | …………………… |
| ● | ● | ● | ● | ● | ● | Address=63 |

| **FREQUENCY (Dip-Switches: SW2)** | |
|---|---|
| 1 | Meaning |
| | Electric network frequency=50Hz |
| ● | Electric network frequency=60Hz |

| **OUTPUT – ELECTRIC VALUE (Dip-Switches: SW2)** | | |
|---|---|---|
| 2 | 3 | Meaning |
| | | Output=0..10V |
| | ● | Output=0..5V |
| ● | | Output=0..20mA |
| ● | ● | Output=4..20mA |

| **INPUT-RISCALE TYPE (Dip-Switches: SW2)** | | |
|---|---|---|
| 4 | 5 | Meaning |
| | | Rescaled=100% (see table below) |
| | ● | Rescaled=50% (see table below) |
| ● | | Rescaled=25% (see table below) |
| ● | ● | This setting is not allowed |

| **INPUT RESCALE (Dip-Switches: SW2)** | | | |
|---|---|---|---|
| 6 | 7 | 8 | Meaning |
| | | | RMS voltage |
| | | ● | RMS current |
| | ● | | Active power |
| | ● | ● | CosΦ |
| ● | | | This setting is not allowed |
| ● | | ● | Reactive power |
| ● | ● | | This setting is not allowed |
| ● | ● | ● | This setting is not allowed |

| RS485 TERMINATOR (Dip-Switches: SW3) | | |
|---|---|---|
| 1 | 2 | Meaning |
| | | RS485 terminator disabled |
| ● | | RS485 terminator enabled |

The measure ranges for RMS voltage, RMS current, active power, reactive power, cosΦ, frequency are shown in the following table.

RMS voltage, RMS current, active power are measured by Z203 directly; reactive power, cosΦ are obtained through processing by Z203.

| **Possible measures** | **Measure range (100%)** | | **Measure range (50%)** | | **Measure range (25%)** | |
|---|---|---|---|---|---|---|
| | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** |
| RMS voltage | 0Vac | 500Vac | 0Vac | 250Vac | 0Vac | 125Vac |
| RMS current | 0A | 5A | 0A | 2.5A | 0A | 1.25A |
| Active power | 0W | 2500W | 0W | 1250W | 0W | 625W |
| Reactive power | 0VAR | 2500 VAR | 0 VAR | 1250 VAR | 0 VAR | 625 VAR |
| CosΦ | 0 | 1 | 0 | 0.5 | 0 | 0.25 |
| Frequency (*) | 40Hz | 70Hz | 40Hz | 70Hz | 40Hz | 70Hz |

(*) It is possible to use the Z203 module as frequency meter to measure frequencies between 40Hz and 70Hz. To measure RMS voltage, RMS current, active power, reactive power, cosΦ, the signal have to have an accurate frequency (about 50Hz or 60Hz).

## *RS485 Register table*

| **Name** | Range | **Interpretation of register** | **R/W** | **Default** | **Address** |
|---|---|---|---|---|---|
| MachineID | / | MSB, LSB | R | | 40001 |
| | Id_Code (Module ID) | | | 0x13 (19 decimal) | Bit [15:8] |
| | Ext_Rev (Module version) | | | | Bit [7:0] |
| FWREV | / | Word | R | | 40005 |
| | Firmware Code | | | | |
| Status | / | Bit | R/W | | 40093 |
| | Reset of module: 0x65(101 decimal)=activated; any other number=deactivated | | | / | Bit [15:8] |
| | Input voltage: 0=voltage>40Vrms; 1=voltage<40Vrms | | | / | Bit 7 |
| | These bits aren't used | | | / | Bit [6:5] |
| | Hardware error: 0=there isn't; 1=there is | | | / | Bit 4 |
| | These bits aren't used | | | / | Bit [3:0] |
| Baudrate Delay | / | MSB, LSB | R/W | | 40003 |
| | 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 | | | 38400 | Bit [15:8] |

| | | | | | |
|---|---|---|---|---|---|
| | Delay for RS485 (delay of communication response: it represents the number of the pauses(*) between the end of Rx message and the start of Tx message): from 0x00=0 to 0xFF=255 (*)1 pause=6 characters | | | 0 | Bit [7:0] |
| Address Parity | Address: from 0x01=1 to 0xFF=255 | MSB, LSB | R/W | | 40002 |
| | Address for RS485 (address of module/node if parameters are configurated by memory modality) | | | 1 | Bit [15:8] |
| | Parity for RS485: 0=there isn't; 1=even; 2=odd | | | 0 | Bit [7:0] |
| CT Ratio | | Word | R/W | | 40004 |
| | Transformation ratio for possible current transformer connected to input (CT). If there isn't, reg.40004=10 (CT=1); if there is, reg.40004=10*CT. | | | 10 (CT=1) | |
| **VOLTAGE** | | | | | |
| Voltage MSW | | FP32bit_MSW | R | | 40081 |
| Voltage LSW | | FP32bit_LSW | R | | 40082 |
| | RMS voltage electrical measure of input [Vrms]. This value is regardless of reg.40004 | | | / | |
| Voltage | 0..10000 | Word | R | | 40095 |
| | RMS voltage normalized measure of input This value is regardless of reg.40004 | | | / | |
| **CURRENT** | | | | | |
| Current MSW | | FP32bit_MSW | R | | 40083 |
| Current LSW | | FP32bit_LSW | R | | 40084 |
| | RMS current electrical measure of input [Arms]. This value depends on reg.40004 | | | / | |
| Current | 0..10000 | Word | R | | 40096 |
| | RMS current normalized measure of input. This value is regardless of reg.40004 | | | / | |
| **ACTIVE POWER** | | | | | |
| Active Power MSW | | FP32bit_MSW | R | | 40085 |
| Active Power LSW | | FP32bit_LSW | R | | 40086 |
| | Active power electrical measure of input [W]. This value depends on reg.40004 | | | / | |
| Active power | 0..10000 | | R | | 40097 |
| | Active power normalized measure of input. This value is regardless of reg.40004 | | | / | |
| **REACTIVE POWER** | | | | | |
| Reactive Power MSW | | FP32bit_MSW | R | | 40089 |
| Reactive Power LSW | | FP32bit_LSW | R | | 40090 |
| | RMS reactive power electrical measure of input [VARrms]. This value depends on reg.40004 | | | / | |
| Reactive power | -10000..10000 | | R | | 40098 |
| | RMS reactive power normalized measure of input. This value is regardless of reg.40004 | | | / | |
| **COSΦ** | | | | | |
| CosΦ MSW | | FP32bit_MSW | R | | 40091 |
| CosΦ LSW | | FP32bit_LSW | R | | 40092 |
| | CosΦ electrical measure of input [W] | | | / | |
| CosΦ | -10000..10000 | | R | | 40099 |
| | CosΦ normalized measure of input. This value is regardless of reg.40004 | | | / | |

| FREQUENCY | | | | | |
|---|---|---|---|---|---|
| Freq MSW | | FP32bit_MSW | R | | 40087 |
| Freq LSW | | FP32bit_LSW | R | | 40088 |
| | Frequency electrical measure of input [Arms] | | | | |

## LEDs 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 | Measure of voltage: <40Vac |
| | Constant 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 |

# Seneca Z-PC Line module: **Z-4RTD-2**

The Z-4RTD-2 module acquires up to 4 RTD signals (through 4 inputs regardless and isolated with each other) e it converts them it to a temperature or resistance measure.

## *General characteristics*

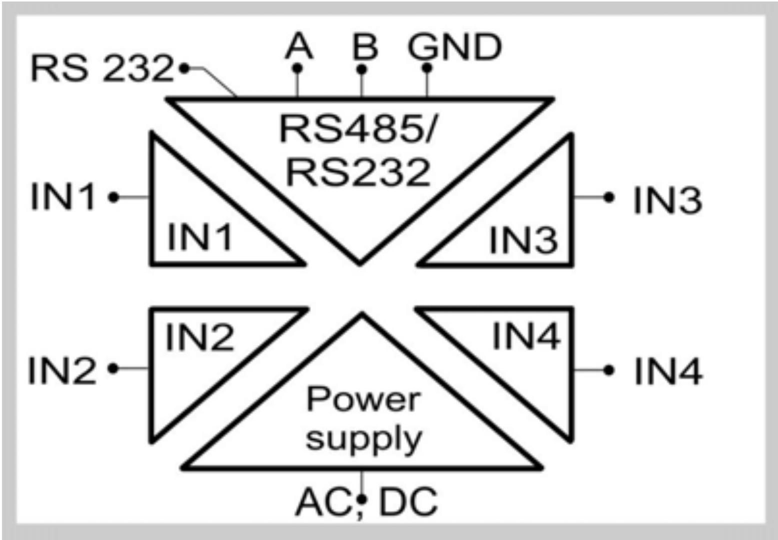
- It's possible to choose if the input is RTD-type: PT100, NI100, PT500, PT1000
- It's possible to choose the RTD-measure type: temperature (°C) or resistance (Ω) (for each input)
- It's possible to choose if RTD-wire connection: 2-wire, 3-wire or 4-wire (for each input)
- Wire measure and wire resistance compensation (if 3-wire connection)
- Configuration of a filter applied to each input signal
- 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

## *Features*

| **INPUT** | |
|---|---|
| **Number** | 1 |
| **Resolution** | 13bit (if filter=0-1); 14 bit (if filter=2-7) |
| **Sampling frequency** | Configurable between: 48Hz (if the filter is deactivated), 20Hz (if filter=1), 11Hz (if filter=2-7) |
| **Rejection** | 50Hz or 60 Hz |
| **Filter (0-7)** | IIR and FIR; configurable between: 0 (deactivated), from 1(min) to 7(max) |
| **Accuracy** | Initial:0.05% of 350 Ω (PT100, NI100 end scale); 0.05% of 1850 Ω (PT500, PT1000 end scale) |
| | Linearity:0.025% of 350 Ω (PT100, NI100 end scale); 0.025% of 1850 Ω (PT500, PT1000 end scale) |
| | Thermal stability: < 50 ppm/°K |
| | EMI: < 1% |
| **Protection** | This module provides inputs protection against the ESD (up to 4kV) |

| | **Temperature range** | **Resistance range (RTD=Rx)** | **Burn-out error if (RTD=Rx)** | **Max wire resistance (Rf)** | **Rated current through RTD** |
|---|---|---|---|---|---|
| **RTD:PT100-type input (EN 60751)** | From -200°C to 650°C | From 18.5Ω to 330Ω | Rx<18 Ω Rx>341 Ω | 20 Ω | 875µA |
| **RTD:NI100-type input (DIN 43760)** | From -60°C to 250°C | From 69Ω to 295Ω | Rx<60 Ω Rx>301 Ω | 30 Ω | 875µA |
| **RTD:PT500-type input (EN 60751)** | From -200°C to 750°C | From 92.5Ω to 1800Ω | Rx<90 Ω Rx>1851 Ω | 30 Ω | 333µA |
| **RTD:PT1000-type input (EN 60751)** | From -200°C to 210°C | From 185Ω to 1850Ω | Rx<180 Ω Rx>1851 Ω | 30 Ω | 333µA |

| CONNECTIONS | |
|---|---|
| **RS485 interface** | IDC10 connector for DIN 46277 rail (back-side panel) |
| **RS232 interface** | Jack stereo 3.5mm connector: plugs into COMport |
| **1500 Vac ISOLATIONS** | |
| | Between: power supply, ModBUS RS485/RS232, input 1, input 2, input 3, input 4 |



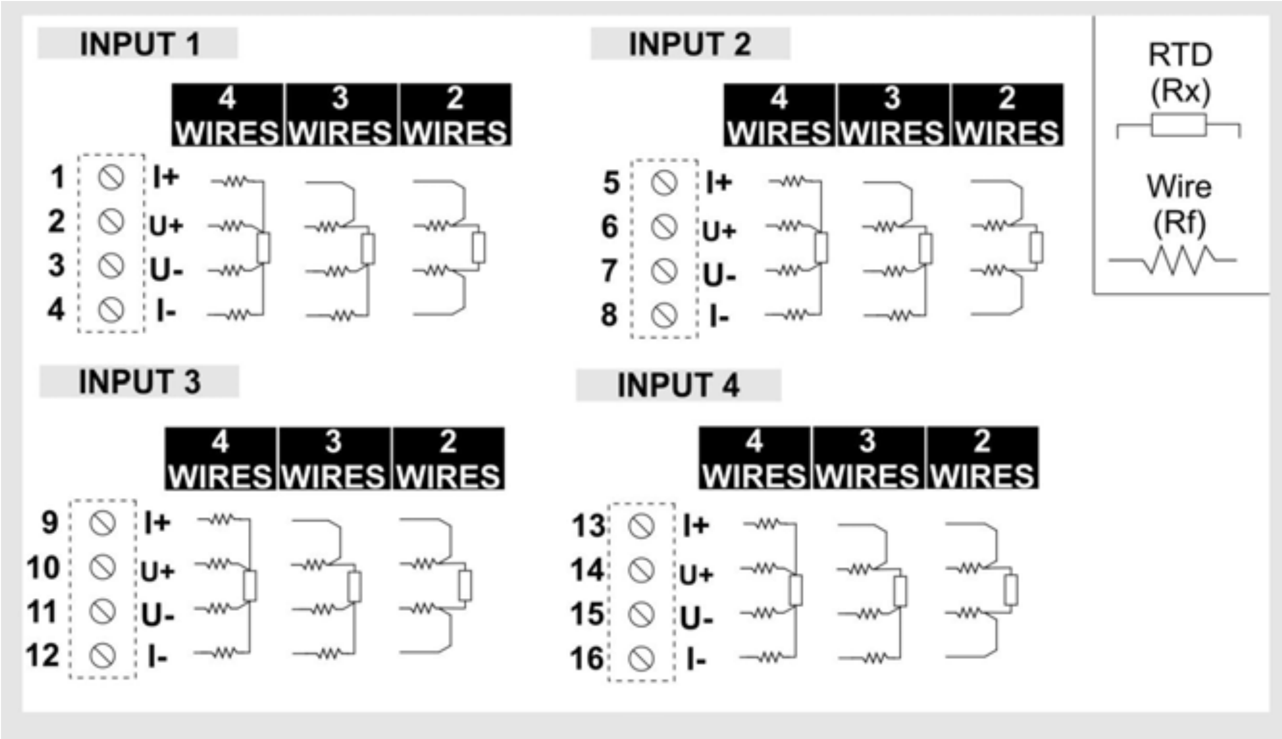

| POWER SUPPLY | |
|---|---|
| **Supply voltage** | 10 – 40 Vdc or 19 – 28 Vac ( 50Hz - 60Hz) |
| **Power consumption** | Max: 0.7W |

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 = 17.5 mm |
| **Terminal board** | Removable 4-way screw terminals:<br>pitch 3.5mm, sections 2.5mm$^2$ |
| **Protection class** | IP20 (International Protection) |

## Input connections

It is possible to connect to Z-4RTD-2 module Platinum or Nichel thermoresistances with 2,3,4 wires.




| RTD-wires connection | Distance between RTD and module | Wires compensation | RTD measure (°C-Ω) depends/does not depend on wire-resistances |
|---|---|---|---|
| 2 wires | <10m | NO | Depends |
| 3 wires | >10m | YES (the compensation is performed on the average value of wire resistances) | Does not depend (if the wire resistances are equal) |
| 4 wires | >10m | NO | Does not depend (max accuracy) |

## Dip-switches table

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: DIP-SWITCH STATUS) | | |
|---|---|---|
| 1 | 2 | Meaning |
| | | Baud-rate=9600 Baud |
| | ● | Baud-rate=19200 Baud |
| ● | | Baud-rate=38400 Baud |
| ● | ● | Baud-rate=57600 Baud |

| ADDRESS (Dip-Switches: DIP-SWITCH STATUS) | | | | | | |
|---|---|---|---|---|---|---|
| 3 | 4 | 5 | 6 | 7 | 8 | Meaning |
| | | | | | | **Address and Baud-Rate are acquired from memory(EEPROM)** |
| | | | | | ● | Address=1 |
| | | | | ● | | Address=2 |
| | | | | ● | ● | Address=3 |
| | | | ● | | | Address=4 |
| X | X | X | X | X | X | …………………… |
| ● | ● | ● | ● | ● | ● | Address=63 |

| RS485 TERMINATOR (Dip-Switches: DIP-SWITCH STATUS) | | |
|---|---|---|
| 9 | 10 | Meaning |
| | | RS485 terminator disabled |
| | ● | RS485 terminator enabled |

## *RS485 Register table*

| Name | Range | Interpretation of register | R/W | Default | Address |
|---|---|---|---|---|---|
| MachineID | / | MSB, LSB | R | | 40001 |
| | Id_Code (Module ID) | | | 0x16 | Bit [15:8] |
| | Ext_Rev (Module version) | | | | Bit [7:0] |
| Errors | / | Bit | R | | 40002 |
| | Input 1 error: 0=there isn’t; 1=there is | | | / | Bit 15 |
| | Input 2 error: 0=there isn’t; 1=there is | | | / | Bit 14 |
| | Input 3 error: 0=there isn’t; 1=there is | | | / | Bit 13 |
| | Input 4 error: 0=there isn’t; 1=there is | | | / | Bit 12 |
| | Input 1 burn-out error: 0=there isn’t; 1=there is | | | / | Bit 11 |
| | Input 2 burn-out error: 0=there isn’t; 1=there is | | | / | Bit 10 |
| | Input 3 burn-out error: 0=there isn’t; 1=there is | | | / | Bit 9 |
| | Input 4 burn-out error: 0=there isn’t; 1=there is | | | / | Bit 8 |
| | Input 1 temperature-acquired error: 0=there isn’t; 1=there is | | | / | Bit 7 |
| | Input 2 temperature-acquired error: 0=there isn’t; 1=there is | | | / | Bit 6 |
| | Input 3 temperature-acquired error: 0=there isn’t; 1=there is | | | / | Bit 5 |
| | Input 4 temperature-acquired error: 0=there isn’t; 1=there is | | | / | Bit 4 |
| | Initialization error for input 1: 0=there isn’t; 1=there is | | | / | Bit 3 |
| | Initialization error for input 2: 0=there isn’t; 1=there is | | | / | Bit 2 |
| | Initialization error for input 3: 0=there isn’t; 1=there is | | | / | Bit 1 |
| | Initialization error for input 4: 0=there isn’t; 1=there is | | | / | Bit 0 |

| | | | | | |
|---|---|---|---|---|---|
| Errors IN1&IN2 | / | Bit | R | | 40025 |
| | Supply-voltage error for input1: 0=there isn’t; 1=there is | | | / | Bit 15 |
| | RS485-reception error for input1: 0=there isn’t; 1=there is | | | / | Bit 14 |
| | Memory error (EEPROM) for input 1: 0=there isn’t; 1=there is | | | / | Bit 13 |
| | This bit isn’t used | | | / | Bit 12 |
| | RTD (Rx) measure error for input 1: 0=there isn’t; 1=there is | | | / | Bit 11 |
| | Wire-resistance (Rf) measure error for input 1 (if 3-wires connection): 0=there isn’t; 1=there is | | | / | Bit 10 |
| | Acquisition error for input 1: 0=there isn’t; 1=there is | | | / | Bit 9 |
| | CRC EEPROM error for input 1: 0=there isn’t; 1=there is. If “1”, it is not possible to save in memory (EEPROM) | | | / | Bit 8 |
| | Supply-voltage error for input2: 0=there isn’t; 1=there is | | | / | Bit 7 |
| | RS485-reception error for input2: 0=there isn’t; 1=there is | | | / | Bit 6 |
| | Memory error (EEPROM) for input 2: 0=there isn’t; 1=there is | | | / | Bit 5 |
| | This bit isn’t used | | | / | Bit 4 |
| | RTD (Rx) measure error for input 2: 0=there isn’t; 1=there is | | | / | Bit 3 |
| | Wire-resistance (Rf) measure error for input 2 (if 3-wires connection): 0=there isn’t; 1=there is | | | / | Bit 2 |
| | Acquisition error for input 2: 0=there isn’t; 1=there is | | | / | Bit 1 |
| | CRC EEPROM error for input 2: 0=there isn’t; 1=there is. If “1”, it is not possible to save in memory (EEPROM) | | | / | Bit 0 |
| Errors IN3&IN4 | / | Bit | R | | 40026 |
| | Supply-voltage error for input3: 0=there isn’t; 1=there is | | | / | Bit 15 |
| | RS485-reception error for input3: 0=there isn’t; 1=there is | | | / | Bit 14 |
| | Memory error (EEPROM) for input 3: 0=there isn’t; 1=there is | | | / | Bit 13 |
| | This bit isn’t used | | | / | Bit 12 |
| | RTD (Rx) measure error for input 3: 0=there isn’t; 1=there is | | | / | Bit 11 |
| | Wire-resistance (Rf) measure error for input 3 (if 3-wires connection): 0=there isn’t; 1=there is | | | / | Bit 10 |
| | Acquisition error for input 3: 0=there isn’t; 1=there is | | | / | Bit 9 |
| | CRC EEPROM error for input 3: 0=there isn’t; 1=there is. If “1”, it is not possible to save in memory (EEPROM) | | | / | Bit 8 |
| | Supply-voltage error for input4: 0=there isn’t; 1=there is | | | / | Bit 7 |
| | RS485-reception error for input4: 0=there isn’t; 1=there is | | | / | Bit 6 |
| | Memory error (EEPROM) for input 4: 0=there isn’t; 1=there is | | | / | Bit 5 |
| | This bit isn’t used | | | / | Bit 4 |
| | RTD (Rx) measure error for input 4: 0=there isn’t; 1=there is | | | / | Bit 3 |
| | Wire-resistance (Rf) measure error for input 4 (if 3-wires connection): 0=there isn’t; 1=there is | | | / | Bit 2 |
| | Acquisition error for input 4: 0=there isn’t; 1=there is | | | / | Bit 1 |
| | CRC EEPROM error for input 4: 0=there isn’t; 1=there is. If “1”, it is not possible to save in memory (EEPROM) | | | / | Bit 0 |
| Configuration | / | Bit | R/W | | 40041 |
| | Floating point (32bits) registers interpretation. If bit 40041.15=0, FP32bit_MSW is most significant word of 32bits registers and FP32bit_LSW is less significant word of 32bit registers; if bit40041.15=1, FP32bit_LSW is most significant word of 32bits registers and FP32bit_MSW is less significant word of 32bit registers | | | 0 | Bit 15 |

| | | | | | |
|---|---|---|---|---|---|
| | These bits aren't used | | | / | Bit [14:8] |
| | LED ERR status to signal if there is input 1 error (see bit40002.15): 0=LED ERR "ON" means that there is input 1 error; 1=LED ERR is regardless of input 1 error | | | 0 | Bit 7 |
| | LED ERR status to signal if there is input 2 error (see bit40002.14): 0=LED ERR "ON" means that there is input 2 error; 1=LED ERR is regardless of input 2 error | | | 0 | Bit 6 |
| | LED ERR status to signal if there is input 3 error (see bit40002.13): 0=LED ERR "ON" means that there is input 3 error; 1=LED ERR is regardless of input 3 error | | | 0 | Bit 5 |
| | LED ERR status to signal if there is input 4 error (see bit40002.12): 0=LED ERR "ON" means that there is input 4 error; 1=LED ERR is regardless of input 4 error | | | 0 | Bit 4 |
| | Module behavior if there is input 1 error: 0=register 40042 is overwritten in 40003 (word register) and in 40007,40008 (floating point register); 1=content of register 40003 (word) and 40007,40008(FP) is the last measure acquired through input 1 correctly | | | 0 | Bit 3 |
| | Module behavior if there is input 2 error: 0=register 40043 is overwritten in 40004 (word register) and in 40009,40010(floating point register); 1= content of register 40004 (word) and 40009,40010(FP) is the last measure acquired through input 2 correctly | | | 0 | Bit 2 |
| | Module behavior if there is input 3 error: 0=register 40044 is overwritten in 40005 (word register) and in 40011,40012(floating point register); 1= content of register 40005 (word) and 40011,40012(FP) is the last measure acquired through input 3 correctly | | | 0 | Bit 1 |
| | Module behavior if there is input 4 error: 0=register 40045 is overwritten in 40006 (word register) and in 40013,40014 (floating point register); 1= content of register 40006 (word) and 40013,40014(FP) is the last measure acquired through input 4 correctly | | | 0 | Bit 0 |
| Baudrate Delay | Delay: from 0x00=0 to 0xFF=255 | MSB, LSB | R/W | | 40036 |
| | 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 | | | 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] |
| Address Parity | Address: from 0x01=1 to 0xFF=255 | MSB, LSB | R/W | | 40035 |
| | Address for RS485 (address of module/node if parameters are configurated by memory modality) | | | 1 | Bit [15:8] |
| | Parity for RS485: 0=there isn't; 1=even parity; 2=odd parity | | | 0 | Bit [7:0] |
| Reset | 0xCCCC | Word | R/W | | 40029 |
| | Reset of module, if reg.40029=0xCCCC | | | / | |
| **INPUT 1** | | | | | |
| IN1 Flags | / | Bit | R/W | | 40037 |
| | These bits aren't used | | | / | Bit [15:8] |
| | RTD-type input. If bit40037.[7:6]=0b00: PT100; if bit40037.[7:6]=0b01: NI100; if bit40037.[7:6]=0b10: PT500; if bit40037.[7:6]=0b11: PT1000 | | | 0b00 | Bit [7:6] |
| | Input measure type: 0=temperature; 1=resistance | | | 0 | Bit 5 |
| | RTD connection type: 2 or 4 wires (if bit40037.4=0), 3 wires (if bit40037.4=1) | | | 0 | Bit 4 |
| | Rejection: 0=50Hz; 1=60Hz | | | 0 | Bit 3 |

| | | | | | |
|---|---|---|---|---|---|
| | Filter applied to acquired input. To know the configurations of bit40037.[2:0], see table1 | | | 0b010 | Bit [2:0] |
| IN1 | / | Word | R | | 40003 |
| | Measure of input 1 [°C/10] (if bit40037.5=0), [Ω/100] (if bit40037.5=1 and RTD-type is PT100, NI100), [Ω/10] (if bit40037.5=1 and RTD-type is PT1000, PT500) | | | / | |
| IN1 MSW | | FP32bit_MSW | R | | 40007 |
| IN1 LSW | | FP32bit_LSW | R | | 40008 |
| | Floating point measure of input 1 [°C] (if bit40037.5=0), [Ω] (if bit40037.5=1 and RTD-type is PT100, NI100), [Ω] (if bit40037.5=1 and RTD-type is PT1000, PT500). To interpret the FP32bit register, see bit40041.15 | | | / | |
| IN1 wire | | Word | R | | 40016 |
| | Wire-connection measure of input 1 [mΩ] | | | / | |
| IN1 Fault | Between: -32000, 32000 (if temperature); 0, 32000 (if resistance) | Word | R/W | | 40042 |
| | Fault value of input 1 [°C/10] (if bit40037.5=0), [Ω/100] (if bit40037.5=1 and RTD-type is PT100, NI100), [Ω/10] (if bit40037.5=1 and RTD-type is PT1000, PT500). | | | 8500 | |
| **INPUT 2** | | | | | |
| IN2 Flags | / | Bit | R/W | | 40038 |
| | These bits aren't used | | | / | Bit [15:8] |
| | RTD-type input. If bit40038.[7:6]=0b00: PT100; if bit40038.[7:6]=0b01: NI100; if bit40038.[7:6]=0b10: PT500; if bit40038.[7:6]=0b11: PT1000 | | | 0b00 | Bit [7:6] |
| | Input measure type: 0=temperature; 1=resistance | | | 0 | Bit 5 |
| | RTD connection type: 2 or 4 wires (if bit40038.4=0), 3 wires (if bit40038.4=1) | | | 0 | Bit 4 |
| | Rejection: 0=50Hz; 1=60Hz | | | 0 | Bit 3 |
| | Filter applied to acquired input. To know the configurations of bit40038.[2:0], see table1 | | | 0b010 | Bit [2:0] |
| IN2 | / | Word | R | | 40004 |
| | Measure of input 2 [°C/10] (if bit40038.5=0), [Ω/100] (if bit40038.5=1 and RTD-type is PT100, NI100), [Ω/10] (if bit40038.5=1 and RTD-type is PT1000, PT500) | | | / | |
| IN2 MSW | | FP32bit_MSW | R | | 40009 |
| IN2 LSW | | FP32bit_LSW | R | | 40010 |
| | Floating point measure of input 2 [°C] (if bit40038.5=0), [Ω] (if bit40038.5=1 and RTD-type is PT100, NI100), [Ω] (if bit40038.5=1 and RTD-type is PT1000, PT500). To interpret the FP32bit register, see bit40041.15 | | | / | |
| IN2 wire | | Word | R | | 40017 |
| | Wire-connection measure of input 2 [mΩ] | | | / | |
| IN2 Fault | Between: -32000, 32000 (if temperature); 0, 32000 (if resistance) | Word | R/W | | 40043 |
| | Fault value of input 2 [°C/10] (if bit40038.5=0), [Ω/100] (if bit40038.5=1 and RTD-type is PT100, NI100), [Ω/10] (if bit40038.5=1 and RTD-type is PT1000, PT500). | | | 8500 | |
| **INPUT 3** | | | | | |
| IN3 Flags | / | Bit | R/W | | 40039 |
| | These bits aren't used | | | / | Bit [15:8] |
| | RTD-type input. If bit40039.[7:6]=0b00: PT100; if bit40039.[7:6]=0b01: NI100; if bit40037.[7:6]=0b10: PT500; if bit40039.[7:6]=0b11: PT1000 | | | 0b00 | Bit [7:6] |
| | Input measure type: 0=temperature; 1=resistance | | | 0 | Bit 5 |
| | RTD connection type: 2 or 4 wires (if bit40039.4=0), 3 wires (if bit40039.4=1) | | | 0 | Bit 4 |
| | Rejection: 0=50Hz; 1=60Hz | | | 0 | Bit 3 |

| | | | | | |
|---|---|---|---|---|---|
| | Filter applied to acquired input. To know the configurations of bit40039.[2:0], see table1 | | | 0b010 | Bit [2:0] |
| IN3 | / | Word | R | | 40005 |
| | Measure of input 3 [°C/10] (if bit40039.5=0), [Ω/100] (if bit40039.5=1 and RTD-type is PT100, NI100), [Ω/10] (if bit40039.5=1 and RTD-type is PT1000, PT500) | | | / | |
| IN3 MSW | | FP32bit_MSW | R | | 40011 |
| IN3 LSW | | FP32bit_LSW | R | | 40012 |
| | Floating point measure of input 1 [°C] (if bit40039.5=0), [Ω] (if bit40039.5=1 and RTD-type is PT100, NI100), [Ω] (if bit40039.5=1 and RTD-type is PT1000, PT500). To interpret the FP32bit register, see bit40041.15 | | | / | |
| IN3 wire | | Word | R | | 40018 |
| | Wire-connection measure of input 3 [mΩ] | | | / | |
| IN3 Fault | Between: -32000, 32000 (if temperature); 0, 32000 (if resistance) | Word | R/W | | 40044 |
| | Fault value of input 3 [°C/10] (if bit40039.5=0), [Ω/100] (if bit40039.5=1 and RTD-type is PT100, NI100), [Ω/10] (if bit40039.5=1 and RTD-type is PT1000, PT500). | | | 8500 | |
| | **INPUT 4** | | | | |
| IN4 Flags | / | Bit | R/W | | 40040 |
| | These bits aren't used | | | / | Bit [15:8] |
| | RTD-type input. If bit40040.[7:6]=0b00: PT100; if bit40040.[7:6]=0b01: NI100; if bit40040.[7:6]=0b10: PT500; if bit40040.[7:6]=0b11: PT1000 | | | 0b00 | Bit [7:6] |
| | Input measure type: 0=temperature; 1=resistance | | | 0 | Bit 5 |
| | RTD connection type: 2 or 4 wires (if bit40040.4=0), 3 wires (if bit40040.4=1) | | | 0 | Bit 4 |
| | Rejection: 0=50Hz; 1=60Hz | | | 0 | Bit 3 |
| | Filter applied to acquired input. To know the configurations of bit40040.[2:0], see table1 | | | 0b010 | Bit [2:0] |
| IN4 | / | Word | R | | 40006 |
| | Measure of input 4 [°C/10] (if bit40040.5=0), [Ω/100] (if bit40040.5=1 and RTD-type is PT100, NI100), [Ω/10] (if bit40040.5=1 and RTD-type is PT1000, PT500) | | | / | |
| IN4 MSW | | FP32bit_MSW | R | | 40013 |
| IN4 LSW | | FP32bit_LSW | R | | 40014 |
| | Floating point measure of input 4 [°C] (if bit40040.5=0), [Ω] (if bit40040.5=1 and RTD-type is PT100, NI100), [Ω] (if bit40040.5=1 and RTD-type is PT1000, PT500). To interpret the FP32bit register, see bit40041.15 | | | / | |
| IN4 wire | | Word | R | | 40019 |
| | Wire-connection measure of input 4 [mΩ] | | | / | |
| IN4 Fault | Between: -32000, 32000 (if temperature); 0, 32000 (if resistance) | Word | R/W | | 40045 |
| | Fault value of input 4 [°C/10] (if bit40040.5=0), [Ω/100] (if bit40040.5=1 and RTD-type is PT100, NI100), [Ω/10] (if bit40040.5=1 and RTD-type is PT1000, PT500). | | | 8500 | |

| **TABLE 1 – CONFIGURATIONS FOR FILTER APPLIED TO ACQUIRED INPUT IN1 (bit40037.[2:0]), IN2 (bit40038.[2:0]), IN3 (bit40039.[2:0]), IN4 (bit40040.[2:0])** | | | |
|---|---|---|---|
| Bit [2:0] | Filter type | Propagation time (if IN<T) | Propagation time (if IN>T) |
| 0b000 | Deactivated | 45ms | 45ms |
| 0b001 | Average (13bits) | 236ms | 103ms |
| 0b010 | Average (14bits) | 405ms | 179ms |
| 0b011 | Average + exp (14bits) | 1s | 179ms |
| 0b100 | Average + exp (14bits) | 3s | 179ms |
| 0b101 | Average + exp (14bits) | 8s | 179ms |
| 0b110 | Average + exp (14bits) | 24s | 179ms |
| 0b111 | Average + exp (14bits) | 72s | 179ms |

Threshold values T: PT100, T=8°C; NI100, T=5°C; PT500, T=9°C; PT1000, T=5°C.

Propagation time: interval time between a step change of input electrical signal and corresponding change of measure in register (at 115kBaud). The propagation times shown in table 1 refer to 50Hz rejection; to obtain the propagation times refer to 60Hz rejection, divide them for 1.2.

## *LEDs 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 |
| | Constant light | Module failure |
| 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 |
| | Constant light | Module failure |

# Seneca Z-PC Line module: **Z-SG**

The Z-SG module allows to manage the load cell signals and to process the weight value.

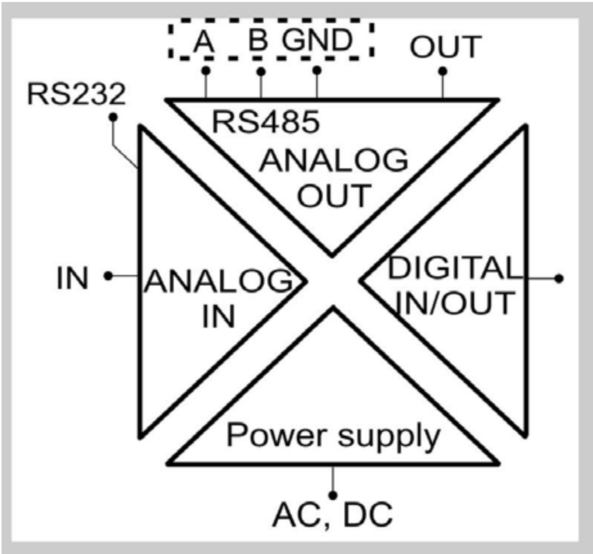
## *General characteristics*

- It is possible to configure an analog output by Dip-Switches. This output is directly proportional to the input signal, and it can be: 0..5V or 0..10V (if voltage-type output), 0..20mA or 4..20mA (if current-type output)
- It is possible to select load cell sensitivity by Dip-Switches (between 7 values)
- It is possible to choose resolution
- Technical net weight measure is available through RS232 and RS485 bus communication
- Moving average filtering of weight
- It is possible to acquire tare value when a digital signal commutation occurs or by a button. Tare value can be saved in RAM and/or EEPROM memory.
- It is possible to connect to digital output a resistive load to detect when a particular condition occurs
- Configuration of 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

## *Features*

| | |
|---|---|
| **ANALOG INPUT** | |
| **Number** | 1 (for one load cell: + Excitation, - Excitation, +Sense, - Sense, + Signal, - Signal) |
| **Resolution** | 24bits |
| **Sampling frequency** | Configurable between: 12.53Hz; 16.65Hz; 24.82Hz; 37.59Hz; 49.95Hz; 50.57Hz; 74.46Hz; 151.71Hz |
| **Rejection** | 50Hz or 60Hz |
| **Accuracy** | Initial: 0.1% of E.E.S. |
| | Linearity: 0.03% of E.E.S. |
| | Thermal stability: 25ppm/K |
| | EMI: < 1% |
| **ANALOG OUTPUT** | |
| **Number** | 1 |
| **Accuracy** | 0.1% of output scale range |
| **Response time (10%-90%)** | 5ms |
| **Voltage-type OUT** | Output scale range configurable between: 0..5V or 0..10V by Dip-Switches. Minimum resistance that can be connected: 2 kΩ |
| **Current-type OUT** | Output scale range configurable between: 0..20mA or 4..20mA by Dip-Switches. Max resistance that can be connected: 500 Ω |
| **LOAD CELLS** | |
| A load cell or more load cells (if they are parallel-connected) can be connected to the Z-SG module. | |
| **Load impedance** | Minimum impedance that can be connected: 87 Ω. This value can be equivalent impedance of more parallel-connected load cells. For example: up to 4 load cells (if each cell has input impedance: 350Ω), up to 8 load cells (if each cell has input impedance: 1000Ω) |

| | |
|---|---|
| **Cell sensitivity** | Configurable between: ±1mV/V; ±2mV/V; ±4mV/V; ±8mV/V; ±16mV/V; ±32mV/V; ±64mV/V by Dip-Switches. Cell sensitivity can be acquired by register (in alternative) |
| **Internal voltage supply** | To supply the load cell(s), the #7 screw terminal (+Excitation) powers 5Vdc with reference to the #10 screw terminal (-Excitation). The #8 screw terminal (+Sense) reads “+Excitation”, the #11 screw terminal (-Sense) reads “-Excitation” |
| **CONNECTIONS** | |
| **RS485 interface** | IDC10 connector |
| **RS232 interface** | Jack stereo 3.5mm connector: plugs into COMport |
| **PROTECTION** | |
| | This module provides inputs protection against the ESD (up to 4kV) for every screw terminals |
| **1500 Vac ISOLATIONS** | |
| | Between: power supply, ModBUS RS485 and analog output, analog input, digital input/output |



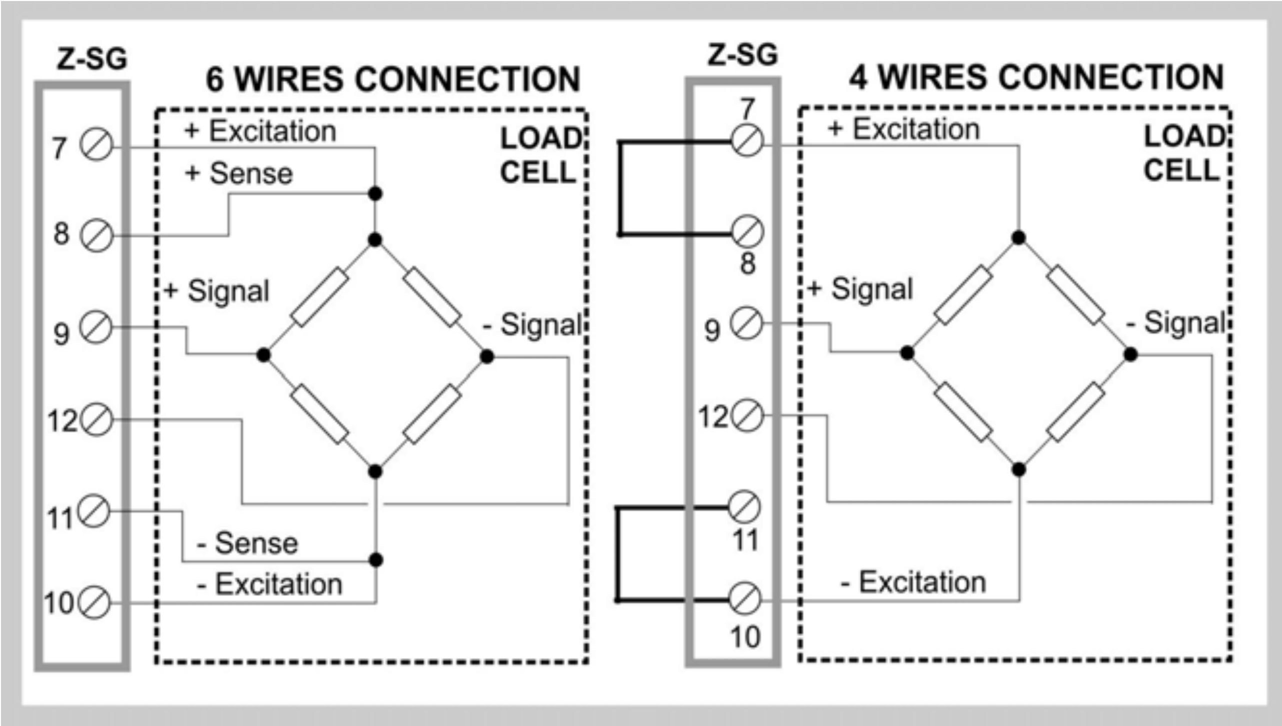

| | |
|---|---|
| **POWER SUPPLY** | |
| **Supply voltage** | 10 – 40 Vdc or 19 – 28 Vac ( 50Hz - 60Hz) |
| **Power consumption** | Max: 2W |

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.

## *Functioning and connections*

Z-SG setting parameters are: digital input/output, analog output, operating modality, load cell sensitivity. These parameters are settable only by Dip-Switches (except load cell sensitivity, settable by Dip-Switches and by bus communication).

## ANALOG INPUT




| Input | Screw terminal | Meaning |
|---|---|---|
| + Excitation | 7 | Load cell power (+) |
| + Sense | 8 | Reading of load cell power (+) |
| + Signal | 9 | Load cell output signal (+) |
| - Signal | 12 | Load cell output signal (-) |
| - Sense | 11 | Reading of load cell power (-) |
| - Excitation | 10 | Load cell power (-) |

**To connect the Z-SG to load cell in 4-wires modality:**

**- short-circuit screw terminal 7 to screw terminal 8;**

**- short-circuit screw terminal 10 to screw terminal 11.**

Use shielded cables for connections.

## ANALOG OUTPUT


”V” means voltmeter, “A” means amperemeter.

Z-SG module allows to associate net weight to the analog output value (and normalized net-weight measure), as described in the following points:

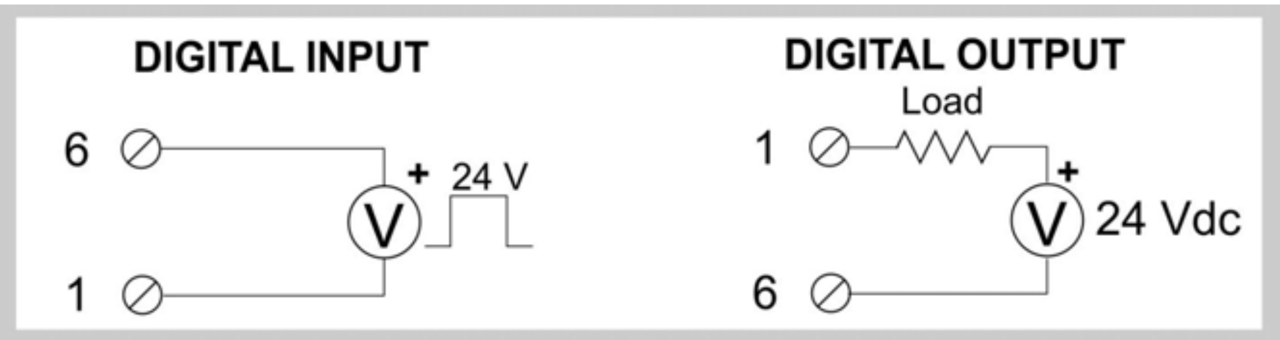
- if technical net weight measure (reg.40064, 40065 FP) is less than min tech net-weight (reg.40050, 40051 FP): normalized net-weight measure (reg.40063) is equal to 0 and analog output is 0% (0V, 0mA, 4mA), available through screw terminals 4 and 5;
- if technical net weight measure (reg.40064, 40065 FP) is greater than max tech net-weight (reg.40052, 40053 FP): normalized net-weight measure (reg. 40063) is equal to 30000 and analog output is 100% (5V, 10V, 20mA), available through screw terminals 4 and 5;
- if technical net weight measure (reg.40064, 40065 FP) is between min tech net-weight and max tech net-weight, analog output (current/voltage) is directly proportional to the net weight measure and it is available through screw terminals 4 and 5.

## STABLE WEIGHT

Z-SG module allows to detect when a weight is stable: weight stability information is available through bit40066.4 or through digital output.

In particular, a weight measure is stable if the weight variation of net weight (reg.40064, 40065), in a given time interval (“delta time”, reg.40058), is less than weight interval (“delta weight”, reg.40056, 40057 floating point).

## DIGITAL INPUT OR DIGITAL OUTPUT




”V” means equivalent voltage generator.

Z-SG module allows to activate a digital input or (in alternative) a digital output only by Dip-Switch. Digital input allows to storage tare value and it can be always used in alternative to calibration button. Digital output allows to open/close a opto-isolated contact: to use this information, it is possible to connect a 24Vdc voltage generator with a series resistive load. In this way, if one of the following setting (selected by bit40059.[6:0]) occurs, there is a no zero current through resistive load (example: lamp).

- gross weight is greater than load cell end scale
- weight is stable and net weight is greater than Threshold
- weight is stable

## *Dip-switches table*

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 | Meaning |
| | | Baud-rate=9600 Baud |
| | ● | Baud-rate=19200 Baud |
| ● | | Baud-rate=38400 Baud |
| ● | ● | Baud-rate=57600 Baud |

| **ADDRESS (Dip-Switches: SW1)** | | | | | | |
|---|---|---|---|---|---|---|
| 3 | 4 | 5 | 6 | 7 | 8 | Meaning |
| | | | | | | **Address and Baud-Rate are acquired from memory(EEPROM)** |
| | | | | | ● | Address=1 |
| | | | | ● | | Address=2 |
| | | | | ● | ● | Address=3 |
| | | | ● | | | Address=4 |
| X | X | X | X | X | X | ...................... |
| ● | ● | ● | ● | ● | ● | Address=63 |

| **DIGITAL INPUT/OUTPUT (Dip-Switches: SW2)** | |
|---|---|
| 1 | Meaning |
| | Digital input. Calibration button (used during calibration procedure) is enabled |
| ● | Digital output |

| **ANALOG OUTPUT (Dip-Switches: SW2)** | | |
|---|---|---|
| 2 | 3 | Meaning |
| | | Output scale range=0..10V |
| | ● | Output scale range=0..5V |
| ● | | Output scale range=0..20mA |
| ● | ● | Output scale range=4..20mA |

| **OPERATING MODALITY (Dip-Switches: SW2)** | | |
|---|---|---|
| 4 | 5 | Meaning |
| | | Factory calibration |
| | ● | Calibration with known weight |
| ● | | Factory calibration using calibration button (or digital input) |
| ● | ● | Calibration with known weight using calibration button (or digital input) |

| LOAD CELL SENSITIVITY (Dip-Switches: SW2) | | | |
|---|---|---|---|
| 6 | 7 | 8 | Meaning |
| | | | ±1 mV/V |
| | | ● | ±2 mV/V |
| | ● | | ±4 mV/V |
| | ● | ● | ± 8mV/V |
| ● | | | ±16 mV/V |
| ● | | ● | ±32 mV/V |
| ● | ● | | ±64 mV/V |
| ● | ● | ● | The module acquires load cell sensitivity from register 40044, 40045 (FP): in this case, real numbers for sensitivity are allowed |

| RS485 TERMINATOR (Dip-Switches: SW3) | | |
|---|---|---|
| 1 | 2 | Meaning |
| | | RS485 terminator disabled |
| ● | | RS485 terminator enabled |

## *RS485 Register table*

Generic parameters of Z-SG module are shown in the following table.

| Name | Range | Interpretation of register | R/W | Default | Address |
|---|---|---|---|---|---|
| MachineID | / | MSB, LSB | R | | 40001 |
| | Id_Code (Module ID) | | | 0x17 (23 decimal) | Bit [15:8] |
| | Ext_Rev (Module version) | | | | Bit [7:0] |
| FWREV | / | Word | R | | 40002 |
| | Firmware Code | | | | |
| HWREV | / | Word | R | | 40003 |
| | Hardware Code | | | | |
| Status | / | Bit | R/W | | 40066 |
| | These bits aren't used | | | / | Bit [15:5] |
| | Weight stability. 0=weight is not stable; 1=weight is stable | | | / | Bit 4 |
| | Tare-value storage in RAM memory. 0=no operation; 1=save the tare value | | | / | Bit 3 |
| | 0=gross weight is greater than tare-value saved in memory;<br>1=gross weight is less than tare-value saved in memory | | | / | Bit 2 |
| | 0=gross weight is less than load cell end scale;<br>1=gross weight is greater than load cell end scale | | | / | Bit 1 |
| | 0=net weight is less than Threshold (reg.40054, 40055 FP) or weight measure is not stable<br>1=net weight is greater than Threshold (reg.40054, 40055 FP) and weight measure is stable | | | / | Bit 0 |

| Command | / | Bit | R/W | | 40068 |
|---|---|---|---|---|---|
| | Reset of module, if reg.40068=0xABAC=43948;<br>save value-tare in RAM memory,<br>if reg.40068=0xC1BA=49594 (equivalent command to bit40066.1=1);<br>save standard weight in EEPROM memory,<br>if reg.40068=0xC60C=50700<br>save value-tare in EEPROM and RAM memory,<br>if reg.40068=0xC2FA=49914 | | | / | |
| Dip-Switch Status | / | Bit | R | | 40067 |
| | Switch1 of “SW1” state. Bit40067.15=0 corresponds to Switch1=”0”, bit40067.15=1 corresponds to Switch1=”1” | | | / | Bit 15 |
| | Switch2 of “SW1” state. Bit40067.14=0 corresponds to Switch2=”0”, bit40067.14=1 corresponds to Switch2=”1” | | | / | Bit 14 |
| | Switch3 of “SW1” state. Bit40067.13=0 corresponds to Switch3=”0”, bit40067.13=1 corresponds to Switch3=”1” | | | / | Bit 13 |
| | Switch4 of “SW1” state. Bit40067.12=0 corresponds to Switch4=”0”, bit40067.12=1 corresponds to Switch4=”1” | | | / | Bit 12 |
| | Switch5 of “SW1” state. Bit40067.11=0 corresponds to Switch5=”0”, bit40067.11=1 corresponds to Switch5=”1” | | | / | Bit 11 |
| | Switch6 of “SW1” state. Bit40067.10=0 corresponds to Switch6=”0”, bit40067.10=1 corresponds to Switch6=”1” | | | / | Bit 10 |
| | Switch7 of “SW1” state. Bit40067.9=0 corresponds to Switch7=”0”, bit40067.9=1 corresponds to Switch7=”1” | | | / | Bit 9 |
| | Switch8 of “SW1” state. Bit40067.8=0 corresponds to Switch8=”0”, bit40067.8=1 corresponds to Switch8=”1” | | | / | Bit 8 |
| | Switch1 of “SW2” state. Bit40067.7=0 corresponds to Switch1=”0”, bit40067.7=1 corresponds to Switch1=”1” | | | / | Bit 7 |
| | Switch2 of “SW2” state. Bit40067.6=0 corresponds to Switch2=”0”, bit40067.6=1 corresponds to Switch2=”1” | | | / | Bit 6 |
| | Switch3 of “SW2” state. Bit40067.5=0 corresponds to Switch3=”0”, bit40067.5=1 corresponds to Switch3=”1” | | | / | Bit 5 |
| | Switch4 of “SW2” state. Bit40067.4=0 corresponds to Switch4=”0”, bit40067.4=1 corresponds to Switch4=”1” | | | / | Bit 4 |
| | Switch5 of “SW2” state. Bit40067.3=0 corresponds to Switch5=”0”, bit40067.3=1 corresponds to Switch5=”1” | | | / | Bit 3 |
| | Switch6 of “SW2” state. Bit40067.2=0 corresponds to Switch6=”0”, bit40067.2=1 corresponds to Switch6=”1” | | | / | Bit 2 |
| | Switch7 of “SW2” state. Bit40067.1=0 corresponds to Switch7=”0”, bit40067.1=1 corresponds to Switch7=”1” | | | / | Bit 1 |
| | Switch8 of “SW2” state. Bit40067.0=0 corresponds to Switch8=”0”, bit40067.0=1 corresponds to Switch8=”1” | | | / | Bit 0 |
| Sampling Freq Rejection | / | Word | R/W | | 40060 |
| | The value of reg.40060 relates to one of the configuration shown in the following table, for sampling frequency, 50Hz rejection and 60Hz rejection. As you can see, only a few register (40060) values are allowed | | | 0x0052 | |

| Register (40060) value | | Sampling frequency (Hz) | 50Hz rejection | 60Hz rejection |
|---|---|---|---|---|
| 0x | decimal | | | |
| 001B | 27 | 151.71 | NO | NO |
| 0037 | 55 | 74.46 | NO | NO |
| 0052 | 82 | 49.95 | YES | YES |
| 006D | 109 | 37.59 | NO | YES |
| 009B | 155 | 50.57 | NO | NO |
| 00B7 | 183 | 24.82 | YES | NO |
| 00D2 | 210 | 16.65 | YES | YES |
| 00ED | 237 | 12.53 | NO | YES |

| | | | | | |
|---|---|---|---|---|---|
| Resolution | / | Bit | R/W | | 40059 |
| | 0=resolution value is acquired from bit[14:8]; 1=resolution is equal to 24bits | | | 0 | Bit 15 |
| | Resolution value (needs to be multiplied by 1000), if bit40059.15=0 | | | 30 | Bit [14:8] |
| Number Of Samples | Between: 1; 100 | Word | R/W | | 40061 |
| | These bits aren't used | | | / | Bit [15:8] |
| | Number of samples to execute the moving average of weight. Registers 40064 and 40065 contain the result of moving average (floating point weight) | | | 100 | Bit [7:0] |

To choose the number of samples, see the following table.

| Number of samples | Weight measure stability | Weight measure speed |
|---|---|---|
| High values (up to 100) | Better | Worst |
| Low values (up to 1) | Worst | Better |

| | | | | | |
|---|---|---|---|---|---|
| Address Parity | / | MSB, LSB | R/W | | 40004 |
| | Address for RS485 (address of module/node if parameters are configurated by memory modality): from 0x01=1 to 0xFF=255 | | | 1 | Bit [15:8] |
| | Parity for RS485: 0=there isn't; 1=even parity; 2=odd parity | | | 0 | Bit [7:0] |
| Baudrate Delay | / | MSB, LSB | R/W | | 40005 |
| | 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 | | | 38400 | Bit [15:8] |
| | Delay for RS485 (delay of communication response: it represents the number of the pauses(*) between the end of Rx message and the start of Tx message): from 0x00=0 to 0xFF=255<br>(*)1 pause=6 characters | | | 0 | Bit [7:0] |

Load-cell configuration parameters are shown in the following table.

| | | | | | |
|---|---|---|---|---|---|
| Sensitivity MSW | | FP32bit_MSW | R/W | | 40044 |
| Sensitivity LSW | | FP32bit_LSW | R/W | | 40045 |
| | If Dip-Switches SW2-7 is "ON", SW2-8 is "ON", SW2-9 is "ON", the Z-SG module acquires sensitivity [mV/V] from these registers (reg.40044, 40045 FP) | | | 2[mV/V] | |
| Load cell end scale MSW | | FP32bit_MSW | R/W | | 40046 |
| Load cell end scale LSW | | FP32bit_LSW | R/W | | 40047 |
| | If load cell end scale is known, switch Dip-Switches SW2-4 to OFF and SW2-5 to OFF. In this case, reg. 40046, 40047 (FP) is the load cell end scale [mg, g, kg, etc…] | | | 10000 [mg, g, kg, etc…] | |

| | | | | | |
|---|---|---|---|---|---|
| Known weight MSW | | FP32bit_MSW | R/W | | 40048 |
| Known weight LSW | | FP32bit_LSW | R/W | | 40049 |
| | If load cell end scale is unknown, switch Dip-Switches SW2-4 to OFF and SW2-5 to ON. In this case, reg. 40048, 40049 (FP) is the known weight [mg, g, kg, etc…] | | | 10000 [mg, g, kg, etc…] | |

Net-weight parameters are shown in the following table.

| | | | | | |
|---|---|---|---|---|---|
| Tech net-weight measure MSW | | FP32bit_MSW | R | | 40064 |
| Tech net-weight measure LSW | | FP32bit_LSW | R | | 40065 |
| | Technical net weight measure [mg, g, kg, etc…] | | | / | |
| Norm net-weight measure MSW | -31000; +31000 | Word | R | | 40063 |
| | Normalized net weight measure. If technical net weight measure (reg.40064, 40065 FP) is less than min tech net-weight (reg.40052, 40053 FP): reg.40063 is equal to 0.<br>If technical net weight measure (reg.40064, 40065 FP) is greater than max tech net-weight (reg.40050, 40051 FP): reg. 40063 is equal to 30000. | | | / | |
| Min tech net-weight MSW | | FP32bit_MSW | R/W | | 40052 |
| Min tech net-weight LSW | | FP32bit_LSW | R/W | | 40053 |
| | Min technical net weight. It corresponds to the analog output start scale (settable by Dip-Switches: 0V, 0mA, 4mA) | | | 0 [mg, g, kg, etc…] | |
| Max tech net-weight MSW | | FP32bit_MSW | R/W | | 40050 |
| Max tech net-weight LSW | | FP32bit_LSW | R/W | | 40051 |
| | Max technical net weight. It corresponds to the analog output end scale (settable by Dip-Switches: 5V, 10V, 20mA) | | | 10000 [mg, g, kg, etc…] | |

ADC value is shown in the following table.

| | | | | | |
|---|---|---|---|---|---|
| ADC value | | Word | R | | 40062 |
| | ADC value (it refers to gross weight) | | | | |

Stable-weight parameters are shown in the following table.

| | | | | | |
|---|---|---|---|---|---|
| Delta weight MSW | | FP32bit_MSW | R/W | | 40056 |
| Delta weight LSW | | FP32bit_LSW | R/W | | 40057 |
| | Weight interval [mg, g, kg, etc…] to define if a weight measure is stable, with reference to the net weight | | | 1 [mg, g, kg, etc…] | |

| | | | | | |
|---|---|---|---|---|---|
| Delta time LSW | | Word | R/W | | 40058 |
| | Time interval to define if a weight measure is stable, with reference to the net weight | | | 1 (=100 [msec]) | |

A weight measure is stable if the weight variation of net weight (reg.40064, 40065), in a given time interval (“delta time”, reg.40058), is less than weight interval (“delta weight”, reg.40056, 40057 floating point); time interval (“delta time”) and weight interval (“delta weight”) are settable by “stable weight condition” window.

Digital output parameters are shown in the following table.

| | | | | | |
|---|---|---|---|---|---|
| Digital output | | Bit | R/W | | 40059 |
| | Digital output behavior if the selected condition of digital output occurs (see bit[6:0]).<br>0=if the selected condition of digital output occurs, digital output (open normally) switches from open to closed (no-zero current through external load)<br>1=if the selected condition of digital output occurs, digital output (closed normally) switches from closed to open (no current through external load) | | | 0 | Bit 7 |
| | Condition of digital output. It is possible to select one of the following setting:<br>0=gross weight is greater than load cell end scale<br>1=weight is stable and net weight is greater than Threshold<br>2=weight is stable | | | 0 | Bit [6:0] |
| Threshold MSW | | FP32bit_MSW | R/W | | 40054 |
| Threshold LSW | | FP32bit_LSW | R/W | | 40055 |
| | Threshold of net weight (see bit40059.[6:0]) | | | 0 | |

## *Setting using PLC*

There are two alternative modalities to configure the Z-SG module using PLC (Programmable Logic Controller):

**CALIBRATION WITH KNOWN WEIGHT**

**WARNING**

**Gross weight (tare + known weight) must not to exceed load cell end scale, to avoid serious damage to the cell.**

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

2) Switch Dip-Switch SW2-1 as desired: “OFF”=digital input enabled, digital output disabled; “ON”=digital input disabled, digital output enabled

3) Switch Dip-Switches SW2-2 and SW2-3 as desired: see Dip-Switches table

4) Switch Dip-Switches SW2-4 to “OFF” and SW2-5 to “ON”

5) Switch Dip-Switches SW2-6 to “ON”, SW2-7 to “ON”, SW2-8 to “ON”

6) Power on the Z-SG module

7) Write sensitivity value in reg. 40044, 40045 (FP)

8) Write known weight value in reg. 40048, 40049 (FP)

9) Reset the module (write 0xABAC=43948 in reg.40068)

New sensitivity and known weight are saved in Z-SG module.

10) Put the tare on the balance

11) Save the tare value in EEPROM memory (write 0xC2FA=49914 in reg.40068)

12) Put the known weight on the tare

13) Save the known weight in EEPROM memory (write 0xC60C=50700 in reg.40068)

## FACTORY CALIBRATION

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

2) Switch Dip-Switch SW2-1 as desired: “OFF”=digital input enabled, digital output disabled; “ON”=digital input disabled, digital output enabled

3) Switch Dip-Switches SW2-2 and SW2-3 as desired: see Dip-Switches table

4) Switch Dip-Switches SW2-4 to “OFF” and SW2-5 to “OFF”

5) Switch Dip-Switches SW2-6 to “ON”, SW2-7 to “ON”, SW2-8 to “ON”

6) Power on the Z-SG module

7) Write sensitivity value in reg. 40044, 40045 (FP)

8) Write load cell end scale in reg. 40046, 40047 (FP)

New sensitivity and load cell end scale are saved in Z-SG module.

10) Put the tare on the balance

11) Save the tare value in EEPROM memory (write 0xC2FA=49914 in reg.40068

## *Setting by calibration button (or digital input)*

There are two alternative modalities to configure the Z-SG module by calibration button (if the user has not a Personal Computer and has a known weight that corresponds to the analog output end scale).

**CALIBRATION WITH KNOWN WEIGHT USING CALIBRATION BUTTON (OR DIGITAL INPUT)**

**WARNING**

**Gross weight (tare + known weight) must not to exceed load cell end scale, to avoid serious damage to the cell.**

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

2) Switch the Dip-Switches SW2-4 to “ON” and SW2-5 to “ON”. In this way, setting by calibration button is possible.

3) Switch the Dip-Switch SW2-1 to “OFF”. In this way, calibration with known weight using calibration button (or digital input) is possible.

4) Switch the Dip-Switches SW2-2 and SW2-3 as shown in Dip-Switches table, to select one of the possible modalities of analog output.

5) Switch the Dip-Switches SW2-6, SW2-7, SW2-8 to choose the load cell sensitivity (see Dip-Switch table)

6) Power on the module

7) Keep pushed the calibration button (or in alternative use digital input signal) until LED ERR is “ON”

8) Release the calibration button

9) Control that the LED ERR is flashing

10) Put the tare on the load cell

11) Keep pushed the calibration button (or in alternative use digital input signal) until LED ERR switches from flashing to “OFF”

The Z-SG module has acquired the tare value.

12) Keep pushed the calibration button (or in alternative use digital input signal) until LED ERR is “ON”

13) Release the calibration button

14) Control that the LED ERR is flashing

15) Put the known weight on the tare

16) Keep pushed the calibration button (or in alternative use digital input signal) until LED ERR switches from flashing to “OFF”

The Z-SG module has acquired the known weight value.

17) Power off the module

18) Switch the Dip-Switches SW2-4 to “OFF” and SW2-5 to “ON”. In this way, Z-SG module is calibrated.

19) Power on the module

When calibration procedure is ended, it is possible to calibrate the Z-SG by digital input or by calibration button (after switching SW2-1 to “OFF”: digital input is enabled). If a digital signal commutation (from “0” to “1”) occurs (through screw terminals 1-6), a tare value is saved in RAM memory. This value is erased if the module is power off or when a new digital signal commutation (from “0” to “1”) occurs (through screw terminals 1-6).

If the module is power off during this procedure, calibration setting is lost. Restart the calibration procedure from the first point.

**FACTORY CALIBRATION USING CALIBRATION BUTTON (OR DIGITAL INPUT)**

**WARNING**

**Gross weight (tare + known weight) must not to exceed load cell end scale, to avoid serious damage to the cell.**

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

2) Switch the Dip-Switches SW2-4 to “ON” and SW2-5 to “OFF”. In this way, factory calibration using calibration button (or digital input). It is possible to acquire tare value by digital input or calibration button.

3) Switch the Dip-Switch SW2-1 to “OFF”. In this way, calibration button for digital input (used during calibration procedure) is enabled and it is possible to acquire tare value.

4) Switch the Dip-Switches SW2-2 and SW2-3 as shown in Dip-Switches table, to select one of the possible modalities of analog output.

5) Switch the Dip-Switches SW2-6, SW2-7, SW2-8 to choose the load cell sensitivity (see Dip-Switch table)

6) Power on the module

7) Put the tare on the load cell

8) Keep pushed the calibration button (or in alternative use digital input signal) until LED ERR is "ON"

The Z-SG module has acquired tare value: this value is saved in EEPROM (keep saved when the module is power off).

9) Power off the module

10) Switch the Dip-Switches SW2-4 to "OFF" and SW2-5 to "OFF". In this way, Z-SG module is calibrated.

11) Power on the module

When calibration procedure is ended, it is possible to calibrate the Z-SG by digital input or by calibration button (after switching SW2-1 to "OFF": digital input is enabled). If a digital signal commutation (from "0" to "1") occurs (through screw terminals 1-6), a tare value is saved in RAM memory. This value is erased if the module is power off or when a new digital signal commutation (from "0" to "1") occurs (through screw terminals 1-6).

If the module is power off during this procedure, calibration setting is lost. Restart the calibration procedure from the first point.

Analog output end scale is related to load cell end scale, with the following equation:

Real end scale = Load cell end scale – tare

Example:

If load cell end scale is equal to 50kg, tare is equal to 10kg and analog output scale range is 0..10V, real end scale is

Real end scale = 50 – 10 = 40kg

If technical net weight is equal to real end scale, analog output will result

$$\frac{50\text{kg} - 10\text{kg}}{50\text{kg}} \text{X } 100 = 80\%$$

and 80% corresponds to an analog output equal to 8V.

## *LEDs 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 | See “Setting by calibration button” |
| | Turn off after 3 seconds | See “Setting by calibration button” |
| 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 |

# Seneca Z-PC Line module: **Z-DAQ-PID**

The Z-DAQ-PID module acquires 1 universal input signal (voltage, current, potentiometer, thermo-couple, thermo-resistance, milli-voltmeter) and converts it to an analog format (with PID regulation), sent through 1 universal and isolated output signal (voltage, current).

## *General characteristics*

- Three operating modalities: conversion with PID regulator, conversion without PID regulator, manual (constant output configurated through ModBUS register)
- Two output types: analog or ON/OFF (time of high-state digital signal is directly proportional to the analog signal)
- Possible inputs: voltage type, current type, potentiometer type, thermocouple (TC) type, RTD (Resistance Temperature Detector) type, millivoltmeter type
- Possible outputs: voltage type, active current type, passive current type
- Management of: slew-rate, burn-out, output limiters
- Configuration of the module (node) address and baudrate by Dip-Switches
- It's possible to add/remove the module to/from RS485-bus without disconnecting the communication or power supply
- Switching automatically RS485 to RS232 or vice versa

## *Features*

| **INPUT** | |
|---|---|
| **Number** | 1 |
| **Resolution** | 14 bits |
| **Sampling time** | Configurable between: 5 ms ("Fast", no rejection), 16.66 ms (rejection to 60 Hz) or 20 ms (rejection to 50 Hz) |
| **Filter** | Configurable between: 0 (no filter is applied), from 1 (min) to 19 (max) |
| **Response time** | Sampling time + 6 ms |
| **Voltage-type IN** | Scale range is configurable: from 0 V to 10 V. Input impedance:>5MΩ |
| **Current-type IN (mA-passive module/mA-active module)** | Scale range is configurable: from 0 mA to 20 mA. Internal shunt: 50Ω.It's possible to power the sensor by: itself (mA-passive module) or module (mA-active module) using #7 screw terminal (max 25 mA to max 17 V, short-circuited protected) |
| **Potentiometer-type IN** | Scale range is configurable: from 1 kΩ to 100 kΩ (with parallel resistor R=330Ω to connect externally). Excitation current:1 mA. Input impedance:>5MΩ |
| **Thermocouple-type IN** | For TC type: J, K, R, S, T, B, E, N. Input impedance:>5 MΩ. Automatic detection if a TC interruption occurs |
| **RTD-type IN** | For RTD type: PT100, PT500, PT1000, NI100. Resistance measure (for 2,3,4-wires connection) and wire-resistance measure (for 3,4-wires connection). Excitation current:1.1 mA (PT100) and 0.11 mA(PT1000, PT500). Automatic detection if a wire or RTD interruption occurs |
| **Millivoltmeter-type IN** | Scale range is configurable: from -10 mV to 80 mV. Input impedance:>5 MΩ |

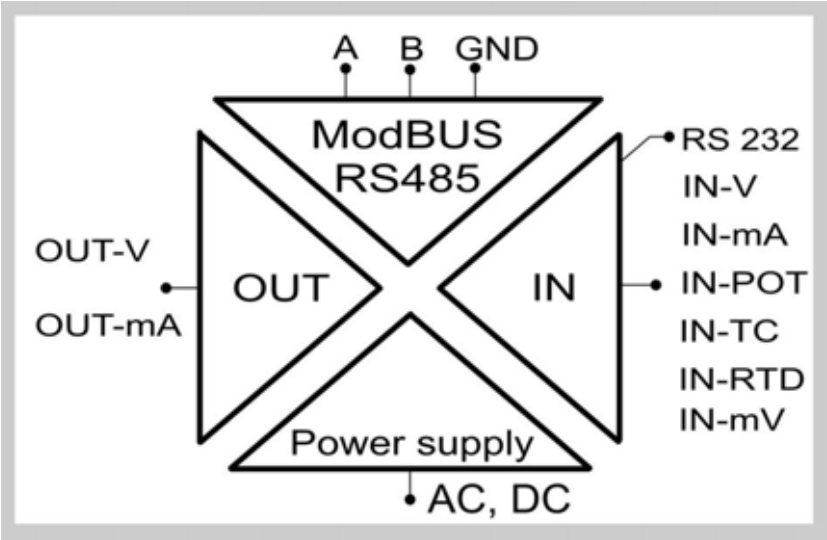
| Errors related to max measuring range | Accuracy | Thermal stability | Linearity error | EMI |
|---|---|---|---|---|
| **Voltage or current-type input** | 0.1% | 0.01%/°K | 0.05% | <1% (2) |
| **TC-type input: J,K,E,T,N** | 0.1% | 0.01%/°K | 0.2°C | <1% (2) |
| **TC-type input:R,S** | 0.1% | 0.01%/°K | 0.5°C | <1% (2) |
| **TC-type input:B** (3) | 0.1% | 0.01%/°K | 1.5°C | <1% (2) |
| **Cold junction compensation (for TC-type input)** | 2°C between 0-50°C | / | / | / |
| **POT-type IN** | 0.1% | 0.01%/°K | 0.1% | <1% |
| **RTD-type IN** (4) | 0.1% | 0.01%/°K | 0.02% (if t>0°C)<br>0.05% (if t<0°C) | <1% (5) |

(1) For the input scale ranges, see "Connections"
(2) Influence of wire resistance: 0.1 µV/Ω
(3) Output zero if t<400°C
(4) For RTD type: PT100, PT500, PT1000, NI100. All the errors have to be calculated with reference to resistive value
(5) Influence of wires resistance: 0.005%/Ω, max20Ω

| **OUTPUT** | |
|---|---|
| **Number** | 1 |
| **Resolution** | 14 bit |
| **Signal-amplitude limiting** | The output signal can be amplitude-limited by an "output limiter" |
| **Voltage-type OUT** | Configurable between: 0-5 V, 0-10 V (with minimum load resistance: 1 kΩ). Saturation value: 10.5 V |
| **Current-type OUT (active or passive)** | Configurable between: 0-20 mA, 4-20 mA (with maximum load resistance: 600 Ω). Saturation value: 21 mA. "Active current" =the output: already powered on, needs to be connected to the passive module; "passive current" =the output: powered off, needs to be connected to the active module |

| Errors related to max measuring range | Errors related to max measuring range | Accuracy | Thermal stability | Linearity error |
|---|---|---|---|---|
| **Voltage-type OUT** | 0.1% | 0.01%/°K | 0.01% | <1% |
| **Voltage-type OUT (active or passive)** | 0.1% | 0.01%/°K | 0.01% | <1% |

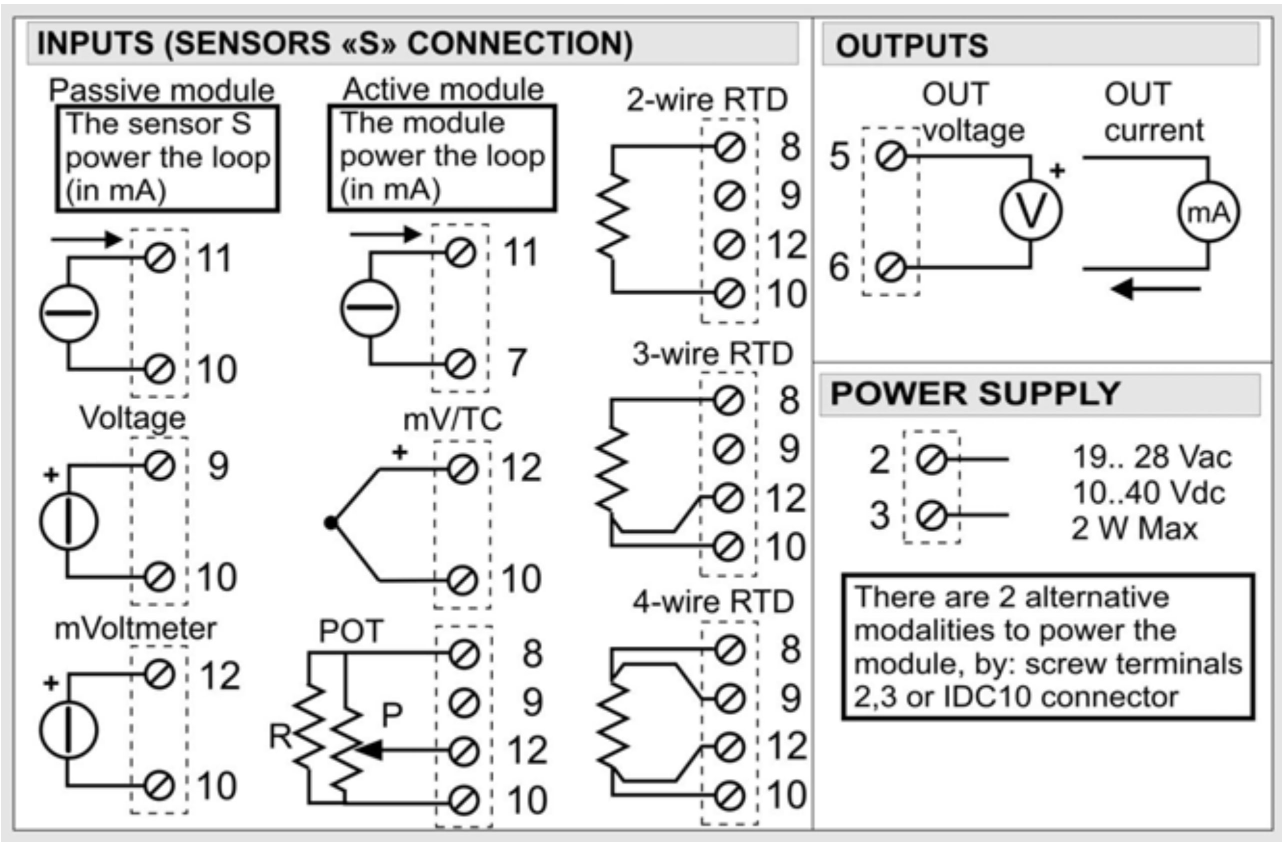
| **CONNECTIONS** | |
|---|---|
| **RS485 interface** | IDC10 connector |
| **RS232 interface** | Jack stereo 3.5 mm connector: plugs into COM port |
| **1500 Vac ISOLATIONS** | |
| | Between: power supply, ModBUS RS485, analog input, analog output |




| POWER SUPPLY | |
|---|---|
| **Supply voltage** | 10 – 40 Vdc or 19 – 28 Vac (50Hz - 60Hz) |
| **Power consumption** | Min: 0.5 W;  Max: 2 W |

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

## *Connections*



**For potentiometer input connection: with R=330 Ω (R needs to be added externally), P=1 kΩ-100 kΩ.**

In particular the input scale range values, for thermocouple-type input selected, are shown in the following table.

| TC-type | Scale range | TC-type | Scale range |
|---|---|---|---|
| J | -210°C..1200°C | S | -50°C..1768°C |
| K | -200°C..1372°C | R | -50°C..1768°C |
| E | -200°C..1000°C | B | 250°C..1820°C |
| N | -210°C..1300°C | T | -200°C..400°C |

The input scale range values, for RTD-type input selected, are shown in the following table.

| RTD-type | Scale range | RTD-type | Scale range |
|---|---|---|---|
| PT100 | -210°C..650°C | PT1000 | -200°C..210°C |
| PT500 | -200°C..750°C | NI100 | -60°C..250°C |

# *Functioning*

There are six possible functioning modalities of the Z-DAQ-PID module, with reference to the following figure:

- conversion with PID, analog output

- conversion with PID, ON/OFF output

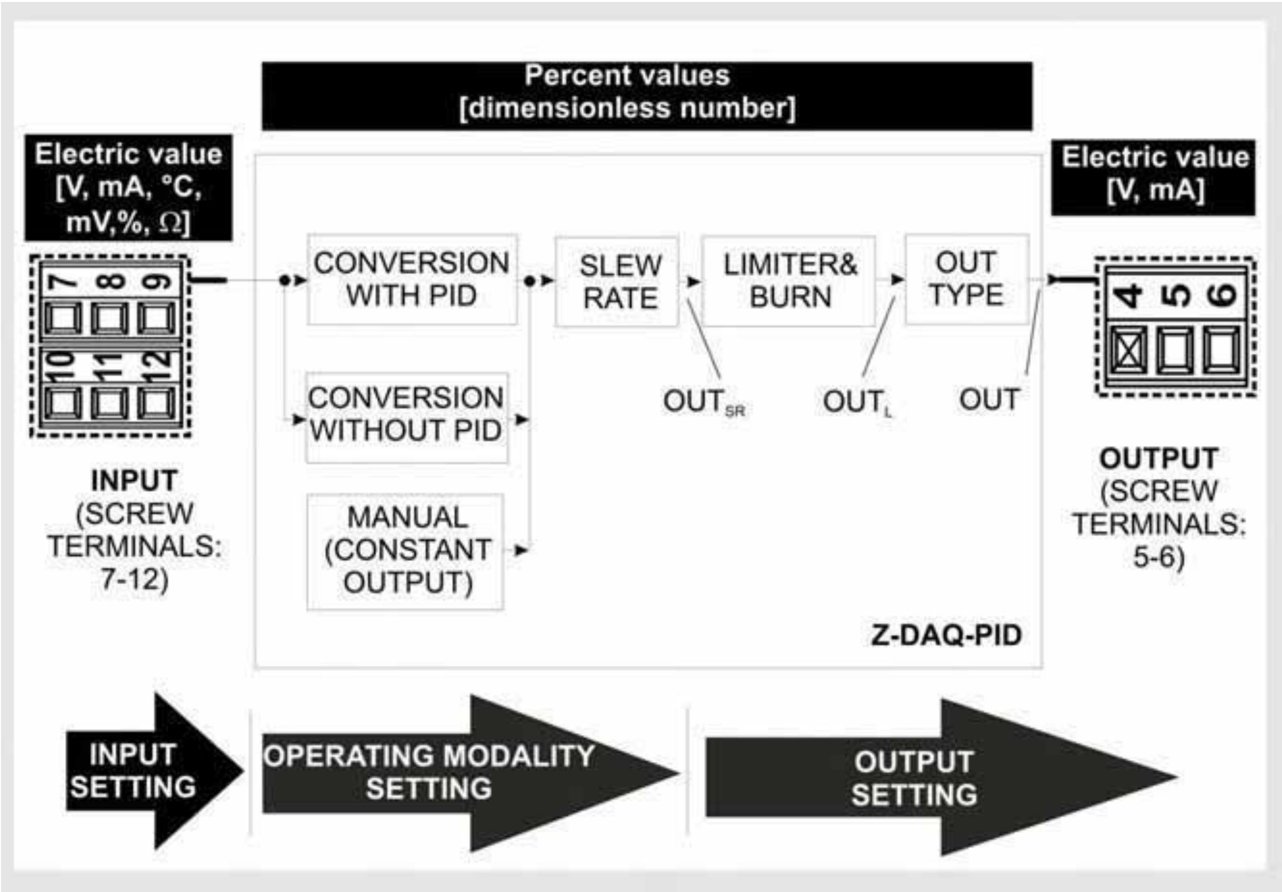
- conversion without PID, analog output

- conversion without PID, ON/OFF output

- manual (constant output), analog output

- manual (constant output), ON/OFF output

With reference to the following figure, the lowest part shows the Z-DAQ-PID setting procedure in three steps: input setting, operating modality setting, output setting.




In particular, there are three operating modalities, each of them allows to supply a ON/OFF output or an analog output:

| Operating modality | Description |
|---|---|
| **Conversion with PID** | The analog output is a function of the analog input processed by the PID transfer function. Moreover, analog output is directly proportional to the analog input |
| **Conversion without PID** | The analog output is directly proportional to the analog input |
| **Manual (constant output without PID)** | The analog output is input-indipendent. Anyhow, the input is acquired and can be found in the RS485 registers (only reading) |

Slew rate allows to limit the slope of the signal (see reg.40031 and 40032) and burn-out allows to overwrite the OUT-Fault value (reg.40020, 40021) to the reg.40105, 40106 (burn-out overwriting is available only for analog output).

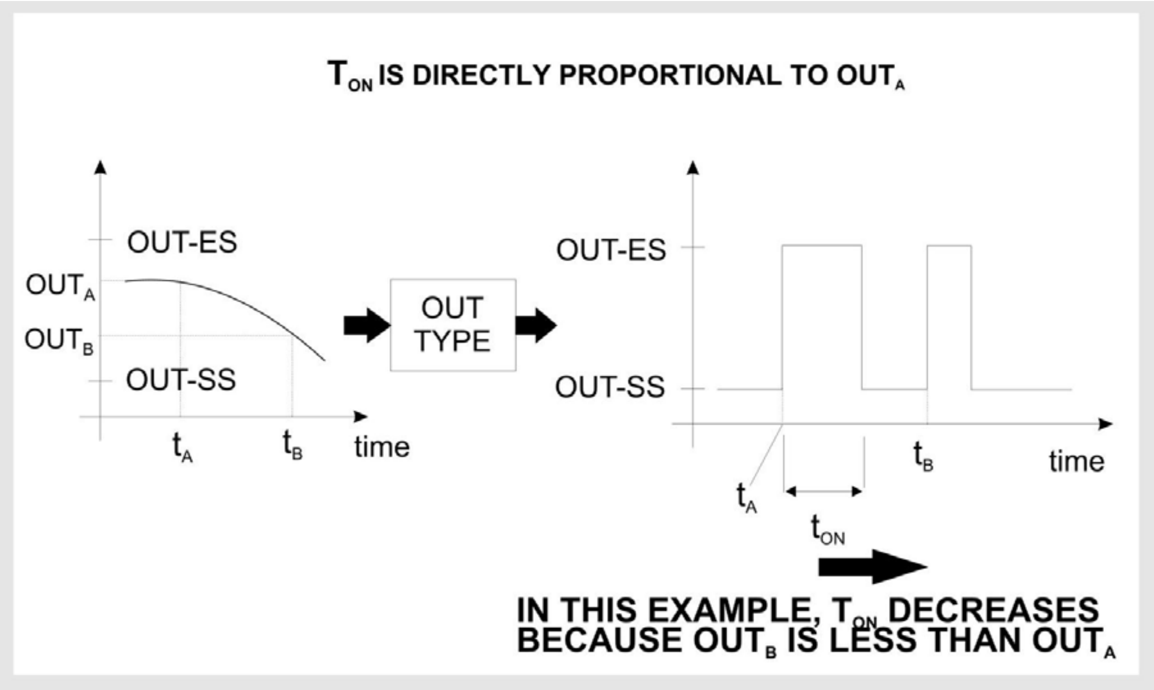
Operating modality is configurable by software or by FunctionMod register (40007.[15:8]), with reference to the "RS485 registers table".

There are two output type of Z-DAQ-PID, regardless of operating modality:

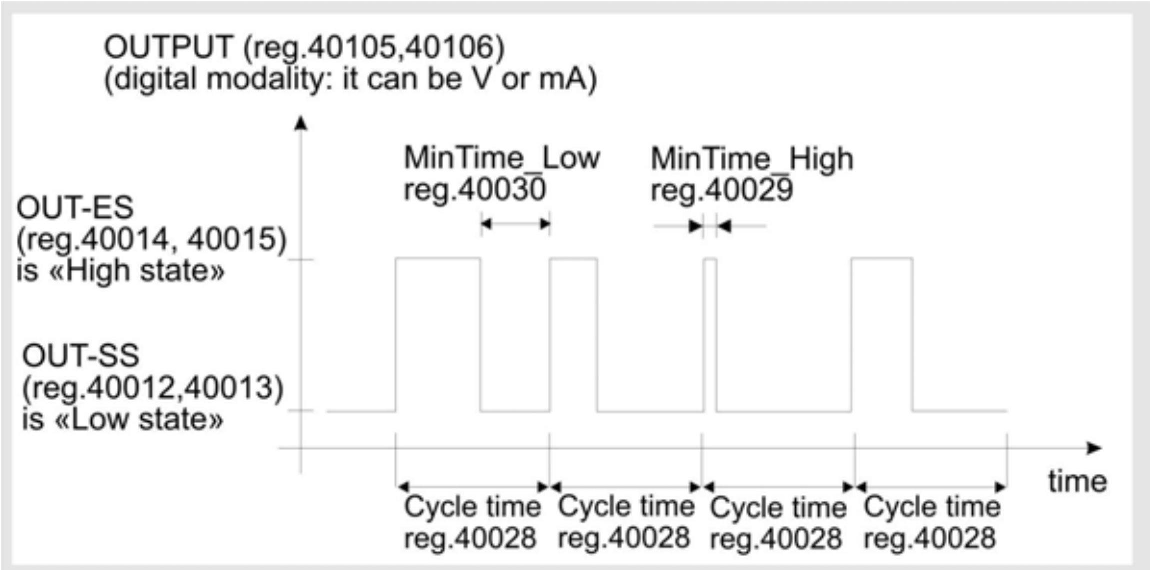
| Out type | Description |
|---|---|
| **Analog** | OUT is an analog signal |
| **ON-OFF**<br>**(see the following figures)** | OUT is a ON/OFF signal. High state output is OUT-ES, low state output is OUT-SS |

If out type is "ON/OFF", the Z-DAQ-PID module allows to have a ON/OFF output with activation time $t_{ON}$ (time corresponding to the high-state output) directly proportional to $OUT_L$.

To understand the ON/OFF out type functioning, see the following figure.



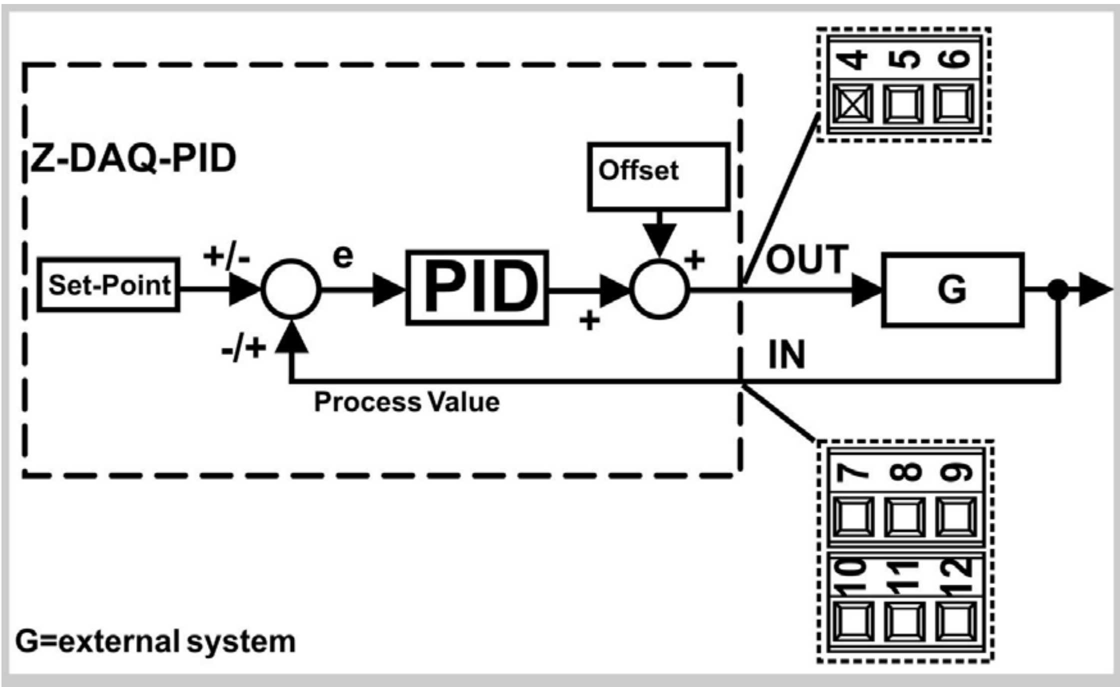

It is possible to limit inferiorly the time of high-state ON/OFF output (reg.40029) and to limit inferiorly the time of low-state ON/OFF output (reg.40030). The cycle time is reg.40028 (constant frequency of ON/OFF output=1/cycle time).




**Most important operating modality: CONVERSION WITH PID**

In “Conversion with PID” operating modality, the output (analog or ON/OFF) is a function of the analog input processed by the PID transfer function. Moreover, output is directly proportional to the analog input.

PID regulation allows to incline input signal PV (process value) to SP (set point value) with particular properties (rise time, overshoot, steady-state error, settling time, etc…). In the following figure is shown the Z-DAQ-PID module used as PID.



In particular, "e" means the difference between set-point and process-value:

Signal error e = (process value – set point) means PID regulation direct-type (for example: used for cooling)

Signal error e = (set point – process value) means PID regulation reverse-type (for example: used for heating)

The PID regulation is described by the following parameters:

| Term | Parameter | Meaning | Register |
|---|---|---|---|
| **Proportional** | BP | Proportional band | 40025 |
| **Integral** | Ti | Integral time | 40026 |
| **Derivative** | Td | Derivative time | 40027 |

where Tsample means the PID sampling time (it is equal to 100ms).

**If BP decreases**

| Proportional action strengths | Proportional action weaknesses |
|---|---|
| Rise time decreases | Ringing and overshoot increases |
| Steady-state error decreases | |

**If Ti decreases**

| Integral action strengths | Integral action weaknesses |
|---|---|
| Steady-state error is equal to zero<br>(if input is a constant value) | Rise time increases |
| | Settling time increases |

**If Td increases**

| Derivative action strengths | Derivative action weaknesses |
|---|---|
| Settling time decreases | Noise is amplified |

# Setting

## Input setting

To set Z-DAQ-PID input characteristics, configure the following registers:

| Description of register | Option/Meaning | Address |
|---|---|---|
| Input type | V, mA, %, °C, Ω, mV<br>(see RS485 register table) | 40003 |
| Cold-junction compensation (if TC-type input) | 0=deactivated<br>1=activated | 40005.8 |
| Input start scale | Value in [V, mA, %, °C, Ω, mV] | 40008 (MSW)<br>40009 (LSW) |
| Input end scale | Value in [V, mA, %, °C, Ω, mV] | 40010 (MSW)<br>40011 (LSW) |
| Filter applied to input signal | 0=deactivated<br>1-19=filtering values | 40005.[7:0] |
| Rejection | 0b00=50Hz rejection<br>0b01=60Hz rejection<br>0b10=Fast (no rejection) | 40006.[9:8] |

## Operating modality setting

To set Z-DAQ-PID functioning modality characteristics, configure the following registers:

| Description of register | Option/Meaning | Address |
|---|---|---|
| Functioning modality | 0=Conversion with PID, analog output<br>1=Conversion without PID, analog output<br>2=Conversion with PID, ON/OFF output<br>3=Conversion without PID, ON/OFF output<br>4=Manual, analog output<br>5=Manual, ON/OFF output | 40007.[15:8] |

| | | |
|---|---|---|
| Cycle time | Time in [sec/10]<br>(if output modality=ON/OFF) | 40028 |
| Minimum time of high-state ON/OFF output | Time in [sec/10]<br>(if output modality=ON/OFF) | 40029 |
| Minimum time of low-state ON/OFF output | Time in [sec/10]<br>(if output modality=ON/OFF) | 40030 |

| | | |
|---|---|---|
| SlewRate enabling | 0=deactivated<br>1=activated | 40031 |
| SlewRate | Value in [%/sec] | 40032 |

| | | |
|---|---|---|
| PID regulation sign | 0=direct-type (example: cooling)<br>1=reverse-type (example: heating)<br>(if operating modality=conversion with PID) | 40007.[7:0] |
| Set point<br>(it corresponds to the process-value desired) | Value in [%], with reference to the input scale range<br>(if operating modality=conversion with PID) | 40022 (MSW)<br>40023 (LSW) |

| | | |
|---|---|---|
| Proportional band (BP) | Value in [%], with reference to the input scale range<br>(if operating modality=conversion with PID) | 40025 |
| Integral time | Time in [sec/10]<br>(if operating modality=conversion with PID) | 40026 |
| Derivative time | Time in [sec/10]<br>(if operating modality=conversion with PID) | 40027 |
| Offset | Value in [%/100], with reference to the output scale range<br>(if operating modality=conversion with PID) | 40024 |

**Output setting**

To set Z-DAQ-PID output characteristics, configure the following registers:

| Description of register | Option/Meaning | Address |
|---|---|---|
| Output type | 0=current<br>1=voltage | 40004.8 |
| Output current type | 0=active current (the module supplies the loop)<br>1=passive current (the sensor supplies the loop)<br>(if output type is current) | 40004.12 |
| Output start scale | Value in [V, mA] | 40012 (MSW)<br>40013 (LSW) |
| Output end scale | Value in [V, mA] | 40014 (MSW)<br>40015 (LSW) |
| Output limiter enabling | 0=deactivated<br>1=activated | 40004.0 |
| Limit inferior of the output limiter | Value in [%], with reference to the output scale range | 40018 (MSW)<br>40019 (LSW) |
| Limit superior of the output limiter | Value in [%], with reference to the output scale range | 40016 (MSW)<br>40017 (LSW) |

## *Dip-switches table*

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 | | | | | Meaning |
| | | | | | | Baud-rate=9600 Baud |
| | ● | | | | | Baud-rate=19200 Baud |
| ● | | | | | | Baud-rate=38400 Baud |
| ● | ● | | | | | Baud-rate=57600 Baud |
| **ADDRESS (Dip-Switches: SW1)** | | | | | | |
| 3 | 4 | 5 | 6 | 7 | 8 | Meaning |
| | | | | | | **Address and Baud-Rate are acquired from memory(EEPROM)** |
| | | | | | ● | Address=1 |
| | | | | ● | | Address=2 |
| | | | | ● | ● | Address=3 |
| | | | ● | | | Address=4 |
| X | X | X | X | X | X | …………………… |
| ● | ● | ● | ● | ● | ● | Address=63 |
| **RS485 TERMINATOR (Dip-Switches: SW2)** | | | | | | |
| 1 | 2 | | | | | Meaning |
| | | | | | | RS485 terminator disabled |
| | ● | | | | | RS485 terminator enabled |

## *RS485 register table*

| Name | Range | Interpretation of register | R/W | Default | Address |
|---|---|---|---|---|---|
| MachineID | / | MSB, LSB | R | | 40001 |
| | Id_Code (Module ID) | | | 0x42 | Bit [15:8] |
| | Ext_Rev (Module version) | | | | Bit [7:0] |
| FWREV | / | Word | R | | 40002 |
| | Firmware Code | | | | |
| Errors | / | Bit | R | | 40069 |
| | These bits aren't used | | | / | Bit [15:6] |
| | Over-scale range error for acquired input (over hardware limits): 0=there isn't; 1=there is | | | / | Bit 5 |
| | Amplitude detection of acquired input signal: 0=amplitude is between input start scale and input end scale; 1=amplitude is less than input start scale | | | / | Bit 4 |
| | Amplitude detection of acquired input signal: 0=amplitude is between input start scale and input end scale; 1=amplitude is greater than input end scale | | | / | Bit 3 |
| | Input burn-out error (if bit40006.0=1 and the input is greater than input scale range): 0=there isn't; 1=there is. | | | / | Bit 2 |
| | Temperature acquisition error in the thermocouple cold-junctions (if TC-type input): 0=there isn't; 1=there is | | | / | Bit 1 |
| | Memory loss-of-data: 0=there isn't; 1=there is | | | / | Bit 0 |
| Rejection Burn | / | Bit | R/W | | 40006 |
| | These bits aren't used | | | / | Bit[15:10] |

| | | | | | |
|---|---|---|---|---|---|
| | Rejection: 0b00=50Hz; 0b01=60Hz; 0b10=No rejection ("fast" sampling) | | | 0b00 | Bit [9:8] |
| | These bits aren't used | | | / | Bit [7:1] |
| | Burn-out enabling: 0=deactivated; 1=activated (if 1: fault output value is overwritten into output register) | | | 0 | Bit 0 |
| Filter Cold-junction | / | Bit, LSB | R/W | | 40005 |
| | These bits aren't used | | | / | Bit [15:9] |
| | Cold-junction compensation (if TC-type input): 0=deactivated; 1=activated | | | 0 | Bit 8 |
| | Filter applied to the acquired input signal: 0=deactivated; 1=filtering min-value; 19=filtering max-value | | | 0 | Bit [7:0] |
| IN Type | / | Word | R/W | | 40003 |
| | Input-type: 0=current; 1=voltage; 2=potentiometer; 3=TC J; 4=TC K; 5=TC R; 6=TC S; 7=TC T; 8=TC B; 9=TC E; 10=TC N; 11= 2-wires PT100; 12=3-wires PT100; 13=4-wires PT100; 14=2-wires NI100; 15=3-wires NI100; 16=4-wires NI100; 17=2-wires PT500; 18=3-wires PT500; 19=4-wires PT500; 20=2-wires PT1000; 21=3-wires PT1000; 22=4-wires PT1000; 23=millivoltmeter | | | 0 | |
| Address Parity | / | MSB, LSB | R/W | | 40033 |
| | Address for RS485 (address of module/node if parameters are configurated by memory modality): from 0x01=1 to 0xFF=255 | | | 1 | Bit [15:8] |
| | Parity for RS485: 0=there isn't; 1=even parity; 2=odd parity | | | 0 | Bit [7:0] |
| Baudrate Delay | / | MSB, LSB | R/W | | 40034 |
| | Baud-rate for RS485 (baud-rate of module/node if parameters are configurated by memory modality): 0=1200; 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: it represents the number of the pauses(*) between the end of Rx message and the start of Tx message): from 0x00=0 to 0xFF=255<br>(*)1 pause=6 characters | | | 0 | Bit [7:0] |
| Function modality | / | Word | R/W | | 40007 |
| | Functioning modality:<br>0=Conversion with PID, analog output<br>1=Conversion without PID, analog output<br>2=Conversion with PID, ON/OFF output<br>3=Conversion without PID, ON/OFF output<br>4=Manual, analog output<br>5=Manual, ON/OFF output | | | 0 | Bit [15:8] |
| IN-SS MSW | See "Input" | FP-32bit_MSW | R/W | | 40008 |
| IN-SS LSW | | FP-32bit_LSW | R/W | | 40009 |
| | Input Start Scale: [mA] (if current-type input); [V] (if voltage-type input) [mV] (if millivoltmeter-type input); [%] (if potentiometer-type input); [°C] (if TC or RTD-type input) | | | 0 [mA] | |
| IN-ES MSW | See "Input" | FP-32bit_MSW | R/W | | 40010 |
| IN-ES LSW | | FP-32bit_LSW | R/W | | 40011 |
| | Input End Scale: [mA] (if current-type input); [V] (if voltage-type input or millivoltmeter-type input); [%] (if potentiometer-type input); [°C] (if TC or RTD-type input) | | | 20 [mA] | |

| | | | | | |
|---|---|---|---|---|---|
| IN Percent MSW | Between:0-1 | FP-32bit_MSW | R | | 40110 |
| IN Percent LSW | | FP-32bit_LSW | R | | 40111 |
| | Percent measure of input: [%] with reference to the Input Scale range (for selected input-type) (if it is equal to 0, it corresponds to the 0% of the Input Scale range; if it is equal to 1, it corresponds to the 100% of the Input Scale range) | | | / | |
| mA MSW | FP between: IN-SS, IN-ES | FP-32bit_MSW | R | | 40091 |
| mA LSW | | FP-32bit_LSW | R | | 40092 |
| | Electric measure of input: [mA] (if current-type input) | | | / | |
| V MSW | FP between: IN-SS, IN-ES | FP-32bit_MSW | R | | 40093 |
| V LSW | | FP-32bit_LSW | R | | 40094 |
| | Electric measure of input: [V] (if voltage-type input) | | | / | |
| POT MSW | FP between: IN-SS, IN-ES | FP-32bit_MSW | R | | 40099 |
| POT LSW | | FP-32bit_LSW | R | | 40100 |
| | Electric measure of input: [%] (if potentiometer-type input) | | | / | |
| TC MSW | FP between: IN-SS, IN-ES | FP-32bit_MSW | R | | 40083 |
| TC LSW | | FP-32bit_LSW | R | | 40084 |
| | Electric measure of input: [mV] (if TC-type input) without cold-junction compensation (if bit40005.8=0), with cold-junction compensation (if bit40005.8=1) | | | / | |
| TCT MSW | FP between: IN-SS, IN-ES | FP-32bit_MSW | R | | 40085 |
| TCT LSW | | FP-32bit_LSW | R | | 40086 |
| | Electric measure of input: [°C] (if TC-type input) with compensation | | | | |
| CJ MSW | / | FP-32bit_MSW | R | | 40079 |
| CJ LSW | | FP-32bit_LSW | R | | 40080 |
| | Equivalent electric measure of the cold-junction: [mV] (if TC-type input) | | | / | |
| RTDO MSW | / | FP-32bit_MSW | R | | 40087 |
| RTDO LSW | | FP-32bit_LSW | R | | 40088 |
| | Electric measure of input: [Ω] (if RTD-type input) | | | / | |
| RTD MSW | FP between: IN-SS, IN-ES | FP-32bit_MSW | R | | 40089 |
| RTD LSW | | FP-32bit_LSW | R | | 40090 |
| | Electric measure of input: [°C] (if RTD-type input) | | | / | |
| 3wires-RTD MSW | / | FP-32bit_MSW | R | | 40095 |
| 3wires-RTD LSW | | FP-32bit_LSW | R | | 40096 |
| | Measure of the wire resistance for 3 wires RTD connection [Ω] (if RTD-type input) | | | / | |
| 4wires-RTD MSW | / | FP-32bit_MSW | R | | 40097 |
| 4wires-RTD LSW | | FP-32bit_LSW | R | | 40098 |
| | Measure of the wire resistance for 4 wires RTD connection [Ω] (if RTD-type input) | | | / | |

| | | | | | |
|---|---|---|---|---|---|
| OUT Type Limiter | / | Bit | R/W | | 40004 |
| | These bits aren't used | | | / | Bit[15:13] |
| | Output current type: 0=active current (the module supplies the loop); 1=passive current (the sensor supplies the loop) | | | 0 | Bit 12 |
| | These bits aren't used | | | / | Bit [11:9] |
| | Output type: 0=current; 1=voltage | | | 0 | Bit 8 |
| | These bits aren't used | | | / | Bit [7:1] |
| | Output limiter: 0=deactivated; 1=activated | | | 0 | Bit 0 |
| OUT-SS MSW | See "Output" | FP-32bit_MSW | R/W | | 40012 |
| OUT-SS LSW | | FP-32bit_LSW | R/W | | 40013 |
| | Output Start Scale: [mA] (if current-type output); [V] (if voltage-type output) | | | 0 [mA] | |
| OUT-ES MSW | See "Output" | FP-32bit_MSW | R/W | | 40014 |
| OUT-ES LSW | | FP-32bit_LSW | R/W | | 40015 |
| | Output End Scale: [mA] (if current-type output); [V] (if voltage-type output) | | | 20 [mA] | |
| OUT MSW | | FP-32bit_MSW | R | | 40105 |
| OUT LSW | | FP-32bit_LSW | R | | 40106 |
| | Output value: [mA] (if current-type output); [V] (if voltage-type output) | | | / | |
| OUT | | Word | R | | 40109 |
| | Output value: [µA] (if current-type output); [mV] (if voltage-type output) | | | / | |
| OUT-Fault MSW | | FP-32bit_MSW | R/W | | 40020 |
| OUT-Fault LSW | | FP-32bit_LSW | R/W | | 40021 |
| | Fault output value (measure unit is the same of output) Reg.40105,40106 are equal to reg.40020,40021 if 40069.2=1 (there is input burn-out error) (if out type = analog) | | | 0 [%] | |
| OUT-Manual | Between: 0; 10000 | Word | R/W | | 40107 |
| | Output manual value [%·100] (if it is equal to 0, it corresponds to the 0% of the Output Scale range; if it is equal to 10000, it corresponds to the 100% of the Output Scale range); for selected output-type, see reg.40004 (if operating modality=manual, constant output) | | | 0 [%] | |
| Lim Inf MSW | | FP-32bit_MSW | R/W | | 40018 |
| Lim Inf LSW | | FP-32bit_LSW | R/W | | 40019 |
| | Limit inferior of the output limiter (measure unit is the same of output) | | | 0 (=0 [mA]) | |
| Lim Sup MSW | | FP-32bit_MSW | R/W | | 40016 |
| Lim Sup LSW | | FP-32bit_LSW | R/W | | 40017 |
| | Limit superior of the output limiter (measure unit is the same of output) | | | 1 (=20[mA]) | |
| PID-sign | | Bit | R/W | | 40007 |
| | PID regulation sign: 0=direct-type (cooling); 1=reverse-type (heating) | | | 0 | Bit [7:0] |
| Proportional Band | | Word | R/W | | 40025 |
| | PID regulation proportional band [%], with reference to the Input Scale range (if operating modality=conversion with PID) | | | 100% | |
| Integral time | | Word | R/W | | 40026 |
| | PID regulation integral time [sec/10]. 0=there is no integral action (if operating modality=conversion with PID) | | | 2400 [sec/10] (=240sec) | |

| | | | | | |
|---|---|---|---|---|---|
| Derivative time | | Word | R/W | | 40027 |
| | PID regulation derivative time [sec/10]. 0=there is no derivative action (if operating modality=conversion with PID) | | | 0 [sec/10] | |
| Set point MSW | | FP-32bit_MSW | R/W | | 40022 |
| Set point LSW | | FP-32bit_LSW | R/W | | 40023 |
| | Input set point for the PID regulation [%] with reference to the Input Scale range (if it is equal to 0, it corresponds to the 0% of the Input Scale range; if it is equal to 1, it corresponds to the 100% of the Input Scale range) (if operating modality=conversion with PID) | | | 50% | |
| Process Value MSW | | FP-32bit_MSW | R | | 40103 |
| Process Value LSW | | FP-32bit_LSW | R | | 40104 |
| | Process value for the PID regulation: [mA] (if current-type input); [V] (if voltage-type input); [mV] (if millivoltmeter-type input); [%] (if potentiometer-type input); [°C] (if TC or RTD-type input) | | | / | |
| Process value | | Word | R | | 40108 |
| | Process value for the PID regulation: [µA] (if current-type input); [mV] (if voltage-type input); [mV/100] (if millivoltmeter-type input); [%/100] (if potentiometer-type input); [°C/10] (if TC or RTD-type input) | | | / | |
| Offset | | Word | R/W | | 40024 |
| | Output offset for the PID regulation [%/100] with reference to the Output Scale range (if it is equal to 0, it corresponds to the 0% of the Output Scale range; if it is equal to 1, it corresponds to the 100% of the Output Scale range) (if operating modality=conversion with PID) | | | 5000 (=50%) | |
| Slew Rate enabling | | Word | R/W | | 40031 |
| | Output slew rate: 0=deactivated; 1=activated | | | 1 | |
| Slew Rate | | Word | R/W | | 40032 |
| | Output slew rate [%/sec] | | | 100 [%/sec] | |
| Cycle Time | From 1 to 1310 | Word | R/W | | 40028 |
| | Output cycle time [sec/10] (if output modality=ON/OFF) | | | 300 (=30 sec) | |
| MinTime-High | From 1 to 1310 | Word | R/W | | 40029 |
| | Minimum time of high-state output [sec/10] (if output modality=ON/OFF) | | | 0 (=0 sec) | |
| MinTime-Low | From 1 to 1310 | Word | R/W | | 40030 |
| | Minimum time of low-state output [sec/10] (if output modality=ON/OFF) | | | 0 (=0 sec) | |

## *LEDs 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 |

# Seneca Z-PC Line module: **S203T**

The S203T module is a three-phase network analyzer for electric-line voltage up to 600Vac and electric-line current up to 100mA*CT ratio, tipically up to 100A (50 Hz or 60 Hz). The module has an analog output, electrical value directly proportional to the selected input: voltage-type output or current-type output. The electrical value (analog output) is available on screw terminals and the normalized value is available on RS485 registers.

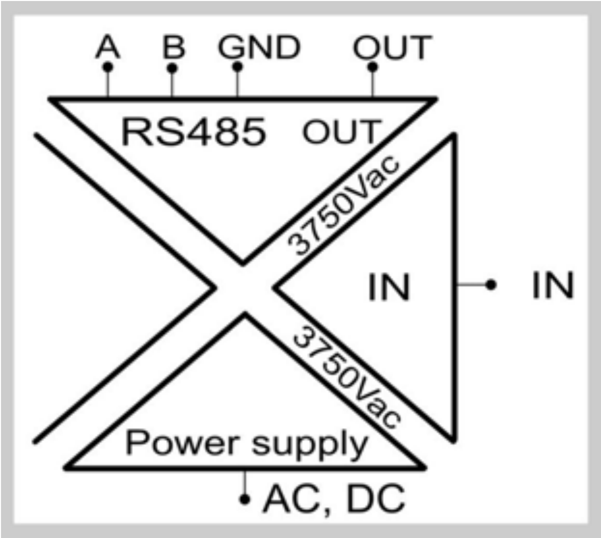
## General characteristics

- It is possible to detect, with reference to the electrical-line and load connected to its: RMS voltage, RMS current, active power, reactive power, apparent power, cosΦ, frequency, energy (for each measure: phase A, phase B, phase C and three-phase values are available, except frequency)
- Normalized start/end scale between 0..+10000 (for RMS voltage, RMS current, active power, apparent power) or between ± 10000 (for reactive power, cosΦ)
- It is possible to reset the energy values
- It is possible to manage connections with high power devices using current transformers
- It is possible to connect the module using single-phase insertion, ARON insertion (three-phase without neutral) or 4-wires insertion (three-phase with neutral)
- Configuration of the module (node) address and baud-rate by Dip-Switches
- It is possible to configure the electrical-line frequency, output (electrical value), single/three phase application, rescaled-input type, insertion-type and maximum current by Dip-Switches

## Features

| | |
|---|---|
| **INPUT** | |
| **Number** | 3 (Phase A, phase B, phase C) + Neutral |
| **Accuracy** | 0.2% of E.E.S. (Voltmeter, amperemeter, wattmeter) |
| | Thermal stability: < 100 ppm/°K |
| | EMI: < 1% |
| **Protection** | This module provides inputs protection against the ESD (up to 4kV) |
| **Voltage-type IN** | E.S.S./E.E.S.(Electrical Start/End Scale) between: 0..600Vac. Input impedance: 800 kΩ |
| **Current-type IN** | E.S.S./E.E.S.(Electrical Start/End Scale) between: 0...100A: (0…25 or 0…100mArms)*CT. Max peak factor: 4; max current: (100 or 400 mApeak)*CT. Input impedance: 1 Ω |
| **OUTPUT** | |
| **Number** | 1 |
| **Type** | Voltage, active current, passive current |
| **Accuracy** | 0.1% of output scale range |
| **Cable max resistance at secondary circuit** | 3Ω (two cables necessary to connect CT secondary to S203T) |
| **Response time (10%..90%)** | 0.4s |
| **Voltage-type OUT** | Output scale range configurable between: 0-10 V or 0-5V (minimum resistance that can be connected: 2 kΩ). Saturation value is 11V |
| **Current-type OUT** | Output scale range configurable between: 0-20 mA or 4-20mA (max resistance that can be connected: 500Ω). Saturation value is 22mA |

| CONNECTIONS | |
|---|---|
| **RS485 interface** | Screw terminals 31 (B), 32 (A), 33 (GND) |
| **ISOLATIONS** | |
| | 1500Vac isolation between: power supply, ModBUS RS485 + output<br>3750Vac isolation between: input (electric network) and other parts |

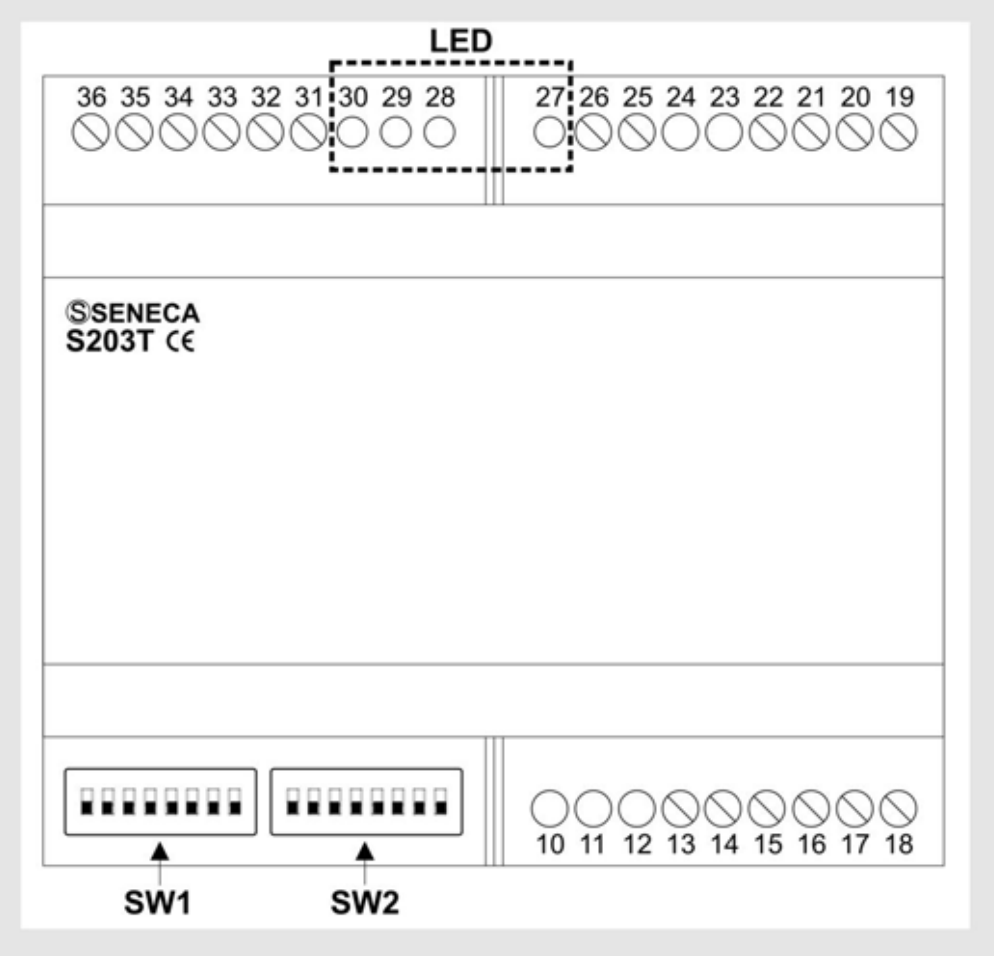



| POWER SUPPLY | |
|---|---|
| **Supply voltage** | 10 – 40 Vdc or 19 – 28 Vac (50Hz - 60Hz) |
| **Power consumption** | Max: 2.5 W |

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

“Accuracy” terms are guaranteed with reference to the following ranges: RMS voltage=40…600Vac, RMS current=(0.1…25 or 0.4…100)mA · CT.

| MODULE CASE | |
|---|---|
| **Case-type** | DIN 43880, UL94VO plastic material, gray |
| **Dimensions** | 105x89x60mm |
| **Terminal board** | Not removable 3-way screw terminals: pitch 5.08mm, sections 2.5mm$^2$ |
| **Protection class** | IP20 |

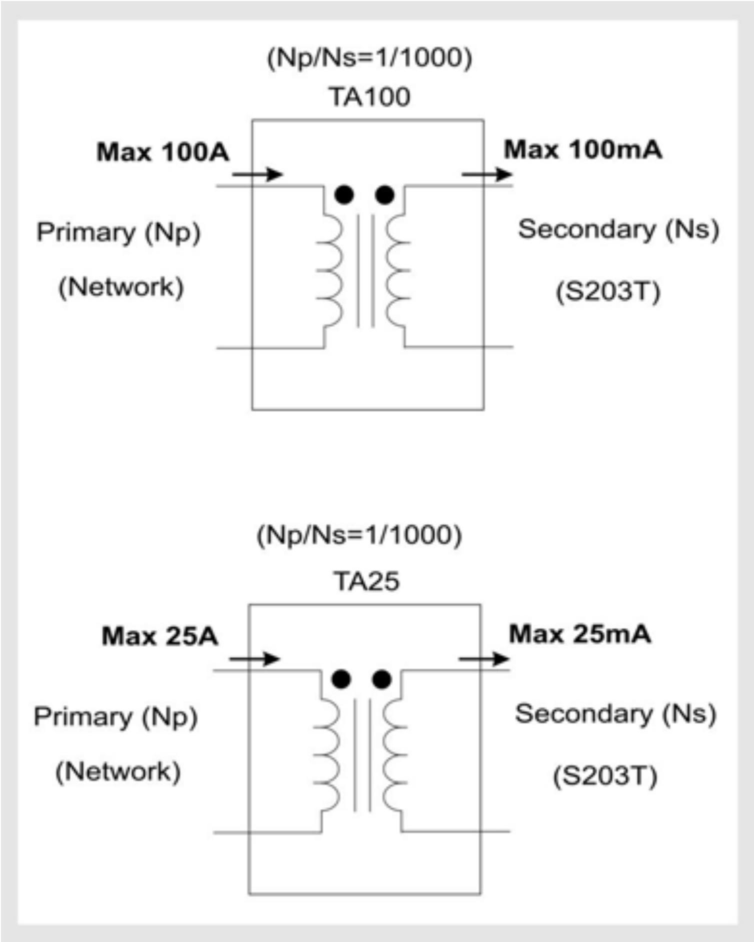



| Screw terminals | Measurement scale range |
|---|---|
| 13, 14 | Connect CT secondary for phase A |
| 15, 16 | Connect CT secondary for phase B |
| 17, 18 | Connect CT secondary for phase C |
| 19, 20, 21, 22 | See input connection figure |
| 25, 26 | Power supply (10..40Vdc or 19…28Vac; 2.5W) |
| 27 | LED PWR |
| 28 | LED ERR |
| 29 | LED Tx |
| 30 | LED Rx |
| 31 | RS485 B |
| 32 | RS485 A |
| 33 | RS485 GND |
| 34, 35, 36 | See output connection figure |

## *Connections*

Input connection

In the following figure are shown typical current transformers (TA25 and TA100), to connect S203T module with electrical line.




Np=turn number of primary; Ns=turn number of secondary.

**Accuracy class equal to 0.2 is the sum of the accuracy class for S203T module and accuracy class of its current transformer (this is not true for S203TA module).**

In the following figure are shown input connections for three insertion types: single-phase, ARON (three-phase with two CT) and 4-wires (three-phase with three CT).

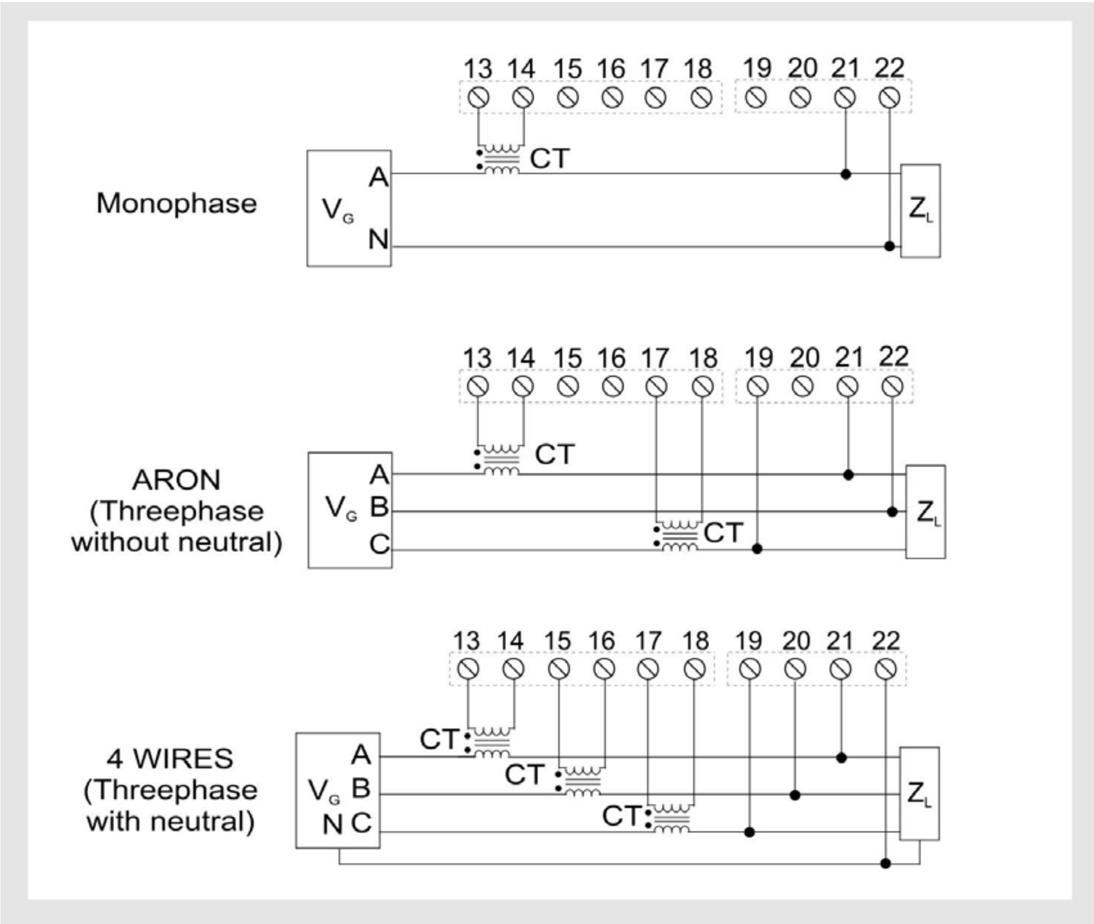
**WARNING**

**ONLY the connections shown in the following figure for S203T module are allowed!**

**If a negative power is measured, check current transformer insertion!**

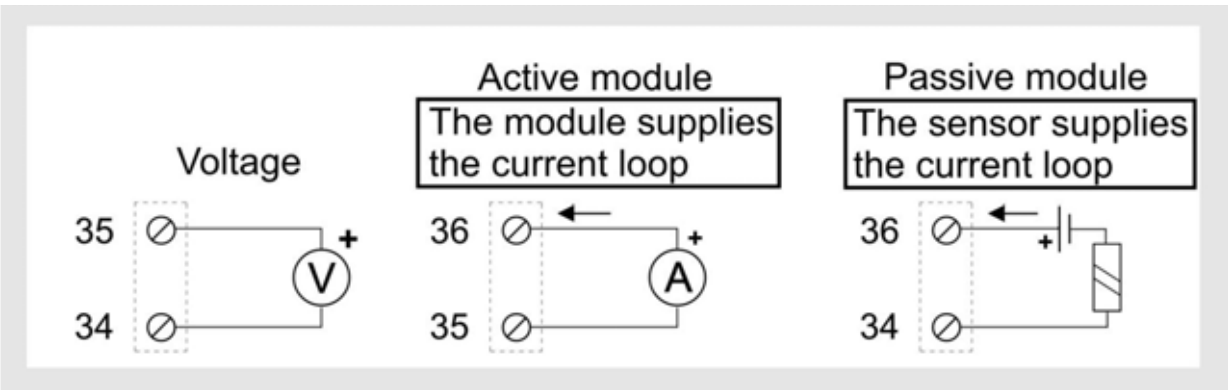
**NOTE**

**It is forbidden** to connect the current transformer secondary to ground.




14, 16, 18, 22 screw terminals are connected internally.

Output connection



Shielded cables are recommended to connect the outputs.

It is not possible to obtain an output (electric value) directly proportional to the electric-network frequency, energy, reactive power, apparent power (see Dip-switches SW2-6 and SW2-7).

This module allows to associate a electric quantity (RMS voltage, RMS current, active power, cosϕ, through Dip-switches) to the analog output value (and normalized measure), as described in the following points:

- if selected electric quantity (single-phase/three-phase, RMS voltage/RMS current/active power/cosϕ) is less than MinIN (reg.40028, 40029 floating point): normalized measure (reg.40217) is equal to 0 and analog output is 0% (0V, 0mA, 4mA), available through screw terminals;
- if selected electric quantity (single-phase/three-phase, RMS voltage/RMS current/active power/cosϕ) is greater than MaxIN (reg.40030, 40031 floating point): normalized measure (reg. 40217) is equal to 10000 and analog output is 100% (5V, 10V, 20mA), available through screw terminals;
- if selected electric quantity (single-phase/three-phase, RMS voltage/RMS current/active power/cosϕ) is between MinIN and MaxIN, analog output (current/voltage) is directly proportional to the selected electric quantity and it is available through screw terminals.

To choose if electric quantity is single-phase (it is possible to choose which phase: A, B or C) or three-phase, set reg.40025.

<u>RS485 serial port and power supply</u>


## *Functioning*

The S203T module allows to detect and capture the following electric quantity: RMS voltage, RMS current, active power, reactive power, apparent power, frequency, cosϕ, energy. For each quantity, it is possible to read phase A, phase B, phase C and three-phase value (except for frequency).

The measure ranges for RMS voltage, RMS current, active power, reactive power, apparent power, energy, cosΦ, frequency are shown in the following table.

| Possible measures (electric quantities) | Measurement scale range |
|---|---|
| RMS voltage | 0…600Vac |
| RMS current | (0…25 or 0…100) mA · CT |
| Active power | (0…15 or 0…60) W · CT |
| Reactive power | (0…15 or 0…60) VAR · CT |
| Apparent power | (0…15 or 0…60) VA · CT |
| Energy | / |
| CosΦ | 0…1 |
| Frequency | 40…70Hz |

The S203T module allows to read floating point measures (for every quantity) and normalized values (except for energy and frequency); in particular, energy values are kept stored if module is power off.

RMS voltage, RMS current, active power, frequency, energy are measured by S203T directly (for each phase A, B, C); reactive power, apparent power, cosΦ and all three-phase values are obtained through processing by S203T.

| Possible measures | Symbol | Measured value | Calculated value | Value |
|---|---|---|---|---|
| RMS voltage for phase A,B,C | $V_A$ $V_B$ $V_C$ | • | | / |
| Average RMS voltage (three-phase) | V | | • | $(V_A + V_B + V_C)/3$ |
| RMS current for phase A,B,C | $I_A$ $I_B$ $I_C$ | • | | / |
| Average RMS current (three-phase) | I | | • | $(I_A + I_B + I_C)/3$ |
| Active power for phase A,B,C | $P_A$ $P_B$ $P_C$ | • | | / |
| Active power (three-phase) | P | | • | $P_A + P_B + P_C$ |
| Reactive power for phase A,B,C | $Q_A$ $Q_B$ $Q_C$ | | • | $\sqrt{S^2_{A,B,C} - P^2_{A,B,C}}$ |
| Reactive power (three-phase) | Q | | • | $Q_A + Q_B + Q_C$ |
| Apparent power for phase A,B,C | $S_A$ $S_B$ $S_C$ | | • | $V_{A,B,C} \cdot I_{A,B,C}$ |
| Apparent power (three-phase) | S | | • | $S_A + S_B + S_C$ |
| Energy for phase A,B,C | $E_A$ $E_B$ $E_C$ | • | | / |
| Energy (three-phase) | E | | • | $E_A + E_B + E_C$ |
| CosΦ for phase A,B,C | $\cos\phi_A$ $\cos\phi_B$ $\cos\phi_C$ | | • | $P_{A,B,C}/S_{A,B,C}$ |
| CosΦ (three-phase) | $\cos\phi$ | | • | P/S |
| Frequency (*) | f | • | | / |

(*) It is possible to use the S203T module as frequency meter to measure frequencies between 40Hz and 70Hz. To measure RMS voltage, RMS current, active power, reactive power, apparent power, energy, cosΦ, the signal has to have an accurate frequency (about 50Hz or 60Hz).

It is possible to compensate the network frequency: energy and power measures correction for 50Hz or 60Hz (if network frequency fluctuation is greater than 30mHz).

# Dip-switches table

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 | Meaning |
| | | Baud-rate=9600 Baud |
| | ● | Baud-rate=19200 Baud |
| ● | | Baud-rate=38400 Baud |
| ● | ● | Baud-rate=57600 Baud |

| **ADDRESS (Dip-Switches: SW1)** | | | | | | |
|---|---|---|---|---|---|---|
| 3 | 4 | 5 | 6 | 7 | 8 | Meaning |
| | | | | | | **Address and Baud-Rate are acquired from memory(EEPROM)** |
| | | | | | ● | Address=1 |
| | | | | ● | | Address=2 |
| | | | | ● | ● | Address=3 |
| | | | ● | | | Address=4 |
| X | X | X | X | X | X | …………………… |
| ● | ● | ● | ● | ● | ● | Address=63 |

| **FREQUENCY (Dip-Switches: SW2)** | |
|---|---|
| 1 | Meaning |
| | Electric network frequency=50Hz |
| ● | Electric network frequency=60Hz |

| **OUTPUT – ELECTRIC VALUE (Dip-Switches: SW2)** | | |
|---|---|---|
| 2 | 3 | Meaning |
| | | Output=0..10V |
| | ● | Output=0..5V |
| ● | | Output=0..20mA |
| ● | ● | Output=4..20mA |

| **APPLICATION TYPE (Dip-Switches: SW2)** | |
|---|---|
| 4 | Meaning |
| | Three-phase |
| ● | Single-phase |

| **INSERTION TYPE (Dip-Switches: SW2)** | |
|---|---|
| 5 | Meaning |
| | 4-wires (it is activated if SW2-4 is “Three-phase”) |
| ● | Aron (it is activated if SW2-4 is “Three-phase”) |

| **INPUT – ELECTRIC VALUE SENT TO OUTPUT – ELECTRIC VALUE (Dip-Switches: SW2)** | | |
|---|---|---|
| 6 | 7 | Meaning |
| | | RMS voltage |
| | ● | RMS current |
| ● | | Active power |
| ● | ● | Cosϕ |

| **MAX CURRENT MEASURABLE USING CT TURNS RATIO Np/Ns EQUAL TO 1:1000 (Dip-Switches: SW2)** | |
|---|---|
| 8 | Meaning |
| | 100A |
| ● | 25A |

Np=turn number of primary; Ns=turn number of secondary.

# *RS485 Register table*

| Name | Range | Interpretation of register | R/W | Default | Address |
|---|---|---|---|---|---|
| MachineID | / | MSB, LSB | R | | 40001 |
| | Id_Code (Module ID) | | | 0x26 | Bit [15:8] |
| | Ext_Rev (Module version) | | | | Bit [7:0] |
| Errors | / | Bit | R | | 40133 |
| | Energy value saving error: 0=there isn't; 1=there is | | | / | Bit 15 |
| | These bits aren't used | | | | Bit [14:7] |
| | Phases B,C reversal: 0=there isn't; 1=there is | | | / | Bit 6 |
| | Phase C voltage: 0=it is not acquired correctly (<40Vac); 1=it is acquired correctly (>40Vac) | | | / | Bit 5 |
| | Phase B voltage: 0=it is not acquired correctly (<40Vac); 1=it is acquired correctly (>40Vac) | | | / | Bit 4 |
| | Phase A voltage: 0=it is not acquired correctly (<40Vac); 1=it is acquired correctly (>40Vac) | | | / | Bit 3 |
| | These bits aren't used | | | / | Bit [2:0] |
| Reset | | Word | R/W | | 40131 |
| | Module reset (if reg.40131=0x1234)<br>Energy reset for phases A, B, C (if reg.40131=0x1000) | | | / | |
| Frequency compensation | | Bit | R/W | | 40032 |
| | These bits aren't used | | | / | Bit [15:1] |
| | Electrical-line frequency compensation: 0=there is no compensation; 1=energy and power measures correction for 50Hz or 60Hz (if electrical-line frequency fluctuation is greater than 30mHz). Voltage and current values are regardless of reg.40032 | | | 0 | Bit 0 |
| Baudrate Delay | / | MSB, LSB | R/W | | 40034 |
| | 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 | | | 38400 | Bit [15:8] |
| | Delay for RS485 (delay of communication response: it represents the number of the pauses(*) between the end of Rx message and the start of Tx message): from 0x00=0 to 0xFF=255 (*)1 pause=6 characters | | | 0 | Bit [7:0] |
| Address Parity | / | MSB, LSB | R/W | | 40033 |
| | Address for RS485 (address of module/node if parameters are configurated by memory modality): from 0x01=1 to 0xFF=255 | | | 1 | Bit [15:8] |
| | Parity for RS485: 0=there isn't; 1=even parity; 2=odd parity | | | 0 | Bit [7:0] |
| CT Type | | Word | R/W | | 40024 |
| | These bits aren't used | | | / | Bit [15:1] |
| | Current Transformer-type setting: 0=passive CT (as the equipment supplied current transformer); 1=compensated CT (phase error is zero). Only for equipment supplied current transformer (passive CT) the precision class is guaranteed | | | 0 | Bit 0 |

| | | | | | |
|---|---|---|---|---|---|
| CT Ratio MSW | | Word | R/W | | 40026 |
| CT Ratio LSW | | Word | R/W | | 40027 |
| | Current transformer turns-ratio (Ns/Np) setting. This value affects: RMS current floating-point value, active power floating-point value, reactive power floating-point value, apparent power floating-point value, energy floating-point value (both single-phase and three-phase); this value does not affect normalized values.<br>Np=turn number of primary<br>Ns=turn number of secondary | | | 1000 (=Ns/Np) | |
| OUT phase | | Word | R/W | | 40025 |
| | Output-electric value (see screw terminals: 34, 35, 36, and Dip-switches SW2-6 and SW2-7) is referred to one of the following phases:<br>0=phase A<br>1=phase B<br>2=phase C<br>Any other value of reg.40025=three-phase value | | | 0 (if single-phase) | |
| MinIN MSW | | FP32bit_MSW | R/W | | 40028 |
| MinIN LSW | | FP32bit_LSW | R/W | | 40029 |
| | Input-electric value corresponding to minimum normalized value and minimum output-electric value. To choose which phase corresponds to normalized value, set reg.40025; to choose which input-electric value corresponds to normalized value, set Dip-Switches SW2-6 and SW2-7 (RMS voltage, RMS current, active power, cos$\phi$). For RMS voltage, MinIN is [V]; for RMS current, MinIN is [mA]; for active power, MinIN is [W]; for cos$\phi$, MinIN is a dimensionless number | | | 0 | |
| MaxIN MSW | | FP32bit_MSW | R/W | | 40030 |
| MaxIN LSW | | FP32bit_LSW | R/W | | 40031 |
| | Input-electric value corresponding to max normalized value and max output-electric value. To choose which phase corresponds to normalized value, set reg.40025; to choose which input-electric value corresponds to normalized value, set Dip-Switches SW2-6 and SW2-7 (RMS voltage, RMS current, active power, cos$\phi$). For RMS voltage, MaxIN is [V]; for RMS current, MaxIN is [mA]; for active power, MaxIN is [W]; for cos$\phi$, MaxIN is a dimensionless number | | | 600 | |
| Normalized Measure | Between:0; 10000 | Word | R | | 40217 |
| | Normalized measure of input: this value is referred to reg. 40028, 40029 (Floating point) and reg. 40030, 40031 (Floating point). To know which phase corresponds to normalized value, see reg.40025; to know which input-electric value corresponds to normalized value, see Dip-Switches SW2-6 and SW2-7 configuration (RMS voltage, RMS current, active power, cos$\phi$).<br>Reg.40217 is equal to 0, if selected floating point value is less than reg.40028,40029 (FP)<br>Reg.40217 is equal to 10000, if selected floating point value is greater than 40030,40031 (FP)<br>Reg.40217 is directly proportional to input electrical value, for any other value (saturation value: 11000) | | | / | |

| | | | | | |
|---|---|---|---|---|---|
| | | **VOLTAGE** | | | |
| VoltageA MSW | | FP32bit_MSW | R | | 40135 |
| VoltageA LSW | | FP32bit_LSW | R | | 40136 |
| | RMS voltage electrical measure of input [Vrms] for phase A. | | | / | |
| VoltageB MSW | | FP32bit_MSW | R | | 40137 |
| VoltageB LSW | | FP32bit_LSW | R | | 40138 |
| | RMS voltage electrical measure of input [Vrms] for phase B. | | | / | |
| VoltageC MSW | | FP32bit_MSW | R | | 40139 |
| VoltageC LSW | | FP32bit_LSW | R | | 40140 |
| | RMS voltage electrical measure of input [Vrms] for phase C. | | | / | |
| Voltage3PH MSW | | FP32bit_MSW | R | | 40141 |
| Voltage3PH LSW | | FP32bit_LSW | R | | 40142 |
| | RMS voltage electrical measure of input [Vrms] for three-phase $(V_A + V_B + V_C)/3$. | | | / | |
| VoltageA | Between: 0; 10000 | Word | R | | 40193 |
| | RMS voltage normalized value for phase A. This value is regardless of reg.40026, 40027 | | | / | |
| VoltageB | Between: 0; 10000 | Word | R | | 40194 |
| | RMS voltage normalized value for phase B. This value is regardless of reg.40026, 40027 | | | / | |
| VoltageC | Between: 0; 10000 | Word | R | | 40195 |
| | RMS voltage normalized value for phase C. This value is regardless of reg.40026, 40027 | | | / | |
| Voltage3PH | Between: 0; 10000 | Word | R | | 40196 |
| | RMS voltage normalized value for three-phase. This value is regardless of reg.40026, 40027 | | | / | |
| | | **CURRENT** | | | |
| CurrentA MSW | | FP32bit_MSW | R | | 40143 |
| CurrentA LSW | | FP32bit_LSW | R | | 40144 |
| | RMS current electrical measure of input [mArms] for phase A. This value depends on reg.40026, 40027 | | | / | |
| CurrentB MSW | | FP32bit_MSW | R | | 40145 |
| CurrentB LSW | | FP32bit_LSW | R | | 40146 |
| | RMS current electrical measure of input [mArms] for phase B. This value depends on reg.40026, 40027 | | | / | |
| CurrentC MSW | | FP32bit_MSW | R | | 40147 |
| CurrentC LSW | | FP32bit_LSW | R | | 40148 |
| | RMS current electrical measure of input [mArms] for phase C. This value depends on reg.40026, 40027 | | | / | |

| | | | | | |
|---|---|---|---|---|---|
| Current3PH MSW | | FP32bit_MSW | R | | 40149 |
| Current3PH LSW | | FP32bit_LSW | R | | 40150 |
| | RMS current electrical measure of input [mArms] for three-phase ($I_A$ + $I_B$ + $I_C$)/3. This value depends on reg.40026, 40027 | | | / | |
| CurrentA | Between: 0; 10000 | Word | R | | 40197 |
| | RMS current normalized value for phase A. This value is regardless of reg.40026, 40027 | | | / | |
| CurrentB | Between: 0; 10000 | Word | R | | 40198 |
| | RMS current normalized value for phase B. This value is regardless of reg.40026, 40027 | | | / | |
| CurrentC | Between: 0; 10000 | Word | R | | 40199 |
| | RMS current normalized value for phase C. This value is regardless of reg.40026, 40027 | | | / | |
| Current3PH | Between: 0; 10000 | Word | R | | 40200 |
| | RMS current normalized value for three-phase. This value is regardless of reg.40026, 40027 | | | / | |
| **ACTIVE POWER** | | | | | |
| ActivePowA MSW | | FP32bit_MSW | R | | 40151 |
| ActivePowA LSW | | FP32bit_LSW | R | | 40152 |
| | Active power electrical measure of input [W] for phase A. This value depends on reg.40026, 40027 | | | / | |
| ActivePowB MSW | | FP32bit_MSW | R | | 40153 |
| ActivePowB LSW | | FP32bit_LSW | R | | 40154 |
| | Active power electrical measure of input [W] for phase B. This value depends on reg.40026, 40027 | | | / | |
| ActivePowC MSW | | FP32bit_MSW | R | | 40155 |
| ActivePowC LSW | | FP32bit_LSW | R | | 40156 |
| | Active power electrical measure of input [W] for phase C. This value depends on reg.40026, 40027 | | | / | |
| ActivePow3PH MSW | | FP32bit_MSW | R | | 40157 |
| ActivePow3PH LSW | | FP32bit_LSW | R | | 40158 |
| | Active power electrical measure of input [W] for three-phase ($P_A$ + $P_B$ + $P_C$)/3. This value depends on reg.40026, 40027 | | | / | |
| ActivePowA | Between: 0; 10000 | Word | R | | 40201 |
| | Active power normalized value for phase A. This value is regardless of reg.40026, 40027 | | | / | |
| ActivePowB | Between: 0; 10000 | Word | R | | 40202 |
| | Active power normalized value for phase B. This value is regardless of reg.40026, 40027 | | | / | |
| ActivePowC | Between: 0; 10000 | Word | R | | 40203 |
| | Active power normalized value for phase C. This value is regardless of reg.40026, 40027 | | | / | |
| ActivePow3PH | Between: 0; 10000 | Word | R | | 40204 |
| | Active power normalized value for three-phase. This value is regardless of reg.40026, 40027 | | | / | |

| | | | | | |
|---|---|---|---|---|---|
| **REACTIVE POWER** | | | | | |
| ReactivePowA MSW | | FP32bit_MSW | R | | 40159 |
| ReactivePowA LSW | | FP32bit_LSW | R | | 40160 |
| | Reactive power electrical measure of input [VAR] for phase A. This value depends on reg.40026, 40027 | | | / | |
| ReactivePowB MSW | | FP32bit_MSW | R | | 40161 |
| ReactivePowB LSW | | FP32bit_LSW | R | | 40162 |
| | Reactive power electrical measure of input [VAR] for phase B. This value depends on reg.40026, 40027 | | | / | |
| ReactivePowC MSW | | FP32bit_MSW | R | | 40163 |
| ReactivePowC LSW | | FP32bit_LSW | R | | 40164 |
| | Reactive power electrical measure of input [VAR] for phase C. This value depends on reg.40026, 40027 | | | / | |
| ReactivePow3 PH MSW | | FP32bit_MSW | R | | 40165 |
| ReactivePow3 PH LSW | | FP32bit_LSW | R | | 40166 |
| | Reactive power electrical measure of input [VAR] for three-phase $(Q_A + Q_B + Q_C)/3$. This value depends on reg.40026, 40027 | | | / | |
| ReactivePowA | Between: -10000; 10000 | Word | R | | 40205 |
| | Reactive power normalized value for phase A. This value is regardless of reg.40026, 40027 | | | / | |
| ReactivePowB | Between: -10000; 10000 | Word | R | | 40206 |
| | Reactive power normalized value for phase B. This value is regardless of reg.40026, 40027 | | | / | |
| ReactivePowC | Between: -10000; 10000 | Word | R | | 40207 |
| | Reactive power normalized value for phase C. This value is regardless of reg.40026, 40027 | | | / | |
| ReactivePow3 PH | Between: -10000; 10000 | Word | R | | 40208 |
| | Reactive power normalized value for three-phase. This value is regardless of reg.40026, 40027 | | | / | |
| **APPARENT POWER** | | | | | |
| ApparentPowA MSW | | FP32bit_MSW | R | | 40167 |
| ApparentPowA LSW | | FP32bit_LSW | R | | 40168 |
| | Apparent power electrical measure of input [VA] for phase A. This value depends on reg.40026, 40027 | | | / | |
| ApparentPowB MSW | | FP32bit_MSW | R | | 40169 |
| ApparentPowB LSW | | FP32bit_LSW | R | | 40170 |
| | Apparent power electrical measure of input [VA] for phase B. This value depends on reg.40026, 40027 | | | / | |
| ApparentPow C MSW | | FP32bit_MSW | R | | 40171 |
| ApparentPow C LSW | | FP32bit_LSW | R | | 40172 |
| | Apparent power electrical measure of input [VA] for phase C. This value depends on reg.40026, 40027 | | | / | |

| | | | | | |
|---|---|---|---|---|---|
| ApparentPow3 PH MSW | | FP32bit_MSW | R | | 40173 |
| ApparentPow3 PH LSW | | FP32bit_LSW | R | | 40174 |
| | Apparent power electrical measure of input [VA] for threephase ($S_A$ + $S_B$ + $S_C$)/3. This value depends on reg.40026, 40027 | | | / | |
| ApparentPowA | Between: 0; 10000 | Word | R | | 40209 |
| | Apparent power normalized value for phase A. This value is regardless of reg.40026, 40027 | | | / | |
| ApparentPowB | Between: 0; 10000 | Word | R | | 40210 |
| | Apparent power normalized value for phase B. This value is regardless of reg.40026, 40027 | | | / | |
| ApparentPow C | Between: 0; 10000 | Word | R | | 40211 |
| | Apparent power normalized value for phase C. This value is regardless of reg.40026, 40027 | | | / | |
| ApparentPow3 PH | Between: 0; 10000 | Word | R | | 40212 |
| | Apparent power normalized value for three-phase. This value is regardless of reg.40026, 40027 | | | / | |
| **ENERGY** | | | | | |
| EnergyA MSW | | FP32bit_MSW | R | | 40185 |
| EnergyA LSW | | FP32bit_LSW | R | | 40186 |
| | Energy electrical measure of input [Wh] for phase A. | | | / | |
| EnergyB MSW | | FP32bit_MSW | R | | 40187 |
| EnergyB LSW | | FP32bit_LSW | R | | 40188 |
| | Energy electrical measure of input [Wh] for phase B. | | | / | |
| EnergyC MSW | | FP32bit_MSW | R | | 40189 |
| EnergyC LSW | | FP32bit_LSW | R | | 40190 |
| | Energy electrical measure of input [Wh] for phase C. | | | / | |
| Energy3PH MSW | | FP32bit_MSW | R | | 40191 |
| Energy3PH LSW | | FP32bit_LSW | R | | 40192 |
| | Energy electrical measure of input [Wh] for three-phase ($E_A$ + $E_B$ + $E_C$)/3. | | | / | |
| **COSϕ** | | | | | |
| CosϕA MSW | | FP32bit_MSW | R | | 40175 |
| CosϕA LSW | | FP32bit_LSW | R | | 40176 |
| | Cosϕ electrical measure of input [dimensionless number] for phase A | | | / | |
| CosϕB MSW | | FP32bit_MSW | R | | 40177 |
| CosϕB LSW | | FP32bit_LSW | R | | 40178 |
| | Cosϕ electrical measure of input [dimensionless number] for phase B | | | / | |
| CosϕC MSW | | FP32bit_MSW | R | | 40179 |
| CosϕC LSW | | FP32bit_LSW | R | | 40180 |
| | Cosϕ electrical measure of input [VA] for phase C | | | / | |
| Cosϕ3PH MSW | | FP32bit_MSW | R | | 40181 |
| Cosϕ3PH LSW | | FP32bit_LSW | R | | 40182 |
| | Cosϕ electrical measure of input [VA] for three-phase ( P/S) | | | / | |

| | | | | | |
|---|---|---|---|---|---|
| CosφA | Between: -10000; 10000 | Word | R | | 40213 |
| | Cosφ normalized value for phase A. | | | / | |
| CosφB | Between: -10000; 10000 | Word | R | | 40214 |
| | Cosφ normalized value for phase B. | | | / | |
| CosφC | Between: -10000; 10000 | Word | R | | 40215 |
| | Cosφ normalized value for phase C. | | | / | |
| Cosφ3PH | Between: -10000; 10000 | Word | R | | 40216 |
| | Cosφ normalized value for three-phase. | | | / | |
| **FREQUENCY** | | | | | |
| Freq MSW | | FP32bit_MSW | R | | 40183 |
| Freq LSW | | FP32bit_LSW | R | | 40184 |
| | Electrical-line frequency measure [Hz] | | | / | |

## *LEDs 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 module power is on |
| ERR | Blinking light | Measure of voltage: <40Vac (at least one of the phase used) |
| | Constant 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 |

# Seneca Z-PC Line module: **S203TA**

The S203TA module is a three-phase network analyzer for electric-line voltage up to 600Vac and electric-line current up to the current transformer rated current (50 Hz or 60 Hz). The module has an analog output, electrical value directly proportional to selected input: voltage-type output or current-type output. The electrical value (analog output) is available on screw terminals and the normalized value is available on RS485 registers.

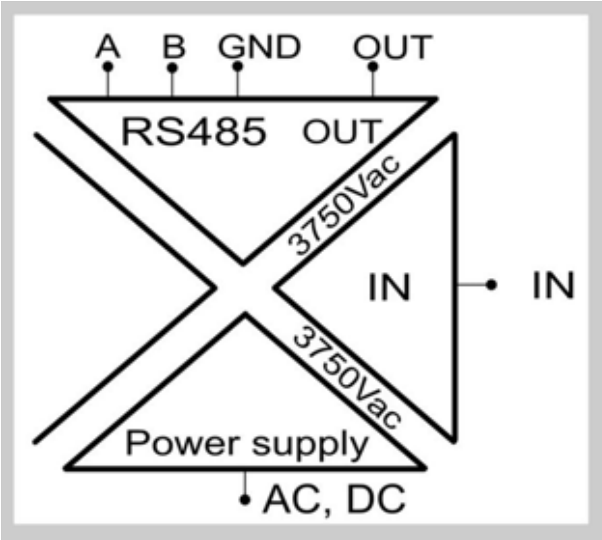
## *General characteristics*

- It is possible to detect, with reference to the electric-line and load connected to its: RMS voltage, RMS current, active power, reactive power, apparent power, cosΦ, frequency, energy (for each measure: phase A, phase B, phase C and three-phase values are available, except frequency)
- Normalized start/end scale between 0..+10000 (for RMS voltage, RMS current, active power, apparent power) or between ± 10000 (for reactive power, cosΦ)
- It is possible to reset the energy values
- It is possible to manage connections for high power devices using current transformers (with secondary current=5Arms)
- It is possible to connect the module using single-phase insertion, ARON insertion (three-phase without neutral), 4-wires insertion (three-phase with neutral), single-phase without CT insertion
- It is possible to configure the module (node) address and baud-rate by Dip-Switches
- It is possible to configure electrical-line frequency, output (electrical value), single/three phase application, rescaled-input type, insertion-type and maximum current by Dip-Switches

## *Features*

| **INPUT** | |
|---|---|
| **Number** | 3 (Phase A, phase B, phase C) + Neutral |
| **Accuracy** | 0.2% of E.E.S. (Voltmeter, amperemeter, watt-meter) + accuracy of the current transformer |
| | Thermal stability: < 100 ppm/°K |
| | EMI: < 1% |
| **Protection** | This module provides inputs protection against the ESD (up to 4kV) |
| **Voltage-type IN** | E.S.S./E.E.S.(Electrical Start/End Scale) between: 0..600Vac. Input impedance: 800 kΩ |
| **Current-type IN** | E.S.S./E.E.S.(Electrical Start/End Scale) between: 0…current transformer primary current; max peak factor: 3. Input impedance: 1 Ω |
| **OUTPUT** | |
| **Number** | 1 |
| **Type** | Voltage, active current, passive current |
| **Accuracy** | 0.1% of output scale range |
| **Cables at secondary circuit** | The power consumption through two cables (they are necessary to connect CT secondary to S203TA) must to be less than rated power of current transformer |
| **Response time (10%..90%)** | 0.4s |
| **Voltage-type OUT** | Output scale range configurable between: 0-10 V or 0-5V (minimum resistance that can be connected: 2 kΩ). Saturation value is 11V |

| | |
|---|---|
| **Current-type OUT** | Output scale range configurable between: 0-20 mA or 4-20mA (max resistance that can be connected: 500Ω). Saturation value is 22mA |
| **CONNECTIONS** | |
| **RS485 interface** | Screw terminals 31 (B), 32 (A), 33 (GND) |
| **ISOLATIONS** | |
| | 1500Vac isolation between: power supply, ModBUS RS485 + output<br>3750Vac isolation between: input (electric network) and other parts |

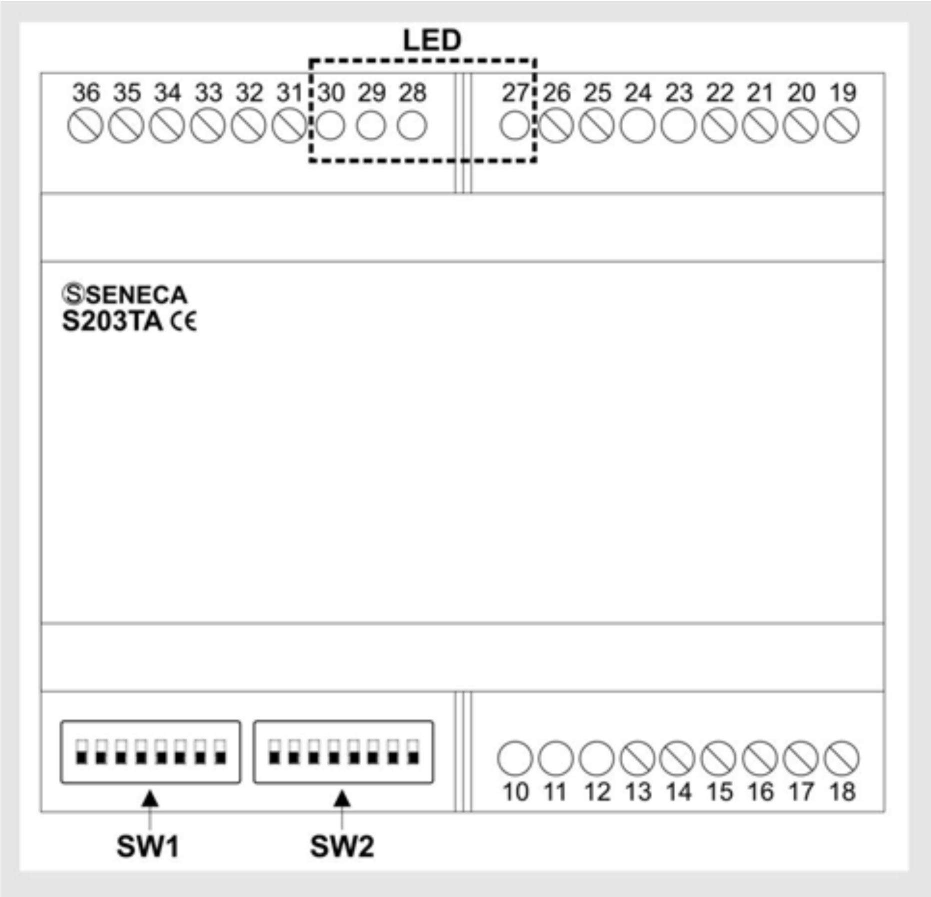



| | |
|---|---|
| **POWER SUPPLY** | |
| **Supply voltage** | 10 – 40 Vdc or 19 – 28 Vac (50Hz - 60Hz) |
| **Power consumption** | Max: 2.5 W |

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

"Accuracy" terms are guaranteed with reference to the following ranges: RMS voltage=40…600Vac, RMS current=(0.4…100)% of $I_{NOM}$ (current-transformer primary-current).

| | |
|---|---|
| **MODULE CASE** | |
| **Case-type** | DIN 43880, UL94VO plastic material, gray |
| **Dimensions** | 105x89x60mm |
| **Terminal board** | Not removable 3-way screw terminals: pitch 5.08mm, sections $2.5mm^2$ |
| **Protection class** | IP20 |

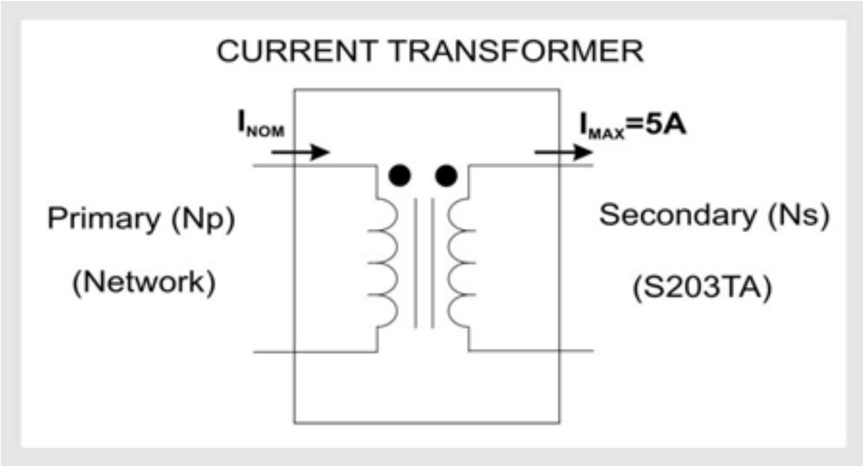



| Screw terminals | Measurement scala range |
|---|---|
| 13, 14 | Connect CT secondary for phase A |
| 15, 16 | Connect CT secondary for phase B |
| 17, 18 | Connect CT secondary for phase C |
| 19, 20, 21, 22 | See input connection figure |
| 25, 26 | Power supply (10..40Vdc or 19…28Vac; 2.5W) |
| 27 | LED PWR |
| 28 | LED ERR |
| 29 | LED Tx |
| 30 | LED Rx |
| 31 | RS485 B |
| 32 | RS485 A |
| 33 | RS485 GND |
| 34, 35, 36 | See output connection figure |

# *Connections*

Input connection

In the following figure are shown typical current transformer, to connect S203TA module with electrical-line.




Np=turn number of primary; Ns=turn number of secondary.

**Accuracy class equal to 0.2 is the accuracy class related to the S203TA module only: it is regardless of the accuracy class for current transformer CT, because CT is chosen by user (this is not true for S203T module).**

In the following figure are shown input connections for four insertion types: single-phase, single-phase without current transformer, ARON (three-phase with two CT) and 4-wires (three-phase with three CT).

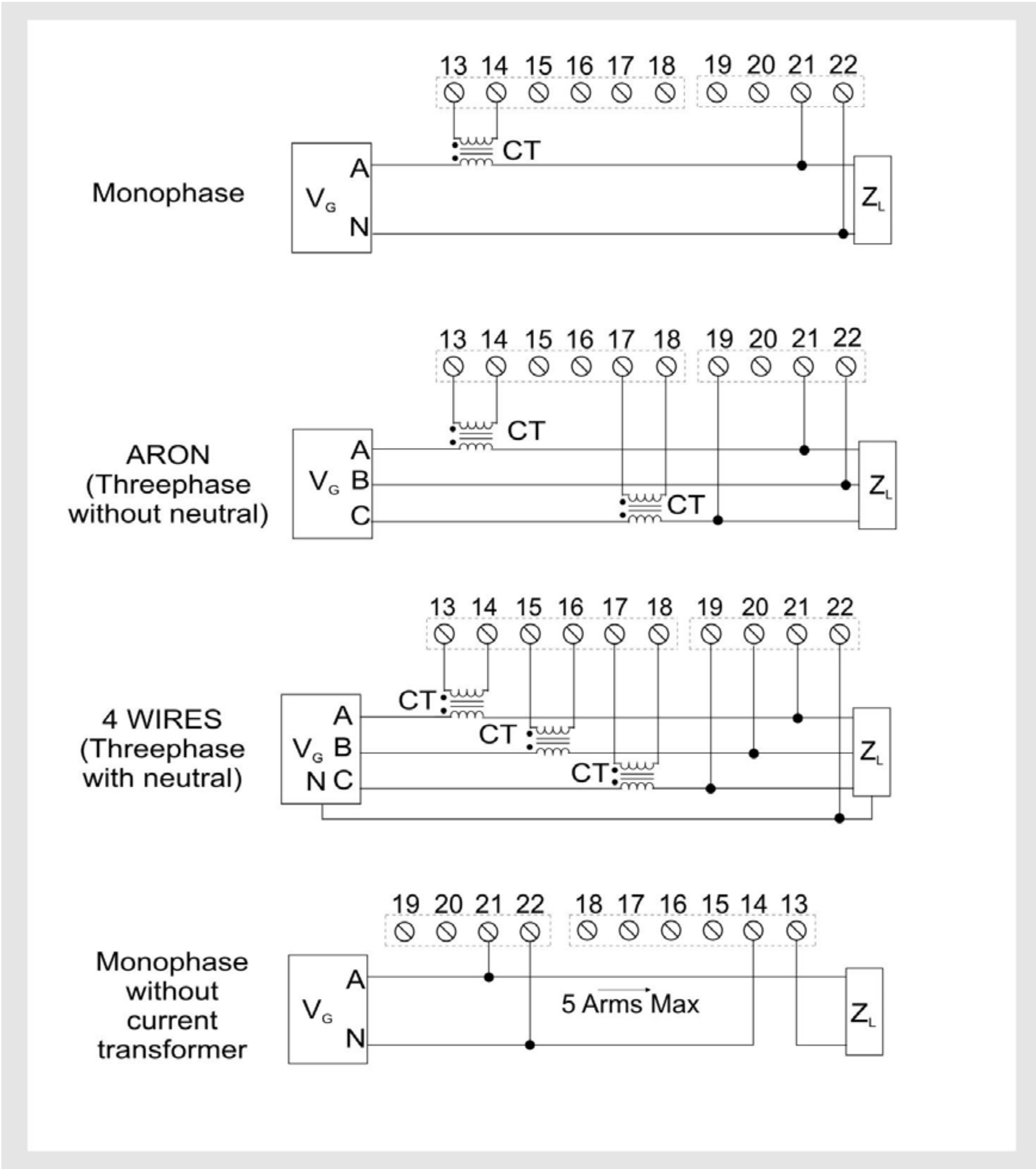
**WARNING**

**ONLY the connections shown in the following figure for S203TA module are allowed!**

**If a negative power is measured, check current transformer insertion!**

**NOTE**

**It is forbidden** to connect the current transformer secondary to ground.

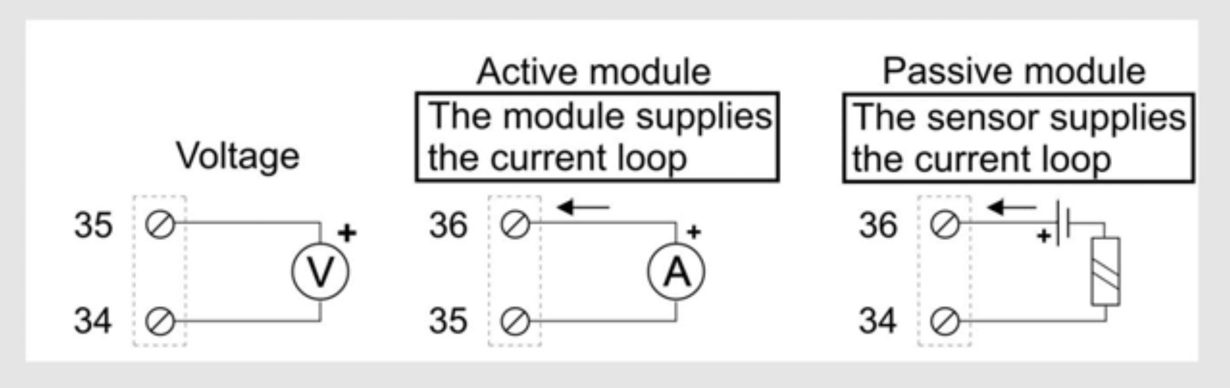



 **ATTENTION**

**In “single-phase without current transformer”-insertion figure, screw terminals are shown in a different position!**

 14, 16, 18, 22 screw terminals are connected internally.

Output connection




Shielded cables are recommended to connect the outputs.

It is not possible to obtain an output (electric value) directly proportional to the electric-line frequency, energy, reactive power, apparent power (see Dip-switches SW2-6 and SW2-7).

This module allows to associate a electric quantity (RMS voltage, RMS current, active power, cosϕ, through Dip-switches) to the analog output value (and normalized measure), as described in the following points:

- if selected electric quantity (single-phase/three-phase, RMS voltage/RMS current/active power/cosϕ) is less than MinIN (reg.40028, 40029 floating point): normalized measure (reg.40217) is equal to 0 and analog output is 0% (0V, 0mA, 4mA), available through screw terminals;
- if selected electric quantity (single-phase/three-phase, RMS voltage/RMS current/active power/cosϕ) is greater than MaxIN (reg.40030, 40031 floating point): normalized measure (reg. 40217) is equal to 10000 and analog output is 100% (5V, 10V, 20mA), available through screw terminals;
- if selected electric quantity (single-phase/three-phase, RMS voltage/RMS current/active power/cosϕ) is between MinIN and MaxIN, analog output (current/voltage) is directly proportional to the selected electric quantity and it is available through screw terminals.

To choose if electric quantity is single-phase (it is possible to choose which phase: A, B or C) or three-phase, set reg.40025.

RS485 serial port and power supply

# Functioning

The S203TA module allows to detect and capture the following electric quantity: RMS voltage, RMS current, active power, reactive power, apparent power, frequency, cos$\phi$, energy. For each quantity, it is possible to read phase A, phase B, phase C and three-phase value (except for frequency).

The measure ranges for RMS voltage, RMS current, active power, reactive power, apparent power, energy, cos$\Phi$, frequency are shown in the following table.

| Possible measures (electric quantities) | Measurement scale range |
|---|---|
| RMS voltage | 0…600Vac |
| RMS current | 0… $I_{NOM}$ (current transformer) |
| Active power | 0… $(600 \cdot I_{NOM})$ W |
| Reactive power | 0… $(600 \cdot I_{NOM})$ VAR |
| Apparent power | 0… $(600 \cdot I_{NOM})$ VA |
| Energy | / |
| Cos$\Phi$ | 0…1 |
| Frequency | 40…70Hz |

The S203TA module allows to read floating point measures (for every quantity) and normalized values (except for energy and frequency); in particular, energy values are kept stored if module is power off.

RMS voltage, RMS current, active power, frequency, energy are measured by S203TA directly (for each phase A, B, C); reactive power, apparent power, cos$\Phi$ and all three-phase values are obtained through processing by S203TA.

| Possible measures | Symbol | Measured value | Calculated value | Value |
|---|---|---|---|---|
| RMS voltage for phase A,B,C | $V_A$ $V_B$ $V_C$ | • | | / |
| Average RMS voltage (three-phase) | V | | • | $(V_A + V_B + V_C)/3$ |
| RMS current for phase A,B,C | $I_A$ $I_B$ $I_C$ | • | | / |
| Average RMS current (three-phase) | I | | • | $(I_A + I_B + I_C)/3$ |
| Active power for phase A,B,C | $P_A$ $P_B$ $P_C$ | • | | / |
| Active power (three-phase) | P | | • | $P_A + P_B + P_C$ |
| Reactive power for phase A,B,C | $Q_A$ $Q_B$ $Q_C$ | | • | $\sqrt{S_{A,B,C}^2 - P_{A,B,C}^2}$ |
| Reactive power (three-phase) | Q | | • | $Q_A + Q_B + Q_C$ |
| Apparent power for phase A,B,C | $S_A$ $S_B$ $S_C$ | | • | $V_{A,B,C} \cdot I_{A,B,C}$ |
| Apparent power (three-phase) | S | | • | $S_A + S_B + S_C$ |
| Energy for phase A,B,C | $E_A$ $E_B$ $E_C$ | • | | / |
| Energy (three-phase) | E | | • | $E_A + E_B + E_C$ |
| Cos$\Phi$ for phase A,B,C | cos$\phi_A$ cos$\phi_B$ cos$\phi_C$ | | • | $P_{A,B,C}/S_{A,B,C}$ |
| Cos$\Phi$ (three-phase) | cos$\phi$ | | • | P/S |
| Frequency (*) | f | • | | / |

(*) It is possible to use the S203TA module as frequency meter to measure frequencies between 40Hz and 70Hz. To measure RMS voltage, RMS current, active power, reactive power, apparent power, energy, cosΦ, the signal has to have an accurate frequency (about 50Hz or 60Hz).

It is possible to compensate the electrical-line frequency: energy and power measures correction for 50Hz or 60Hz (if network frequency fluctuation is greater than 30mHz).

## *Dip-switches table*

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 | Meaning |
| | | Baud-rate=9600 Baud |
| | ● | Baud-rate=19200 Baud |
| ● | | Baud-rate=38400 Baud |
| ● | ● | Baud-rate=57600 Baud |

| **ADDRESS (Dip-Switches: SW1)** | | | | | | |
|---|---|---|---|---|---|---|
| 3 | 4 | 5 | 6 | 7 | 8 | Meaning |
| | | | | | | **Address and Baud-Rate are acquired from memory(EEPROM)** |
| | | | | | ● | Address=1 |
| | | | | ● | | Address=2 |
| | | | | ● | ● | Address=3 |
| | | | ● | | | Address=4 |
| X | X | X | X | X | X | …………………… |
| ● | ● | ● | ● | ● | ● | Address=63 |

| **FREQUENCY (Dip-Switches: SW2)** | |
|---|---|
| 1 | Meaning |
| | Electric network frequency=50Hz |
| ● | Electric network frequency=60Hz |

| **OUTPUT – ELECTRIC VALUE (Dip-Switches: SW2)** | | |
|---|---|---|
| 2 | 3 | Meaning |
| | | Output=0..10V |
| | ● | Output=0..5V |
| ● | | Output=0..20mA |
| ● | ● | Output=4..20mA |

| **APPLICATION TYPE (Dip-Switches: SW2)** | |
|---|---|
| 4 | Meaning |
| | Three-phase |
| ● | Single-phase |

| **INSERTION TYPE (Dip-Switches: SW2)** | |
|---|---|
| 5 | Meaning |
| | 4-wires (it is activated if SW2-4 is "Three-phase") |
| ● | Aron (it is activated if SW2-4 is "Three-phase") |

| INPUT – ELECTRIC VALUE SENT TO OUTPUT – ELECTRIC VALUE (Dip-Switches: SW2) | | |
|---|---|---|
| 6 | 7 | Meaning |
| | | RMS voltage |
| | ● | RMS current |
| ● | | Active power |
| ● | ● | Cosφ |
| **MAX CURRENT MEASURABLE USING CT TURNS RATIO Np/Ns EQUAL TO 1:1000 (Dip-Switches: SW2)** | | |
| 8 | Meaning | |
| | 100A | |
| ● | 25A | |

Np=turn number of primary; Ns=turn number of secondary.

## *RS485 register table*

| Name | Range | Interpretation of register | R/W | Default | Address |
|---|---|---|---|---|---|
| MachineID | / | MSB, LSB | R | | 40001 |
| | Id_Code (Module ID) | | | 0x41 | Bit [15:8] |
| | Ext_Rev (Module version) | | | | Bit [7:0] |
| Errors | / | Bit | R | | 40133 |
| | Energy value saving error: 0=there isn't; 1=there is | | | / | Bit 15 |
| | These bits aren't used | | | | Bit [14:7] |
| | Phases B,C reversal: 0=there isn't; 1=there is | | | / | Bit 6 |
| | Phase C voltage: 0=it is not acquired correctly (<40Vac); 1=it is acquired correctly (>40Vac) | | | / | Bit 5 |
| | Phase B voltage: 0=it is not acquired correctly (<40Vac); 1=it is acquired correctly (>40Vac) | | | / | Bit 4 |
| | Phase A voltage: 0=it is not acquired correctly (<40Vac); 1=it is acquired correctly (>40Vac) | | | / | Bit 3 |
| | These bits aren't used | | | / | Bit [2:0] |
| Reset | | Word | R/W | | 40131 |
| | Module reset (if reg.40131=0x1234)<br>Energy reset for phases A, B, C (if reg.40131=0x1000) | | | / | |
| Frequency compensation | | Bit | R/W | | 40024 |
| | These bits aren't used | | | / | Bit [15:1] |
| | Network frequency compensation: energy and power measures correction for 50Hz or 60Hz (if network frequency fluctuation is greater than 30mHz). Voltage and current values are regardless of reg.40024 | | | 0 | Bit 0 |
| Baudrate Delay | / | MSB, LSB | R/W | | 40026 |
| | 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 | | | 38400 | Bit [15:8] |

| | | | | | |
|---|---|---|---|---|---|
| | Delay for RS485 (delay of communication response: it represents the number of the pauses(*) between the end of Rx message and the start of Tx message): from 0x00=0 to 0xFF=255 (*)1 pause=6 characters | | | 0 | Bit [7:0] |
| Address Parity | / | MSB, LSB | R/W | | 40025 |
| | Address for RS485 (address of module/node if parameters are configurated by memory modality): from 0x01=1 to 0xFF=255 | | | 1 | Bit [15:8] |
| | Parity for RS485: 0=there isn't; 1=even parity; 2=odd parity | | | 0 | Bit [7:0] |
| CT Type | | Word | R/W | | 40016 |
| | These bits aren't used | | | / | Bit [15:1] |
| | Current Transformer-type setting: 0=passive CT, with output=5Arms (as the equipment supplied current transformer); 1=compensated CT (phase error is zero). Only for equipment supplied current transformer (passive CT) the precision class is guaranteed | | | 0 | Bit 0 |
| Nominal Current MSW | | Word | R/W | | 40018 |
| Nominal Current LSW | | Word | R/W | | 40019 |
| | Current transformer nominal current (primary current) setting. This value affects: RMS current floating point value, active power floating point value, reactive power floating point value, apparent power floating point value, energy floating point value (both single-phase and three-phase); this value does not affect normalized values.<br>Np=turn number of primary<br>Ns=turn number of secondary | | | 1000 [Arms] | |
| OUT phase | | Word | R/W | | 40017 |
| | Output-electric value (see screw terminals: 34, 35, 36, and Dip-switches SW2-6 and SW2-7) is referred to one of the following phases:<br>0=phase A<br>1=phase B<br>2=phase C<br>Any other value of reg.40017=three-phase value | | | 0 (if single-phase) | |
| MinIN MSW | | FP32bit_MSW | R/W | | 40020 |
| MinIN LSW | | FP32bit_LSW | R/W | | 40021 |
| | Input-electric value corresponding to minimum normalized value and minimum output-electric value. To choose which phase corresponds to normalized value, set reg.40017; to choose which input-electric value corresponds to normalized value, set Dip-Switches SW2-6 and SW2-7 (RMS voltage, RMS current, active power, cosϕ). For RMS voltage, MinIN is [V]; for RMS current, MinIN is [mA]; for active power, MinIN is [W]; for cosϕ, MinIN is a dimensionless number | | | 0 | |
| MaxIN MSW | | FP32bit_MSW | R/W | | 40022 |
| MaxIN LSW | | FP32bit_LSW | R/W | | 40023 |
| | Input-electric value corresponding to max normalized value and max output-electric value. To choose which phase corresponds to normalized value, set reg.40017; to choose which input-electric value corresponds to normalized value, set Dip-Switches SW2-6 and SW2-7 (RMS voltage, RMS current, active power, cosϕ). For RMS voltage, MaxIN is [V]; for RMS current, MaxIN is [mA]; for active power, MaxIN is [W]; for cosϕ, MaxIN is a dimensionless number | | | 600 | |

| | | | | | |
|---|---|---|---|---|---|
| Normalized Measure | Between:0; 10000 | Word | R | | 40217 |
| | Normalized measure of input: this value is referred to reg. 40020,40021 FP) and reg.40022,40023 (FP). To know which phase corresponds to normalized value, see reg.40017; to know which input-electric value corresponds to normalized value, see Dip-Switches SW2-6 and SW2-7 configuration (RMS voltage, RMS current, active power, cosϕ).<br>Reg.40217 is equal to 0, if selected floating point value is less than reg.40020,40021 (FP)<br>Reg.40217 is equal to 10000, if selected floating point value is greater than 40022,40023 (FP)<br>Reg.40217 is directly proportional to input electrical value, for any other value (saturation value: 11000) | | | / | |
| **VOLTAGE** | | | | | |
| VoltageA MSW | | FP32bit_MSW | R | | 40135 |
| VoltageA LSW | | FP32bit_LSW | R | | 40136 |
| | RMS voltage electrical measure of input [Vrms] for phase A. | | | / | |
| VoltageB MSW | | FP32bit_MSW | R | | 40137 |
| VoltageB LSW | | FP32bit_LSW | R | | 40138 |
| | RMS voltage electrical measure of input [Vrms] for phase B. | | | / | |
| VoltageC MSW | | FP32bit_MSW | R | | 40139 |
| VoltageC LSW | | FP32bit_LSW | R | | 40140 |
| | RMS voltage electrical measure of input [Vrms] for phase C. | | | / | |
| Voltage3PH MSW | | FP32bit_MSW | R | | 40141 |
| Voltage3PH LSW | | FP32bit_LSW | R | | 40142 |
| | RMS voltage electrical measure of input [Vrms] for three-phase $(V_A + V_B + V_C)/3$. | | | / | |
| VoltageA | Between: 0; 10000 | Word | R | | 40193 |
| | RMS voltage normalized value for phase A. This value is regardless of reg.40018, 40019 | | | / | |
| VoltageB | Between: 0; 10000 | Word | R | | 40194 |
| | RMS voltage normalized value for phase B. This value is regardless of reg.40018, 40019 | | | / | |
| VoltageC | Between: 0; 10000 | Word | R | | 40195 |
| | RMS voltage normalized value for phase C. This value is regardless of reg.40018, 40019 | | | / | |
| Voltage3PH | Between: 0; 10000 | Word | R | | 40196 |
| | RMS voltage normalized value for three-phase. This value is regardless of reg.40018, 40019 | | | / | |
| **CURRENT** | | | | | |
| CurrentA MSW | | FP32bit_MSW | R | | 40143 |
| CurrentA LSW | | FP32bit_LSW | R | | 40144 |
| | RMS current electrical measure of input [mArms] for phase A. This value depends on reg.40018, 40019 | | | / | |
| CurrentB MSW | | FP32bit_MSW | R | | 40145 |
| CurrentB LSW | | FP32bit_LSW | R | | 40146 |
| | RMS current electrical measure of input [mArms] for phase B. This value depends on reg.40018, 40019 | | | / | |

| | | | | | |
|---|---|---|---|---|---|
| CurrentC MSW | | FP32bit_MSW | R | | 40147 |
| CurrentC LSW | | FP32bit_LSW | R | | 40148 |
| | RMS current electrical measure of input [mArms] for phase C. This value depends on reg.40018, 40019 | | | / | |
| Current3PH MSW | | FP32bit_MSW | R | | 40149 |
| Current3PH LSW | | FP32bit_LSW | R | | 40150 |
| | RMS current electrical measure of input [mArms] for three-phase ($I_A$ + $I_B$ + $I_C$)/3. This value depends on reg.40018, 40019 | | | / | |
| CurrentA | Between: 0; 10000 | Word | R | | 40197 |
| | RMS current normalized value for phase A. This value is regardless of reg.40018, 40019 | | | / | |
| CurrentB | Between: 0; 10000 | Word | R | | 40198 |
| | RMS current normalized value for phase B. This value is regardless of reg.40018, 40019 | | | / | |
| CurrentC | Between: 0; 10000 | Word | R | | 40199 |
| | RMS current normalized value for phase C. This value is regardless of reg.40018, 40019 | | | / | |
| Current3PH | Between: 0; 10000 | Word | R | | 40200 |
| | RMS current normalized value for three-phase. This value is regardless of reg.40018, 40019 | | | / | |
| **ACTIVE POWER** | | | | | |
| ActivePowA MSW | | FP32bit_MSW | R | | 40151 |
| ActivePowA LSW | | FP32bit_LSW | R | | 40152 |
| | Active power electrical measure of input [W] for phase A. This value depends on reg.40018, 40019 | | | / | |
| ActivePowB MSW | | FP32bit_MSW | R | | 40153 |
| ActivePowB LSW | | FP32bit_LSW | R | | 40154 |
| | Active power electrical measure of input [W] for phase B. This value depends on reg.40018, 40019 | | | / | |
| ActivePowC MSW | | FP32bit_MSW | R | | 40155 |
| ActivePowC LSW | | FP32bit_LSW | R | | 40156 |
| | Active power electrical measure of input [W] for phase C. This value depends on reg.40018, 40019 | | | / | |
| ActivePow3PH MSW | | FP32bit_MSW | R | | 40157 |
| ActivePow3PH LSW | | FP32bit_LSW | R | | 40158 |
| | Active power electrical measure of input [W] for three-phase ($P_A$ + $P_B$ + $P_C$)/3. This value depends on reg.40018, 40019 | | | / | |
| ActivePowA | Between: 0; 10000 | Word | R | | 40201 |
| | Active power normalized value for phase A. This value is regardless of reg.40018, 40019 | | | / | |
| ActivePowB | Between: 0; 10000 | Word | R | | 40202 |
| | Active power normalized value for phase B. This value is regardless of reg.40018, 40019 | | | / | |
| ActivePowC | Between: 0; 10000 | Word | R | | 40203 |
| | Active power normalized value for phase C. This value is regardless of reg.40018, 40019 | | | / | |

| | | | | | |
|---|---|---|---|---|---|
| ActivePow3PH | Between: 0; 10000 | Word | R | | 40204 |
| | Active power normalized value for three-phase. This value is regardless of reg.40018, 40019 | | | / | |
| **REACTIVE POWER** | | | | | |
| ReactivePowA MSW | | FP32bit_MSW | R | | 40159 |
| ReactivePowA LSW | | FP32bit_LSW | R | | 40160 |
| | Reactive power electrical measure of input [VAR] for phase A. This value depends on reg.40018, 40019 | | | / | |
| ReactivePowB MSW | | FP32bit_MSW | R | | 40161 |
| ReactivePowB LSW | | FP32bit_LSW | R | | 40162 |
| | Reactive power electrical measure of input [VAR] for phase B. This value depends on reg.40018, 40019 | | | / | |
| ReactivePowC MSW | | FP32bit_MSW | R | | 40163 |
| ReactivePowC LSW | | FP32bit_LSW | R | | 40164 |
| | Reactive power electrical measure of input [VAR] for phase C. This value depends on reg.40018, 40019 | | | / | |
| ReactivePow3 PH MSW | | FP32bit_MSW | R | | 40165 |
| ReactivePow3 PH LSW | | FP32bit_LSW | R | | 40166 |
| | Reactive power electrical measure of input [VAR] for three-phase ($Q_A$ + $Q_B$ + $Q_C$)/3. This value depends on reg.40018, 40019 | | | / | |
| ReactivePowA | Between: -10000; 10000 | Word | R | | 40205 |
| | Reactive power normalized value for phase A. This value is regardless of reg.40018, 40019 | | | / | |
| ReactivePowB | Between: -10000; 10000 | Word | R | | 40206 |
| | Reactive power normalized value for phase B. This value is regardless of reg.40018, 40019 | | | / | |
| ReactivePowC | Between: -10000; 10000 | Word | R | | 40207 |
| | Reactive power normalized value for phase C. This value is regardless of reg.40018, 40019 | | | / | |
| ReactivePow3 PH | Between: -10000; 10000 | Word | R | | 40208 |
| | Reactive power normalized value for three-phase. This value is regardless of reg.40018, 40019 | | | / | |
| **APPARENT POWER** | | | | | |
| ApparentPowA MSW | | FP32bit_MSW | R | | 40167 |
| ApparentPowA LSW | | FP32bit_LSW | R | | 40168 |
| | Apparent power electrical measure of input [VA] for phase A. This value depends on reg.40018, 40019 | | | / | |
| ApparentPowB MSW | | FP32bit_MSW | R | | 40169 |
| ApparentPowB LSW | | FP32bit_LSW | R | | 40170 |
| | Apparent power electrical measure of input [VA] for phase B. This value depends on reg.40018, 40019 | | | / | |

| | | | | | |
|---|---|---|---|---|---|
| ApparentPow C MSW | | FP32bit_MSW | R | | 40171 |
| ApparentPow C LSW | | FP32bit_LSW | R | | 40172 |
| | Apparent power electrical measure of input [VA] for phase C. This value depends on reg.40018, 40019 | | | / | |
| ApparentPow3 PH MSW | | FP32bit_MSW | R | | 40173 |
| ApparentPow3 PH LSW | | FP32bit_LSW | R | | 40174 |
| | Apparent power electrical measure of input [VA] for three-phase ($S_A$ + $S_B$ + $S_C$)/3. This value depends on reg.40018, 40019 | | | / | |
| ApparentPowA | Between: 0; 10000 | Word | R | | 40209 |
| | Apparent power normalized value for phase A. This value is regardless of reg.40018, 40019 | | | / | |
| ApparentPowB | Between: 0; 10000 | Word | R | | 40210 |
| | Apparent power normalized value for phase B. This value is regardless of reg.40018, 40019 | | | / | |
| ApparentPow C | Between: 0; 10000 | Word | R | | 40211 |
| | Apparent power normalized value for phase C. This value is regardless of reg.40018, 40019 | | | / | |
| ApparentPow3 PH | Between: 0; 10000 | Word | R | | 40212 |
| | Apparent power normalized value for three-phase. This value is regardless of reg.40018, 40019 | | | / | |
| **ENERGY** | | | | | |
| EnergyA MSW | | FP32bit_MSW | R | | 40185 |
| EnergyA LSW | | FP32bit_LSW | R | | 40186 |
| | Energy electrical measure of input [Wh] for phase A. This value depends on reg.40018, 40019 | | | / | |
| EnergyB MSW | | FP32bit_MSW | R | | 40187 |
| EnergyB LSW | | FP32bit_LSW | R | | 40188 |
| | Energy electrical measure of input [Wh] for phase B. This value depends on reg.40018, 40019 | | | / | |
| EnergyC MSW | | FP32bit_MSW | R | | 40189 |
| EnergyC LSW | | FP32bit_LSW | R | | 40190 |
| | Energy electrical measure of input [Wh] for phase C. This value depends on reg.40018, 40019 | | | / | |
| Energy3PH MSW | | FP32bit_MSW | R | | 40191 |
| Energy3PH LSW | | FP32bit_LSW | R | | 40192 |
| | Energy electrical measure of input [Wh] for three-phase ($E_A$ + $E_B$ + $E_C$)/3. This value depends on reg.40018, 40019 | | | / | |
| **COSφ** | | | | | |
| CosφA MSW | | FP32bit_MSW | R | | 40175 |
| CosφA LSW | | FP32bit_LSW | R | | 40176 |
| | Cosφ electrical measure of input [dimensionless number] for phase A | | | / | |
| CosφB MSW | | FP32bit_MSW | R | | 40177 |
| CosφB LSW | | FP32bit_LSW | R | | 40178 |
| | Cosφ electrical measure of input [dimensionless number] for phase B | | | / | |
| CosφC MSW | | FP32bit_MSW | R | | 40179 |
| CosφC LSW | | FP32bit_LSW | R | | 40180 |
| | Cosφ electrical measure of input [VA] for phase C | | | / | |

| | | | | | |
|---|---|---|---|---|---|
| Cosϕ3PH MSW | | FP32bit_MSW | R | | 40181 |
| Cosϕ3PH LSW | | FP32bit_LSW | R | | 40182 |
| | Cosϕ electrical measure of input [VA] for three-phase ( P/S) | | | / | |
| CosϕA | Between: -10000; 10000 | Word | R | | 40213 |
| | Cosϕ normalized value for phase A. This value is regardless of reg.40018, 40019 | | | / | |
| CosϕB | Between: -10000; 10000 | Word | R | | 40214 |
| | Cosϕ normalized value for phase B. This value is regardless of reg.40018, 40019 | | | / | |
| CosϕC | Between: -10000; 10000 | Word | R | | 40215 |
| | Cosϕ normalized value for phase C. This value is regardless of reg.40018, 40019 | | | / | |
| Cosϕ3PH | Between: -10000; 10000 | Word | R | | 40216 |
| | Cosϕ normalized value for three-phase. This value is regardless of reg.40018, 40019 | | | / | |
| **FREQUENCY** | | | | | |
| Freq MSW | | FP32bit_MSW | R | | 40183 |
| Freq LSW | | FP32bit_LSW | R | | 40184 |
| | Network frequency measure [Hz] | | | / | |

## *LEDs 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 module power is on |
| ERR | Blinking light | Measure of voltage: <40Vac (at least one of the phase used) |
| | Constant 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 |

# 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 |

If the value of object 0x6003 subindex 1 is “0” all inputs from 1 to 8 are configured in counter mode, in other word counter mode switched ON.

If the value of object 0x6003 subindex 1 is not equal to “0” the counter mode is switched OFF.

**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.

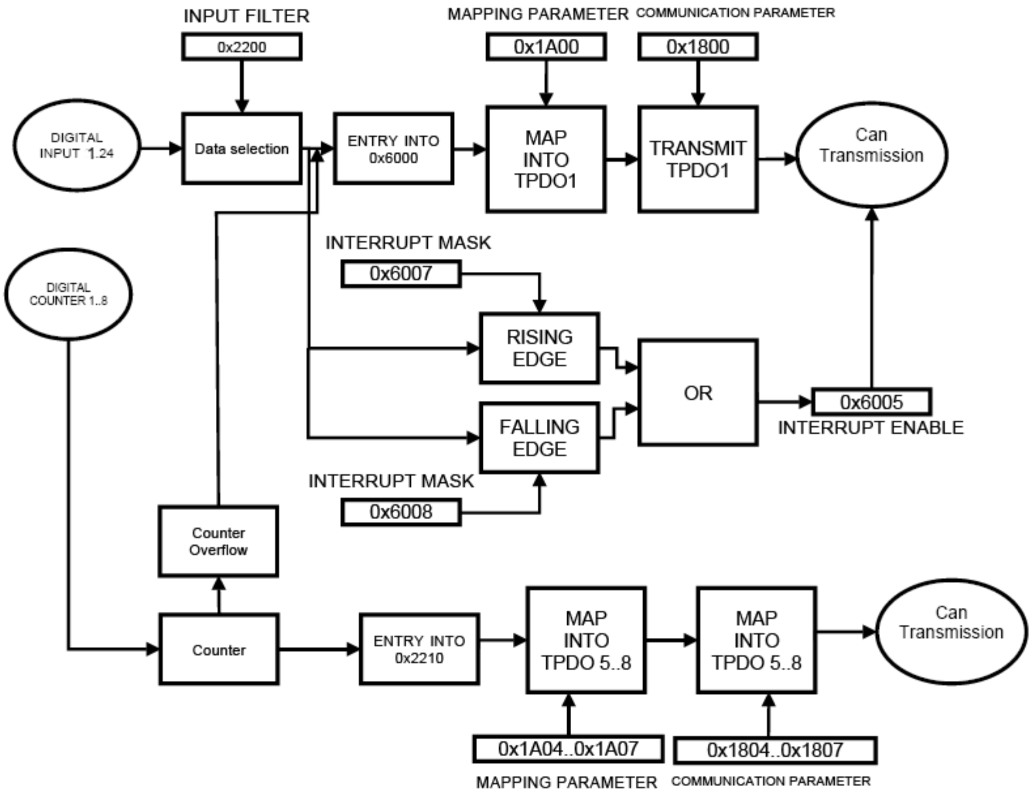
**Object 0x6008** is used as Digital Interrupt Mask High to Low.

| 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 0x01 to 0xF0 =synchronous- cyclic 0xFF=asynchronous | UNSIGNED 8 | RW | 0xFF |
| | 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)<br>1=20kbps<br>2=50kbps<br>3=125kbps<br>4=250kbps<br>5=500kbps<br>6=800kbps<br>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<br>Supported commands:<br>0x5Cnn force preset for counter mask nn<br>0x5Dnn force reset for counter mask nn<br>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<br>Mask bit0=filter disabled<br>(and counters 1..8 enabled)<br>Mask bit1= filter enabled<br>(and counters 1..8 disabled) | UNSIGNED 8 | RW | 0xFF |
| | 2 | Input [9..16] filter mask enable | Input [9..16] filter mask enable | UNSIGNED 8 | RW | 0xFF |
| | 3 | Input [17..24] filter mask enable | Input [17..24] filter mask enable | UNSIGNED 8 | RW | 0xFF |
| 0x6005 | 0 | Global interrupt enabled | 0=TxPDO asynchronous disabled<br>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<br>Mask bit0=rising interrupt disabled<br>Mask bit1=rising interrupt enabled | UNSIGNED 8 | RW | 0xFF |
| | 2 | Mask interrupt input [9..16] | Input [9..16] rising interrupt mask enable<br>Mask bit0=rising interrupt disabled<br>Mask bit1=rising interrupt enabled | UNSIGNED 8 | RW | 0xFF |
| | 3 | Mask interrupt input [17..24] | Input [17..24] rising interrupt mask enable<br>Mask bit0=rising interrupt disabled<br>Mask bit1=rising interrupt enabled | UNSIGNED 8 | RW | 0xFF |
| | 4 | Mask interrupt counter overflow | Counter [1..8] rising interrupt mask enable<br>Mask bit0=rising interrupt disabled<br>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<br>Mask bit0= falling interrupt disabled<br>Mask bit1=rising interrupt enabled | UNSIGNED 8 | RW | 0xFF |
| | 2 | Mask interrupt input [9..16] | Input [9..16] falling interrupt mask enable<br>Mask bit0= falling interrupt disabled<br>Mask bit1= falling interrupt enabled | UNSIGNED 8 | RW | 0xFF |
| | 3 | Mask interrupt input [17..24] | Input [17..24] falling interrupt mask enable<br>Mask bit0= falling interrupt disabled<br>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”<br>1=input is “high” | BOOLEAN | RO | |
| | 2 | Input 2 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 3 | Input 3 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 4 | Input 4 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 5 | Input 5 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 6 | Input 6 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 7 | Input 7 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 8 | Input 8 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 9 | Input 9 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 10 | Input 10 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 11 | Input 11 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 12 | Input 12 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 13 | Input 13 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 14 | Input 14 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 15 | Input 15 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 16 | Input 16 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 17 | Input 17 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 18 | Input 18 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 19 | Input 19 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 20 | Input 20 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 21 | Input 21 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 22 | Input 22 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 23 | Input 23 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 24 | Input 24 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |

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

In this chapter are described the features of ZC-24DO 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 |
| 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 | 1RX |
| 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 |
| RPDO1 | 0x200 + NodeId | Digital output [1..8] | 0x6200 | 1 |
| | | Digital output [9..16] | 0x6200 | 2 |
| | | Digital output [17..24] | 0x6200 | 3 |

### 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 |
| 0xFF30 | Vext for outputs not found/ SPI communication error |
| 0xFF50 | Output fail |

| 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 hardware 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 hardware 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 0x2520** is used to monitor outputs status: “1”=error; “0”=ok.

| OUTPUT STATUS (Object 0x2520) | |
|---|---|
| **Command code** | **Description** |
| 0x5C0n | Output [1..8] status |
| 0x5D0n | Output [9..16] status |
| 0x5E0n | Output [17..24] status |

### *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 |
| **OUTPUT LED DESCRIPTION** | | |
| **LED** | **LED status** | **Meaning** |
| 1-8 | ON | Output [1..8] is high |
| | OFF | Output [1..8] is low |
| 9-16 | ON | Output [9..16] is high |
| | OFF | Output [9..16] is low |
| 17-24 | ON | Output [17..24] is high |
| | OFF | Output [17..24] is low |

## *CANOpen digital output management*

**Object 0x6200** is used as 8 bit output.

| 8 BIT OUTPUT (Object 0x6200) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Output [1..8] value |
| 2 | Output [9..16] value |
| 3 | Output [17..24] value |

**Object 0x6206** is used in FAULT case:

If the output n corresponding bit is “0”, this output keeps the last value;

If the output n corresponding bit is “1”, this output is loaded with object 0x6207

| OUTPUT ERROR MODE (Object 0x6206) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Output [1..8] error mode |
| 2 | Output [9..16] error mode |
| 3 | Output [17..24] error mode |

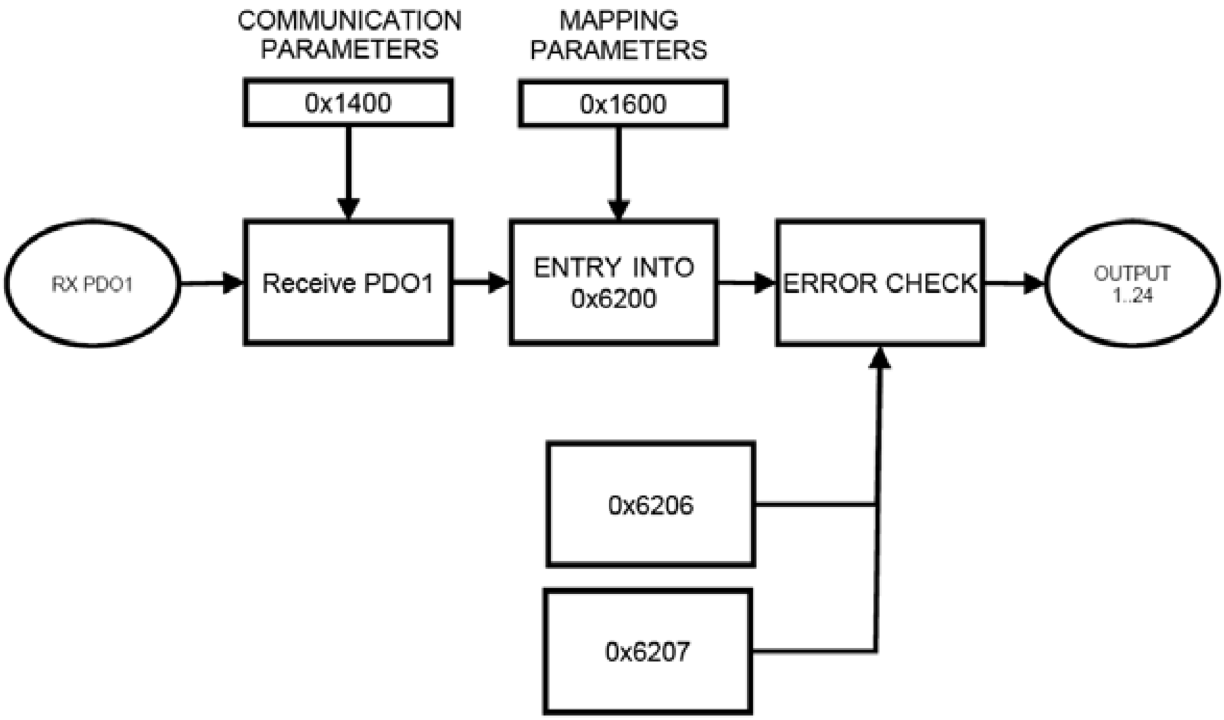
**Object 0x6207** is used to store outputs values to load, in fault case (only if in output error mode the corresponding bit value is “1”).

| OUTPUT ERROR VALUE | |
|---|---|
| **Subindex** | **Description** |
| 1 | Output [1..8] error value |
| 2 | Output [9..16] error value |
| 3 | Output [17..24] error value |

| OUTPUT SINGLE BIT (Object 0x6220) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Output 1 value |
| 2 | Output 2 value |
| 3 | Output 3 value |
| 4 | Output 4 value |
| 5 | Output 5 value |
| 6 | Output 6 value |
| 7 | Output 7 value |
| 8 | Output 8 value |
| 9 | Output 9 value |
| 10 | Output 10 value |
| 11 | Output 11 value |
| 12 | Output 12 value |
| 13 | Output 13 value |
| 14 | Output 14 value |
| 15 | Output 15 value |
| 16 | Output 16 value |
| 17 | Output 17 value |
| 18 | Output 18 value |
| 19 | Output 19 value |
| 20 | Output 20 value |
| 21 | Output 21 value |
| 22 | Output 22 value |
| 23 | Output 23 value |
| 24 | Output 24 value |

***CANOpen functional diagram***

***Digital output***



***CANOpen Object dictionary***

| COMMUNICATION PROFILE AREA | | | | | | |
|---|---|---|---|---|---|---|
| **INDEX** | **SUB INDEX** | **NAME** | **DESCRIPTION** | **TYPE** | **ACCESS** | **DEFAULT** |
| 0x1000 | 0 | Device type | (profile 401=0x191) | UNSIGNED 32 | RO | 0x00020191 |
| 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-24DO" |
| 0x1009 | 0 | Manufacturer HW version | Hardware version | VISIBLE STRING | RO | "SC000000" |
| 0x100A | 0 | Manufacturer SW version | Software version | VISIBLE STRING | RO | "SW001181" |
| 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-24DO Machine ID Code | UNSIGNED 32 | RO | 0x00000021 |
| | 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 /number of mapped object | Max subindex number | UNSIGNED 8 | RO | 3 |
| | 1 | COB-ID used by PDO | COB-ID of RxPDO1 | UNSIGNED 32 | RW | $NODEID+ 0x200 |
| | 2 | Transmission type | Transmission type for PDO1 0x00=synchronous-acyclic 0x01 to 0xF0 =synchronous- cyclic 0xFF=asynchronous | UNSIGNED 8 | RW | 0xFF |
| | 3 | Inhibit time | Min delay for the next PDO (ms/10) | UNSIGNED 16 | RW | 0x0000 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0x1600 | 0 | 1st receive PDO mapping parameter/ number of mapping objects | Max subindex number | UNSIGNED 8 | RW | 3 |
| | 1 | 1st object to be mapped | First object (default output: 1..8) | UNSIGNED 32 | RW | 0x62000108 Object=0x6000 Subindex=1 Length=8bit |
| | 2 | 2nd object to be mapped | Second object (default output: 9..16) | UNSIGNED 32 | RW | 0x62000208 Object=0x6000 Subindex=2 Length=8bit |
| | 3 | 3rd object to be mapped | Third object (default output: 17..24) | UNSIGNED 32 | RW | 0x62000308 Object=0x6000 Subindex=3 Length=8bit |

## 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)<br>1=20kbps<br>2=50kbps<br>3=125kbps<br>4=250kbps<br>5=500kbps<br>6=800kbps<br>7=1Mbps | UNSIGNED 8 | RW | 0x01 |
| 0x2003 | 0 | Master firmware code | | UNSIGNED 16 | RO | 1185 |
| 0x2030 | 0 | Device temperature | number of parameters | UNSIGNED 8 | RO | 4 |
| | 1 | Internal temperature | [°C/10] | INTEGER 16 | RO | 0 |
| | 2 | Hi Hi temperature | [°C/10] | INTEGER 16 | RO | 950 |
| | 3 | Hi temperature | [°C/10] | INTEGER 16 | RO | 900 |
| | 4 | Low temperature | [°C/10] | INTEGER 16 | RO | -250 |
| 0x2520 | 0 | Output status | Max subindex number | UNSIGNED 8 | RO | 3 |
| | 1 | Output [1..8] status | 1= output status ERROR<br>0= output status OK | UNSIGNED 8 | RO | 0 |
| | 2 | Output [9..16] status | 1= output status ERROR<br>0= output status OK | UNSIGNED 8 | RO | 0 |
| | 3 | Output [17..24] status | 1= output status ERROR<br>0= output status OK | UNSIGNED 8 | RO | 0 |

| STANDARD DEVICE PROFILE AREA | | | | | | |
|---|---|---|---|---|---|---|
| **INDEX** | **SUB INDEX** | **NAME** | **DESCRIPTION** | **TYPE** | **ACCESS** | **DEFAULT** |
| 0x6200 | 0 | 8 bit output/ number of output 8 bit | Max subindex number | UNSIGNED 8 | RO | 3 |
| | 1 | Digital output [1..8] | Output [1..8] values | UNSIGNED 8 | RW | 0 |
| | 2 | Digital output [9..16] | Output [9..16] values | UNSIGNED 8 | RW | 0 |
| | 3 | Digital output [17..24] | Output [17..24] values | UNSIGNED 8 | RW | 0 |
| 0x6206 | 0 | Error mode output/ number of output | Max subindex number | UNSIGNED 8 | RO | 1 |
| | 1 | Output [1..8] error mode | 1=load 0x6207 value 0=keep last | UNSIGNED 8 | RW | 0xFF |
| | 2 | Output [9..16] error mode | 1=load 0x6207 value 0=keep last | UNSIGNED 8 | RW | 0xFF |
| | 3 | Output [17..24] error mode | 1=load 0x6207 value 0=keep last | UNSIGNED 8 | RW | 0xFF |
| 0x6207 | 0 | Error value output | Max subindex number | UNSIGNED 8 | RO | 1 |
| | 1 | Output [1..8] error value | Value to load in fail case | UNSIGNED 8 | RW | 0x00 |
| | 2 | Output [9..16] error value | Value to load in fail case | UNSIGNED 8 | RW | 0x00 |
| | 3 | Output [17..24] error value | Value to load in fail case | UNSIGNED 8 | RW | 0x00 |
| 0x6220 | 0 | Single bit output | Max subindex number | UNSIGNED 8 | RW | 8 |
| | 1 | Output 1 value | | BOOLEAN | RW | 0 |
| | 2 | Output 2 value | | BOOLEAN | RW | 0 |
| | 3 | Output 3 value | | BOOLEAN | RW | 0 |
| | 4 | Output 4 value | | BOOLEAN | RW | 0 |
| | 5 | Output 5 value | | BOOLEAN | RW | 0 |
| | 6 | Output 6 value | | BOOLEAN | RW | 0 |
| | 7 | Output 7 value | | BOOLEAN | RW | 0 |
| | 8 | Output 8 value | | BOOLEAN | RW | 0 |
| | 9 | Output 9 value | | BOOLEAN | RW | 0 |
| | 10 | Output 10 value | | BOOLEAN | RW | 0 |
| | 11 | Output 11 value | | BOOLEAN | RW | 0 |
| | 12 | Output 12 value | | BOOLEAN | RW | 0 |
| | 13 | Output 13 value | | BOOLEAN | RW | 0 |
| | 14 | Output 14 value | | BOOLEAN | RW | 0 |
| | 15 | Output 15 value | | BOOLEAN | RW | 0 |
| | 16 | Output 16 value | | BOOLEAN | RW | 0 |
| | 17 | Output 17 value | | BOOLEAN | RW | 0 |
| | 18 | Output 18 value | | BOOLEAN | RW | 0 |
| | 19 | Output 19 value | | BOOLEAN | RW | 0 |
| | 20 | Output 20 value | | BOOLEAN | RW | 0 |
| | 21 | Output 21 value | | BOOLEAN | RW | 0 |
| | 22 | Output 22 value | | BOOLEAN | RW | 0 |
| | 23 | Output 23 value | | BOOLEAN | RW | 0 |
| | 24 | Output 24 value | | BOOLEAN | RW | 0 |

# Seneca Z-PC Line module: **ZC-16DI-8DO (CANOpen)**

In this chapter are described the features of ZC-16DI-8DO 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) for inputs<br>1.25 ms for outputs |
| **CANOpen TECHNICAL DATA** | |
| NMT | slave |
| | Node guarding, heartbeat |
| Node ID | HW switch or software |
| Number of PDO | 5 TX, 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 |
| RPDO1 | 0x200 + NodeId | Digital input [1..8] | 0x6200 | 1 |
| 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 |
| 0xFF30 | Vext for outputs not found/ SPI communication error |
| 0xFF50 | Output fail |

| 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 hardware 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 hardware 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 |

| DIGITAL COUNTERS (Object 0x2211) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Preset Counter 1 value |
| 2 | Preset Counter 2 value |
| 3 | Preset Counter 3 value |
| 4 | Preset Counter 4 value |
| 5 | Preset Counter 5 value |
| 6 | Preset Counter 6 value |
| 7 | Preset Counter 7 value |
| 8 | Preset 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/OUTPUT LED DESCRIPTION** | | |
| **LED** | **LED status** | **Meaning** |
| 1-8 | ON | Input [1..8] is high |
| | OFF | Input [1..8] is low |
| 9-16 | ON | Input [9..16] is high |
| | OFF | Input [9..16] is low |
| 1O-8O | ON | Output [1..8] is high |
| | OFF | Output [1..8] 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 |

If the value of object 0x6003 subindex 1 is “0” all inputs from 1 to 8 are configured in counter mode, in other word counter mode switched ON.

If the value of object 0x6003 subindex 1 is not equal to “0” the counter mode is switched OFF.

**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] |
| 4 | Interrupt mask for counters overflow |

For subindex for 1 and 2, if value is “1” the generation of TxPDO on rising edge is enabled.

If subindex 3 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] |

For subindex 1 and 2, if values is “1” the generation of TxPDO on falling edge is enable.

### *CANOpen digital output management*

**Object 0x6200** is used as 8 bit output.

| 8 BIT OUTPUT (Object 0x6200) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Output [1..8] value |

**Object 0x6206** is used in FAULT case:

If the output n corresponding bit is “0”, this output keeps the last value;

If the output n corresponding bit is “1”, this output is loaded with object 0x6207

| OUTPUT ERROR MODE (Object 0x6206) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Output [1..8] error mode |

**Object 0x6207** is used to store outputs values to load, in fault case (only if in output error mode the corresponding bit value is “1”).

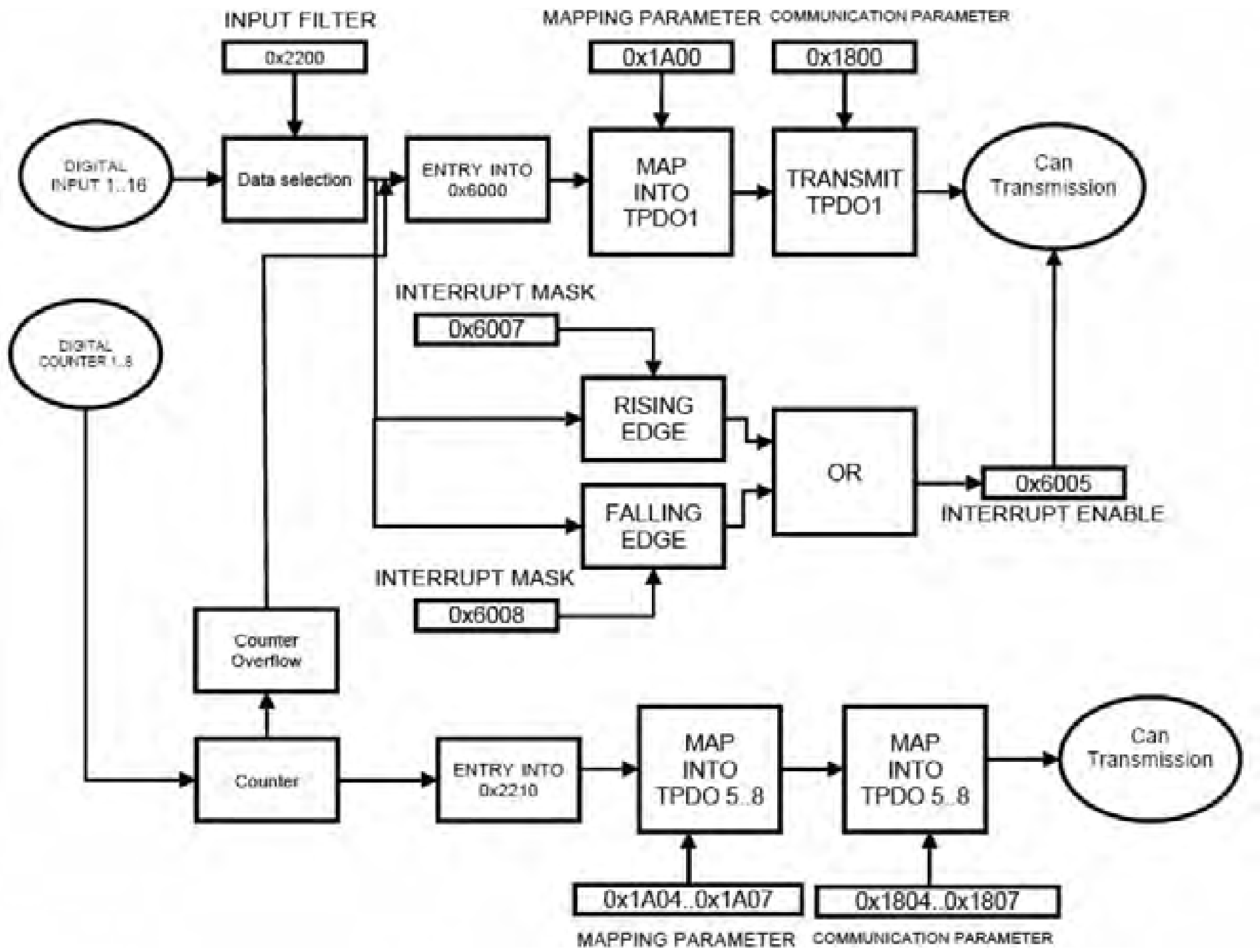
| OUTPUT ERROR VALUE | |
|---|---|
| **Subindex** | **Description** |
| 1 | Output [1..8] error value |

**Object 0x6220** is used for outputs corresponding bits.

| OUTPUT SINGLE BIT (Object 0x6220) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Output 1 value |
| 2 | Output 2 value |
| 3 | Output 3 value |
| 4 | Output 4 value |
| 5 | Output 5 value |
| 6 | Output 6 value |
| 7 | Output 7 value |
| 8 | Output 8 value |

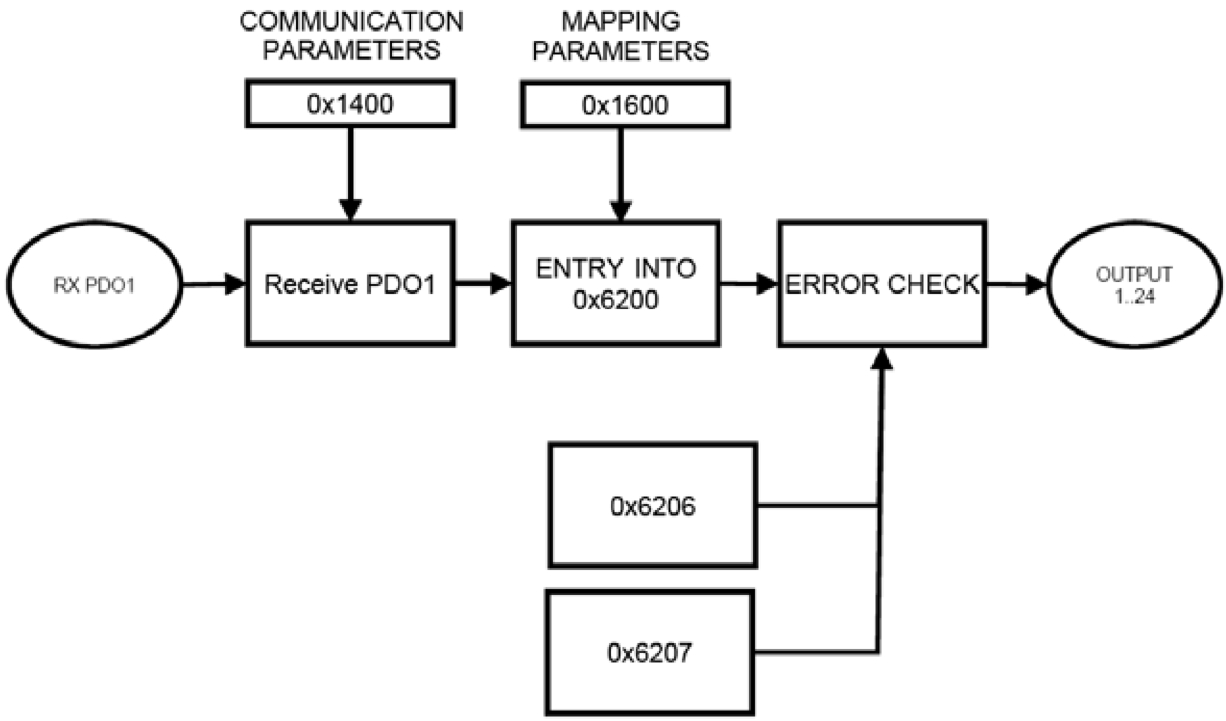
***CANOpen functional diagram***

***counter mode ON (subindex 1 Object 0x6003="0")***



### *CANOpen functional diagram*

### *Digital output*



***CANOpen Object dictionary***

| COMMUNICATION PROFILE AREA | | | | | | |
|---|---|---|---|---|---|---|
| **INDEX** | **SUB INDEX** | **NAME** | **DESCRIPTION** | **TYPE** | **ACCESS** | **DEFAULT** |
| 0x1000 | 0 | Device type | (profile 401=0x191) | UNSIGNED 32 | RO | 0x00030191 |
| 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 | 0x80 |
| 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-16DI-8DO” |
| 0x1009 | 0 | Manufacturer HW version | Hardware version | VISIBLE STRING | RO | “SC000000” |
| 0x100A | 0 | Manufacturer SW version | Software version | VISIBLE STRING | RO | “SW001191” |
| 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-16DI-8DO Machine ID Code | UNSIGNED 32 | RO | 0x00000022 |
| | 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 /number of mapped object | Max subindex number | UNSIGNED 8 | RO | 3 |
| | 1 | COB-ID used by PDO | COB-ID of RxPDO1 | UNSIGNED 32 | RW | $NODEID+ 0x200 |
| | 2 | Transmission type | Transmission type for PDO1 0x00=synchronous-acyclic 0x01 to 0xF0 =synchronous- cyclic 0xFF=asynchronous | UNSIGNED 8 | RW | 0xFF |
| | 3 | Inhibit time | Min delay for the next PDO (ms/10) | UNSIGNED 16 | RW | 0x0000 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0x1600 | 0 | 1st receive PDO mapping parameter/ number of mapping objects | Max subindex number | UNSIGNED 8 | RW | 1 |
| | 1 | 1st object to be mapped | First object (default output: 1..8) | UNSIGNED 32 | RW | 0x62000108 Object=0x6000 Subindex=1 Length=8bit |
| 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 0x01 to 0xF0 =synchronous- cyclic 0xFF=asynchronous | UNSIGNED 8 | RW | 0xFF |
| | 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 | 3 |
| | 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: counter 1..8 overflow) | UNSIGNED 32 | RW | 0x60000308 Object=0x6000 Subindex=3 Length=8bit |
| 0x1A04 | 0 | 5th Transmit PDO mapping parameter/ number of mapped object | Max subindex number | UNSIGNED 8 | RW | 0 |
| | 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 | 0 |
| | 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 | 0 |
| | 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 | 0 |
| | 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)<br>1=20kbps<br>2=50kbps<br>3=125kbps<br>4=250kbps<br>5=500kbps<br>6=800kbps<br>7=1Mbps | UNSIGNED 8 | RW | 0x01 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0x2003 | 0 | Master firmware code | | UNSIGNED 16 | RO | 1185 |
| 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 |
| 0x2520 | 0 | Output status | Max subindex number | UNSIGNED 8 | RO | 1 |
| | 1 | Output [1..8] status | 1=output status error<br>0=output status error | UNSIGNED 8 | RO | 0 |
| 0x2521 | 0 | Output fail type/ number of parameters | Max subindex number | UNSIGNED 8 | RO | 1 |
| | 1 | Fail type output [1..8] | reserved | UNSIGNED 8 | RO | 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 | 3 |
| | 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 | 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<br>Mask bit0=filter disabled<br>(and counters 1..8 enabled)<br>Mask bit1= filter enabled<br>(and counters 1..8 disabled) | UNSIGNED 8 | RW | 0xFF |
| | 2 | Input [9..16] filter mask enable | Input [9..16] filter mask enable | UNSIGNED 8 | RW | 0xFF |
| 0x6005 | 0 | Global interrupt enabled | 0=TxPDO asynchronous disabled<br>1=TxPDO asynchronous enabled | BOOLEAN | RW | 1 |
| 0x6007 | 0 | Interrupt mask Low to High/number of input | Max subindex number | UNSIGNED 8 | RO | 3 |
| | 1 | Mask interrupt input [1..8] | Input [1..8] rising interrupt mask enable<br>Mask bit0=rising interrupt disabled<br>Mask bit1=rising interrupt enabled | UNSIGNED 8 | RW | 0xFF |
| | 2 | Mask interrupt input [9..16] | Input [9..16] rising interrupt mask enable<br>Mask bit0=rising interrupt disabled<br>Mask bit1=rising interrupt enabled | UNSIGNED 8 | RW | 0xFF |
| | 3 | Mask interrupt counter overflow | Counter [1..8] rising interrupt mask enable<br>Mask bit0=rising interrupt disabled<br>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 | 2 |
| | 1 | Mask interrupt input [1..8] | Input [1..8] falling interrupt mask enable<br>Mask bit0= falling interrupt disabled<br>Mask bit1=falling interrupt enabled | UNSIGNED 8 | RW | 0xFF |
| | 2 | Mask interrupt input [9..16] | Input [9..16] falling interrupt mask enable<br>Mask bit0= falling interrupt disabled<br>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 | 16 |
| | 1 | Input 1 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 2 | Input 2 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 3 | Input 3 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 4 | Input 4 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 5 | Input 5 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 6 | Input 6 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 7 | Input 7 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 8 | Input 8 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 9 | Input 9 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 10 | Input 10 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 11 | Input 11 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 12 | Input 12 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 13 | Input 13 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 14 | Input 14 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 15 | Input 15 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |
| | 16 | Input 16 value | 0=input is “low”<br>1=input is “high” | BOOLEAN | RO | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0x6200 | 0 | 8 bit output/ number of output 8 bit | Max subindex number | UNSIGNED 8 | RO | 1 |
| | 1 | Digital output [1..8] | Output [1..8] values | UNSIGNED 8 | RW | 0 |
| 0x6206 | 0 | Error mode output/ number of output | Max subindex number | UNSIGNED 8 | RO | 1 |
| | 1 | Output [1..8] error mode | 1=load 0x6207 value 0=keep last | UNSIGNED 8 | RW | 0xFF |
| 0x6207 | 0 | Error value output | Max subindex number | UNSIGNED 8 | RO | 1 |
| | 1 | Output [1..8] error value | Value to load in fail case | UNSIGNED 8 | RW | 0x00 |
| 0x6220 | 0 | Single bit output | Max subindex number | UNSIGNED 8 | RO | 8 |
| | 1 | Output 1 value | | BOOLEAN | RW | 0 |
| | 2 | Output 2 value | | BOOLEAN | RW | 0 |
| | 3 | Output 3 value | | BOOLEAN | RW | 0 |
| | 4 | Output 4 value | | BOOLEAN | RW | 0 |
| | 5 | Output 5 value | | BOOLEAN | RW | 0 |
| | 6 | Output 6 value | | BOOLEAN | RW | 0 |
| | 7 | Output 7 value | | BOOLEAN | RW | 0 |
| | 8 | Output 8 value | | BOOLEAN | RW | 0 |

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

In this chapter are described the features of ZC-3AO 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 |
| 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

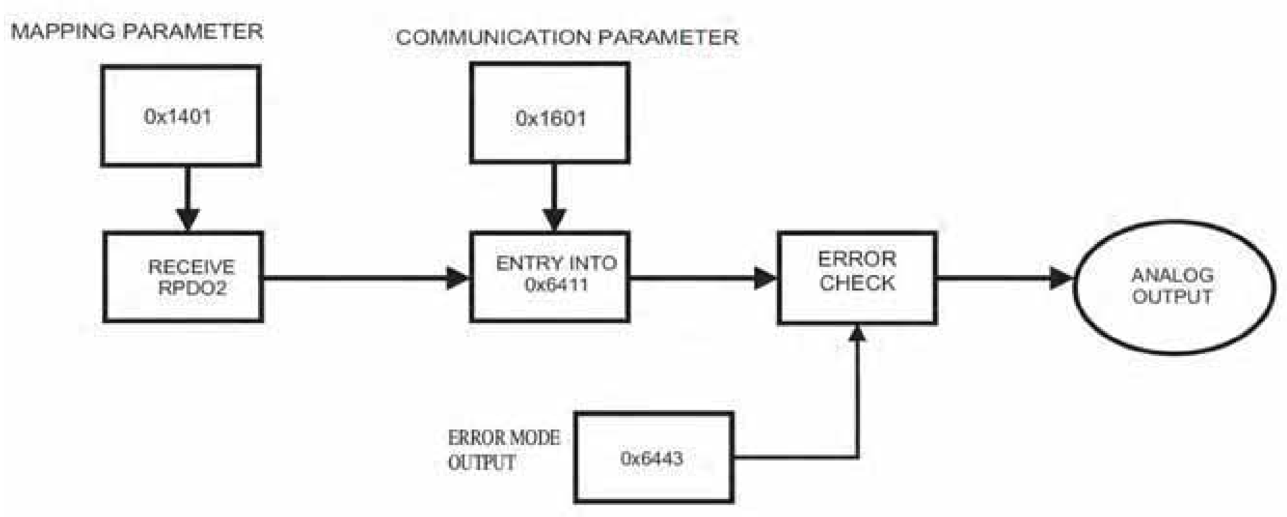
| FAULT OUTPUT MODE (Object 0x6443) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Channel 1 fault mode |
| 2 | Channel 2 fault mode |
| 3 | Channel 3 fault mode |

**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/ number of mapped object | Max subindex number | UNSIGNED 8 | RO | 2 |
| | 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 7=1Mbps | UNSIGNED 8 | RW | 0x01 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 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 |

# Seneca Z-PC Line module: **ZC-4RTD**

In this chapter are described the features of ZC-4RTD 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 |
| Typical conversion time | 20 ms for 4 channels |
| RTD supported | PT100, NI100, PT500, PT1000 |
| Range in Ohm-meter mode | From 18 Ω to 1851 Ω |
| **CANOpen TECHNICAL DATA** | |
| NMT | Slave |
| | Node guarding, heartbeat |
| Node ID | HW switch or software |
| Number of PDO | 2 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 |

## *Supported RTD*

| PT100 – EN60751/A2 (ITS-90) | | PT1000 – EN60751/A2 (ITS-90) | |
|---|---|---|---|
| Temperature range | -200°C..+600°C | Temperature range | -200°C..+210°C |
| **PT500 – EN60751/A2 (ITS-90)** | | **NI100** | |
| Temperature range | -200°C..+750°C | Temperature range | -60°C..+250°C |

## *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** |
| TPDO2 | 0x40000280 + NodeId | Value CH1 16 bit | 0x6401 | 1 |
| | | Value CH2 16 bit | 0x6401 | 2 |
| | | Value CH3 16 bit | 0x6401 | 3 |
| | | Value CH4 16 bit | 0x6401 | 4 |
| TPDO3 | 0x40000380 + NodeId | Value CH1 float | 0x6403 | 1 |
| | | Value CH2 float | 0x6403 | 2 |
| | | Value CH3 float | 0x6403 | 3 |
| | | Value CH4 float | 0x6403 | 4 |

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)

Max of 5 bytes of MEF (Manufacturer error filled)

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 | Channel 1 fail | 0x2120 subindex 1 |
| 14 | Channel 2 fail | 0x2120 subindex 2 |
| 13 | Channel 3 fail | 0x2120 subindex 3 |
| 12 | Channel 4 fail | 0x2120 subindex 4 |
| 11 | Channel 1 sensor error | 0x2120 subindex 1 |
| 10 | Channel 2 sensor error | 0x2120 subindex 2 |
| 9 | Channel 3 sensor error | 0x2120 subindex 3 |
| 8 | Channel 4 sensor error | 0x2120 subindex 4 |
| 7 | Channel 1 communication fail | 0x2121 subindex 1 |
| 6 | Channel 2 communication fail | 0x2121 subindex 2 |
| 5 | Channel 3 communication fail | 0x2121 subindex 3 |
| 4 | Channel 4 communication fail | 0x2121 subindex 4 |

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 NR | Object 0x2103 subindex channelID | |

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 HOT STOP ERROR |
| 0x4202 | CPU temperature over HOT STOP |
| 0x4203 | CPU temperature under COLD ERROR |
| 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) | | |
|---|---|---|
| **BIT** | **Description** | **Object for error details** |
| 15 | Channel 1 fail | 0x2120 subindex 1 |
| 14 | Channel 2 fail | 0x2120 subindex 2 |
| 13 | Channel 3 fail | 0x2120 subindex 3 |
| 12 | Channel 4 fail | 0x2120 subindex 4 |
| 11 | Channel 1 sensor error | 0x2120 subindex 1 |
| 10 | Channel 2 sensor error | 0x2120 subindex 2 |
| 9 | Channel 3 sensor error | 0x2120 subindex 3 |
| 8 | Channel 4 sensor error | 0x2120 subindex 4 |
| 7 | Channel 1 communication fail | 0x2121 subindex 1 |
| 6 | Channel 2 communication fail | 0x2121 subindex 2 |
| 5 | Channel 3 communication fail | 0x2121 subindex 3 |
| 4 | Channel 4 communication fail | 0x2121 subindex 4 |
| 3..0 | NA | NA |

**Object 0x2106**, **0x2107**, **0x2108**, **0x2109** contain the channels configuration:

| CHANNELS SETUP (Object 0x2106 – 0x2107 – 0x2108 – 0x2109) | |
|---|---|
| **Subindex** | **Description** |
| 1 | RTD sensor type<br>0= PT100<br>1=NI100<br>2=PT500<br>3=PT1000 |
| 2 | Measure type (0=°C, 1=Ω) |
| 3 | Three wires connection<br>0=two or four wires connection<br>1=three wires connection |
| 4 | Frequency rejection (1=60Hz, 0=50Hz) |
| 5 | Filter value |
| 6 | Channel enable<br>0=channel disabled<br>1=channel enabled |

| FILTER VALUES | |
|---|---|
| **Value** | **Filter type** |
| 0 | Disabled |
| 1 | Average filter |
| 2 | Hires + average filter |
| 3 | Hires + average + exponential (level 1) filter |
| .. | … |
| 7 | Hires + average + exponential (level 5) filter |

### *Object 0x2125 – FAULT ACTIONS*

**Object 0x2125** sets the fault actions.

| FAULT ACTIONS (Object 0x2125) | |
|---|---|
| **BIT** | **Description** |
| 15 | Fault action CH1 0=load 0x2160, 1=last good |
| 14 | Fault action CH2 0=load 0x2160, 1=last good |
| 13 | Fault action CH3 0=load 0x2160, 1=last good |
| 12 | Fault action CH4 0=load 0x2160, 1=last good |

### *Object 0x2160 – FAULT VALUES*

**Object 0x2160** contains the floating point value (32 bit) to load in fault case.

The measure unit can be: °C or Ω.

| 0x2160 | |
|---|---|
| **Subindex** | **Description** |
| 1 | Channel 1 fault value |
| 2 | Channel 2 fault value |
| 3 | Channel 3 fault value |
| 4 | Channel 4 fault 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 |

## *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 0x6401** contains the 16 bit (signed) values for channels 1..4 in [°C/10], [Ω/10], [Ω/100].

| 16 BIT INTEGER INPUT (Object 0x6411) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Channel 1 16 bit input value |
| 2 | Channel 2 16 bit input value |
| 3 | Channel 3 16 bit input value |
| 4 | Channel 4 16 bit input value |

**Object 0x6403** contains the floating point (32 bit) values for channel 1..4 in [°C] or [Ω].

| 32 BIT REAL INPUT (Object 0x6403) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Channel 1 floating point value |
| 2 | Channel 2 floating point value |
| 3 | Channel 3 floating point value |
| 4 | Channel 4 floating point value |

**Object 0x6423** interrupt enable:

If the value is “1”, the station can generate asynchronous TxPDO.

If the value is “0”, the station can not generate asynchronous TxPDO.

### *Object 0x6424 interrupt upper limit integer*

If enabled (see object 0x6423), an interrupt is triggered when the analogue input is equal or rises above the given value.

As long as the trigger condition is met, every change of the analogue input data generates a new interrupt.

| INTERRUPT UPPER LIMIT 16 BIT INTEGER (OBJECT 0X6424) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Channel 1 upper limit integer [°C/10], [Ω/10], [Ω/100] |
| 2 | Channel 2 upper limit integer [°C/10], [Ω/10], [Ω/100] |
| 3 | Channel 3 upper limit integer [°C/10], [Ω/10], [Ω/100] |
| 4 | Channel 4 upper limit integer [°C/10], [Ω/10], [Ω/100] |

### *Object 0x6425 interrupt lower limit integer*

If enabled (see object 0x6423), an interrupt is triggered when the analogue input falls below the given value.

As long as the trigger condition is met, every change of the analogue input data generates a new interrupt.

| INTERRUPT LOWER LIMIT 16 BIT INTEGER (OBJECT 0X6425) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Channel 1 lower limit integer [°C/10], [Ω/10], [Ω/100] |
| 2 | Channel 2 lower limit integer [°C/10], [Ω/10], [Ω/100] |
| 3 | Channel 3 lower limit integer [°C/10], [Ω/10], [Ω/100] |
| 4 | Channel 4 lower limit integer [°C/10], [Ω/10], [Ω/100] |

### *Object 0x6426 interrupt delta unsigned*

The object sets the delta value (rising or falling above or below the last communicated value) for interrupt-enabled analogue inputs (if object 0x6423 enables the interrupt).

| INTERRUPT DELTA UNSIGNED INTEGER 16 BIT (OBJECT 0X6426) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Channel 1 delta unsigned [°C/10], [Ω/10], [Ω/100] |
| 2 | Channel 2 delta unsigned [°C/10], [Ω/10], [Ω/100] |
| 3 | Channel 3 delta unsigned [°C/10], [Ω/10], [Ω/100] |
| 4 | Channel 4 delta unsigned [°C/10], [Ω/10], [Ω/100] |

### *Object 0x6429 interrupt upper limit float*

This object sets the converted upper limits for interrupt-enabled analogue inputs (see 0x6423 object). As long as the trigger condition is met, every change of the analogue input data generates a new interrupt.

| INTERRUPT UPPER LIMIT FLOAT (OBJECT 0X6429) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Channel 1 upper limit float [°C], [Ω] |
| 2 | Channel 2 upper limit float [°C], [Ω] |
| 3 | Channel 3 upper limit float [°C], [Ω] |
| 4 | Channel 4 upper limit float [°C], [Ω] |

### *Object 0x642A interrupt lower limit float*

This object sets the lower limits for interrupt-enabled analogue inputs (see 0x6423 object). As long as the trigger condition is met, every change of the analogue input data generates a new interrupt.

| INTERRUPT LOWER LIMIT FLOAT (OBJECT 0X6425) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Channel 1 lower limit float [°C], [Ω] |
| 2 | Channel 2 lower limit float [°C], [Ω] |
| 3 | Channel 3 lower limit float [°C], [Ω] |
| 4 | Channel 4 lower limit float [°C], [Ω] |

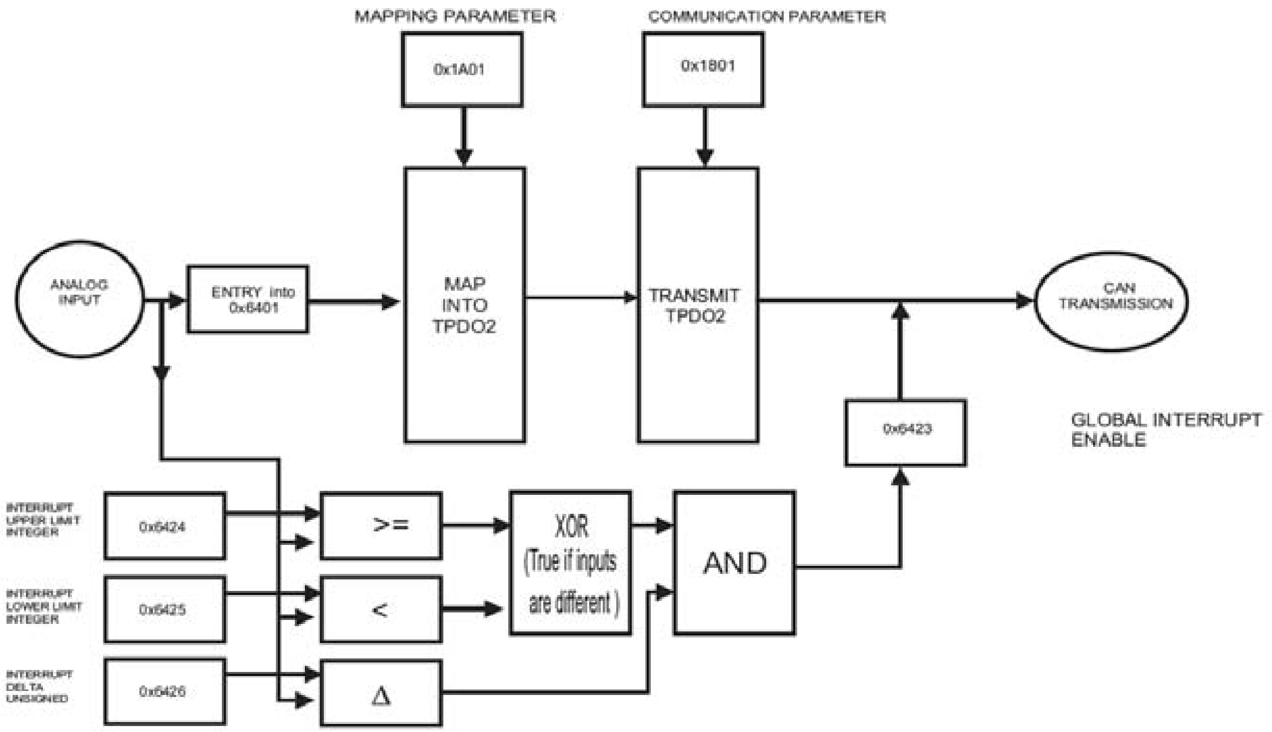
### *Object 0x642B interrupt delta float*

The object sets the delta value (rising or falling above or below the last sample) in float format for interrupt-enabled analogue inputs (if object 0x6423 enables the interrupt).

| INTERRUPT DELTA UNSIGNED FLOAT (OBJECT 0X6426) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Channel 1 delta float [°C], [Ω] |
| 2 | Channel 2 delta float [°C], [Ω] |
| 3 | Channel 3 delta float [°C], [Ω] |
| 4 | Channel 4 delta float [°C], [Ω] |

### *CANOpen functional diagram*

### *For integer values*



## CANOpen Object dictionary

| COMMUNICATION PROFILE AREA | | | | | | |
|---|---|---|---|---|---|---|
| **INDEX** | **SUB INDEX** | **NAME** | **DESCRIPTION** | **TYPE** | **ACCESS** | **DEFAULT** |
| 0x1000 | 0 | Device type | Profile 401=0x191 | UNSIGNED 32 | RO | 0x00040191 |
| 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-4RTD" |
| 0x1009 | 0 | Manufacturer HW version | Hardware version | VISIBLE STRING | RO | "SC000000" |
| 0x100A | 0 | Manufacturer SW version | Software version | VISIBLE STRING | RO | "SW001120" |
| 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 | 8 |
| | 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 CH1 parameters | Store not volatile parameters (write in ASCII "save" for store process MSB 0x65766173 LSB) | UNSIGNED 32 | RW | 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 6 | Save CH2 parameters | Store not volatile parameters (write in ASCII “save” for store process MSB 0x65766173 LSB) | UNSIGNED 32 | RW | 1 |
| | 7 | Save CH3 parameters | Store not volatile parameters (write in ASCII “save” for store process MSB 0x65766173 LSB) | UNSIGNED 32 | RW | 1 |
| | 8 | Save CH4 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 | 8 |
| | 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 CH1 parameters | Restore not volatile parameters (write in ASCII “load” for store process MSB 0x64616F6C LSB) | UNSIGNED 32 | RW | 0 |
| | 6 | Restore CH2 parameters | Restore not volatile parameters (write in ASCII “load” for store process MSB 0x64616F6C LSB) | UNSIGNED 32 | RW | 0 |
| | 7 | Restore CH3 parameters | Restore not volatile parameters (write in ASCII “load” for store process MSB 0x64616F6C LSB) | UNSIGNED 32 | RW | 0 |
| | 8 | Restore CH4 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-4RTD Machine ID Code | UNSIGNED 32 | RO | 0x0000001B |
| | 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 |
| 0x1801 | 0 | 2nd transmit PDO parameters | Number of mapped objects | UNSIGNED 8 | RO | 3 |
| | 1 | COB-ID used by PDO | COB-ID of TxPDO2 | UNSIGNED 32 | RW | $NODEID+ 0x40000280 |
| | 2 | Transmission type | Transmission type for TxPDO2 0x00=synchronous – acyclic 0x01 to 0xF0=synchronous – cyclic 0xFF=asynchronous | UNSIGNED 8 | RW | 0xFF |
| | 3 | Inhibit time | Min delay for the next PDO (ms/10) | UNSIGNED 16 | RW | 0x0000 |
| 0x1802 | 0 | 3rd transmit PDO parameters | Max subindex number | UNSIGNED 8 | RO | 3 |
| | 1 | COB-ID used by PDO | COB-ID of TxPDO3 | UNSIGNED 32 | RW | $NODEID+ 0x40000380 |
| | 2 | Transmission type | Transmission type for TxPDO3 0x00=synchronous – acyclic 0x01 to 0xF0=synchronous – cyclic 0xFF=asynchronous | UNSIGNED 8 | RW | 0xFF |
| | 3 | Inhibit time | Min delay for the next PDO (ms/10) | UNSIGNED 16 | RW | 0x0000 |
| 0x1A01 | 0 | 2nd transmit PDO mapping parameter | Number of mapped objects | UNSIGNED 8 | RW | 4 |
| | 1 | 1st object to be mapped | First object (default: CHANNEL 1 16 bits input) | UNSIGNED 32 | RW | 0x64010110 Object=0x6401 Subindex=1 Length=16bit |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 2 | 2nd object to be mapped | Second object (default: CHANNEL 2 16 bits input) | UNSIGNED 32 | RW | 0x64010210 Object=0x6401 Subindex=2 Length=16bit |
| | 3 | 3rd object to be mapped | Third object (default: CHANNEL 3 16 bits input) | UNSIGNED 32 | RW | 0x64010310 Object=0x6401 Subindex=3 Length=16bit |
| | 4 | 4th object to be mapped | Fourth object (default: CHANNEL 4 16 bits input) | UNSIGNED 32 | RW | 0x64010410 Object=0x6401 Subindex=4 Length=16bit |
| 0x1A02 | 0 | 3rd transmit PDO mapping parameter | Number of mapped objects | UNSIGNED 8 | RW | 0 |
| | 1 | 1st object to be mapped | First object (default: NONE) | UNSIGNED 32 | RW | 0 |
| | 2 | 2nd object to be mapped | Second object (default: NONE) | UNSIGNED 32 | RW | 0 |
| | 3 | 3rd object to be mapped | Third object (default: NONE) | UNSIGNED 32 | RW | 0 |
| | 4 | 4th object to be mapped | Fourth object (default: NONE) | UNSIGNED 32 | RW | 0 |

## 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)<br>1=20kbps<br>2=50kbps<br>3=125kbps<br>4=250kbps<br>5=500kbps<br>6=800kbps<br>7=1Mbps | UNSIGNED 8 | RW | 0x01 |
| 0x2003 | 0 | Master firmware code | | UNSIGNED 16 | RO | 1122 |
| 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 |
| 0x2100 | 0 | Channel global status | | UNSIGNED 16 | RO | 0 |
| 0x2104 | 0 | Channels CMD | Max subindex number | UNSIGNED 8 | RO | 4 |
| | 1 | CMD CH1 | Writing 0xC0DE will return the channel fw code into 0x2015 | UNSIGNED 16 | RW | 0 |
| | 2 | CMD CH2 | Writing 0xC0DE will return the channel fw code into 0x2015 | UNSIGNED 16 | RW | 0 |
| | 3 | CMD CH3 | Writing 0xC0DE will return the channel fw code into 0x2015 | UNSIGNED 16 | RW | 0 |
| | 4 | CMD CH4 | Writing 0xC0DE will return the channel fw code into 0x2015 | UNSIGNED 16 | RW | 0 |
| 0x2105 | 0 | Channels AUX CMD | Max subindex number | UNSIGNED 8 | RO | 4 |
| | 1 | AUX CMD CH1 | Fw code return value | UNSIGNED 16 | RW | 0 |
| | 2 | AUX CMD CH2 | Fw code return value | UNSIGNED 16 | RW | 0 |
| | 3 | AUX CMD CH3 | Fw code return value | UNSIGNED 16 | RW | 0 |
| | 4 | AUX CMD CH4 | Fw code return value | UNSIGNED 16 | RW | 0 |
| 0x2106 | 0 | Channel 1 setup | Number of parameters | UNSIGNED 8 | RO | 6 |
| | 1 | CH1 sensor type | Channel 1 sensor type<br>0=PT100<br>1=NI100<br>2=PT500<br>3=PT1000 | UNSIGNED 8 | RW | 0 |
| | 2 | CH1 – Measure type | 0=°C, 1=Ω | UNSIGNED 8 | RW | 0 |
| | 3 | CH1 – Wire compensation | 0=2 or 4 wires connection<br>1=3 wires connection | UNSIGNED 8 | RW | 1 |
| | 4 | CH1 – Frequency rejection | 0=50Hz<br>1=60Hz | UNSIGNED 8 | RW | 0 |
| | 5 | CH1 - Filter | 0=None, 1=Min, 7=Max | UNSIGNED 8 | RW | 2 |
| | 6 | CH1 - Enable | 0=channel disabled | UNSIGNED 8 | RW | 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | 1=channel enabled | | | |
| 0x2107 | 0 | Channel 2 setup | Number of parameters | UNSIGNED 8 | RO | 6 |
| | 1 | CH2 sensor type | Channel 2 sensor type<br>0=PT100<br>1=NI100<br>2=PT500<br>3=PT1000 | UNSIGNED 8 | RW | 0 |
| | 2 | CH2 – Measure type | 0=°C, 1=Ω | UNSIGNED 8 | RW | 0 |
| | 3 | CH2 – Wire compensation | 0=2 or 4 wires connection<br>1=3 wires connection | UNSIGNED 8 | RW | 1 |
| | 4 | CH2 – Frequency rejection | 0=50Hz<br>1=60Hz | UNSIGNED 8 | RW | 0 |
| | 5 | CH2 - Filter | 0=None, 1=Min, 7=Max | UNSIGNED 8 | RW | 2 |
| | 6 | CH2 - Enable | 0=channel disabled<br>1=channel enabled | UNSIGNED 8 | RW | 1 |
| 0x2108 | 0 | Channel 3 setup | Number of parameters | UNSIGNED 8 | RO | 6 |
| | 1 | CH3 sensor type | Channel 3 sensor type<br>0=PT100<br>1=NI100<br>2=PT500<br>3=PT1000 | UNSIGNED 8 | RW | 0 |
| | 2 | CH3 – Measure type | 0=°C, 1=Ω | UNSIGNED 8 | RW | 0 |
| | 3 | CH3 – Wire compensation | 0=2 or 4 wires connection<br>1=3 wires connection | UNSIGNED 8 | RW | 1 |
| | 4 | CH3 – Frequency rejection | 0=50Hz<br>1=60Hz | UNSIGNED 8 | RW | 0 |
| | 5 | CH3 - Filter | 0=None, 1=Min, 7=Max | UNSIGNED 8 | RW | 2 |
| | 6 | CH3 - Enable | 0=channel disabled<br>1=channel enabled | UNSIGNED 8 | RW | 1 |
| 0x2109 | 0 | Channel 4 setup | Number of parameters | UNSIGNED 8 | RO | 6 |
| | 1 | CH4 sensor type | Channel 4 sensor type<br>0=PT100<br>1=NI100<br>2=PT500<br>3=PT1000 | UNSIGNED 8 | RW | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 2 | CH4 – Measure type | 0=°C, 1=Ω | UNSIGNED 8 | RW | 0 |
| | 3 | CH4 – Wire compensation | 0=2 or 4 wires connection<br>1=3 wires connection | UNSIGNED 8 | RW | 1 |
| | 4 | CH4 – Frequency rejection | 0=50Hz<br>1=60Hz | UNSIGNED 8 | RW | 0 |
| | 5 | CH4 - Filter | 0=None, 1=Min, 7=Max | UNSIGNED 8 | RW | 2 |
| | 6 | CH4 - Enable | 0=channel disabled<br>1=channel enabled | UNSIGNED 8 | RW | 1 |
| 0x2125 | 0 | Fault actions mask | 1=last good<br>0=load object 0x2160<br>Bit 11..0 not used | UNSIGNED 16 | RW | 0xF000 |
| 0x2154 | 0 | Wire resistance value [Ω/100] | Max subindex number | UNSIGNED 8 | RO | 4 |
| | 1 | CHANNEL1-Wire resistance value [Ω/100] | 3rd wire resistance value [Ω/100] | UNSIGNED 16 | RO | 0 |
| | 2 | CHANNEL2-Wire resistance value [Ω/100] | 3rd wire resistance value [Ω/100] | UNSIGNED 16 | RO | 0 |
| | 3 | CHANNEL3-Wire resistance value [Ω/100] | 3rd wire resistance value [Ω/100] | UNSIGNED 16 | RO | 0 |
| | 4 | CHANNEL4-Wire resistance value [Ω/100] | 3rd wire resistance value [Ω/100] | UNSIGNED 16 | RO | 0 |
| 0x2160 | 0 | Fault value | Max subindex number | UNSIGNED 8 | RO | 4 |
| | 1 | CHANNEL1 Fault value [°C,Ω] | Float value | REAL 32 | RW | 850.0 |
| | 2 | CHANNEL2 Fault value [°C,Ω] | Float value | REAL 32 | RW | 850.0 |
| | 3 | CHANNEL3 Fault value [°C,Ω] | Float value | REAL 32 | RW | 850.0 |
| | 4 | CHANNEL4 Fault value [°C,Ω] | Float value | REAL 32 | RW | 850.0 |

## STANDARD DEVICE PROFILE AREA

| INDEX | SUB INDEX | NAME | DESCRIPTION | TYPE | ACCESS | DEFAULT |
|---|---|---|---|---|---|---|
| 0x6401 | 0 | 16 bit input | Number of input | UNSIGNED 8 | RO | 4 |
| | 1 | CH1 16 bit | Channel 1 value [°C/10] or [Ω/10]:Pt100, Ni100; [Ω/100]:others | INTEGER 16 | RO | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 2 | CH2 16 bit | Channel 2 value [°C/10] or [Ω/10]:Pt100, Ni100; [Ω/100]:others | INTEGER 16 | RO | |
| | 3 | CH3 16 bit | Channel 3 value [°C/10] or [Ω/10]:Pt100, Ni100; [Ω/100]:others | INTEGER 16 | RO | |
| | 4 | CH4 16 bit | Channel 4 value [°C/10] or [Ω/10]:Pt100, Ni100; [Ω/100]:others | INTEGER 16 | RO | |
| 0x6403 | 0 | Float input | Number of input float | UNSIGNED 8 | RO | 4 |
| | 1 | CH1 float | Channel 1 value [°C,Ω] | REAL 32 | RO | |
| | 2 | CH2 float | Channel 2 value [°C,Ω] | REAL 32 | RO | |
| | 3 | CH3 float | Channel 3 value [°C,Ω] | REAL 32 | RO | |
| | 4 | CH4 float | Channel 4 value [°C,Ω] | REAL 32 | RO | |
| 0x6423 | 0 | Interrupt global enable | 0=disable asynchronous TxPDO 1=enable asynchronous TxPDO | BOOLEAN | RW | 0 |
| 0x6424 | 0 | Analogue interrupt upper limit – 16 bit | Number upper value 16 bit | UNSIGNED 8 | RO | 4 |
| | 1 | CH1 interrupt upper value | Analogue interrupt upper limit – 16 bit [°C/10] or [Ω/10]:Pt100, Ni100; [Ω/100]:others | INTEGER 16 | RW | 0 |
| | 2 | CH2 interrupt upper value | Analogue interrupt upper limit – 16 bit [°C/10] or [Ω/10]:Pt100, Ni100; [Ω/100]:others | INTEGER 16 | RW | 0 |
| | 3 | CH3 interrupt upper value | Analogue interrupt upper limit – 16 bit [°C/10] or [Ω/10]:Pt100, Ni100; [Ω/100]:others | INTEGER 16 | RW | 0 |
| | 4 | CH4 interrupt upper value | Analogue interrupt upper limit – 16 bit [°C/10] or [Ω/10]:Pt100, Ni100; [Ω/100]:others | INTEGER 16 | RW | 0 |
| 0x6425 | 0 | Analogue interrupt lower limit – 16 bit | Number lower value 16 bit | UNSIGNED 8 | RO | 4 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 1 | CH1 interrupt lower value | Analogue interrupt lower limit – 16 bit [°C/10] or [Ω/10]:Pt100, Ni100; [Ω/100]:others | INTEGER 16 | RW | 0 |
| | 2 | CH2 interrupt lower value | Analogue interrupt lower limit – 16 bit [°C/10] or [Ω/10]:Pt100, Ni100; [Ω/100]:others | INTEGER 16 | RW | 0 |
| | 3 | CH3 interrupt lower value | Analogue interrupt lower limit – 16 bit [°C/10] or [Ω/10]:Pt100, Ni100; [Ω/100]:others | INTEGER 16 | RW | 0 |
| | 4 | CH4 interrupt lower value | Analogue interrupt lower limit – 16 bit [°C/10] or [Ω/10]:Pt100, Ni100; [Ω/100]:others | INTEGER 16 | RW | 0 |
| 0x6426 | 0 | Analogue interrupt delta – 16 bit | Max subindex number | UNSIGNED 8 | RO | 4 |
| | 1 | CH1 interrupt delta value | Analogue interrupt delta value – 16 bit [°C/10] or [Ω/10]:Pt100, Ni100; [Ω/100]:others | UNSIGNED 32 | RW | 0 |
| | 2 | CH2 interrupt delta value | Analogue interrupt delta value – 16 bit [°C/10] or [Ω/10]:Pt100, Ni100; [Ω/100]:others | UNSIGNED 32 | RW | 0 |
| | 3 | CH3 interrupt delta value | Analogue interrupt delta value – 16 bit [°C/10] or [Ω/10]:Pt100, Ni100; [Ω/100]:others | UNSIGNED 32 | RW | 0 |
| | 4 | CH4 interrupt delta value | Analogue interrupt delta value – 16 bit [°C/10] or [Ω/10]:Pt100, Ni100; [Ω/100]:others | UNSIGNED 32 | RW | 0 |
| 0x6429 | 0 | Analogue interrupt upper limit – 32 bit | Number upper value 16 bit | REAL 32 | RO | 4 |
| | 1 | CH1 interrupt upper value | Analogue interrupt upper limit – 16 bit [°C] or [Ω] | REAL 32 | RW | 0 |
| | 2 | CH2 interrupt upper value | Analogue interrupt upper limit – 16 bit [°C] or [Ω] | REAL 32 | RW | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 3 | CH3 interrupt upper value | Analogue interrupt upper limit – 16 bit [°C] or [Ω] | REAL 32 | RW | 0 |
| | 4 | CH4 interrupt upper value | Analogue interrupt upper limit – 16 bit [°C] or [Ω] | REAL 32 | RW | 0 |
| 0x642A | 0 | Analogue interrupt lower limit – 16 bit | Number lower value 16 bit | UNSIGNED 8 | RO | 4 |
| | 1 | CH1 interrupt lower value | Analogue interrupt lower limit – 16 bit [°C] or [Ω] | REAL 32 | RW | 0 |
| | 2 | CH2 interrupt lower value | Analogue interrupt lower limit – 16 bit [°C] or [Ω] | REAL 32 | RW | 0 |
| | 3 | CH3 interrupt lower value | Analogue interrupt lower limit – 16 bit [°C] or [Ω] | REAL 32 | RW | 0 |
| | 4 | CH4 interrupt lower value | Analogue interrupt lower limit – 16 bit [°C] or [Ω] | REAL 32 | RW | 0 |
| 0x642B | 0 | Analogue interrupt delta – 16 bit | Max subindex number | UNSIGNED 8 | RO | 4 |
| | 1 | CH1 interrupt delta value | Analogue interrupt delta value – 32 bit [°C] or [Ω] | REAL 32 | RW | 0 |
| | 2 | CH2 interrupt delta value | Analogue interrupt delta value – 32 bit [°C] or [Ω] | REAL 32 | RW | 0 |
| | 3 | CH3 interrupt delta value | Analogue interrupt delta value – 32 bit [°C] or [Ω] | REAL 32 | RW | 0 |
| | 4 | CH4 interrupt delta value | Analogue interrupt delta value – 32 bit [°C] or [Ω] | REAL 32 | RW | 0 |

# Seneca Z-PC Line module: **ZC-8AI**

In this chapter are described the features of ZC-8AI 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 |
| Typical conversion time | 20 ms for 4 channels/ 40 ms for 8 channels |
| Input supported | Voltage from 0 to 10.5 V<br>Current from 0 to 20.5 mA |
| **CANOpen TECHNICAL DATA** | |
| NMT | Slave<br>Node guarding, heartbeat |
| Node ID | HW switch or software |
| Number of PDO | 4 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 |
| TPDO2 | 0x40000280 + NodeId | Value CH1 16 bit | 0x6401 | 1 |
| | | Value CH2 16 bit | 0x6401 | 2 |
| | | Value CH3 16 bit | 0x6401 | 3 |
| | | Value CH4 16 bit | 0x6401 | 4 |
| TPDO3 | 0x40000380 + NodeId | Value CH5 16 bit | 0x6401 | 5 |
| | | Value CH6 16 bit | 0x6401 | 6 |
| | | Value CH7 16 bit | 0x6401 | 7 |
| | | Value CH8 16 bit | 0x6401 | 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)

Max of 4 bytes of MEF (Manufacturer error filled)

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 | Channel 1/2 fail | 0x2120 subindex 1 |
| 14 | Channel 3/4 fail | 0x2120 subindex 2 |
| 13 | Channel 5/6 fail | 0x2120 subindex 3 |
| 12 | Channel 7/8 fail | 0x2120 subindex 4 |
| 11 | Channel 1 fail | 0x2120 subindex 1 |
| 10 | Channel 2 fail | 0x2120 subindex 1 |
| 9 | Channel 3 fail | 0x2120 subindex 2 |
| 8 | Channel 4 fail | 0x2120 subindex 2 |
| 7 | Channel 5 fail | 0x2120 subindex 3 |
| 6 | Channel 6 fail | 0x2120 subindex 3 |
| 5 | Channel 7 fail | 0x2120 subindex 4 |
| 4 | Channel 8 fail | 0x2120 subindex 4 |
| 3 | Channel 1/2 communication fail | 0x2121 subindex 1 |
| 2 | Channel 3/4 communication fail | 0x2121 subindex 2 |
| 1 | Channel 5/6 communication fail | 0x2121 subindex 3 |
| 0 | Channel 7/8 communication fail | 0x2121 subindex 4 |

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 HOT STOP ERROR |
| 0x4202 | CPU temperature over HOT STOP |
| 0x4203 | CPU temperature under COLD ERROR |
| 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..18 | NA |
| 17 | Channel 8 saturation error |
| 16 | Channel 7 saturation error |
| 15 | Channel 6 saturation error |
| 14 | Channel 5 saturation error |
| 13 | Channel 4 saturation error |
| 12 | Channel 3 saturation error |
| 11 | Channel 2 saturation error |
| 10 | Channel 1 saturation error |
| 9 | Good data value |
| 8 | Precision data value |
| 7..1 | NA |
| 0 | CPU EEPROM 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) | | |
|---|---|---|
| **BIT** | **Description** | **Object for error details** |
| 15 | Channel 1/2 fail | 0x2120 subindex 1 |
| 14 | Channel 3/4 fail | 0x2120 subindex 2 |
| 13 | Channel 5/6 fail | 0x2120 subindex 3 |
| 12 | Channel 7/8 fail | 0x2120 subindex 4 |
| 11 | Channel 1 fail | 0x2120 subindex 1 |
| 10 | Channel 2 fail | 0x2120 subindex 1 |
| 9 | Channel 3 fail | 0x2120 subindex 2 |
| 8 | Channel 4 fail | 0x2120 subindex 2 |
| 7 | Channel 5 fail | 0x2120 subindex 3 |
| 6 | Channel 6 fail | 0x2120 subindex 3 |
| 5 | Channel 7 fail | 0x2120 subindex 4 |
| 4 | Channel 8 fail | 0x2120 subindex 4 |
| 3 | Channel 1/2 communication fail | 0x2121 subindex 1 |
| 2 | Channel 3/4 communication fail | 0x2121 subindex 2 |
| 1 | Channel 5/6 communication fail | 0x2121 subindex 3 |
| 0 | Channel 7/8 communication fail | 0x2121 subindex 4 |

**Object 0x2106**, **0x2107**, **0x2108**, **0x2109** contain the channels configuration:

| CHANNELS CONFIGURATION | |
|---|---|
| **Subindex** | **Description** |
| 0x2106 | Channel 1/2 configuration |
| 0x2107 | Channel 3/4 configuration |
| 0x2108 | Channel 5/6 configuration |
| 0x2109 | Channel 7/8 configuration |

| SUBINDEX CHANNELS CONFIGURATION | |
|---|---|
| **Subindex** | **Description** |
| 1 | Channel A enable (1=enable, 0=disable) |
| 2 | Channel B enable (1=enable, 0=disable) |
| 3 | Channel A type (1=current, 0=voltage) |
| 4 | Channel B type (1=current, 0=voltage) |
| 5 | Frequency rejection (1=60 Hz, 0=50 Hz) |
| 6 | Filter |

| FILTER | |
|---|---|
| **Value** | **Filter type** |
| 0 | disabled |
| 1 | Average filter |
| 2 | Hires+average filter |
| 3 | Hires+average+exponential (level1) filter |
| .. | .. |
| 7 | Hires+average+exponential (level5) filter |

## 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: Int16=((VAL-BGN)/(END-BGN))*10000

## BEGIN FOR INTEGER SCALE: Object 0x2700

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

| BEGIN FOR INTEGER SCALE (Object 0x2700) | |
|---|---|
| **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] |
| 4 | Begin value for channel 4 [mV] or [µA] |
| 5 | Begin value for channel 5 [mV] or [µA] |
| 6 | Begin value for channel 6 [mV] or [µA] |
| 7 | Begin value for channel 7 [mV] or [µA] |
| 8 | Begin value for channel 8 [mV] or [µA] |

## END FOR INTEGER SCALE: Object 0x2701

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

| BEGIN FOR INTEGER SCALE (Object 0x2700) | |
|---|---|
| **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] |
| 4 | End value for channel 4 [mV] or [µA] |
| 5 | End value for channel 5 [mV] or [µA] |
| 6 | End value for channel 6 [mV] or [µA] |
| 7 | End value for channel 7 [mV] or [µA] |
| 8 | End value for channel 8 [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 0x6401** contains the 16 bit (signed) values for channels 1..8.

| 16 BIT INTEGER INPUT (Object 0x6411) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Channel 1 16 bit input value |
| 2 | Channel 2 16 bit input value |
| 3 | Channel 3 16 bit input value |
| 4 | Channel 4 16 bit input value |
| 5 | Channel 5 16 bit input value |
| 6 | Channel 6 16 bit input value |
| 7 | Channel 7 16 bit input value |
| 8 | Channel 8 16 bit input value |

**Object 0x6403** contains the floating point (32 bit) values for channel 1..8.

| 32 BIT REAL INPUT (Object 0x6403) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Channel 1 floating point value |
| 2 | Channel 2 floating point value |
| 3 | Channel 3 floating point value |
| 4 | Channel 4 floating point value |
| 5 | Channel 5 floating point value |
| 6 | Channel 6 floating point value |
| 7 | Channel 7 floating point value |
| 8 | Channel 8 floating point value |

**Object 0x6423** interrupt enable:

If the value is “1”, the station can generate asynchronous TxPDO.

If the value is “0”, the station can not generate asynchronous TxPDO.

**Object 0x6430** assigns the measure unit for the analogic input measure. Subindex 1 is referred to input 1…subindex 8 is referred to input 8.

| SI UNIT (Object 0x6430) | |
|---|---|
| **Measure unit** | **Value** |
| mV | 0xFD260000 |
| µA | 0xFA040000 |

### *Object 0x6424 interrupt upper limit integer*

If enabled (see object 0x6423), an interrupt is triggered when the analogue input is equal or rises above the given value.

As long as the trigger condition is met, every change of the analogue input data generates a new interrupt.

| INTERRUPT UPPER LIMIT 16 BIT INTEGER (OBJECT 0X6424) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Channel 1 upper limit integer [mV] or [µA] |
| 2 | Channel 2 upper limit integer [mV] or [µA] |
| 3 | Channel 3 upper limit integer [mV] or [µA] |
| 4 | Channel 4 upper limit integer [mV] or [µA] |
| 5 | Channel 5 upper limit integer [mV] or [µA] |
| 6 | Channel 6 upper limit integer [mV] or [µA] |
| 7 | Channel 7 upper limit integer [mV] or [µA] |
| 8 | Channel 8 upper limit integer [mV] or [µA] |

### *Object 0x6425 interrupt lower limit integer*

If enabled (see object 0x6423), an interrupt is triggered when the analogue input falls below the given value.

As long as the trigger condition is met, every change of the analogue input data generates a new interrupt.

| INTERRUPT LOWER LIMIT 16 BIT INTEGER (OBJECT 0X6425) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Channel 1 lower limit integer [mV] or [µA] |
| 2 | Channel 2 lower limit integer [mV] or [µA] |
| 3 | Channel 3 lower limit integer [mV] or [µA] |
| 4 | Channel 4 lower limit integer [mV] or [µA] |
| 5 | Channel 5 lower limit integer [mV] or [µA] |
| 6 | Channel 6 lower limit integer [mV] or [µA] |
| 7 | Channel 7 lower limit integer [mV] or [µA] |
| 8 | Channel 8 lower limit integer [mV] or [µA] |

### *Object 0x6426 interrupt delta unsigned*

The object sets the delta value (rising or falling above or below the last communicated value) for interrupt-enabled analogue inputs (if object 0x6423 enables the interrupt).

| INTERRUPT DELTA UNSIGNED INTEGER 16 BIT (OBJECT 0X6426) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Channel 1 delta unsigned [mV] or [µA] |
| 2 | Channel 2 delta unsigned [mV] or [µA] |
| 3 | Channel 3 delta unsigned [mV] or [µA] |
| 4 | Channel 4 delta unsigned [mV] or [µA] |
| 5 | Channel 5 delta unsigned [mV] or [µA] |
| 6 | Channel 6 delta unsigned [mV] or [µA] |
| 7 | Channel 7 delta unsigned [mV] or [µA] |
| 8 | Channel 8 delta unsigned [mV] or [µA] |

### *Object 0x6429 interrupt upper limit float*

This object sets the converted upper limits for interrupt-enabled analogue inputs (see 0x6423 object). As long as the trigger condition is met, every change of the analogue input data generates a new interrupt.

| INTERRUPT UPPER LIMIT 32BIT FLOAT (OBJECT 0X6429) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Channel 1 upper limit float [mV] or [µA] |
| 2 | Channel 2 upper limit float [mV] or [µA] |
| 3 | Channel 3 upper limit float [mV] or [µA] |
| 4 | Channel 4 upper limit float [mV] or [µA] |
| 5 | Channel 5 upper limit float [mV] or [µA] |
| 6 | Channel 6 upper limit float [mV] or [µA] |
| 7 | Channel 7 upper limit float [mV] or [µA] |
| 8 | Channel 8 upper limit float [mV] or [µA] |

### *Object 0x642A interrupt lower limit float*

This object sets the lower limits for interrupt-enabled analogue inputs (see 0x6423 object). As long as the trigger condition is met, every change of the analogue input data generates a new interrupt.

| INTERRUPT LOWER LIMIT 32BIT FLOAT (OBJECT 0X6425) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Channel 1 lower limit float [mV] or [µA] |
| 2 | Channel 2 lower limit float [mV] or [µA] |
| 3 | Channel 3 lower limit float [mV] or [µA] |
| 4 | Channel 4 lower limit float [mV] or [µA] |
| 5 | Channel 5 lower limit float [mV] or [µA] |
| 6 | Channel 6 lower limit float [mV] or [µA] |
| 7 | Channel 7 lower limit float [mV] or [µA] |
| 8 | Channel 8 lower limit float [mV] or [µA] |

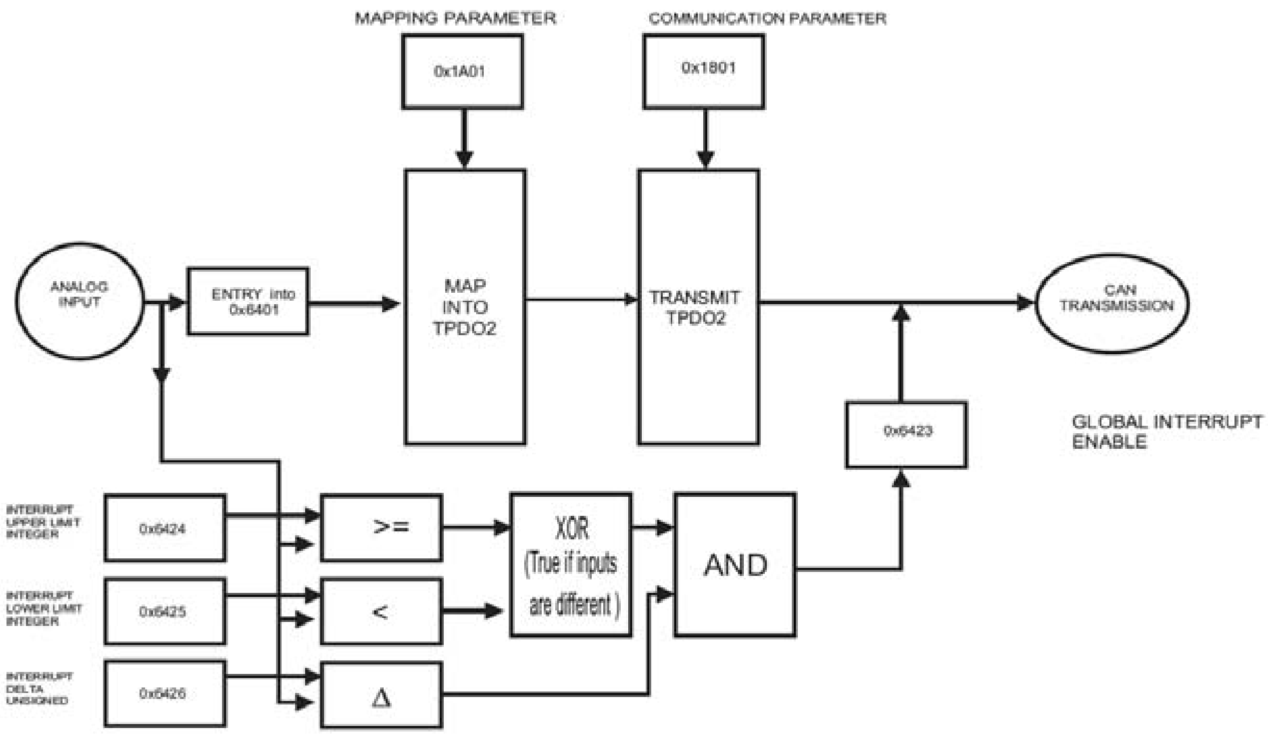
### *Object 0x642B interrupt delta float*

The object sets the delta value (rising or falling above or below the last sample) in float format for interrupt-enabled analogue inputs (if object 0x6423 enables the interrupt).

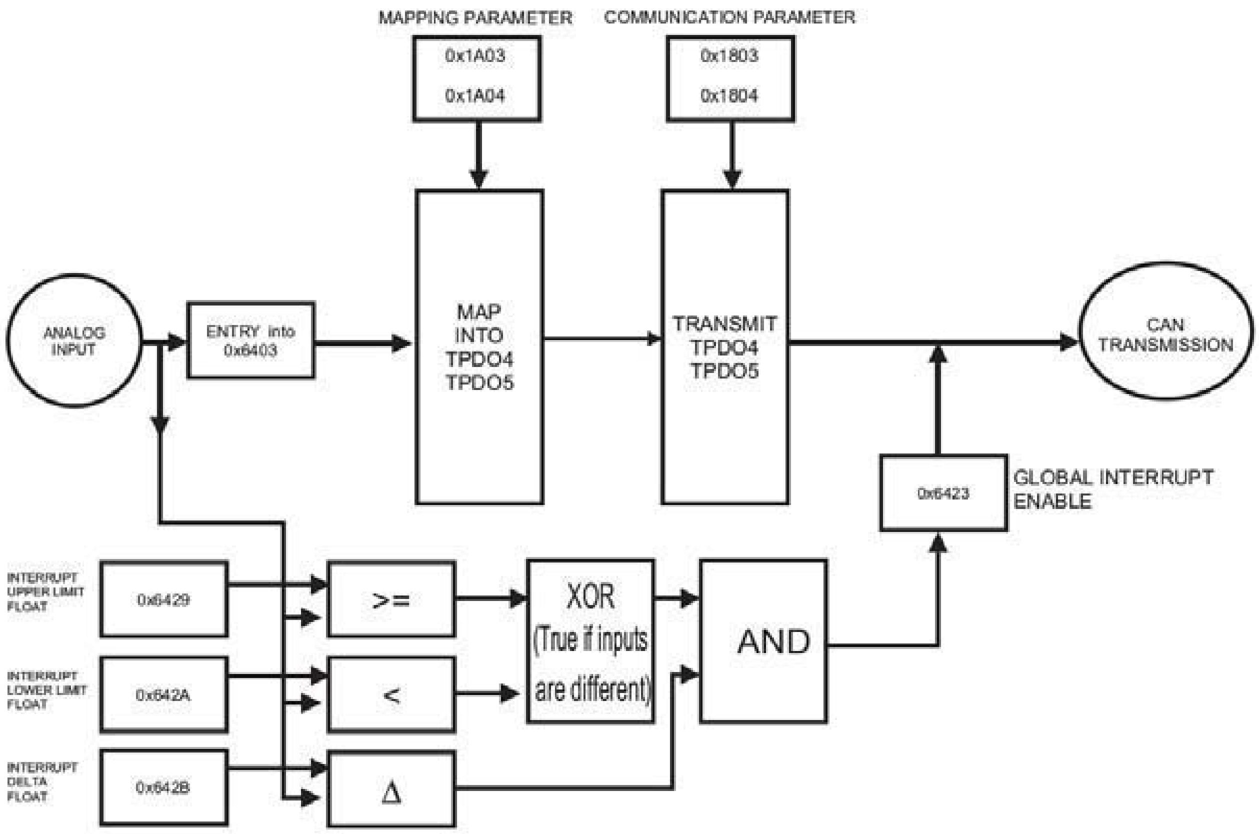
| INTERRUPT DELTA 323 BIT FLOAT (OBJECT 0X6426) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Channel 1 delta float [mV] or [µA] |
| 2 | Channel 2 delta float [mV] or [µA] |
| 3 | Channel 3 delta float [mV] or [µA] |
| 4 | Channel 4 delta float [mV] or [µA] |
| 5 | Channel 5 delta float [mV] or [µA] |
| 6 | Channel 6 delta float [mV] or [µA] |
| 7 | Channel 7 delta float [mV] or [µA] |
| 8 | Channel 8 delta float [mV] or [µA] |

### *CANOpen functional diagram*

### *For integer values*



***For float values***



## *CANOpen Object dictionary*

| COMMUNICATION PROFILE AREA | | | | | | |
|---|---|---|---|---|---|---|
| **INDEX** | **SUB INDEX** | **NAME** | **DESCRIPTION** | **TYPE** | **ACCESS** | **DEFAULT** |
| 0x1000 | 0 | Device type | Profile 401=0x191 | UNSIGNED 32 | RO | 0x00040191 |
| 0x1001 | 0 | Error register | Error register (DS401) | UNSIGNED 8 | RO | 0 |
| 0x1002 | 0 | Manufacturer Status register | Status register | UNSIGNED 32 | RO | |
| 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-8AI” |
| 0x1009 | 0 | Manufacturer HW version | Hardware version | VISIBLE STRING | RO | “SC000000” |
| 0x100A | 0 | Manufacturer SW version | Software version | VISIBLE STRING | RO | “SW001142” |
| 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 | 8 |
| | 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 CH1-2 parameters | Store not volatile parameters (write in ASCII “save” for store process MSB 0x65766173 LSB) | UNSIGNED 32 | RW | 1 |
| | 6 | Save CH3-4 parameters | Store not volatile parameters (write in ASCII “save” for store process MSB 0x65766173 LSB) | UNSIGNED 32 | RW | 1 |
| | 7 | Save CH5-6 parameters | Store not volatile parameters (write in ASCII “save” for store process MSB 0x65766173 LSB) | UNSIGNED 32 | RW | 1 |
| | 8 | Save CH7-8 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 | 8 |
| | 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 CH1-2 parameters | Restore not volatile parameters (write in ASCII “load” for store process MSB 0x64616F6C LSB) | UNSIGNED 32 | RW | 0 |
| | 6 | Restore CH3-4 parameters | Restore not volatile parameters (write in ASCII “load” for store process MSB 0x64616F6C LSB) | UNSIGNED 32 | RW | 0 |
| | 7 | Restore CH5-6 parameters | Restore not volatile parameters (write in ASCII “load” for store process MSB 0x64616F6C LSB) | UNSIGNED 32 | RW | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 8 | Restore CH7-8 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-8AI Machine ID Code | UNSIGNED 32 | RO | 0x00001D00 |
| | 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 |
| 0x1801 | 0 | 2nd transmit PDO parameters | Number of mapped objects | UNSIGNED 8 | RO | 3 |
| | 1 | COB-ID used by PDO | COB-ID of TxPDO2 | UNSIGNED 32 | RW | $NODEID+ 0x40000280 |
| | 2 | Transmission type | Transmission type for TxPDO2 0x00=synchronous – acyclic 0x01 to 0xF0=synchronous – cyclic 0xFF=asynchronous | UNSIGNED 8 | RW | 0xFF |
| | 3 | Inhibit time | Min delay for the next PDO (ms/10) | UNSIGNED 16 | RW | 0x0000 |
| 0x1802 | 0 | 3rd transmit PDO parameters | Max subindex number | UNSIGNED 8 | RO | 3 |
| | 1 | COB-ID used by PDO | COB-ID of TxPDO3 | UNSIGNED 32 | RW | $NODEID+ 0x40000380 |
| | 2 | Transmission type | Transmission type for TxPDO3 0x00=synchronous – acyclic 0x01 to 0xF0=synchronous – cyclic 0xFF=asynchronous | UNSIGNED 8 | RW | 0xFF |
| | 3 | Inhibit time | Min delay for the next PDO (ms/10) | UNSIGNED 16 | RW | 0x0000 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0x1803 | 0 | 4th transmit PDO parameters | Max subindex number | UNSIGNED 8 | RO | 3 |
| | 1 | COB-ID used by PDO | COB-ID of TxPDO4 | UNSIGNED 32 | RW | $NODEID+ 0x40000480 |
| | 2 | Transmission type | Transmission type for TxPDO4 0x00=synchronous – acyclic 0x01 to 0xF0=synchronous – cyclic 0xFF=asynchronous | UNSIGNED 8 | RW | 0xFF |
| | 3 | Inhibit time | Min delay for the next PDO (ms/10) | UNSIGNED 16 | RW | 0x0000 |
| 0x1804 | 0 | 5th transmit PDO parameters | Max subindex number | UNSIGNED 8 | RO | 3 |
| | 1 | COB-ID used by PDO | COB-ID of TxPDO5 | UNSIGNED 32 | RW | 0x80000000 |
| | 2 | Transmission type | Transmission type for TxPDO5 0x00=synchronous – acyclic 0x01 to 0xF0=synchronous – cyclic 0xFF=asynchronous | UNSIGNED 8 | RW | 0xFF |
| | 3 | Inhibit time | Min delay for the next PDO (ms/10) | UNSIGNED 16 | RW | 0x0000 |
| 0x1A01 | 0 | 2nd transmit PDO mapping parameter | Number of mapped objects | UNSIGNED 8 | RW | 4 |
| | 1 | 1st object to be mapped | First object (default: CHANNEL 1 16 bits input) | UNSIGNED 32 | RW | 0x64010110 Object=0x6401 Subindex=1 Length=16bit |
| | 2 | 2nd object to be mapped | Second object (default: CHANNEL 2 16 bits input) | UNSIGNED 32 | RW | 0x64010210 Object=0x6401 Subindex=2 Length=16bit |
| | 3 | 3rd object to be mapped | Third object (default: CHANNEL 3 16 bits input) | UNSIGNED 32 | RW | 0x64010310 Object=0x6401 Subindex=3 Length=16bit |
| | 4 | 4th object to be mapped | Fourth object (default: CHANNEL 4 16 bits input) | UNSIGNED 32 | RW | 0x64010410 Object=0x6401 Subindex=4 Length=16bit |
| 0x1A02 | 0 | 3rd transmit PDO mapping parameter | Number of mapped objects | UNSIGNED 8 | RW | 4 |
| | 1 | 1st object to be mapped | First object (default: CHANNEL 5 16 bits input) | UNSIGNED 32 | RW | 0x64010510 Object=0x6401 Subindex=5 Length=16bit |
| | 2 | 2nd object to be mapped | Second object (default: CHANNEL 6 16 bits input) | UNSIGNED 32 | RW | 0x64010610 Object=0x6401 Subindex=6 Length=16bit |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 3 | 3rd object to be mapped | Third object (default: CHANNEL 7 16 bits input) | UNSIGNED 32 | RW | 0x64010710 Object=0x6401 Subindex=7 Length=16bit |
| | 4 | 4th object to be mapped | Fourth object (default: CHANNEL 8 16 bits input) | UNSIGNED 32 | RW | 0x64010810 Object=0x6401 Subindex=8 Length=16bit |
| 0x1A03 | 0 | 4th transmit PDO mapping parameter | Number of mapped object | UNSIGNED 8 | RW | 4 |
| | 1 | 1st object to be mapped | First object (default: NONE) | UNSIGNED 32 | RW | 0 |
| | 2 | 2nd object to be mapped | Second object (default: NONE) | UNSIGNED 32 | RW | 0 |
| | 3 | 3rd object to be mapped | Third object (default: NONE) | UNSIGNED 32 | RW | 0 |
| | 4 | 4th object to be mapped | Fourth object (default: NONE) | UNSIGNED 32 | RW | 0 |
| 0x1A04 | 0 | 5th transmit PDO mapping parameter | Number of mapped object | UNSIGNED 8 | RW | 4 |
| | 1 | 1st object to be mapped | First object (default: NONE) | UNSIGNED 32 | RW | 0 |
| | 2 | 2nd object to be mapped | Second object (default: NONE) | UNSIGNED 32 | RW | 0 |
| | 3 | 3rd object to be mapped | Third object (default: NONE) | UNSIGNED 32 | RW | 0 |
| | 4 | 4th object to be mapped | Fourth object (default: NONE) | UNSIGNED 32 | RW | 0 |

## 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)<br>1=20kbps<br>2=50kbps<br>3=125kbps<br>4=250kbps<br>5=500kbps<br>6=800kbps<br>7=1Mbps | UNSIGNED 8 | RW | 0x01 |
| 0x2003 | 0 | Firmware release | | UNSIGNED 16 | RO | |
| 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 |
| 0x2100 | 0 | Channel 1..8 global status | | UNSIGNED 16 | RO | |
| 0x2106 | 0 | Channel 1-2 configuration | Number of parameters | UNSIGNED 8 | RO | 6 |
| | 1 | CH1 enable | 0=disable 1=enable | UNSIGNED 8 | RW | 1 |
| | 2 | CH2 enable | 0=disable 1=enable | UNSIGNED 8 | RW | 1 |
| | 3 | CH1 – type | 0=V 1=mA | UNSIGNED 8 | RW | 0 |
| | 4 | CH2 – type | 0=V 1=mA | UNSIGNED 8 | RW | 0 |
| | 5 | CH1-2 line frequency rejection | 0=50 Hz, 1=60 Hz | UNSIGNED 8 | RW | 0 |
| | 6 | Filter | 0=disable, 1=average, 2=hires+average, 3=exp lev1,...7=exp lev5 | UNSIGNED 8 | RW | 2 |
| 0x2107 | 0 | Channel 3-4 configuration | Number of parameters | UNSIGNED 8 | RO | 6 |
| | 1 | CH3 enable | 0=disable 1=enable | UNSIGNED 8 | RW | 1 |
| | 2 | CH4 enable | 0=disable 1=enable | UNSIGNED 8 | RW | 1 |
| | 3 | CH3 – type | 0=V 1=mA | UNSIGNED 8 | RW | 0 |
| | 4 | CH4 – type | 0=V 1=mA | UNSIGNED 8 | RW | 0 |
| | 5 | CH3-4 line frequency rejection | 0=50 Hz, 1=60 Hz | UNSIGNED 8 | RW | 0 |
| | 6 | Filter | 0=disable, 1=average, 2=hires+average, 3=exp lev1,...7=exp lev5 | UNSIGNED 8 | RW | 2 |
| 0x2108 | 0 | Channel 5-6 configuration | Number of parameters | UNSIGNED 8 | RO | 6 |
| | 1 | CH5 enable | 0=disable 1=enable | UNSIGNED 8 | RW | 1 |
| | 2 | CH6 enable | 0=disable 1=enable | UNSIGNED 8 | RW | 1 |
| | 3 | CH5 – type | 0=V 1=mA | UNSIGNED 8 | RW | 0 |
| | 4 | CH6 – type | 0=V 1=mA | UNSIGNED 8 | RW | 0 |
| | 5 | CH5-6 line frequency rejection | 0=50 Hz, 1=60 Hz | UNSIGNED 8 | RW | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 6 | Filter | 0=disable, 1=average, 2=hires+average, 3=exp lev1,...7=exp lev5 | UNSIGNED 8 | RW | 2 |
| 0x2109 | 0 | Channel 7-8 configuration | Number of parameters | UNSIGNED 8 | RO | 6 |
| | 1 | CH7 enable | 0=disable 1=enable | UNSIGNED 8 | RW | 1 |
| | 2 | CH8 enable | 0=disable 1=enable | UNSIGNED 8 | RW | 1 |
| | 3 | CH7 – type | 0=V 1=mA | UNSIGNED 8 | RW | 0 |
| | 4 | CH8 – type | 0=V 1=mA | UNSIGNED 8 | RW | 0 |
| | 5 | CH7-8 line frequency rejection | 0=50 Hz, 1=60 Hz | UNSIGNED 8 | RW | 0 |
| | 6 | Filter | 0=disable, 1=average, 2=hires+average, 3=exp lev1,...7=exp lev5 | UNSIGNED 8 | RW | 2 |
| 0x2700 | 0 | Begin integer scale | Begin value nr | UNSIGNED 8 | RO | 8 |
| | 1 | Begin scale CH1 | Channel 1 begin integer scale [mV] or [µA] | INTEGER 16 | RW | 0 |
| | 2 | Begin scale CH2 | Channel 2 begin integer scale [mV] or [µA] | INTEGER 16 | RW | 0 |
| | 3 | Begin scale CH3 | Channel 3 begin integer scale [mV] or [µA] | INTEGER 16 | RW | 0 |
| | 4 | Begin scale CH4 | Channel 4 begin integer scale [mV] or [µA] | INTEGER 16 | RW | 0 |
| | 5 | Begin scale CH5 | Channel 5 begin integer scale [mV] or [µA] | INTEGER 16 | RW | 0 |
| | 6 | Begin scale CH6 | Channel 6 begin integer scale [mV] or [µA] | INTEGER 16 | RW | 0 |
| | 7 | Begin scale CH7 | Channel 7 begin integer scale [mV] or [µA] | INTEGER 16 | RW | 0 |
| | 8 | Begin scale CH8 | Channel 8 begin integer scale [mV] or [µA] | INTEGER 16 | RW | 0 |
| 0x2701 | 0 | End scale integer | | UNSIGNED 8 | RO | 8 |
| | 1 | End scale CH1 | Channel 1 end integer scale [mV] or [µA] | INTEGER 16 | RW | 10000 |
| | 2 | End scale CH2 | Channel 2 end integer scale [mV] or [µA] | INTEGER 16 | RW | 10000 |
| | 3 | End scale CH3 | Channel 3 end integer scale [mV] or [µA] | INTEGER 16 | RW | 10000 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 4 | End scale CH4 | Channel 4 end integer scale [mV] or [µA] | INTEGER 16 | RW | 10000 |
| | 5 | End scale CH5 | Channel 5 end integer scale [mV] or [µA] | INTEGER 16 | RW | 10000 |
| | 6 | End scale CH6 | Channel 6 end integer scale [mV] or [µA] | INTEGER 16 | RW | 10000 |
| | 7 | End scale CH7 | Channel 7 end integer scale [mV] or [µA] | INTEGER 16 | RW | 10000 |
| | 8 | End scale CH8 | Channel 8 end integer scale [mV] or [µA] | INTEGER 16 | RW | 10000 |
| **STANDARD DEVICE PROFILE AREA** | | | | | | |
| **INDEX** | **SUB INDEX** | **NAME** | **DESCRIPTION** | **TYPE** | **ACCESS** | **DEFAULT** |
| 0x6401 | 0 | 16 bit input | Number of input float | UNSIGNED 8 | RO | 8 |
| | 1 | CH1 value 16 bits | [mV] or [µA] | INTEGER 16 | RO | |
| | 2 | CH2 value 16 bits | [mV] or [µA] | INTEGER 16 | RO | |
| | 3 | CH3 value 16 bits | [mV] or [µA] | INTEGER 16 | RO | |
| | 4 | CH4 value 16 bits | [mV] or [µA] | INTEGER 16 | RO | |
| | 5 | CH5 value 16 bits | [mV] or [µA] | INTEGER 16 | RO | |
| | 6 | CH6 value 16 bits | [mV] or [µA] | INTEGER 16 | RO | |
| | 7 | CH7 value 16 bits | [mV] or [µA] | INTEGER 16 | RO | |
| | 8 | CH8 value 16 bits | [mV] or [µA] | INTEGER 16 | RO | |
| 0x6403 | 0 | Float input | Number of input float | UNSIGNED 8 | RO | 8 |
| | 1 | CH1 value real | [mV] or [µA] | REAL 32 | RO | |
| | 2 | CH2 value real | [mV] or [µA] | REAL 32 | RO | |
| | 3 | CH3 value real | [mV] or [µA] | REAL 32 | RO | |
| | 4 | CH4 value real | [mV] or [µA] | REAL 32 | RO | |
| | 5 | CH5 value real | [mV] or [µA] | REAL 32 | RO | |
| | 6 | CH6 value real | [mV] or [µA] | REAL 32 | RO | |
| | 7 | CH7 value real | [mV] or [µA] | REAL 32 | RO | |
| | 8 | CH8 value real | [mV] or [µA] | REAL 32 | RO | |
| 0x6423 | 0 | Analogue input interrupt global enable | 0=disable asynchronous TxPDO<br>1=enable asynchronous TxPDO | BOOLEAN | RW | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0x6424 | 0 | analogue interrupt upper limit – 16bit | | UNSIGNED 8 | RO | 8 |
| | 1 | Analogue interrupt upper limit CH1 – 16bit | [mV] or [µA] | UNSIGNED 16 | RW | 0 |
| | 2 | Analogue interrupt upper limit CH2 – 16bit | [mV] or [µA] | UNSIGNED 16 | RW | 0 |
| | 3 | Analogue interrupt upper limit CH3 – 16bit | [mV] or [µA] | UNSIGNED 16 | RW | 0 |
| | 4 | Analogue interrupt upper limit CH4 – 16bit | [mV] or [µA] | UNSIGNED 16 | RW | 0 |
| | 5 | Analogue interrupt upper limit CH5 – 16bit | [mV] or [µA] | UNSIGNED 16 | RW | 0 |
| | 6 | Analogue interrupt upper limit CH6 – 16bit | [mV] or [µA] | UNSIGNED 16 | RW | 0 |
| | 7 | Analogue interrupt upper limit CH7 – 16bit | [mV] or [µA] | UNSIGNED 16 | RW | 0 |
| | 8 | Analogue interrupt upper limit CH8 – 16bit | [mV] or [µA] | UNSIGNED 16 | RW | 0 |
| 0x6425 | 0 | Analogue interrupt lower limit – 16bit | | UNSIGNED 8 | RO | 8 |
| | 1 | Analogue interrupt lower limit CH1 – 16bit | [mV] or [µA] | UNSIGNED 16 | RW | 0 |
| | 2 | Analogue interrupt lower limit CH2 – 16bit | [mV] or [µA] | UNSIGNED 16 | RW | 0 |
| | 3 | Analogue interrupt lower limit CH3 – 16bit | [mV] or [µA] | UNSIGNED 16 | RW | 0 |
| | 4 | Analogue interrupt lower limit CH4 – 16bit | [mV] or [µA] | UNSIGNED 16 | RW | 0 |
| | 5 | Analogue interrupt lower limit CH5 – 16bit | [mV] or [µA] | UNSIGNED 16 | RW | 0 |
| | 6 | Analogue interrupt lower limit CH6 – 16bit | [mV] or [µA] | UNSIGNED 16 | RW | 0 |
| | 7 | Analogue interrupt lower limit CH7 – 16bit | [mV] or [µA] | UNSIGNED 16 | RW | 0 |
| | 8 | Analogue interrupt lower limit CH8 – 16bit | [mV] or [µA] | UNSIGNED 16 | RW | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0x6426 | 0 | Analogue interrupt delta limit – 16bit | | UNSIGNED 8 | RO | 8 |
| | 1 | Analogue interrupt delta limit CH1 – 16bit | [mV] or [µA] | UNSIGNED 16 | RW | 0 |
| | 2 | Analogue interrupt delta limit CH2 – 16bit | [mV] or [µA] | UNSIGNED 16 | RW | 0 |
| | 3 | Analogue interrupt delta limit CH3 – 16bit | [mV] or [µA] | UNSIGNED 16 | RW | 0 |
| | 4 | Analogue interrupt delta limit CH4 – 16bit | [mV] or [µA] | UNSIGNED 16 | RW | 0 |
| | 5 | Analogue interrupt delta limit CH5 – 16bit | [mV] or [µA] | UNSIGNED 16 | RW | 0 |
| | 6 | Analogue interrupt delta limit CH6 – 16bit | [mV] or [µA] | UNSIGNED 16 | RW | 0 |
| | 7 | Analogue interrupt delta limit CH7 – 16bit | [mV] or [µA] | UNSIGNED 16 | RW | 0 |
| | 8 | Analogue interrupt delta limit CH8 – 16bit | [mV] or [µA] | UNSIGNED 16 | RW | 0 |
| 0x6429 | 0 | analogue interrupt upper limit – float | | UNSIGNED 8 | RO | 8 |
| | 1 | Analogue interrupt upper limit CH1 – float | [mV] or [µA] | REAL 32 | RW | 0 |
| | 2 | Analogue interrupt upper limit CH2 – float | [mV] or [µA] | REAL 32 | RW | 0 |
| | 3 | Analogue interrupt upper limit CH3 – float | [mV] or [µA] | REAL 32 | RW | 0 |
| | 4 | Analogue interrupt upper limit CH4 – float | [mV] or [µA] | REAL 32 | RW | 0 |
| | 5 | Analogue interrupt upper limit CH5 – float | [mV] or [µA] | REAL 32 | RW | 0 |
| | 6 | Analogue interrupt upper limit CH6 – float | [mV] or [µA] | REAL 32 | RW | 0 |
| | 7 | Analogue interrupt upper limit CH7 – float | [mV] or [µA] | REAL 32 | RW | 0 |
| | 8 | Analogue interrupt upper limit CH8 – float | [mV] or [µA] | REAL 32 | RW | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0x642A | 0 | Analogue interrupt lower limit – float | | REAL 32 | RO | 8 |
| | 1 | Analogue interrupt lower limit CH1 – float | [mV] or [µA] | REAL 32 | RW | 0 |
| | 2 | Analogue interrupt lower limit CH2 – float | [mV] or [µA] | REAL 32 | RW | 0 |
| | 3 | Analogue interrupt lower limit CH3 – float | [mV] or [µA] | REAL 32 | RW | 0 |
| | 4 | Analogue interrupt lower limit CH4 – float | [mV] or [µA] | REAL 32 | RW | 0 |
| | 5 | Analogue interrupt lower limit CH5 – float | [mV] or [µA] | REAL 32 | RW | 0 |
| | 6 | Analogue interrupt lower limit CH6 – float | [mV] or [µA] | REAL 32 | RW | 0 |
| | 7 | Analogue interrupt lower limit CH7 – float | [mV] or [µA] | REAL 32 | RW | 0 |
| | 8 | Analogue interrupt lower limit CH8 – float | [mV] or [µA] | REAL 32 | RW | 0 |
| 0x642B | 0 | Analogue interrupt delta limit – float | | UNSIGNED 8 | RO | 8 |
| | 1 | Analogue interrupt delta limit CH1 – float | [mV] or [µA] | REAL 32 | RW | 0 |
| | 2 | Analogue interrupt delta limit CH2 – float | [mV] or [µA] | REAL 32 | RW | 0 |
| | 3 | Analogue interrupt delta limit CH3 – float | [mV] or [µA] | REAL 32 | RW | 0 |
| | 4 | Analogue interrupt delta limit CH4 – float | [mV] or [µA] | REAL 32 | RW | 0 |
| | 5 | Analogue interrupt delta limit CH5 – float | [mV] or [µA] | REAL 32 | RW | 0 |
| | 6 | Analogue interrupt delta limit CH6 – float | [mV] or [µA] | REAL 32 | RW | 0 |
| | 7 | Analogue interrupt delta limit CH7 – float | [mV] or [µA] | REAL 32 | RW | 0 |
| | 8 | Analogue interrupt delta limit CH8 – float | [mV] or [µA] | REAL 32 | RW | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0x6430 | 0 | SI unit | | UNSIGNED 8 | RO | 8 |
| | 1 | SI unit CH1 | 0xFD260000=mV<br>0xFD040000=µA | UNSIGNED 32 | RW | 0xFD260000 |
| | 2 | SI unit CH2 | 0xFD260000=mV<br>0xFD040000=µA | UNSIGNED 32 | RW | 0xFD260000 |
| | 3 | SI unit CH3 | 0xFD260000=mV<br>0xFD040000=µA | UNSIGNED 32 | RW | 0xFD260000 |
| | 4 | SI unit CH4 | 0xFD260000=mV<br>0xFD040000=µA | UNSIGNED 32 | RW | 0xFD260000 |
| | 5 | SI unit CH5 | 0xFD260000=mV<br>0xFD040000=µA | UNSIGNED 32 | RW | 0xFD260000 |
| | 6 | SI unit CH6 | 0xFD260000=mV<br>0xFD040000=µA | UNSIGNED 32 | RW | 0xFD260000 |
| | 7 | SI unit CH7 | 0xFD260000=mV<br>0xFD040000=µA | UNSIGNED 32 | RW | 0xFD260000 |
| | 8 | SI unit CH8 | 0xFD260000=mV<br>0xFD040000=µA | UNSIGNED 32 | RW | 0xFD260000 |

# Seneca Z-PC Line module: **ZC-8TC**

In this chapter are described the features of ZC-8TC 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 |
| Typical conversion time | 20 ms for 4 channels/ 40 ms for 8 channels |
| Thermocouple supported | J, K, R, S, T, B, E, N |
| Range in mV mode | From -10.1 mV to +81.4 mV |
| Built-in Cold junction compensation | YES (configurable) |
| **CANOpen TECHNICAL DATA** | |
| NMT | Slave |
| | Node guarding, heartbeat |
| Node ID | HW switch or software |
| Number of PDO | 4 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 |

| SUPPORTED THERMOCOUPLES | | |
|---|---|---|
| **TC TYPE** | **RANGE** | **LINEARIZATION ERROR** |
| J | -210..1200°C | 0.05°C |
| K | -200..1372°C | 0.05°C |
| R | -50..1768°C | 0.02°C |
| S | -50..1768°C | 0.02°C |
| T | -200..400°C | 0.04°C |
| B | 250..1820°C | 0.03°C |
| E | -200..1000°C | 0.02°C |
| N | -200..1300°C | 0.04°C |

## *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** |
| TPDO2 | 0x40000280 + NodeId | Value CH1 16 bit | 0x6401 | 1 |
| | | Value CH2 16 bit | 0x6401 | 2 |
| | | Value CH3 16 bit | 0x6401 | 3 |
| | | Value CH4 16 bit | 0x6401 | 4 |
| TPDO3 | 0x40000380 + NodeId | Value CH5 16 bit | 0x6401 | 5 |
| | | Value CH6 16 bit | 0x6401 | 6 |
| | | Value CH7 16 bit | 0x6401 | 7 |
| | | Value CH8 16 bit | 0x6401 | 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)

Max of 4 bytes of MEF (Manufacturer error filled)

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 | Channel 1/2 fail | 0x2120 subindex 1 |
| 14 | Channel 3/4 fail | 0x2120 subindex 2 |
| 13 | Channel 5/6 fail | 0x2120 subindex 3 |
| 12 | Channel 7/8 fail | 0x2120 subindex 4 |
| 11 | Channel 1 not connected or acquisition error | 0x2120 subindex 1 |
| 10 | Channel 2 not connected or acquisition error | 0x2120 subindex 1 |
| 9 | Channel 3 not connected or acquisition error | 0x2120 subindex 2 |
| 8 | Channel 4 not connected or acquisition error | 0x2120 subindex 2 |
| 7 | Channel 5 not connected or acquisition error | 0x2120 subindex 3 |
| 6 | Channel 6 not connected or acquisition error | 0x2120 subindex 3 |
| 5 | Channel 7 not connected or acquisition error | 0x2120 subindex 4 |
| 4 | Channel 8 not connected or acquisition error | 0x2120 subindex 4 |
| 3 | Channel 1/2 communication fail | 0x2121 subindex 1 |
| 2 | Channel 3/4 communication fail | 0x2121 subindex 2 |
| 1 | Channel 5/6 communication fail | 0x2121 subindex 3 |
| 0 | Channel 7/8 communication fail | 0x2121 subindex 4 |

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 HOT STOP ERROR |
| 0x4202 | CPU temperature over HOT STOP |
| 0x4203 | CPU temperature under COLD ERROR |
| 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) | | |
|---|---|---|
| **BIT** | **Description** | **Object for error details** |
| 15 | Channel 1/2 fail | 0x2120 subindex 1 |
| 14 | Channel 3/4 fail | 0x2120 subindex 2 |
| 13 | Channel 5/6 fail | 0x2120 subindex 3 |
| 12 | Channel 7/8 fail | 0x2120 subindex 4 |
| 11 | Channel 1 not connected or acquisition error | 0x2120 subindex 1 |
| 10 | Channel 2 not connected or acquisition error | 0x2120 subindex 1 |
| 9 | Channel 3 not connected or acquisition error | 0x2120 subindex 2 |
| 8 | Channel 4 not connected or acquisition error | 0x2120 subindex 2 |
| 7 | Channel 5 not connected or acquisition error | 0x2120 subindex 3 |
| 6 | Channel 6 not connected or acquisition error | 0x2120 subindex 3 |
| 5 | Channel 7 not connected or acquisition error | 0x2120 subindex 4 |
| 4 | Channel 8 not connected or acquisition error | 0x2120 subindex 4 |
| 3 | Channel 1/2 communication fail | 0x2121 subindex 1 |
| 2 | Channel 3/4 communication fail | 0x2121 subindex 2 |
| 1 | Channel 5/6 communication fail | 0x2121 subindex 3 |
| 0 | Channel 7/8 communication fail | 0x2121 subindex 4 |

**Object 0x2106**, **0x2107**, **0x2108**, **0x2109** contain the channels configuration:

| CHANNELS 1-2 CONFIGURATION (Object 0x2106) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Channel A enable (1=enable, 0=disable) |
| 2 | Channel B enable (1=enable, 0=disable) |
| 3 | Data type (1=mV, 0=temperature) |
| 4 | Cold junction enable (1=enable, 0=disable) |
| 5 | Frequency rejection (1=60 Hz, 0=50 Hz) |
| 6 | Filter |
| 7 | Channel A thermocouple type |
| 8 | Channel B thermocouple type |

Objects 0x2107, 0x2108, 0x2109 contain respective the channels 3-4, 5-6, 7-8 configurations.

| FILTER | |
|---|---|
| **Value** | **Filter type** |
| 0 | disabled |
| 1 | Average filter |
| 2 | Hires+average filter |
| 3 | Hires+average+exponential (level1) filter |
| .. | .. |
| 7 | Hires+average+exponential (level5) filter |

| THERMOCOUPLE TYPE | |
|---|---|
| **Value** | **Thermocouple type** |
| 0 | Type J |
| 1 | Type K |
| 2 | Type R |
| 3 | Type S |
| 4 | Type T |
| 5 | Type B |
| 6 | Type E |
| 7 | Type N |

### Object 0x2125: Fault actions

**Object 0x2125** sets the fault actions.

| FAULT ACTIONS | |
|---|---|
| **Value** | **Description** |
| 15 | Fault action CH1 0=load 0x2360, 1=last good |
| 14 | Fault action CH2 0=load 0x2360, 1=last good |
| 13 | Fault action CH3 0=load 0x2360, 1=last good |
| 12 | Fault action CH4 0=load 0x2360, 1=last good |
| 11 | Fault action CH5 0=load 0x2360, 1=last good |
| 10 | Fault action CH6 0=load 0x2360, 1=last good |
| 9 | Fault action CH7 0=load 0x2360, 1=last good |
| 8 | Fault action CH8 0=load 0x2360, 1=last good |

### Object 0x2354: Cold junction temperature

**Object 0x2354** contains the cold junction temperature for each channel:

| COLD JUNCTION TEMPERATURE (Object 0x2354) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Channels 1-2 cold junction temperature [°C/10] |
| 2 | Channels 3-4 cold junction temperature [°C/10] |
| 3 | Channels 5-6 cold junction temperature [°C/10] |
| 4 | Channels 7-8 cold junction temperature [°C/10] |

### Object 0x2360: Fault values

**Object 0x2360** contains the floating point value (32 bit) to use in fault case (in agreement with object 0x2125). In agreement with object 0x2106, the measure unit can be in °C or mV.

| BEGIN FOR INTEGER SCALE (Object 0x2360) | |
|---|---|
| **SUBINDEX** | **Description** |
| 1 | Channel 1 fault value |
| 2 | Channel 2 fault value |
| 3 | Channel 3 fault value |
| 4 | Channel 4 fault value |
| 5 | Channel 5 fault value |
| 6 | Channel 6 fault value |
| 7 | Channel 7 fault value |
| 8 | Channel 8 fault 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 |

## *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 0x6401** contains the 16 bit (signed) values for channels 1..8 in [°C/10] or [mV/100] (in agreement with object 0x2106).

| 16 BIT INTEGER INPUT (Object 0x6401) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Channel 1 16 bit input value |
| 2 | Channel 2 16 bit input value |
| 3 | Channel 3 16 bit input value |
| 4 | Channel 4 16 bit input value |
| 5 | Channel 5 16 bit input value |
| 6 | Channel 6 16 bit input value |
| 7 | Channel 7 16 bit input value |
| 8 | Channel 8 16 bit input value |

**Object 0x6403** contains the floating point (32 bit) values for channel 1..8.

| 32 BIT REAL INPUT (Object 0x6403) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Channel 1 floating point value |
| 2 | Channel 2 floating point value |
| 3 | Channel 3 floating point value |
| 4 | Channel 4 floating point value |
| 5 | Channel 5 floating point value |
| 6 | Channel 6 floating point value |
| 7 | Channel 7 floating point value |
| 8 | Channel 8 floating point value |

**Object 0x6423** interrupt enable:

If the value is “1”, the station can generate asynchronous TxPDO.

If the value is “0”, the station can not generate asynchronous TxPDO.

### *Object 0x6424 interrupt upper limit integer*

If enabled (see object 0x6423), an interrupt is triggered when the analogue input is equal or rises above the given value.

As long as the trigger condition is met, every change of the analogue input data generates a new interrupt.

| INTERRUPT UPPER LIMIT 16 BIT INTEGER (OBJECT 0X6424) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Channel 1 upper limit integer [°C/10] or [mV/100] |
| 2 | Channel 2 upper limit integer [°C/10] or [mV/100] |
| 3 | Channel 3 upper limit integer [°C/10] or [mV/100] |
| 4 | Channel 4 upper limit integer [°C/10] or [mV/100] |
| 5 | Channel 5 upper limit integer [°C/10] or [mV/100] |
| 6 | Channel 6 upper limit integer [°C/10] or [mV/100] |
| 7 | Channel 7 upper limit integer [°C/10] or [mV/100] |
| 8 | Channel 8 upper limit integer [°C/10] or [mV/100] |

### *Object 0x6425 interrupt lower limit integer*

If enabled (see object 0x6423), an interrupt is triggered when the analogue input falls below the given value.

As long as the trigger condition is met, every change of the analogue input data generates a new interrupt.

| INTERRUPT LOWER LIMIT 16 BIT INTEGER (OBJECT 0X6425) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Channel 1 lower limit integer [°C/10] or [mV/100] |
| 2 | Channel 2 lower limit integer [°C/10] or [mV/100] |
| 3 | Channel 3 lower limit integer [°C/10] or [mV/100] |
| 4 | Channel 4 lower limit integer [°C/10] or [mV/100] |
| 5 | Channel 5 lower limit integer [°C/10] or [mV/100] |
| 6 | Channel 6 lower limit integer [°C/10] or [mV/100] |
| 7 | Channel 7 lower limit integer [°C/10] or [mV/100] |
| 8 | Channel 8 lower limit integer [°C/10] or [mV/100] |

### *Object 0x6426 interrupt delta unsigned*

The object sets the delta value (rising or falling above or below the last communicated value) for interrupt-enabled analogue inputs (if object 0x6423 enables the interrupt).

| INTERRUPT DELTA UNSIGNED INTEGER 16 BIT (OBJECT 0X6426) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Channel 1 delta unsigned [°C/10] or [mV/100] |
| 2 | Channel 2 delta unsigned [°C/10] or [mV/100] |
| 3 | Channel 3 delta unsigned [°C/10] or [mV/100] |
| 4 | Channel 4 delta unsigned [°C/10] or [mV/100] |
| 5 | Channel 5 delta unsigned [°C/10] or [mV/100] |
| 6 | Channel 6 delta unsigned [°C/10] or [mV/100] |
| 7 | Channel 7 delta unsigned [°C/10] or [mV/100] |
| 8 | Channel 8 delta unsigned [°C/10] or [mV/100] |

### *Object 0x6429 interrupt upper limit float*

This object sets the converted upper limits for interrupt-enabled analogue inputs (see 0x6423 object). As long as the trigger condition is met, every change of the analogue input data generates a new interrupt.

| INTERRUPT UPPER LIMIT 32BIT FLOAT (OBJECT 0X6429) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Channel 1 upper limit float [°C] or [mV] |
| 2 | Channel 2 upper limit float [°C] or [mV] |
| 3 | Channel 3 upper limit float [°C] or [mV] |
| 4 | Channel 4 upper limit float [°C] or [mV] |
| 5 | Channel 5 upper limit float [°C] or [mV] |
| 6 | Channel 6 upper limit float [°C] or [mV] |
| 7 | Channel 7 upper limit float [°C] or [mV] |
| 8 | Channel 8 upper limit float [°C] or [mV] |

### *Object 0x642A interrupt lower limit float*

This object sets the lower limits for interrupt-enabled analogue inputs (see 0x6423 object). As long as the trigger condition is met, every change of the analogue input data generates a new interrupt.

| INTERRUPT LOWER LIMIT 32BIT FLOAT (OBJECT 0X6425) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Channel 1 lower limit float [°C] or [mV] |
| 2 | Channel 2 lower limit float [°C] or [mV] |
| 3 | Channel 3 lower limit float [°C] or [mV] |
| 4 | Channel 4 lower limit float [°C] or [mV] |
| 5 | Channel 5 lower limit float [°C] or [mV] |
| 6 | Channel 6 lower limit float [°C] or [mV] |
| 7 | Channel 7 lower limit float [°C] or [mV] |
| 8 | Channel 8 lower limit float [°C] or [mV] |

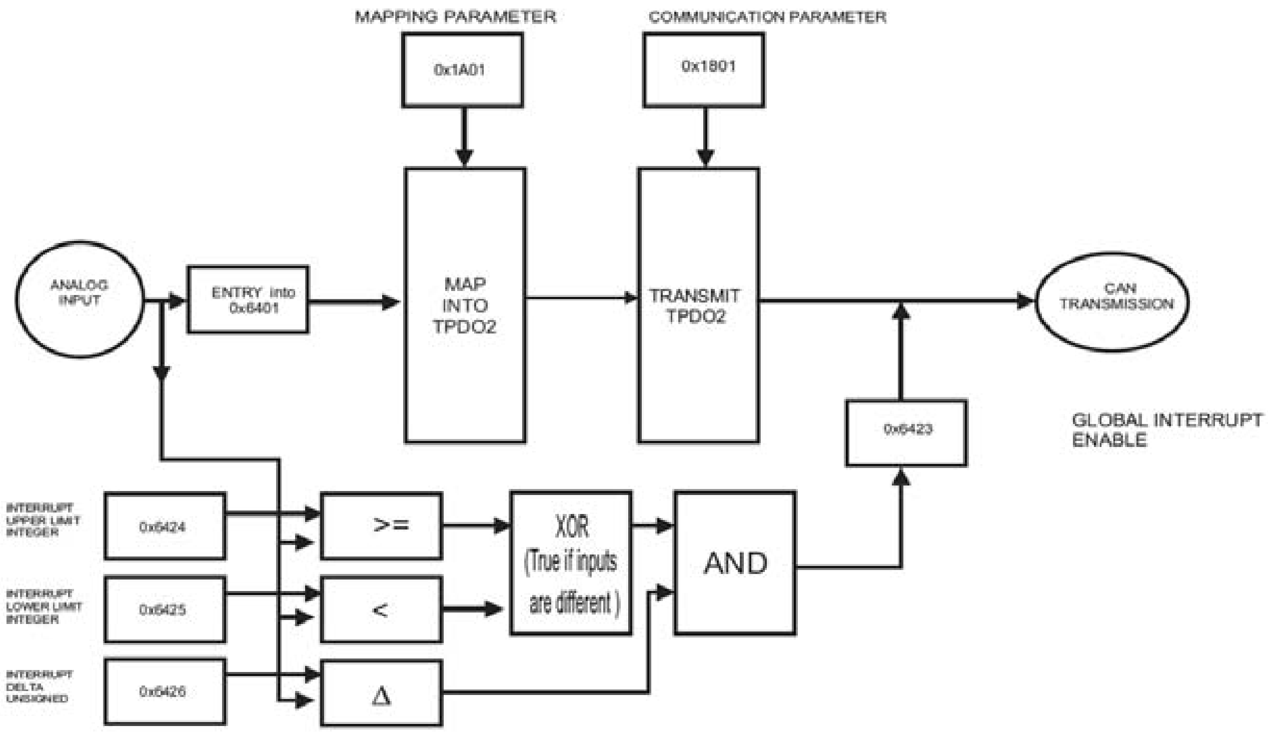
### *Object 0x642B interrupt delta float*

The object sets the delta value (rising or falling above or below the last sample) in float format for interrupt-enabled analogue inputs (if object 0x6423 enables the interrupt).

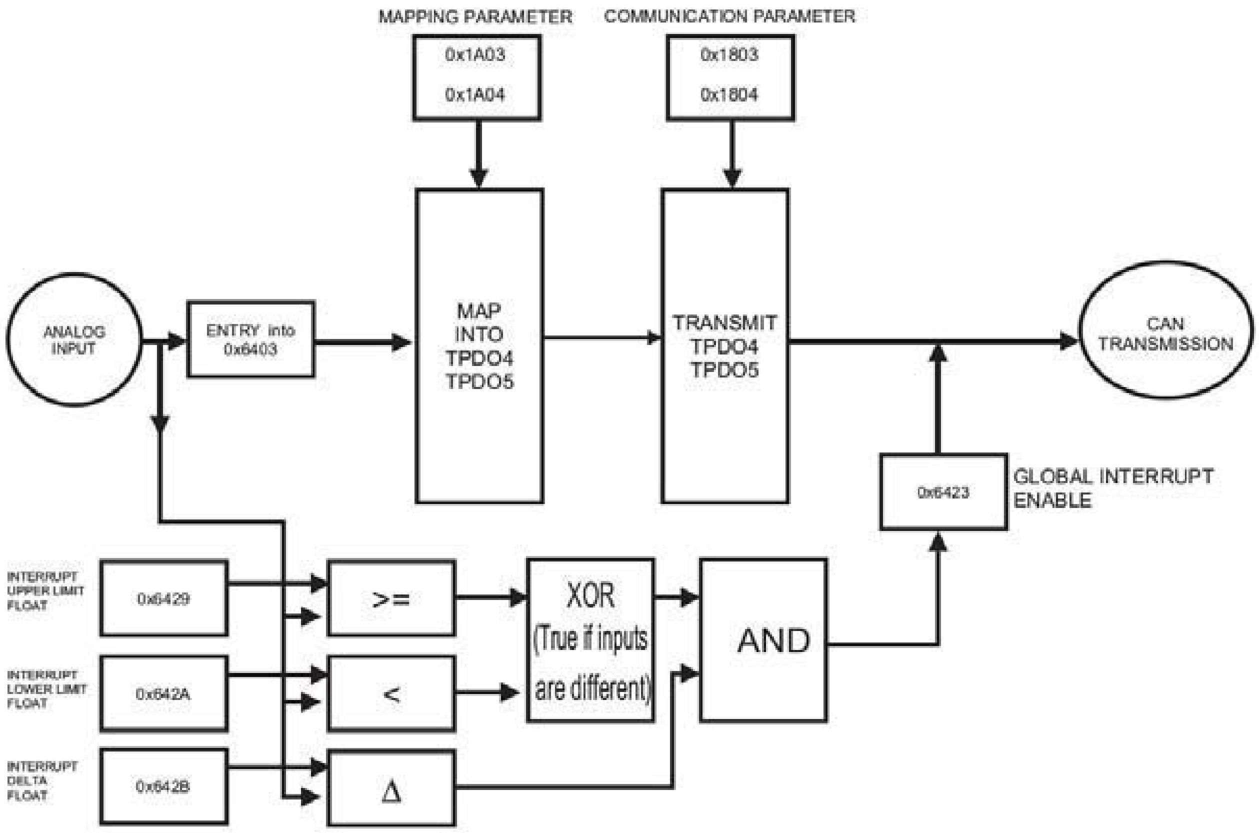
| INTERRUPT DELTA 323 BIT FLOAT (OBJECT 0X6426) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Channel 1 delta float [°C] or [mV] |
| 2 | Channel 2 delta float [°C] or [mV] |
| 3 | Channel 3 delta float [°C] or [mV] |
| 4 | Channel 4 delta float [°C] or [mV] |
| 5 | Channel 5 delta float [°C] or [mV] |
| 6 | Channel 6 delta float [°C] or [mV] |
| 7 | Channel 7 delta float [°C] or [mV] |
| 8 | Channel 8 delta float [°C] or [mV] |

## *CANOpen functional diagram*

### *For integer values*



### *For float values*



### *CANOpen Object dictionary*

| COMMUNICATION PROFILE AREA | | | | | | |
|---|---|---|---|---|---|---|
| **INDEX** | **SUB INDEX** | **NAME** | **DESCRIPTION** | **TYPE** | **ACCESS** | **DEFAULT** |
| 0x1000 | 0 | Device type | Profile 401=0x191 | UNSIGNED 32 | RO | 0x00040191 |
| 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-8TC” |
| 0x1009 | 0 | Manufacturer HW version | Hardware version | VISIBLE STRING | RO | “SC000000” |
| 0x100A | 0 | Manufacturer SW version | Software version | VISIBLE STRING | RO | “SW001130” |
| 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 | 8 |
| | 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 CH1-2 parameters | Store not volatile parameters (write in ASCII “save” for store process MSB 0x65766173 LSB) | UNSIGNED 32 | RW | 1 |
| | 6 | Save CH3-4 parameters | Store not volatile parameters (write in ASCII “save” for store process MSB 0x65766173 LSB) | UNSIGNED 32 | RW | 1 |
| | 7 | Save CH5-6 parameters | Store not volatile parameters (write in ASCII “save” for store process MSB 0x65766173 LSB) | UNSIGNED 32 | RW | 1 |
| | 8 | Save CH7-8 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 | 8 |
| | 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 CH1-2 parameters | Restore not volatile parameters (write in ASCII “load” for store process MSB 0x64616F6C LSB) | UNSIGNED 32 | RW | 0 |
| | 6 | Restore CH3-4 parameters | Restore not volatile parameters (write in ASCII “load” for store process MSB 0x64616F6C LSB) | UNSIGNED 32 | RW | 0 |
| | 7 | Restore CH5-6 parameters | Restore not volatile parameters (write in ASCII “load” for store process MSB 0x64616F6C LSB) | UNSIGNED 32 | RW | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 8 | Restore CH7-8 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-8TC Machine ID Code | UNSIGNED 32 | RO | 0x0000001C |
| | 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 |
| 0x1801 | 0 | 2nd transmit PDO parameters | Number of mapped objects | UNSIGNED 8 | RO | 3 |
| | 1 | COB-ID used by PDO | COB-ID of TxPDO2 | UNSIGNED 32 | RW | $NODEID+ 0x40000280 |
| | 2 | Transmission type | Transmission type for TxPDO2<br>0x00=synchronous – acyclic<br>0x01 to 0xF0=synchronous – cyclic<br>0xFF=asynchronous | UNSIGNED 8 | RW | 0xFF |
| | 3 | Inhibit time | Min delay for the next PDO (ms/10) | UNSIGNED 16 | RW | 0x0000 |
| 0x1802 | 0 | 3rd transmit PDO parameters | Max subindex number | UNSIGNED 8 | RO | 3 |
| | 1 | COB-ID used by PDO | COB-ID of TxPDO3 | UNSIGNED 32 | RW | $NODEID+ 0x40000380 |
| | 2 | Transmission type | Transmission type for TxPDO3<br>0x00=synchronous – acyclic<br>0x01 to 0xF0=synchronous – cyclic<br>0xFF=asynchronous | UNSIGNED 8 | RW | 0xFF |
| | 3 | Inhibit time | Min delay for the next PDO (ms/10) | UNSIGNED 16 | RW | 0x0000 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0x1803 | 0 | 4th transmit PDO parameters | Max subindex number | UNSIGNED 8 | RO | 3 |
| | 1 | COB-ID used by PDO | COB-ID of TxPDO4 | UNSIGNED 32 | RW | $NODEID+ 0xC0000480 |
| | 2 | Transmission type | Transmission type for TxPDO4 0x00=synchronous – acyclic 0x01 to 0xF0=synchronous – cyclic 0xFF=asynchronous | UNSIGNED 8 | RW | 0xFF |
| | 3 | Inhibit time | Min delay for the next PDO (ms/10) | UNSIGNED 16 | RW | 0x0000 |
| 0x1804 | 0 | 5th transmit PDO parameters | Max subindex number | UNSIGNED 8 | RO | 3 |
| | 1 | COB-ID used by PDO | COB-ID of TxPDO5 | UNSIGNED 32 | RW | 0xC0000000 |
| | 2 | Transmission type | Transmission type for TxPDO5 0x00=synchronous – acyclic 0x01 to 0xF0=synchronous – cyclic 0xFF=asynchronous | UNSIGNED 8 | RW | 0xFF |
| | 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 objects | UNSIGNED 8 | RO | 0 |
| 0x1A01 | 0 | 2nd transmit PDO mapping parameter | Number of mapped objects | UNSIGNED 8 | RW | 4 |
| | 1 | 1st object to be mapped | First object (default: CHANNEL 1 16 bits input) | UNSIGNED 32 | RW | 0x64010110 Object=0x6401 Subindex=1 Length=16bit |
| | 2 | 2nd object to be mapped | Second object (default: CHANNEL 2 16 bits input) | UNSIGNED 32 | RW | 0x64010210 Object=0x6401 Subindex=2 Length=16bit |
| | 3 | 3rd object to be mapped | Third object (default: CHANNEL 3 16 bits input) | UNSIGNED 32 | RW | 0x64010310 Object=0x6401 Subindex=3 Length=16bit |
| | 4 | 4th object to be mapped | Fourth object (default: CHANNEL 4 16 bits input) | UNSIGNED 32 | RW | 0x64010410 Object=0x6401 Subindex=4 Length=16bit |
| 0x1A02 | 0 | 3rd transmit PDO mapping parameter | Number of mapped objects | UNSIGNED 8 | RW | 4 |
| | 1 | 1st object to be mapped | First object (default: CHANNEL 5 16 bits input) | UNSIGNED 32 | RW | 0x64010510 Object=0x6401 Subindex=5 Length=16bit |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 2 | 2nd object to be mapped | Second object (default: CHANNEL 6 16 bits input) | UNSIGNED 32 | RW | 0x64010610 Object=0x6401 Subindex=6 Length=16bit |
| | 3 | 3rd object to be mapped | Third object (default: CHANNEL 7 16 bits input) | UNSIGNED 32 | RW | 0x64010710 Object=0x6401 Subindex=7 Length=16bit |
| | 4 | 4th object to be mapped | Fourth object (default: CHANNEL 8 16 bits input) | UNSIGNED 32 | RW | 0x64010810 Object=0x6401 Subindex=8 Length=16bit |
| 0x1A03 | 0 | 4th transmit PDO mapping parameter | Number of mapped object | UNSIGNED 8 | RW | 0 |
| | 1 | 1st object to be mapped | First object (default: NONE) | UNSIGNED 32 | RW | 0 |
| | 2 | 2nd object to be mapped | Second object (default: NONE) | UNSIGNED 32 | RW | 0 |
| | 3 | 3rd object to be mapped | Third object (default: NONE) | UNSIGNED 32 | RW | 0 |
| | 4 | 4th object to be mapped | Fourth object (default: NONE) | UNSIGNED 32 | RW | 0 |
| 0x1A04 | 0 | 5th transmit PDO mapping parameter | Number of mapped object | UNSIGNED 8 | RW | 0 |
| | 1 | 1st object to be mapped | First object (default: NONE) | UNSIGNED 32 | RW | 0 |
| | 2 | 2nd object to be mapped | Second object (default: NONE) | UNSIGNED 32 | RW | 0 |
| | 3 | 3rd object to be mapped | Third object (default: NONE) | UNSIGNED 32 | RW | 0 |
| | 4 | 4th object to be mapped | Fourth object (default: NONE) | UNSIGNED 32 | RW | 0 |

## 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)<br>1=20kbps<br>2=50kbps<br>3=125kbps<br>4=250kbps<br>5=500kbps<br>6=800kbps<br>7=1Mbps | UNSIGNED 8 | RW | 0x01 |
| 0x2003 | 0 | Firmware release | | UNSIGNED 16 | RO | 1132 |
| 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 |
| 0x2104 | 0 | Channel CMD | Number of parameters | UNSIGNED 8 | RO | 4 |
| | 1 | CMD CH1-2 | Writing 0xC0DE will return the channel fw code into 0x2105 | UNSIGNED 16 | RW | 0 |
| | 2 | CMD CH3-4 | Writing 0xC0DE will return the channel fw code into 0x2105 | UNSIGNED 16 | RW | 0 |
| | 3 | CMD CH5-6 | Writing 0xC0DE will return the channel fw code into 0x2105 | UNSIGNED 16 | RW | 0 |
| | 4 | CMD CH7-8 | Writing 0xC0DE will return the channel fw code into 0x2105 | UNSIGNED 16 | RW | 0 |
| 0x2105 | 0 | Channel aux CMD | Number of parameters | UNSIGNED 8 | RO | |
| | 1 | AUX CMD CH1-2 | FW Code return value | UNSIGNED 16 | RW | 0 |
| | 2 | AUX CMD CH3-4 | FW Code return value | UNSIGNED 16 | RW | 0 |
| | 3 | AUX CMD CH5-6 | FW Code return value | UNSIGNED 16 | RW | 0 |
| | 4 | AUX CMD CH7-8 | FW Code return value | UNSIGNED 16 | RW | 0 |
| 0x2106 | 0 | Channel 1-2 parameters | Number of parameters | UNSIGNED 8 | RO | 8 |
| | 1 | CH1 enable | 0=disable 1=enable | UNSIGNED 8 | RW | 1 |
| | 2 | CH2 enable | 0=disable 1=enable | UNSIGNED 8 | RW | 1 |
| | 3 | CH1 – CH2 Data type | 0=°C 1=mV | UNSIGNED 8 | RW | 0 |
| | 4 | CH1-CH2 cold junction compensation enable | 0=disable, 1=enable | UNSIGNED 8 | RW | 1 |
| | 5 | CH1-CH2 Line frequency rejection | 0=50 Hz, 1= 60 Hz | UNSIGNED 8 | RW | 0 |
| | 6 | CH1-CH2 Filter | 0=disable, 1=average, 2=hires+average, 3=exp lev1,…7=exp lev5 | UNSIGNED 8 | RW | 2 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 7 | CH1-thermocouple type | 0=J, 1=K, 2=R, 3=S, 4=T, 5=B, 6=E, 7=N | UNSIGNED 8 | RW | 0 |
| | 8 | CH2-thermocouple type | 0=J, 1=K, 2=R, 3=S, 4=T, 5=B, 6=E, 7=N | UNSIGNED 8 | RW | 0 |
| 0x2107 | 0 | Channel 3-4 parameters | Number of parameters | UNSIGNED 8 | RO | 8 |
| | 1 | CH3 enable | 0=disable 1=enable | UNSIGNED 8 | RW | 1 |
| | 2 | CH4 enable | 0=disable 1=enable | UNSIGNED 8 | RW | 1 |
| | 3 | CH3 – CH4 Data type | 0=°C 1=mV | UNSIGNED 8 | RW | 0 |
| | 4 | CH3-CH4 cold junction compensation enable | 0=disable, 1=enable | UNSIGNED 8 | RW | 1 |
| | 5 | CH3-CH4 Line frequency rejection | 0=50 Hz, 1= 60 Hz | UNSIGNED 8 | RW | 0 |
| | 6 | CH3-CH4 Filter | 0=disable, 1=average, 2=hires+average, 3=exp lev1,…7=exp lev5 | UNSIGNED 8 | RW | 2 |
| | 7 | CH3-thermocouple type | 0=J, 1=K, 2=R, 3=S, 4=T, 5=B, 6=E, 7=N | UNSIGNED 8 | RW | 0 |
| | 8 | CH4-thermocouple type | 0=J, 1=K, 2=R, 3=S, 4=T, 5=B, 6=E, 7=N | UNSIGNED 8 | RW | 0 |
| 0x2108 | 0 | Channel 5-6 parameters | Number of parameters | UNSIGNED 8 | RO | 8 |
| | 1 | CH5 enable | 0=disable 1=enable | UNSIGNED 8 | RW | 1 |
| | 2 | CH6 enable | 0=disable 1=enable | UNSIGNED 8 | RW | 1 |
| | 3 | CH5 – CH6 Data type | 0=°C 1=mV | UNSIGNED 8 | RW | 0 |
| | 4 | CH5-CH6 cold junction compensation enable | 0=disable, 1=enable | UNSIGNED 8 | RW | 1 |
| | 5 | CH5-CH6 Line frequency rejection | 0=50 Hz, 1= 60 Hz | UNSIGNED 8 | RW | 0 |
| | 6 | CH5-CH6 Filter | 0=disable, 1=average, 2=hires+average, 3=exp lev1,…7=exp lev5 | UNSIGNED 8 | RW | 2 |
| | 7 | CH5-thermocouple type | 0=J, 1=K, 2=R, 3=S, 4=T, 5=B, 6=E, 7=N | UNSIGNED 8 | RW | 0 |
| | 8 | CH6-thermocouple type | 0=J, 1=K, 2=R, 3=S, 4=T, 5=B, 6=E, 7=N | UNSIGNED 8 | RW | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0x2109 | 0 | Channel 7-8 parameters | Number of parameters | UNSIGNED 8 | RO | 8 |
| | 1 | CH7 enable | 0=disable 1=enable | UNSIGNED 8 | RW | 1 |
| | 2 | CH8 enable | 0=disable 1=enable | UNSIGNED 8 | RW | 1 |
| | 3 | CH7 – CH8 Data type | 0=°C 1=mV | UNSIGNED 8 | RW | 0 |
| | 4 | CH7-CH8 cold junction compensation enable | 0=disable, 1=enable | UNSIGNED 8 | RW | 1 |
| | 5 | CH7-CH8 Line frequency rejection | 0=50 Hz, 1= 60 Hz | UNSIGNED 8 | RW | 0 |
| | 6 | CH7-CH8 Filter | 0=disable, 1=average, 2=hires+average, 3=exp lev1,...7=exp lev5 | UNSIGNED 8 | RW | 2 |
| | 7 | CH7-thermocouple type | 0=J, 1=K, 2=R, 3=S, 4=T, 5=B, 6=E, 7=N | UNSIGNED 8 | RW | 0 |
| | 8 | CH8-thermocouple type | 0=J, 1=K, 2=R, 3=S, 4=T, 5=B, 6=E, 7=N | UNSIGNED 8 | RW | 0 |
| 0x2120 | 0 | Channel status | Number of parameters | UNSIGNED 8 | RO | 4 |
| | 1 | CH1-2 STATUS | | UNSIGNED 16 | RO | |
| | 2 | CH3-4 STATUS | | UNSIGNED 16 | RO | |
| | 3 | CH5-6 STATUS | | UNSIGNED 16 | RO | |
| | 4 | CH7-8 STATUS | | UNSIGNED 16 | RO | |
| 0x2125 | 0 | Fault actions | 1=last good 0=load object 0x2360 Bit 7..0 not used | UNSIGNED 16 | RW | 0xFF00 |
| 0x2354 | 0 | Cold junction temperature | Number of parameters | UNSIGNED 8 | RO | 4 |
| | 1 | CH1-2 Cold junction value | [°C/10] | INTEGER 16 | RO | |
| | 2 | CH3-4 Cold junction value | [°C/10] | INTEGER 16 | RO | |
| | 3 | CH5-6 Cold junction value | [°C/10] | INTEGER 16 | RO | |
| | 4 | CH7-8 Cold junction value | [°C/10] | INTEGER 16 | RO | |
| 0x2360 | 0 | Fault values | Number of parameters | UNSIGNED 8 | RO | 8 |
| | 1 | CH1 Fault value | [°C] or [mV] | REAL 32 | RW | 2000.0 |
| | 2 | CH2 Fault value | [°C] or [mV] | REAL 32 | RW | 2000.0 |
| | 3 | CH3 Fault value | [°C] or [mV] | REAL 32 | RW | 2000.0 |
| | 4 | CH4 Fault value | [°C] or [mV] | REAL 32 | RW | 2000.0 |
| | 5 | CH5 Fault value | [°C] or [mV] | REAL 32 | RW | 2000.0 |
| | 6 | CH6 Fault value | [°C] or [mV] | REAL 32 | RW | 2000.0 |
| | 7 | CH7 Fault value | [°C] or [mV] | REAL 32 | RW | 2000.0 |
| | 8 | CH8 Fault value | [°C] or [mV] | REAL 32 | RW | 2000.0 |

| STANDARD DEVICE PROFILE AREA | | | | | | |
|---|---|---|---|---|---|---|
| **INDEX** | **SUB INDEX** | **NAME** | **DESCRIPTION** | **TYPE** | **ACCESS** | **DEFAULT** |
| 0x6401 | 0 | 16 bit input | Number of input float | UNSIGNED 8 | RO | 8 |
| | 1 | CH1 measure 16 bits | [°C/10] or [mV/100] | INTEGER 16 | RO | |
| | 2 | CH2 measure 16 bits | [°C/10] or [mV/100] | INTEGER 16 | RO | |
| | 3 | CH3 measure 16 bits | [°C/10] or [mV/100] | INTEGER 16 | RO | |
| | 4 | CH4 measure 16 bits | [°C/10] or [mV/100] | INTEGER 16 | RO | |
| | 5 | CH5 measure 16 bits | [°C/10] or [mV/100] | INTEGER 16 | RO | |
| | 6 | CH6 measure 16 bits | [°C/10] or [mV/100] | INTEGER 16 | RO | |
| | 7 | CH7 measure 16 bits | [°C/10] or [mV/100] | INTEGER 16 | RO | |
| | 8 | CH8 measure 16 bits | [°C/10] or [mV/100] | INTEGER 16 | RO | |
| 0x6403 | 0 | Float input | Number of input float | UNSIGNED 8 | RO | 8 |
| | 1 | CH1 measure real | [mV] or [°C] | REAL 32 | RO | |
| | 2 | CH2 measure real | [mV] or [°C] | REAL 32 | RO | |
| | 3 | CH3 measure real | [mV] or [°C] | REAL 32 | RO | |
| | 4 | CH4 measure real | [mV] or [°C] | REAL 32 | RO | |
| | 5 | CH5 measure real | [mV] or [°C] | REAL 32 | RO | |
| | 6 | CH6 measure real | [mV] or [°C] | REAL 32 | RO | |
| | 7 | CH7 measure real | [mV] or [°C] | REAL 32 | RO | |
| | 8 | CH8 measure real | [mV] or [°C] | REAL 32 | RO | |
| 0x6423 | 0 | Analogue input interrupt global enable | 0=disable asynchronous TxPDO 1=enable asynchronous TxPDO | BOOLEAN | RW | 0 |
| 0x6424 | 0 | analogue interrupt upper limit – 16bit | | UNSIGNED 8 | RO | 8 |
| | 1 | Analogue interrupt upper limit CH1 – 16bit | [°C/10] or [mV/100] | INTEGER 16 | RW | 0 |
| | 2 | Analogue interrupt upper limit CH2 – 16bit | [°C/10] or [mV/100] | INTEGER 16 | RW | 0 |
| | 3 | Analogue interrupt upper limit CH3 – 16bit | [°C/10] or [mV/100] | INTEGER 16 | RW | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 4 | Analogue interrupt upper limit CH4 – 16bit | [°C/10] or [mV/100] | INTEGER 16 | RW | 0 |
| | 5 | Analogue interrupt upper limit CH5 – 16bit | [°C/10] or [mV/100] | INTEGER 16 | RW | 0 |
| | 6 | Analogue interrupt upper limit CH6 – 16bit | [°C/10] or [mV/100] | INTEGER 16 | RW | 0 |
| | 7 | Analogue interrupt upper limit CH7 – 16bit | [°C/10] or [mV/100] | INTEGER 16 | RW | 0 |
| | 8 | Analogue interrupt upper limit CH8 – 16bit | [°C/10] or [mV/100] | INTEGER 16 | RW | 0 |
| 0x6425 | 0 | Analogue interrupt lower limit – 16bit | | UNSIGNED 8 | RO | 8 |
| | 1 | Analogue interrupt lower limit CH1 – 16bit | [°C/10] or [mV/100] | INTEGER 16 | RW | 0 |
| | 2 | Analogue interrupt lower limit CH2 – 16bit | [°C/10] or [mV/100] | INTEGER 16 | RW | 0 |
| | 3 | Analogue interrupt lower limit CH3 – 16bit | [°C/10] or [mV/100] | INTEGER 16 | RW | 0 |
| | 4 | Analogue interrupt lower limit CH4 – 16bit | [°C/10] or [mV/100] | INTEGER 16 | RW | 0 |
| | 5 | Analogue interrupt lower limit CH5 – 16bit | [°C/10] or [mV/100] | INTEGER 16 | RW | 0 |
| | 6 | Analogue interrupt lower limit CH6 – 16bit | [°C/10] or [mV/100] | INTEGER 16 | RW | 0 |
| | 7 | Analogue interrupt lower limit CH7 – 16bit | [°C/10] or [mV/100] | INTEGER 16 | RW | 0 |
| | 8 | Analogue interrupt lower limit CH8 – 16bit | [°C/10] or [mV/100] | INTEGER 16 | RW | 0 |
| 0x6426 | 0 | Analogue interrupt delta limit – 16bit | | UNSIGNED 8 | RO | 8 |
| | 1 | Analogue interrupt delta limit CH1 – 16bit | [°C/10] or [mV/100] | UNSIGNED 16 | RW | 0 |
| | 2 | Analogue interrupt delta limit CH2 – 16bit | [°C/10] or [mV/100] | UNSIGNED 16 | RW | 0 |
| | 3 | Analogue interrupt delta limit CH3 – 16bit | [°C/10] or [mV/100] | UNSIGNED 16 | RW | 0 |
| | 4 | Analogue interrupt delta limit CH4 – 16bit | [°C/10] or [mV/100] | UNSIGNED 16 | RW | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 5 | Analogue interrupt delta limit CH5 – 16bit | [°C/10] or [mV/100] | UNSIGNED 16 | RW | 0 |
| | 6 | Analogue interrupt delta limit CH6 – 16bit | [°C/10] or [mV/100] | UNSIGNED 16 | RW | 0 |
| | 7 | Analogue interrupt delta limit CH7 – 16bit | [°C/10] or [mV/100] | UNSIGNED 16 | RW | 0 |
| | 8 | Analogue interrupt delta limit CH8 – 16bit | [°C/10] or [mV/100] | UNSIGNED 16 | RW | 0 |
| 0x6429 | 0 | Analogue interrupt upper limit – float | | UNSIGNED 8 | RO | 8 |
| | 1 | Analogue interrupt upper limit CH1 – float | [°C] or [mV] | REAL 32 | RW | 0 |
| | 2 | Analogue interrupt upper limit CH2 – float | [°C] or [mV] | REAL 32 | RW | 0 |
| | 3 | Analogue interrupt upper limit CH3 – float | [°C] or [mV] | REAL 32 | RW | 0 |
| | 4 | Analogue interrupt upper limit CH4 – float | [°C] or [mV] | REAL 32 | RW | 0 |
| | 5 | Analogue interrupt upper limit CH5 – float | [°C] or [mV] | REAL 32 | RW | 0 |
| | 6 | Analogue interrupt upper limit CH6 – float | [°C] or [mV] | REAL 32 | RW | 0 |
| | 7 | Analogue interrupt upper limit CH7 – float | [°C] or [mV] | REAL 32 | RW | 0 |
| | 8 | Analogue interrupt upper limit CH8 – float | [°C] or [mV] | REAL 32 | RW | 0 |
| 0x642A | 0 | Analogue interrupt lower limit – float | | REAL 32 | RO | 8 |
| | 1 | Analogue interrupt lower limit CH1 – float | [°C] or [mV] | REAL 32 | RW | 0 |
| | 2 | Analogue interrupt lower limit CH2 – float | [°C] or [mV] | REAL 32 | RW | 0 |
| | 3 | Analogue interrupt lower limit CH3 – float | [°C] or [mV] | REAL 32 | RW | 0 |
| | 4 | Analogue interrupt lower limit CH4 – float | [°C] or [mV] | REAL 32 | RW | 0 |
| | 5 | Analogue interrupt lower limit CH5 – float | [°C] or [mV] | REAL 32 | RW | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 6 | Analogue interrupt lower limit CH6 – float | [°C] or [mV] | REAL 32 | RW | 0 |
| | 7 | Analogue interrupt lower limit CH7 – float | [°C] or [mV] | REAL 32 | RW | 0 |
| | 8 | Analogue interrupt lower limit CH8 – float | [°C] or [mV] | REAL 32 | RW | 0 |
| 0x642B | 0 | Analogue interrupt delta limit – float | | UNSIGNED 8 | RO | 8 |
| | 1 | Analogue interrupt delta limit CH1 – float | [°C] or [mV] | REAL 32 | RW | 0 |
| | 2 | Analogue interrupt delta limit CH2 – float | [°C] or [mV] | REAL 32 | RW | 0 |
| | 3 | Analogue interrupt delta limit CH3 – float | [°C] or [mV] | REAL 32 | RW | 0 |
| | 4 | Analogue interrupt delta limit CH4 – float | [°C] or [mV] | REAL 32 | RW | 0 |
| | 5 | Analogue interrupt delta limit CH5 – float | [°C] or [mV] | REAL 32 | RW | 0 |
| | 6 | Analogue interrupt delta limit CH6 – float | [°C] or [mV] | REAL 32 | RW | 0 |
| | 7 | Analogue interrupt delta limit CH7 – float | [°C] or [mV] | REAL 32 | RW | 0 |
| | 8 | Analogue interrupt delta limit CH8 – float | [°C] or [mV] | REAL 32 | RW | 0 |

# Seneca Z-PC Line module: **ZC-SG**

In this chapter are described the features of ZC-SG 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 |
| Typical refresh time | 20 ms |
| Sensibility supported | From ±1 mV/V to ±64 mV/V |
| **CANOpen TECHNICAL DATA** | |
| NMT | Slave |
| | Node guarding, heartbeat |
| Node ID | HW switch or software |
| Number of PDO | 2 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** |
| TPDO2 | 0x40000280 + NodeId | Measure float | 0x6403 | 1 |
| | | ADC 16 bit | 0x6401 | 2 |
| TPDO3 | 0x40000380 + NodeId | Measure integer | 0x6401 | 1 |
| | | STATUS | 0x2120 | 0 |

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)

Max of 4 bytes of MEF (Manufacturer error filled)

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** |
| 15..6 | NA |
| 5 | Generic communication with input error |
| 4 | CRC communication with input error |
| 3 | EEPROM error |
| 2 | Over weight error |
| 1 | Weight float < 0 |
| 0 | Stable weight |

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

| EMERGENCY MESSAGE | | | | |
|---|---|---|---|---|
| BYTE 0 | BYTE 1 | BYTE 2 | BYTE 3 | BYTE 4 |
| 0xFF11 | | 0x81 | Object 0x2103 | |

For “CPU ERROR” the Emergency message will be:

| EMERGENCY MESSAGE | | | | |
|---|---|---|---|---|
| BYTE 0 | BYTE 1 | BYTE 2 | BYTE 3 | BYTE 4 |
| 0xFF20 | | 0x81 | Object 0x1002 | |

| EEC | |
|---|---|
| **CODE** | **DESCRIPTION** |
| 0x0000 | No error |
| 0x1000 | Generic error |
| 0x4201 | CPU temperature over HOT STOP ERROR |
| 0x4202 | CPU temperature over HOT STOP |
| 0x4203 | CPU temperature under COLD ERROR |
| 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..3 | NA |
| 2 | Communication with input error |
| 1 | NA |
| 0 | EEPROM 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.

### Digital out logic

Digital out logic=0 the digital output it is normally opened.

Digital out logic=1 the digital output it is normally closed.

### Object 0x2104: Execute

The object sends command to the CPU: the supported commands are:

| Object 0x2104 | |
|---|---|
| **COMMAND CODE** | **DESCRIPTION** |
| 0xC2FA | Tare acquisition ready to be saved in EEPROM (allowed also in RUN) |
| 0xC60C | Full scale/known weight acquisition ready to be saved in EEPROM (allowed also in RUN) |
| 0xC1BA | Tare acquisition (on RAM) (allowed also in RUN) |
| 0xD180 | Full scale acquisition (on RAM) (allowed also in RUN) |
| 0xBAB0 | Save new values on EEPROM (allowed also in RUN) |

### Object 0x2105: Execute result

The object is used to know the command execution result (only for special commands).

### Object 0x2107: Configuration register 1

The object is used to setup the measure and the digital input/output.

| CONFIGURATION REGISTER 1 (Object 0x2107) | |
|---|---|
| **SUBINDEX** | **Description** |
| 1 | Sample number |
| 2 | Mode |
| 3 | Cell sensibility |
| 4 | Digital out logic |
| 5 | Digital out mode |
| 6 | Digital IN or OUT selection |

### Sample NR

The sample number it is the number of sample that enters into the measure. Higher values implies lower response speed but more stability.

### *Mode*

The station can be configured in two modes:

Mode=1: a known weight must be used to calibrate the system on site.

Mode=0: no need to use a known weight to calibrate the system, the station will use the factory calibration values.

### *Cell sensibility*

The object sets the cell mV/V sensibility:

0=±1 mV/V

1=±2 mV/V

2=±4 mV/V

3=±8 mV/V

4=±16 mV/V

5=±32 mV/V

6=±64 mV/V

7=from object 0x2108 sub1

### *Digital out logic*

Defines the operation that will cause the switch to ON or OFF for the digital output.

| DIGITAL OUT LOGIC | |
|---|---|
| **Value** | **Description** |
| 0 | The output is normally opened |
| 1 | The output is normally closed |

### *Digital out mode*

Defines the operation that will cause the switch to ON or OFF for the digital output.

| DIGITAL OUT MODE | |
|---|---|
| **Value** | **Description** |
| 0 | The gross weight exceeds the full scale |
| 1 | The weight is stable and the net weight exceeds the threshold set |
| 2 | The weight it is stable |

### *Digital in or out selection*

The station can be configured with a digital input or a digital output:

- if IN or OUT selection=1: digital output enable/digital input disabled

- if IN or OUT selection=0: digital input enable/digital output disabled

### *Object 0x2108: configuration register 2*

The object is used to setup the system measure.

| CONFIGURATION REGISTER 2 | |
|---|---|
| **Subindex** | **Description** |
| 1 | Sense ratio |
| 2 | Cell full scale |
| 3 | Known weight value |
| 4 | Not used |
| 5 | Not used |
| 6 | Threshold value |
| 7 | Delta weight |
| 8 | Delta time |
| 9 | ADC speed |
| 10 | Resolution in number of points |

### *Sense ratio*

Sets the sense ratio for the strain gauge used in [mV/V] (floating point 32 bit format).

### *Cell full scale*

If mode 1 is selected (object 0x2107) sets the full scale of the strain gauge in technical units of weight (kg, pounds,etc…) (Floating point 32 bit format).

### *Known weight value*

If mode 1 is selected (object 0x2107) sets the value of the weight used for the calibration in technical units (kg, pounds, etc) (Floating point 32 bit format).

### Value for Maximum integer

Sets for what net weight (object 0x6403) the integer net value (object 0x6401 subindex 1) rise the +30000 value. (floating point 32 bit format).

### Value for Minimum integer

Sets for what net weight (object 0x6403) the integer net value (object 0x6401 subindex 1) rise the zero value. (floating point 32 bit format).

### Threshold value

If the net weight exceeds the threshold value set and the weight is stable, the digital output (if subindex digital out mode=1) is closed or opened (depending subindex digital output logic) (floating point 32 bit format).

### Delta weight

Weight variation in technical units accepted for the condition of "stable weight" (floating point 32 bit format)

### Delta time

Time in units of 100 ms used with delta weight to establish whether or not the weight is stable [s/10].

### ADC speed

The ADC speed and the frequency rejection can be customized by the table:

| ADC CONFIGURATION | | | |
|---|---|---|---|
| **Value** | **Sampling frequency [Hz]** | **50 Hz rejection** | **60 Hz rejection** |
| 27 | 151.71 | NO | NO |
| 55 | 74.46 | NO | NO |
| 82 | 49.95 | YES | YES |
| 109 | 37.59 | NO | YES |
| 155 | 50.57 | NO | NO |
| 183 | 24.82 | YES | NO |
| 210 | 16.65 | YES | YES |
| 237 | 12.53 | NO | YES |

### Hysteresis

The hysteresis can be used to stabilize the input value. If the hysteresis is activated the resolution is limited to ±30000 points. If hysteresis is disabled, the resolution available is the full 24 bit ADC.

0x00=hysteresis disabled

0x80=hysteresis enabled

## *Object 0x2120: status*

The status object contains important information about the state of the measure and the station.

| STATUS | |
|---|---|
| **Bit** | **Description** |
| 15..7 | NA |
| 6 | Net weight > threshold |
| 5 | Generic communication with input channel error |
| 4 | CRC communication with input channel error |
| 3 | EEPROM error |
| 2 | Over weight error |
| 1 | Negative measure |
| 0 | Stable weight condition |

## *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/overweight error |
| | ON | Communication error with input channel |
| POWER | ON | Power supply |

### Object for analog data

**Object 0x6401** contains the 16 bit (signed) values for the weight and the unsigned 16 bit ADC value.

| 16 BIT INTEGER INPUT (Object 0x6401) | |
|---|---|
| **Subindex** | **Description** |
| 1 | Net value signed |
| 2 | ADC value |

### Integer net value

Integer net value (signed): integer approximation of the floating point value.

### ADC value

The ADC value scaled into 16 bit (unsigned) value.

Where if ADC = 0x8000 means 0 mV on input.

If ADC = 0xFFFF means max positive mV on input.

If ADC = 0 means max negative mV on input.

### Object 0x6403 32 bit float input value

**Object 0x6403** contains the net weight in technical unit in agreement with the known weight object (floating point 32 bit format).

### Cell calibration procedure for mode=1 (calibration with a known weight)

1) Set the right mV/V sensibility on object 0x2107 subindex 3

2) Save the new value by sending the command 0xBAB0 on object 0x2104 subindex 0

3) Send the Reset command by sending command 0xABAC on object 0x2104 subindex 0

4) Put the Tare on the cell

5) Get the Tare value by sending the command 0xC2FA on object 0x2104 subindex 0

6) Enter the known weight value in technical units (kg, pounds, etc) on object 0x2108 subindex 3

7) Put the known weight value on the cell

8) Get the known weight by sending the command 0xC60C on object 0x2104 subindex 0

9) Save the new values by sending the command 0xBAB0 on object 0x2104 subindex 0

10) Wait 5 seconds and Switch OFF and then ON the ZC-SG

### Cell calibration procedure for mode=0 (calibration without a known weight)

1) Set the value 7 on object 0x2107 subindex 3 (use object 2108 for sense ratio)

2) Set the right mV/V sensibility on object 0x2108 subindex1 in floating point value

3) Save the new values by sending the command 0xBAB0 on object 0x2104 subindex 0

4) Send the Reset command by sending command 0xABAC on object 0x2104 subindex 0

5) Put the Tare on the cell

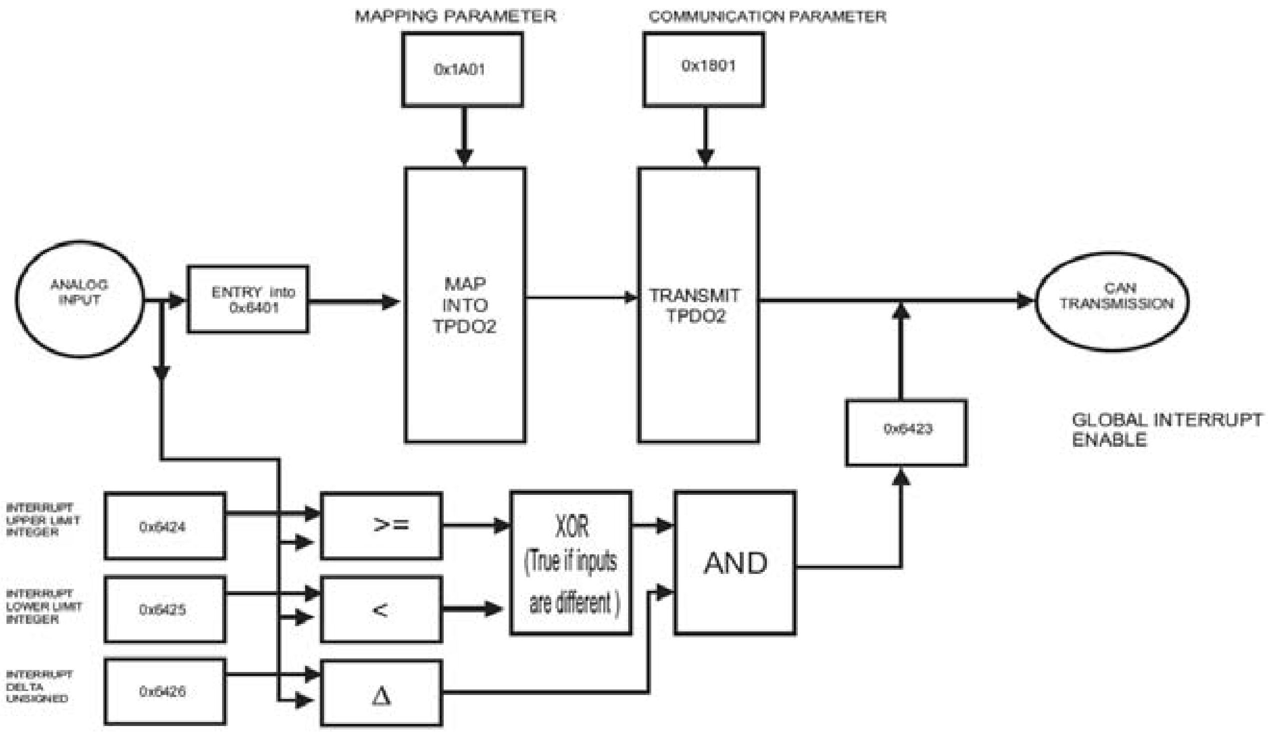
6) Get the Tare value by sending the command 0xC2FA on object 0x2104 subindex 0

7) Save the new values by sending the command 0xBAB0 on object 0x2104 subindex 0

8) Wait 5 seconds and Switch OFF and then ON the ZC-SG

### *CANOpen functional diagram*

### *For integer values*



***CANOpen Object dictionary***

| COMMUNICATION PROFILE AREA | | | | | | |
|---|---|---|---|---|---|---|
| **INDEX** | **SUB INDEX** | **NAME** | **DESCRIPTION** | **TYPE** | **ACCESS** | **DEFAULT** |
| 0x1000 | 0 | Device type | Profile 401=0x191 | UNSIGNED 32 | RO | 0x00040191 |
| 0x1001 | 0 | Error register | Error register (DS401) | UNSIGNED 8 | RO | 0 |
| 0x1002 | 0 | Station status | 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-SG" |
| 0x1009 | 0 | Manufacturer HW version | Hardware version | VISIBLE STRING | RO | "SC000000" |
| 0x100A | 0 | Manufacturer SW version | Software version | VISIBLE STRING | RO | "SW001160" |
| 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 channel 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 | Save 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 | Max subindex number | UNSIGNED 8 | RO | 4 |
| | 1 | Vendor ID | Seneca srl | UNSIGNED 32 | RO | 0x00000249 |
| | 2 | Product code | ZC-SG Machine ID Code | UNSIGNED 32 | RO | 0x0000001F |
| | 3 | Revision number | | UNSIGNED 32 | RO | |
| | 4 | Serial number | | UNSIGNED 32 | RO | |
| 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 |
| 0x1801 | 0 | 2nd transmit PDO parameters | Number of mapped objects | UNSIGNED 8 | RO | 3 |
| | 1 | COB-ID used by PDO | COB-ID of TxPDO2 | UNSIGNED 32 | RW | $NODEID+ 0x40000280 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 2 | Transmission type | Transmission type for TxPDO2<br>0x00=synchronous – acyclic<br>0x01 to 0xF0=synchronous – cyclic<br>0xFE=asynchronous manufacturer specific | UNSIGNED 8 | RW | 0xFF |
| | 3 | Inhibit time | Min delay for the next PDO (ms/10) | UNSIGNED 16 | RW | 0x00 |
| 0x1802 | 0 | 3rd transmit PDO parameters | Max subindex number | UNSIGNED 8 | RO | 3 |
| | 1 | COB-ID used by PDO | COB-ID of TxPDO3 | UNSIGNED 32 | RW | $NODEID+ 0x40000380 |
| | 2 | Transmission type | Transmission type for TxPDO3<br>0x00=synchronous – acyclic<br>0x01 to 0xF0=synchronous – cyclic<br>0xFE=asynchronous manufacturer specific | UNSIGNED 8 | RW | 0xFF |
| | 3 | Inhibit time | Min delay for the next PDO (ms/10) | UNSIGNED 16 | RW | 0x0000 |
| 0x1A01 | 0 | 2nd transmit PDO mapping parameter | Number of mapped objects | UNSIGNED 8 | RW | 2 |
| | 1 | 1st object to be mapped | First object (default: weight float) | UNSIGNED 32 | RW | 0x64030120<br>Object=0x6403<br>Subindex=1<br>Length=32bit |
| | 2 | 2nd object to be mapped | Second object (default: ADC 16 bit value) | UNSIGNED 32 | RW | 0x64010210<br>Object=0x6401<br>Subindex=2<br>Length=16bit |
| 0x1A02 | 0 | 3rd transmit PDO mapping parameter | Number of mapped objects | UNSIGNED 8 | RO | 2 |
| | 1 | 1st object to be mapped | First object (default: weight integer) | UNSIGNED 32 | RW | 0x64010110<br>Object=0x6401<br>Subindex=1<br>Length=16bit |
| | 2 | 2nd object to be mapped | Second object (default: status) | UNSIGNED 32 | RW | 0x21200010<br>Object=0x2120<br>Subindex=0<br>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)<br>1=20kbps<br>2=50kbps<br>3=125kbps<br>4=250kbps<br>5=500kbps<br>6=800kbps<br>7=1Mbps | UNSIGNED 8 | RW | 0x01 |
| 0x2003 | 0 | Firmware release | | UNSIGNED 16 | RO | 1122 |
| 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 |
| 0x2104 | 0 | Execute | Supported commands:<br>0xC2FA=tare acquisition (ready for EEPROM saving)<br>0xC60C=full scale acquisition (ready for EEPROM saving)<br>0xC1BA=tare acquisition (RAM)<br>0xD180=full scale acquisition (RAM)<br>0xBAB0=save values in EEPROM | UNSIGNED 16 | RW | 0 |
| 0x2105 | | Execute result | 0=command done<br>1=command executed with error | UNSIGNED 16 | RW | 0 |
| 0x2107 | 0 | SETUP 1 channel | Number of parameters | UNSIGNED 8 | RO | 6 |
| | 1 | SET1: sample number | Number of samples for filter calculation [1..100] | UNSIGNED 8 | RW | 100 |
| | 2 | SET1: mode | 0=use the factory calibration<br>1=use a known weight | UNSIGNED 8 | RW | 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 3 | SET1: cell sensibility | 0=±1 mV/V<br>1=±2 mV/V<br>2=±4 mV/V<br>3=±8 mV/V<br>4=±16 mV/V<br>5=±32 mV/V<br>6=±64 mV/V<br>7= from object 0x2108 sub1 | UNSIGNED 8 | RW | 1 |
| | 4 | SET1: digital out logic | 0=the output is normally open<br>1=the output is normally closed | UNSIGNED 8 | RW | 0 |
| | 5 | SET1: digital out operation mode | 0=the output is switched when the gross_weight > full_scale<br>1=the output in switched when the weight is stable and the net weight > threshold<br>2=the output is switched when the weight is stable | UNSIGNED 8 | RW | 0 |
| | 6 | SET1: digital in or out mode | 0=digital input mode<br>1=digital output mode | UNSIGNED 8 | RW | 0 |
| 0x2108 | 0 | SETUP Channel | Number of parameters | UNSIGNED 8 | RO | 10 |
| | 1 | SET2: sense ratio | Cell sense ratio in mV/V measure | REAL 32 | RW | 2.0 |
| | 2 | SET2: cell full scale | | REAL 32 | RW | 10000.0 |
| | 3 | SET2: known weight | Known weight [kg, g, etc…] | REAL 32 | RW | 10000.0 |
| | 4 | SET2: not used | | REAL 32 | RO | 10000.0 |
| | 5 | SET2: not used | | REAL 32 | RO | 0.0 |
| | 6 | SET2: threshold | | REAL 32 | RW | 5000.0 |
| | 7 | SET2: Delta weight | Weight variation for the stable condition | REAL 32 | RW | 1.0 |
| | 8 | SET2: Delta time | The variation used for the stable condition<br>Delta time ·100 ms | UNSIGNED 16 | RW | 1 |
| | 9 | SET2: ADC speed | 27=151.71 Hz<br>55=74.46 Hz<br>82=49.95 Hz<br>109=37.59 Hz<br>155=50.57 Hz<br>183=24.82 Hz<br>210=16.65 Hz<br>237=12.53 Hz | UNSIGNED 8 | RW | 82 |
| | 10 | SET2: 30000 points hysteresis | 0x00=full resolution<br>0x80=30000 points resolution | UNSIGNED 8 | RW | 0x80 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0x2120 | 0 | Channel status | Status object | UNSIGNED 16 | RO | |
| 0x2125 | 0 | Fault action | | UNSIGNED 16 | RW | 0x8000 |
| 0x2160 | 0 | Fault value | Number of parameters | UNSIGNED 8 | RO | 0x01 |
| | 1 | Fault value | | REAL 32 | RW | 850.0 |
| **STANDARD DEVICE PROFILE AREA** | | | | | | |
| **INDEX** | **SUB INDEX** | **NAME** | **DESCRIPTION** | **TYPE** | **ACCESS** | **DEFAULT** |
| 0x6401 | 0 | 16 bit input | Number of input | UNSIGNED 8 | RO | 2 |
| | 1 | Weight integer | Weight in integer format | INTEGER 16 | RO | |
| | 2 | ADC value (scaled to 16 bit) | ADC scaled value | UNSIGNED 16 | RO | |
| 0x6403 | 0 | Float input | Number of input | UNSIGNED 8 | RO | 1 |
| | 1 | Weight real | Weight in real format | REAL 32 | RO | |
| 0x6423 | 0 | Global interrupt enable | 0=disable asynchronous TxPDO 1=enable asynchronous TxPDO | BOOLEAN | RW | 0 |
| 0x6424 | 0 | Analogue interrupt upper limit 16 bit | Number upper value 16 bit | UNSIGNED 8 | RO | 1 |
| | 1 | Analogue interrupt upper limit 16 bit | | INTEGER 16 | RW | 0 |
| 0x6425 | 0 | Analogue interrupt lower limit 16 bit | Number lower value 16 bit | UNSIGNED 8 | RO | 1 |
| | 1 | Analogue interrupt lower limit 16 bit | | INTEGER 16 | RW | 0 |
| 0x6426 | 0 | Analogue interrupt delta limit 16 bit | Number delta limit value 16 bit | UNSIGNED 8 | RO | 1 |
| | 1 | Analogue interrupt delta limit 16 bit | | INTEGER 16 | RW | 0 |
| 0x6429 | 0 | Analogue interrupt upper limit float | Number upper value float | UNSIGNED 8 | RO | 1 |
| | 1 | Analogue interrupt upper limit float | | REAL 32 | RW | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0x642A | 0 | Analogue interrupt lower limit float | Number lower value float | UNSIGNED 8 | RO | 1 |
| | 1 | Analogue interrupt lower limit float | | REAL 32 | RW | 0 |
| 0x642B | 0 | Analogue interrupt delta limit float | Number delta limit value float | UNSIGNED 8 | RO | 1 |
| | 1 | Analogue interrupt delta limit float | | REAL 32 | RW | 0 |