



## ZC-16DI-8DO

### CANopen/MODBUS I/O Module

#### 16 Digital Inputs - 8 Digital Outputs

## Installation Manual

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**SENECA s.r.l.**

Via Austria, 26 – 35127 – PADOVA – ITALY

Tel. +39.049.8705355 - 8705359 - Fax +39.049.8706287

 Manuals and configuration software are available at [www.seneca.it](http://www.seneca.it)


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Power Supply	
Voltage	10 – 40 V $\overline{\text{DC}}$ ; 19 - 28 V $\sim$ 50 – 60 Hz
Consumption	Typical: 1,5 W, Max 2,5 W
Environmental Conditions	
Temperature	-10 / + 65 °C
Humidity	30 – 90 % a 40 °C not condensing
Altitude	Up 2000 m a.s.l.
Storage Temperature	-20 / +85 °C
Protection Degree	IP20
Connections	
Digital Inputs and Outputs	Removable 4way screw terminals (3.5 mm pitch)
Power Supply and CAN/MODBUS Interface	Rear IDC10 connector for DIN rail IEC EN 60715
Digital Outputs (alternatively to screw terminals)	IDC10 connector on the side of the module
RS232 interface	Stereophonic 3.5 mm frontal jack
Dimensions / Box	
Dimensions	L: 100 mm; H: 112 mm; W: 35 mm
Box	PA6, black

### Isolations 1500 V $\sim$

### Standards

The module complies with the following standards:

**CE** EN61000-6-4 (electromagnetic emission, industrial environment).

EN61000-6-2 (electromagnetic immunity, industrial environment).

**UL** LISTED 3LU<sup>®</sup> EN61010-1 (safety).

One maximum 2.5A fuse must be installed near the module.

**ADDITIONAL NOTES :**

Use in environment with 2 or less pollution degree.

### INSTALLATION RULES

The module is designed to be installed, in vertical position, on DIN rail IEC EN 60715. In order to ensure optimum performance and a longest working life, the module(s) must be provided with adequate ventilation and no raceways or other objects that obstruct the ventilation slots. **Never install the modules near heat sources.** We recommend installation in the lower part of the control panel.

### GENERAL SPECIFICATIONS

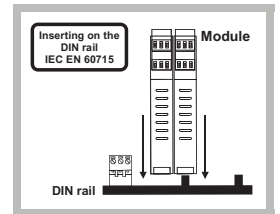
- Sixteen self-powered 16V $\overline{\text{DC}}$  digital inputs with shared negative pole..
- Eight inputs settable as 32-bit counters with 10 kHz maximum frequency.
- Eight Mosfet Digital Outputs with shared negative pole, 5 – 30 V $\overline{\text{DC}}$  collectively supplied.
- Screw terminals and IDC10 rear connector both available for digital outputs to external relays easy connection.
- CAN Interface with CANopen protocol up to 1 Mbps speed or MODBUS RS485 Interface up to 115 Kbit/s speed.
- CANopen Baud rate, MODBUS Baud rate and Node ID configurables by DIP-switches or by software.
- RS232 Serial Communication with MODBUS-RTU protocol.
- Power supply and Canopen/MODBUS wiring connections facilitated by means of a bus that can be housed in the DIN rail IEC EN 60715.
- 1500 V $\sim$  Isolation among input/output, power supply and CAN/MODBUS interface circuits.
- Increments of counters individually configurable on the rising or falling edges of the corresponding digital input.
- Overflow indication available for each counter.
- Preset value configurable for each counter.
- Reset and preset commands individually executable on each counter.
- Short-circuit to ground and overtemperature detection for every digital output with fault condition signalling.
- When there is no communication or there is fault condition then output value become a programmed value or the output holds the last value
- LEDs signalling: power supply, digital inputs/outputs state, outputs fault CAN/MODBUS and MODBUS-RTU communication.
- Node guarding or heartbeat.

TECHNICAL SPECIFICATIONS			
Inputs		Outputs	
Channels	16	Channels	8
Polarity (EN 61131-2 type 2)	Sink (pnp)	Outputs Type	Mosfet (Open Source)
Counters (if enabled)	8 (32 bit)	Power Supply Voltage	5 – 30 V $\overline{\text{DC}}$
U <sub>L</sub> (state OFF)	0 – 7 V $\overline{\text{DC}}$		
U <sub>H</sub> (state ON)	11 – 30 V $\overline{\text{DC}}$		
Absorbed Current (for each input)	3 mA	Maximum current (for each output)	0,5 A (connection from screw terminals)
V Max	30V $\overline{\text{DC}}$		25 mA (connection from IDC10 connector)
Minimum pulse width	350 $\mu$ s		
ON/OFF Delay	Typical: 1.2ms, Max: 3ms	ON/OFF Delay	Max: 1 ms
Counters frequency	Max 10 kHz	RDS on	0,75 $\Omega$

**Inserting on the DIN rail IEC EN 60715**

Like the picture shows:

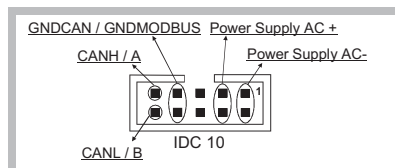
- 1) Insert the module rear IDC10 connector on a DIN rail free slot (there's only one way to insert the module because of polarized connector).
- 2) The module can be fixed on the DIN rail by pressing the four hooks located on the rear of the module.



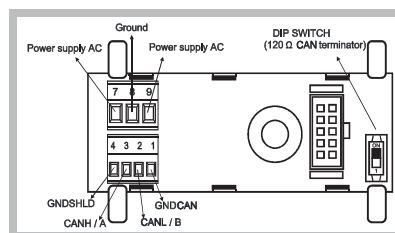
### ELECTRICAL CONNECTIONS

#### Power Supply and CAN / MODBUS Interface

Power Supply and CAN/MODBUS interface are available by using the bus for the Seneca DIN rail, by the rear IDC10 connector or by Z-PC-DINAL1-35 accessory.


**Rear Connector (IDC10)**

In the figure you can see the meaning of the IDC10 connector pins if you want to provide signals through them.

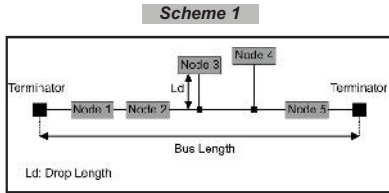


When Z-PC-DINAL1-35 accessory is used, the power supply and communication signals may be provided by the terminals block into the DIN rail support. The figure shows the meaning of the terminal blocks and the position of the DIP-switch for CAN network termination. GNDSHLD: Shield to protect the signals inside the connection cables against interference (recommended).

### CAN BUS CONNECTION RULES

- 1) Install the modules on the DIN rail (max 120).
- 2) Connect the remote modules using cables of proper length. The following table shows the datas about the cables length:
  - Bus Length: CAN network maximum length as a function of the Baud rate. Length of the cables which connect the two bus terminators modules
  - Drop Length: maximum length of a drop line as a function of the Baud Rate. (Please see Scheme 1)

Baud rate	Bus Length	Drop Length
20 kbps	2500 m	150 m
50 kbps	1000 m	60 m
125 kbps	500 m	5 m
250 kbps	250 m	5 m
500 kbps	100 m	5 m
800 kbps	50 m	3 m
1000 kbps	25 m	0.3 m



**NOTE:** For the best performances, the use of special shielded cables is recommended (BELDEN 9841 cable for example).  
 3) Terminate the two ends of the CANbus network by setting to ON the DIP-switch present on the DIN rail connection supports (Please see: Accessories) where the two module ends are inserted.

### Digital Output

#### Screw Terminals Outputs

The total current incoming on power supply terminal must be limited to 4 A with quick-break fuse or equivalent protection.

#### IDC10 Side Connector Outputs

With 24V relays power supply, the total current entering on power supply terminal must be limited to 0.2 A with quick-break fuse or equivalent protection.

### RS232 Serial Port

A female Jack connector on frontal panel allows to connect the module with the RS232 communication bus. The connection cable DB9 – 3.5 mm stereophonic jack can be assembled, as indicated in the following figure, or can be bought, as an accessory: (code PM001601).

### SIGNIFICANT COMPONENTS POSITION

#### Screw terminals / LED / IDC10 Connector / DIP-Switches

The terminals numbering, the leds position on the frontal panel, the rear IDC10 connector (fixing on the DIN rail) and the DIP-switch on the rear side are illustrated below.

#### Frontal Panel

#### Side Panel

### LEDs SIGNALLINGS

#### LED ERR and RUN: CANopen / ModBus COMMUNICATION STATE

The meaning of leds ERR and RUN is described below; For details about the state and the flashing modes of the two leds: please see the User Manual.

LED ERR (Red)	STATE	CANopen state LED meaning
OFF	No error	The Device is in working condition.
Single flash	Warning limit reached	At least one of the error counters of the CAN controller has reached or exceeded the warning level (too many error frames).
Double flash	Error Event	A guard event (NMT-Slave or NMT-master).
Triple flash	Sync Error	The SYNC message has not been received within the communication cycle period time out.
ON	Bus off	The CAN controller is bus off.

LED ERR (Red)	ModBus state LED meaning
ON	The device is receiving.

#### High speed, configurable, digital input counters (Max Frequency: 10 kHz)

#### Generic digital inputs

#### DIP-SWITCHES SETTINGS

The DIP-switches position defines the module CAN/MODBUS communication parameters: Address and Baud Rate. In the following figure the Baud Rate and Address values are listed as a function of the DIP-switches position:

SW1 POSITION	CANopen	ModBus	SW1 POSITION	Address	Address
1 2 3 4 5 6 7 8 9 10	Baud Rate (kbps)		1 2 3 4 5 6 7 8 9 10	binary #	number
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	20	2.4	x x x ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	0000001	ADD.001
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	50	4.8	x x x ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	0000010	ADD.002
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	125	9.6	x x x ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	0000011	ADD.003
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	250	19.2	x x x ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	0000100	ADD.004
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	500	38.4	x x x ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	0000101	ADD.005
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	800	57.6	.....	.....	.....
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	1000	115.2	x x x ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	1111111	ADD.127
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	Software programmed		x . x ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	.....	.....

**Note:** When the DIP-Switches from 3 to 8 are on OFF position, the communication settings are loaded from memory (EEPROM). We underline that on all the DIN rail supports a DIP-switch is present and if it is set to ON position the CAN network termination is inserted.

Type of communication	ModBus terminator	KEY
Protocol	SW2	SW4
ModBus	State	SW3
CANopen	Disabled	ON
	Enabled	OFF

#### PROGRAMMING

##### CAN / MODBUS Interface Programming

The module may be programmed/configured through the CAN/MODBUS interface; refer to the User Manual for details about the communication settings.

**Factory Default Parameters**  
 All the DIP-switches in OFF position (values from memory)  
 The module is default programmed as follows:  
**MODBUS, Baud Rate: 38400, Bit: 8, Parity: None, Stop bit: 1, Address: 1**  
**SW2 and SW4 in ON position: CANopen, Baud Rate: 20 kbps, Address: 127.**

##### RS232 Frontal Jack Programming

The module may be programmed/configured through the RS232 interface by using MODBUS-RTU protocol; refer to the User Manual for details about the communication. The connection parameters are the following:  
**Address: 1, Baud Rate: 2400 Baud, Parity: none, Stop bit: 1.**

LED RUN (Green)	STATE	CANopen state LED meaning
Single flash	Stop	The Device is in STOPPED state.
Blinking	Pre-operational	The Device is in the PRE-OPERATIONAL state.
ON	operational	The Device is in the OPERATIONAL state.

#### LED RUN (Green) ModBus state LED meaning

ON The device is transmitting.

#### LED FAIL and PWR: GENERAL SYSTEM DIAGNOSTICS

LED PWR (Green)	Meaning
ON	Power Supply Presence

LED FAIL (Yellow)	Meaning
ON	RS232 port (COM) data reception.
Blinking	At least an output in Fault

#### LED 01 – 8 / 9 – 24: DIGITAL INPUTS / OUTPUTS STATE

LED 10 – 80 (Green)	Meaning
ON	The correspondent digital output (10..80) ON

LED 11 – 16l (Green)	Meaning
ON	01 – 08: If counters are enabled: the correspondent counter is ON. Otherwise it signals the state of the correspondent digital input. 09 – 16: The correspondent generic digital input is ON.

#### FACTORY SETTINGS

- All DIP-switch OFF:**
- MODBUS Protocol Communication parameters: 38400 8,N,1 Addr. 1
  - Filter active on the 16 Digital inputs and Filter value = 100Hz
  - In case of fail, all outputs go low.
  - Modbus communication monitoring, not active.
  - All dip switch OFF except **SW2 (ON) and SW4 (ON):**
  - CANopen Protocol / - Communication parameters: 20K Addr. 127
  - Filter active on the 16 Digital inputs / - Filter value = 100Hz
  - In case of fail, all outputs go low.

Variations of standard parameters are possible by EASY SETUP software (please see: [www.seneca.it](http://www.seneca.it) download area).  
 For more information about a list of all register and their function Please see: USER manual.

#### 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.