



## GENERAL SPECIFICATIONS

- Three 0..20 / 4..20mA outputs, one of which is convertible 0..10 / 2..10V with 12 bit resolution.
- Insulation of the 1500V AC outputs compared to the remaining low voltage circuits.
- Outputs protected with 400W/ms transient current suppressers; user load protection by PTC.
- Connection to shared negative pole.
- Analogue output response time: 400ms (10-90%).
- Possibility of power supply and serial line facilitated wiring by means of a bus that can be housed in the DIN guide alternatively to the terminals.
- RS485 serial communication with MODBUS RTU protocol, maximum 32 nodes.
- RS232 programming connection on front panel.
- Insertion and extraction from the slot without interrupting bus communication or power supply.
- Communication times below 20 ms (@ 38400 baud).



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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 and 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 this product, please contact your local

## TECHNICAL SPECIFICATIONS

Power supply:	10÷40 VDC (any polarity) or 19÷28 VAC 50÷60 Hz, max 3.2W; 2.5W @ 24VDC with all the outputs in current at 102.5%.		
Communication port:	2 wire RS485 serial with settable speed: 1200, 2400, 9600 , 19200 , 38400 , 57600, 115200 Baud. Serial RS232 2400 Baud (3.5 mm jack cable on front panel).		
Protocol:	Modicon MODBUS RTU.		
Voltage output:	0..10 / 2..10VDC, pilotable impedance > 500W, resolution 12 bit (2.5mV).		
Current outputs:	0..20 / 4..20mA DC, pilotable impedance < 500W, resolution 12 bit (5uA).		
Errors:	Calibration	Linearity	Thermal Stability
	- Voltage:	0.3% of the f.s. Max.; 0.2% typical	0.05% of the f.s.
- Current:	0.2% of the f.s. Max.; 0.1% typical	0.05% of the f.s.	0.01%/°C of the f.s.

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Ambient conditions:	Temperature: 0..55°C , humidity 30÷90% at 40°C non-condensing
Protection rating:	IP20
Weight, dimensions:	140 g., 100 x 112 x 17,5 mm
Standards:	The instrument complies with the following standards: EN61000-6-4 / 2002 (electromagnetic emission, industrial environment) EN61000-6-2 / 2002 (electromagnetic immunity, industrial environment) EN61010-1 (safety) All the circuits must be provided with double insulation against circuits under dangerous voltage. The power supply transformer must comply with EN60742 standards for insulation transformers and safety transformers. The power supply transformer must comply with EN60742 standards for insulation transformers and safety transformers.



## ERRORS CODES AND SIGNALLING:

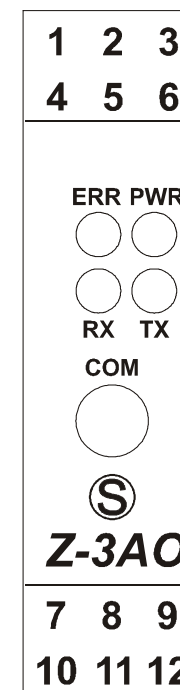
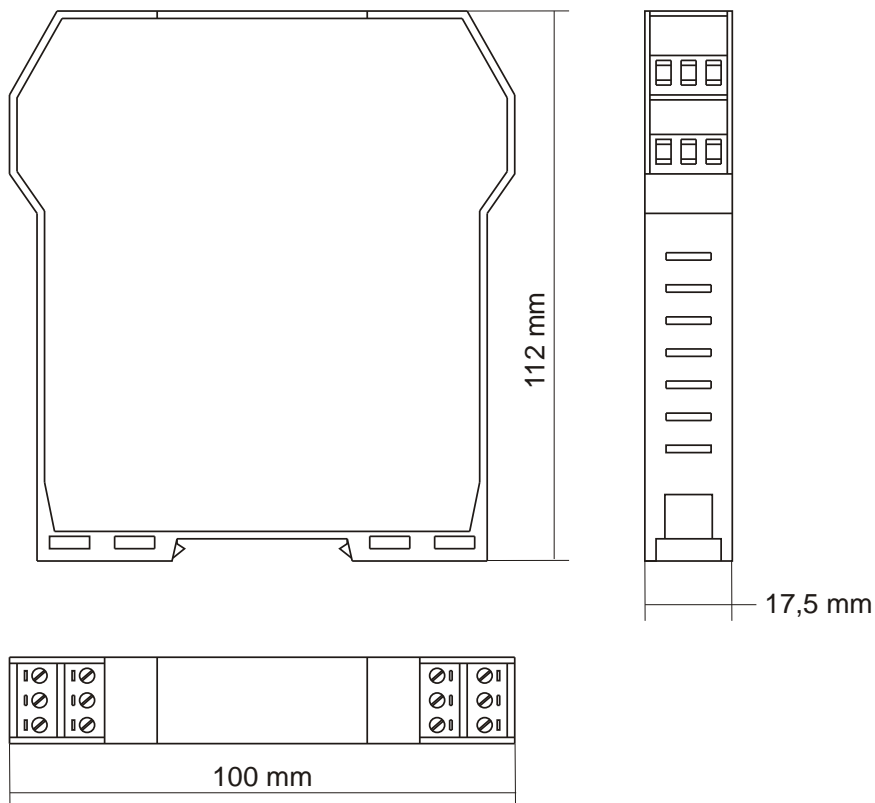
In some situations the module may respond with an exception message. The following table lists these situations and the related response codes.

Situation:	Response Code:
Illegal register address	02
Number of registers requested illegal	04
EEPROM register programming error	08

The front panel features the following LED:

<b>ERR</b>	if flashing, indicates an error in the programming of the parameters or writing in EEPROM.
<b>PWR</b>	indicates power supply presence.
<b>RX</b>	indicates the reception of data by RS485 communication port.
<b>TX</b>	indicates the transmission of data by RS485 communication port.

## OVERALL DIMENSIONS



**STATUS:** This register must be considered in binary format, i.e. each active bit (=1) of the register corresponds to an error or warning status. The table shows the functions associated with each bit.

Bit:	Function:
0	This bit can be set to 1 to obtain <b>reset</b> of the module. After the operation it will be automatically reset to 0.
1	Reserved, do not use.
2	=1: EEPROM programming error. Active if the last programming of an EEPROM register has failed.
3	=1: data programming error. Active if the setting of any parameter is not included in the range of acceptability.
4	None
5	None
6	None
7	None
8	None
9	None
10	None
11	None
12	None
13	None
14	None
15	None

**IMPORTANT**  
**A program known as Z-PROG for the initial programming and testing of the product can be downloaded for free from the [www.seneca.it](http://www.seneca.it) site.**

**INSTALLATION**

The module has been designed for vertical installation on a DIN 46277 guide equipped with a Z-PC-DINx; power supply and communication bus. For optimal operation and long life, adequate ventilation must be provided for the module(s), which must be positioned vertically. Avoid positioning channels or other objects that obstruct the ventilation louvers.

**HARSH OPERATING CONDITIONS:**

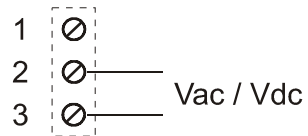
When the modules are fitted side by side it may be **necessary to separate them by at least 5 mm** if the panel temperature is above 45°C and operating conditions are harsh.

- The following constitute harsh operating conditions:
- High power supply voltage ( > 30Vdc / > 26 Vac ).
  - Power supply of loads with impedance of less than 300W per channel (outputs in current).
  - Assembly in horizontal position.

**NOTE:** Use of the DIN guide connectors supplied on request ensures practical fitting and correct ventilation of the modules, in addition to reducing the number of electrical cables.

# ELECTRICAL CONNECTIONS

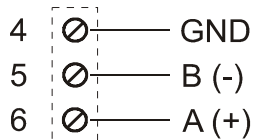
## POWER SUPPLY



The power supply voltage must be between 10 and 40V DC (any polarity) or between 19 and 28V AC; see also section **INSTALLATION**. Terminals 2 and 3 can be used to provide the module with power supply as an alternative to connection using the Z-PC-DINx bus. **The upper limits must not be exceeded as this can seriously damage the module.**

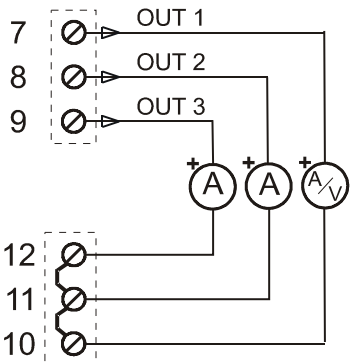
If the power supply source is not protected against overload, a safety fuse with a max. permissible value of 2.5 AT must be installed in the power supply line.

## INPUTS / OUTPUTS



Connection for RS485 communication using the MODBUS master system as an alternative to the Z-PC-DINx bus.

Note: the indication of the RS485 connection polarity is not standardised and in some masters may be inverted.



Output connections terminals 10,11 and 12 are all connected internally. Output 1 (terminal 7) is settable for current or voltage using the DIP-switches.

## Details of some registers:

**EPRFLG:** This register must be considered in binary format, i.e. each register bit activates (1) or deactivates (0) a function. The table shows the functions associated with each bit.

Bit:	Function:
0	None
1	None
2	1 = sets the serial communication response delay. If enabled, there will be a minimum delay of 12 ms (only for the RS485 port).
3	Sets the use of serial communication parity bit: 0 = no parity 1 = active parity (only for the RS485 port).
4	Sets the type of parity: 0 = even, 1 = odd (only for the RS485 port).
5	None
6	1 = TIMEOUT timer reset after receiving writing message; 0 = TIMEOUT timer reset after receiving any valid message.
7	1 = When the TIMEOUT timer runs out, it sets the outputs with the default values. 0 = When the TIMEOUT timer runs out, it does not perform any operation.
8	0 = sets analogue output 1 for the start of the scale 0mA (0V). 1 = sets analogue output 1 for the start of the scale 4mA (1 or 2V, see bit 11).
9	0 = sets analogue output 2 for the start of the scale 0mA. 1 = sets analogue output 2 for the start of the scale 4mA.
10	0 = sets analogue output 3 for the start of the scale 0mA. 1 = sets analogue output 3 for the start of the scale 4mA.
11	0 = sets analogue output 1 for the start of the full scale 10mA (5V) 1 = sets analogue output 1 for the start of the full scale 20mA (10V)
12	None
13	None
14	None
15	None

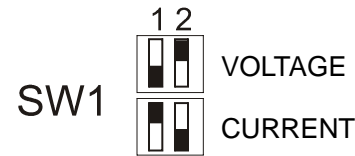
Address	INITIALS / Permitted values	Function
40001	MTYPE, VERS 0x0F00	Contains the type (H) and number of the version (L) of the module. For the Z-3AO module we can have: type=15, version=1. The value read now has the value of 0x0F00=3840. It can be used to automatically recognise a module inserted in the bus to replace a faulty one and appropriately re-programme it. Note: the instrument version can vary from the value indicated above according to the revisions and/or updates carried out.
40002 40066	BAUDR 0..7(H), 1..255(L)	Communication speed (H) and address (L) of the module. This speed can have the following values: 0=4800 bps, 1=9600, 2=19200, 3=38400, 4=57600, 5=115200 (*), 6=2400. The address can be between 1 and 255.
40003 40067	TIME OUT 10..250	Communication control time in tenths of a second. If enabled (see EPRFLG), the analog outputs must be set to the default value or in other words the value set in the corresponding register in EEPROM when communication with the module is interrupted for longer than the TIMEOUT tenths of second.
40004 40068	EPRFLG	See the details table below.
40005 40069	OUTCH1 0..10000	Analogue output value: the acceptable values are from 0 to 10000 with corresponding output of 0..20 mA or 0..10V or 4..20 mA or 2..10V depending on the status of the EPRFLG register flags. The value is limited to 0..10250, corresponding to 0..20.5 mA. The value memorised in EEPROM will be used as a default value when the unit is switched on and at the end of the timeout if the safety function is enabled.
40006 40070	OUTCH2 0..10000	As above, except that this output does not provide for voltage.
40007 40071	OUTCH3 0..10000	As above.
40008	STATUS	Status indicator flags, see below for details.

(\*) The 115200 Baud speed can be affected by communication errors of around 100 per million.

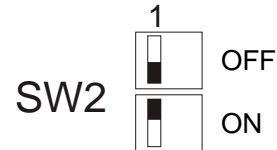
## SETTING THE DIP-SWITCHES

One side of the module features the dip-switches which are useful for selecting the following functions:

### Output 1 setting mode:

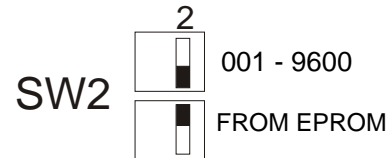


### RS485 line termination:



The RS485 line must be terminated only at the ends of the

### Default Baud rate and address:



Set to OFF to set the module's address and speed to the 001-9600 default values;  
Set to ON to obtain the address and speed programmed in EEPROM through the serial connection.

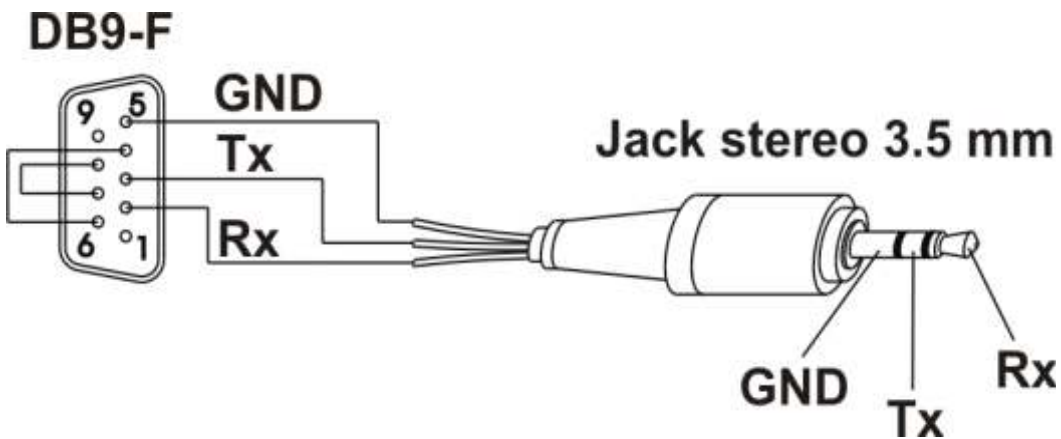
During initial programming, the EEPROM (SW2.2 = ON) settings that are originally programmed as follows

can be used: **Address = 001, Baud Rate = 38400, PARITY = none, NUMBER OF BIT = 8, STOP BIT = 1.**

When reprogramming the module (when address and speed are not known, for example) it is possible to use the default position that sets the fixed parameters visible in the table or use the front programming connector (see below).

NOTE: At the end of programming, the dip-switch1 must be set to ON and the module re-set; in other words, the power supply must be switched off and then switched back on again.

The module can also be programmed with the front connector (COM) by always using Z-PROG software and making sure to set the following parameters for connection: 2400 Baud, no parity, address 1. The COM communication port responds exactly like the RS485 port except as already described for the communication parameters. During the use of the COM port, the bus will be disabled and automatically reenabled 5 seconds after the latest message exchanged on the COM port. The 3.5 mm DB9 jack stereo connection cable can either be assembled as indicated in the following figure or purchased as an accessory (cod. PM001600).



## MODBUS REGISTERS

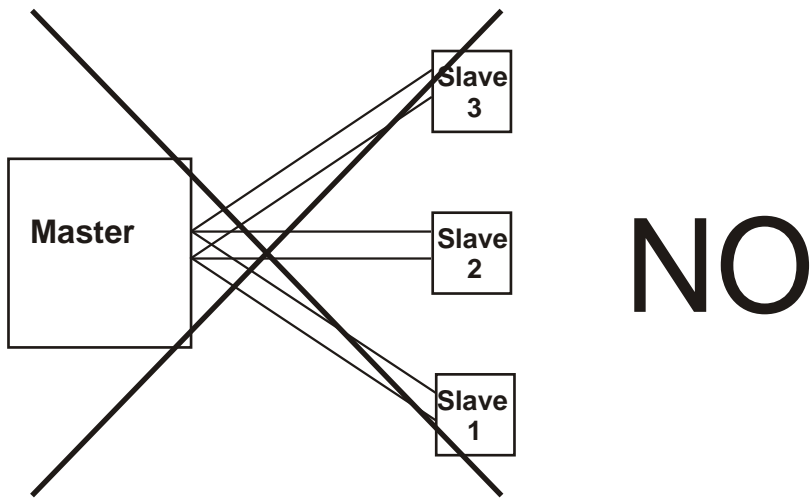
Below, the numerical values are decimals unless indicated otherwise by the prefix '0x' for hexadecimal values or '0b' for binary values. The suffix (H) indicates the upper part of a word and (L) indicates the lower part.

### MODBUS COMMANDS SUPPORTED

Command Code	Description
3 - Read Holding Register	Permits reading of the <b>RAM and EEPROM</b> registers up to a <b>maximum of 8</b> at a time.
6 - Preset Single Register	Permits writing of the <b>RAM and EEPROM</b> registers individually.
16 - Preset Multiple Register	Permits writing of the <b>RAM</b> registers up to a <b>maximum of 8</b> at a time. Multiple writing is impossible in <b>EEPROM</b> .

NOTE: MODBUS RTU protocol specifications have changed since 2002. Up to that time, a register numeration system utilised by many application programs and communication libraries that placed the first 9998 "**Holding Register**" in correspondence using numbers from 40001 to 49999 had been defined. The same registers are effectively equivalent to those with hexadecimal numeration from 0x0000 to 0x270E or with decimal numeration from 0 to 9998.

The following table lists and describes the Holding Registers present in the module. For many registers the original copy exists in EEPROM. The address of this copy is given by the register number increased by 64. In the table below, for each address the EEPROM address is indicated if present. When the device is switched on (or at reset controlled by serial line) the RAM registers are initialised with the values contained in EEPROM. The EEPROM registers must therefore be programmed for configuration of the module. This configuration can be performed both with the module inserted in the bus together with other modules (obviously with a different address) or with module connected to the PC alone.



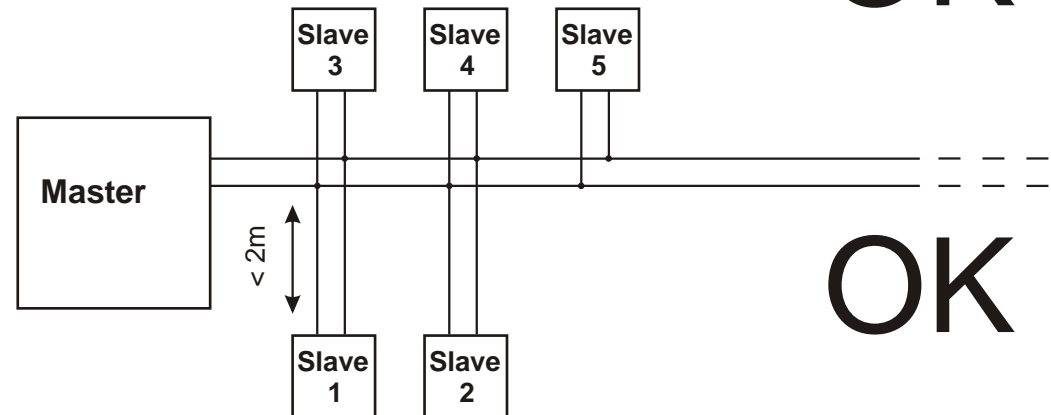
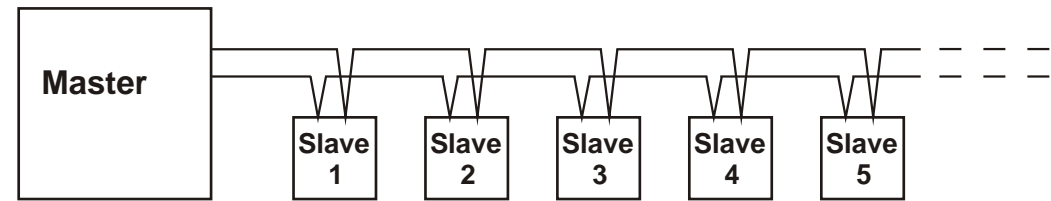
## SERIAL INTERFACE

The RS485 serial interface is based on a balanced differential communication line with typical impedance of 120 ohm. The maximum length of the connection is not defined but depends on the communication speed, the signal-interference ratio and the cable quality.

The maximum length for guaranteed operation is usually set at 1200 m. The connection cable can be unshielded if the distance is only a few meters in an electrical environment with only limited interference. For distances between 15 and 100 m a shielded twisted cable can be used without particular specifications whereas for connections over 100 m you are advised to use, for example, CEAM CPR 6003 or BELDEN 9841 cable.

The communication line should preferably be of the chain type, avoiding star configurations and limiting branches to a few metres (see figure below). The ends of the line must be terminated by setting the respective dip-switch on the module in ON position.

The cable shield must be connected to the **GND** terminal on both sides, and connected to earth on at least one side. If necessary to reduce interference, the other side should be connected to earth by means of a 10 nF capacitor.



OK

OK