



5 digital input module with MODBUS protocol on RS485 Z-D-IN

GENERAL SPECIFICATIONS

- 5 opto-insulated digital inputs with self-powered 24V DC shared negative pole.
- Removable terminals with section of 2.5 mm².
- Input protection by 600W/ms TVS transient current suppressers.
- 16 bit totalizer for each input, max frequency 100Hz
- Possibility to set the input n° 5 for fast totalizer, max frequency 10KHz.
- Possibility of ON-LINE module configuration.
- RS485 serial communication with MODBUS-RTU protocol, maximum 32 nodes.
- 1500Vac input insulation with respect to remaining low voltage circuits.
- Power supply and serial connection wiring facilitated by means of a bus that can be housed in the DIN guide.
- Insertion and extraction of bus without interruption of communication or system power supply.
- Communication times below 10 ms (@ 38400 baud).
- Connection distance up to 1200 m.

TECHNICAL SPECIFICATIONS

Power supply:	19-40 Vdc, 19-28 Vac 50-60Hz , max 2.5W
Communication port:	RS485 serial with settable speed: 9600, 19200, 38400, 57600 baud
Protocol:	Modicon MODBUS RTU
Input:	5 opto-insulated type inputs for REED, PROXIMITY PNP , NPN, contact, etc.
Ambient conditions:	Temperature: 0..55°C , Min.: 30% Max. 90% humidity at 40°C non-condensing, Installation class II, pollution rating 2
Protection rating:	IP20
Weight, dimensions:	140 g., 100 x 112 x 17,5 mm
Standard:	The instrument complies with the following standards: EN50081-2 (electromagnetic emission, industrial environment) EN50082-2 (electromagnetic immunity, industrial environment) EN61010-1 (safety)



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INSTALLATION

The Z-D-IN module has been designed for vertical assembly on DIN 46277 guide.

For optimal operation and long life, adequate ventilation must be provided for the module(s), avoiding positioning channels that obstruct the ventilation louvers.

Avoid fitting modules above equipment that generates heat; you are advised to fit them at the bottom of the panel.

HARSH OPERATING CONDITIONS:

Whenever the modules are assembled side-by-side, it might be necessary to separate them by at least 5 mm whenever the control panel temperature is higher than 45°C and operating conditions have been created as a result.

The following constitute harsh operating conditions:

- *High power supply voltage (> 30Vdc / > 26 Vac).*
- *Sensor power supply at input.*

NOTE: Use of the DIN guide connectors ensures practical fitting and correct ventilation of the modules.



MODULE PROGRAMMING EXAMPLE

Example : We wish to programme the module with the following parameters :

- Filter time : 100ms
- Input negation : active
- Input 5 : fast reading up to 10KHz
- Address and baud rate : 002, 9600 baud

By means of a modbus master, the following parameters must be entered in the respective EEPROM locations (the values are expressed in binary notation) :

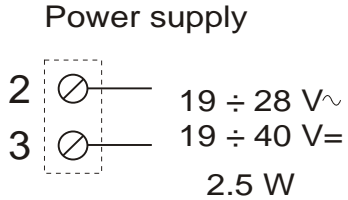
Address	Value
40072	0b 00000000.01100100 (100 decimal)
40073	0b 00000000.10000001 (129 decimal)
40074	0b 00000001.00000010 (258 decimal)

After these settings, simply set bit 40011.0 to obtain total reset of the module which will re-start with the new settings.

Operation of the module after the settings: After re-starting, the module will accept pulses of minimum 100ms duration on input 1..4, while input number 5 will accept pulses with frequency up to 10KHz; the address for the module will be 2 and the communication speed will be 9600 Baud.

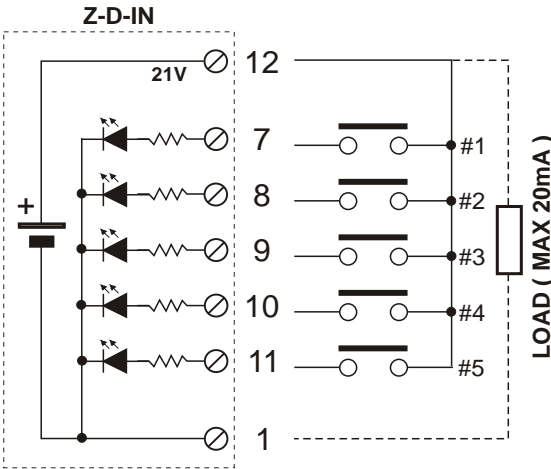
ELECTRICAL CONNECTIONS

POWER SUPPLY



The power supply voltage must be between 19 and 40 Vdc (any polarity) or 19 and 28 Vac; see also section **INSTALLATION**. **The upper limits must not be exceeded as this can seriously damage the module.** The power supply source must be protected from any failures in the module by means of a suitably sized fuse. The module can be powered via the DIN guide connectors

INPUTS



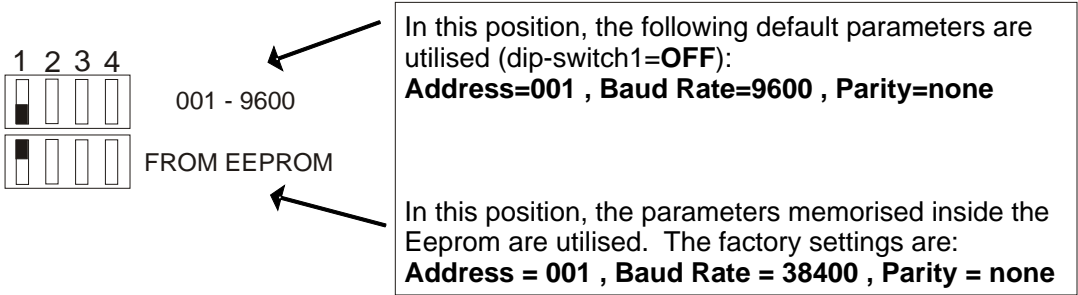
RS485



SETTING THE DIP-SWITCHES

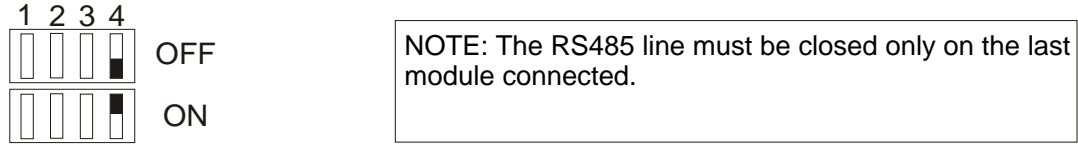
One side of the module features the dip switches useful for selecting the following functions:

Communication parameter selection:

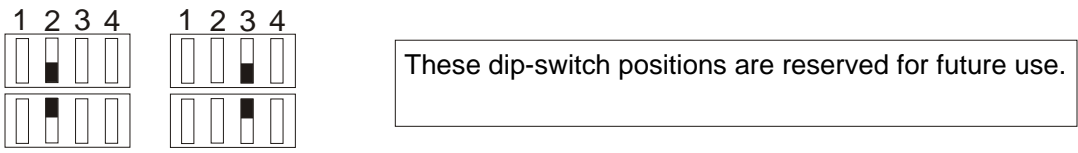


When reprogramming the module (when address and speed are not known, for example) it is possible to use the default position that sets the fixed parameters visible in the box.
 NOTE: At the end of programming, the dip-switch1 must be set to **ON** and the module re-set

RS485 line closure setting:



Reserved position:



		<ul style="list-style-type: none"> • Bit 40009.7 (*) =1 activate fast reading at input n° 5. Maximum input frequency 10 KHz. <p>NOTE: the symbol (*) indicates that the bit modification performed is immediately effective; if this symbol is not present, the module must be reset (after first memorising in EEPROM) in order to enable the modifications.</p>
40010 40074	BAUDR 0..4(H),1..255(L)	Communication speed (H) and address (L) of the module. The speed can have the following values: 0 = 4800 baud 1 = 9600 baud 2 = 19200 baud 3 = 38400 baud 4 = 57600 baud The address can be between 1 and 255.
40011	STATUS	<ul style="list-style-type: none"> • When set to 1, Bit 40011.0 causes the total resetting of the module. • When set to 1 Bit 40011.1 copies Ram registers 40008, 40009, 40010 into EEPROM registers 40072, 40073, 40074.

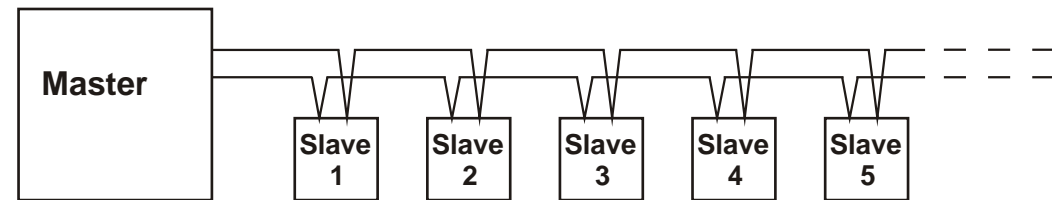
NOTE: If an attempt is made to read or write a memory location NOT included in the previous table, the module will respond with an error message.
NOTE 2 : for the correct operation of the total counters under extreme conditions (inputs 1,2,3,4 all at 100Hz and input 5 at 10KHz), we recommend using a scan rate of >= 250 ms during serial communication; we also recommend adopting elevated communication speeds.

40002	OVERFLOW, INPUT	The inputs are displayed in the bits : input 1: 40002.0 input 2: 40002.1 input 3: 40002.2 input 4: 40002.3 input 5: 40002.4 The bits from 40002.8 a 40002.12 indicate overflow of the respective totalizers. NOTE: The overflow bits MUST be reset from master.
40003	TOTAL 1	16 bit totalizer of input 1 . The overflow is signalled on bit 40002.8
40004	TOTAL 2	16 bit totalizer of input 2 . The overflow is signalled on bit 40002.9
40005	TOTAL 3	16 bit totalizer of input 3 . The overflow is signalled on bit 40002.10
40006	TOTAL 4	16 bit totalizer of input 4 . The overflow is signalled on bit 40002.11
40007	TOTAL 5	16 bit totalizer of input 5 . The overflow is signalled on bit 40002.12
40008 40072	FILTER 1..254	Filter time (L) valid for all inputs (with the exception of input 5 if fast input is set. See below at bit 40009.7). This value can be a value of from 1 to 254 corresponding to a filter of from 1 to 254 ms.
40008 40072	FILTER 1..254	<ul style="list-style-type: none"> • Bit 40009.0 (*) inverts (if =1) / or does not invert (if = 0) the reading of the inputs. If inversion is activated, when the input is read we will have '1' with input open and '0' with input closed. • Bit 40009.1 (*) sets the backward counting of the total counters; when set to 1, the respective counter is decreased by every input pulse received. • Bit 40009.2 (*) sets the latency time between the signal and the Modbus response. If bit =0, there will be a delay of 5 ms, if bit =1, there will be a delay of 12 ms. • Bit 40009.3 sets the utilisation of the parity in the data transmission: 0 = no parity 1 = active parity. • Bit 40009.4 sets the type of parity : 0 = even , 1 = odd • Bit 40009.5 is not used • Bit 40009.6 is not used <p style="text-align: right;">-></p>

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 related dip-sw on the module to ON, or by fitting a resistance of 120 ohm parallel to the line. 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.

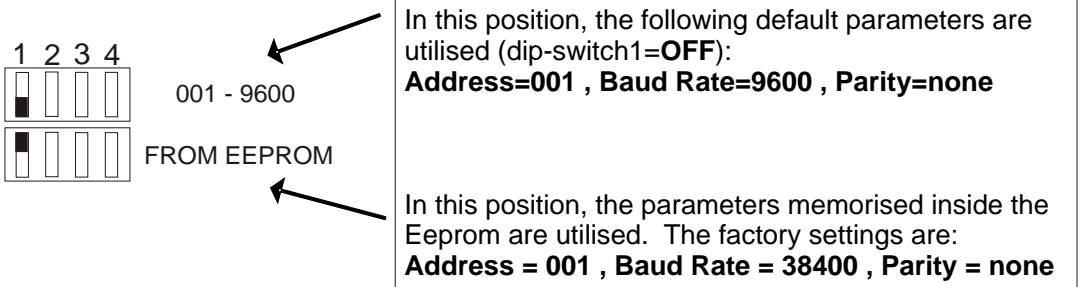


OK

SETTING THE DIP-SWITCHES

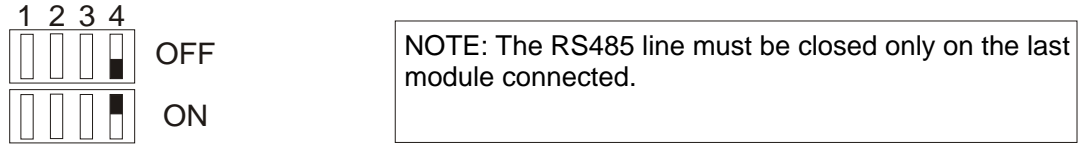
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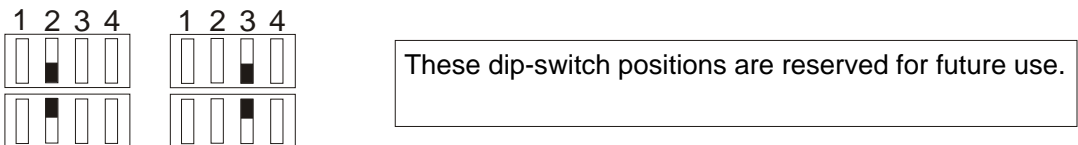


When reprogramming the module (when address and speed are not known, for example) it is possible to use the default position that sets the fixed parameters visible in the box.
 NOTE: At the end of programming, the dip-switch1 must be set to **ON** and the module re-set

RS485 line closure setting:



Reserved position:



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

Command Code	Description
3 - Read Holding Register	Permits the reading of the RAM and EEPROM registers up to a maximum of 9 per time.
6 - Preset Single Register	Permits the writing of the RAM and EEPROM registers singularly.
16 - Preset Multiple Register	Permits the writing of the RAM registers up to a maximum of 3 registers per time. NOTE: with this function it is NOT possible to write in EEPROM (registers 40072,40073,40074); to perform writing bit 40011.1 must be used (see the description in the table below)

The following table lists and describes the Holding Registers present in the module. The original copy for many registers exists in EEPROM (permanent memory); the address of this copy is given by the number of the register increased by 64. The EEPROM address (whenever present) for each address is indicated in the table below. 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.

Address	INITIALS / Permitted values	Function
40001	MTYPE, VERS 0102	Contains the type (H) and number of the version (L) of the module. For the Z-D-IN module we will have: type=1, version=2. The value read is therefore equal to 0x0102=258. 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.