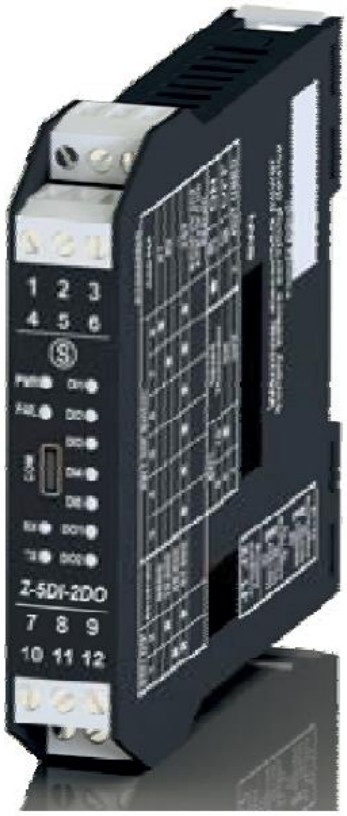
USER MANUAL

Z-5DI2-DO

5 DIGITAL INPUT/COUNTERS AND 2 DIGITAL RELAYS OUTPUT WITH USB / RS485 PORT AND MODBUS RTU PROTOCOL



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SENECA S.r.l.
Via Austria 26 – 35127 – Z.I. - PADOVA (PD) - ITALY
Tel. +39.049.8705355 – 8705355 Fax +39 049.8706287
www.seneca.it

ORIGINAL INSTRUCTIONS

Introduction

The content of the present documentation refers to products and technologies described in it.
All technical data contained in the document may be modified without prior notice.
The content of this documentation is subject to periodical revision.
To use the product safely and effectively, read carefully the following instructions before use.
The product must be used only for the use for which it was designed and built: any other use must be considered with the user's full responsibility.
The installation, programming and set-up is allowed only to authorized operators, physically and intellectually suitable.
Set up shall be performed only after a correct installation and the user shall perform every operation described in the installation manual carefully.
Seneca is not considered liable for any failure, breakdown, accident caused because of ignorance or failure to apply the indicated requirements.
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CONTACT US	
Technical support	supporto@seneca.it
Product information	commerciale@seneca.it

Document revisions

DATE	REVISION	NOTES
11/05/2018	1.0.0.0	First Release
14/12/2018	1.0.0.1	Connection Images Fix Minor Fix

TABLE OF CONTENTS

1. DEVICE DESCRIPTION AND INTENDED USE

⚠ WARNING!

This User Manual extends the information about the device configuration in the Installation Manual. Use the Installation Manual for more info.

⚠ WARNING!

Under no circumstances, SENECA s.r.l. or its suppliers shall be responsible for loss of recording data/income or for consequential or incidental damage due to neglect or reckless mishandling of the device, even though SENECA is well aware of these possible damages.
SENECA, its subsidiaries, affiliates, companies of the group, suppliers and retailers shall not guarantee that the functions will satisfy completely customer's expectations or that the device, firmware and software shall have no errors or work continuously.

1.1. Description

The Z-5DI-2DO module acquires 5 single-ended digital signals, then converts them to a digital format (IN 1-5 state). No. 2 Relay Outputs are also available and can be written from the Modbus RTU Protocol.
The supported communication protocol is Modbus RTU.
The following counters are available:
5 32-bit counters in non-volatile memory (Fe-RAM memory for infinite writing)
5 Frequency/Ton/Toff/Period
An RS485 port with a standard Modbus RTU protocol is also available.

1.2. Features

- No. 5 opto-insulation digital inputs with a common contact. Internal or external, NPN (sink) or PNP (source) selectable by software.
- Insulation of the 1500 Vac inputs complying the remaining low voltage circuits.
- No. 2 SPST relay outputs with common contact, capacity of 2 AAC1 250 Vac.
- 3 kVac insulation between the outputs and the remaining low voltage circuits.
- Inputs with 32-bit totalizers, max frequency 5 KHz.
- Measurement of the period, frequency, TON, TOFF. Max frequency 5KHz.
- Possibility to set the totalizers to count forward or backward
- All the totalizers are saved in a non-volatile memory (Fe-RAM).
- RS485 and USB serial communication with Modbus-RTU protocol, RS485 with 64 nodes maximum (without repeater). Configurable also via dip-switch.
- Communication times shorter than 10 ms (@ 38400 Baud).
- Connection distance up to 1200 m.
- Facilitated wiring of power supply and serial connection by means of a bus which can be housed in the DIN guide.
- Module can be fitted on and removed from bus without interrupting communication or power supply to the system.
- Input Counters IN1-IN5 can be filtered
- Free Easy Setup software for configuration
- Baud rate for Modbus RTU: from 2400 baud up to 115200 baud
- Quick installation on DIN 46277 rail

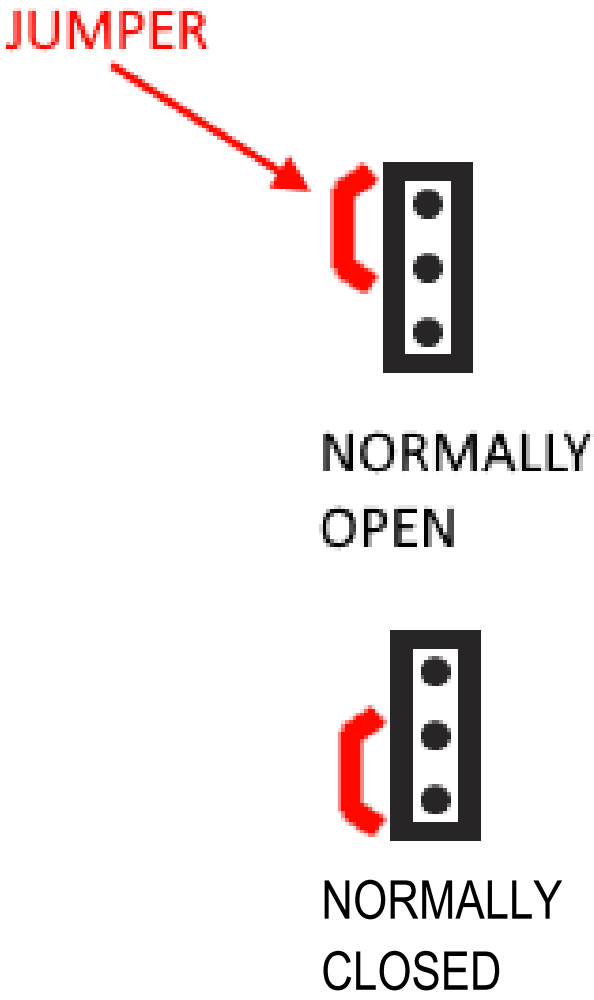
Refer to the installation manual for more information.

2. OUTPUT CONFIGURATION

2.1. Configure Outputs as NO or NC

To configure the outputs as Normally Open or Normally Closed mode use the J1, J2 jampers:

J1 controls Output1 and J2 Output2, to obtain a NO / NC configuration the jamper must be connected this way:



3. DIP SWITCH CONFIGURATION (SW1)

The dip switches can be used to configure the Baud Rate and the Modbus Station Address.
DIP 1 and 2 are used for the RS485 port baud rate
DIP 3 to 8 are used for the RS485 port ModBus station address
DIP 9 is not used
DIP 10 is used to insert an R-C terminal in the RS485 port

3.1. Loading configuration for RS485 port from flash

If ALL Dip Switches 1…8 are OFF, the device uses the Flash configuration (you must use the Easy Setup Software to configure the Modbus parameters)

Load RS485 port Configuration	*DIP1*	*DIP2*	*DIP3*	*DIP4*	*DIP5*	*DIP6*	*DIP7*	*DIP8*
FROM FLASH	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

⚠ WARNING!
Dip switch configuration is active only after a reboot!

⚠ WARNING!
The Dip Switch setting will overwrite the Flash setting so, if you need to use the flash configuration you MUST set ALL dip switches to "OFF".

3.2. Setting the RS485 Port Baud rate

Dip Switch 1 and 2 are used for setting the Baud Rate

Baud Rate	*DIP1*	*DIP2*
9600	OFF	OFF
19200	OFF	ON
38400	ON	OFF
57600	ON	ON

⚠ WARNING!

The Parity bit and the Stop bits cannot be configured with the dip switch configuration but only using the Easy Setup software. By setting the dip switches the parity is always set to "None" and the Stop Bits to 1: (8,N,1).

3.3. Setting the RS485 Port Modbus Station Address

Dip Switch 3 to 8 are used to configure the RS485 Port Station Address using the binary convention:

Modbus Station Address	*DIP3*	*DIP4*	*DIP5*	*DIP6*	*DIP7*	*DIP8*
1	OFF	OFF	OFF	OFF	OFF	ON
2	OFF	OFF	OFF	OFF	ON	OFF
3	OFF	OFF	OFF	OFF	ON	ON
4	OFF	OFF	OFF	ON	OFF	OFF
5	OFF	OFF	OFF	ON	OFF	ON
6	OFF	OFF	OFF	ON	ON	OFF
7	OFF	OFF	OFF	ON	ON	ON
8	OFF	OFF	ON	OFF	OFF	OFF
9	OFF	OFF	ON	OFF	OFF	ON
10	OFF	OFF	ON	OFF	ON	OFF
11	OFF	OFF	ON	OFF	ON	ON
12	OFF	OFF	ON	ON	OFF	OFF
13	OFF	OFF	ON	ON	OFF	ON
14	OFF	OFF	ON	ON	ON	OFF
15	OFF	OFF	ON	ON	ON	ON
…	…	…	…	…	…	…
63	ON	ON	ON	ON	ON	ON

3.4. Setting the RS485 TERMINATOR

The dip switch 10 activates the R-C Terminator:

Terminator	*DIP9*	*DIP10*
OFF	Not Used	OFF
ON	Not Used	ON

4. USB PORT

The USB port uses the following fixed configuration:

Protocol: Modbus RTU Slave
Modbus Station Address: 1
Baud rate: 38400 baud
Data Bit: 8
Parity: None
Stop Bits: 1

⚠ WARNING!
The USB Port configuration is fixed and is not affected by dip switches or flash configuration

⚠ WARNING!
When the USB port is connected the RS485 Port is deactivated.
When the USB Port is disconnected the RS485 Port is activated.
Therefore it is not possible to use the RS485 Port simultaneously with the USB Port

4.1. USB Virtual COM Port Drivers

The Windows Drivers is included in the Easy Setup, drivers for others operating systems can be downloaded from:

http://www.ftdichip.com/Drivers/VCP.htm

5. MODBUS RTU PROTOCOL

The Modbus protocol supported by the Z-5DI-2DO by RS485 and USB ports is:

- Modbus RTU Slave

For more information about this protocol, please refer to the Modbus specification website:

http://www.modbus.org/specs.php.

5.1. Supported Modbus RTU function code

The following Modbus RTU functions are supported:

- Read Holding Register (function code 3) Max 28 Registers
- Write Single Register (function code 6)
- Write Multiple registers (function code 16) Max 10 Registers
- Read Coil Registers (function code 1) Max 7 Registers
- Write Single Coil (function code 5)
- Read Inputs (function code 2) Max 7 Registers

⚠ WARNING!
All 32 bit values are stored into 2 consecutive registers

⚠ WARNING!
You can read a maximum of 28 Modbus Registers with the Read Holding Register function (function code 3)

⚠ WARNING!
You can write a maximum of 10 Modbus Registers with the Write Multiple Register function (function code 16)

6. MODBUS REGISTERS TABLE

In the following table these abbreviations are used:

MS = Most significant
LS = Less significant
MSW = Most significant word (16 bits)
LSW = Least significant word (16 bits)
R = Read only register
RW = Read and writeable register
RW* = Read and writeable register, the value can be stored in flash by using the store flash command
Unsigned 16 bits = Unsigned 16-bit register (from 0 to 65535)
Signed 16 bits = 16-bit register with sign (from -32768 to +32767)
Float 32 bits = Floating point single precision 32-bit (IEEE 754) register
0x = Hexadecimal Value

6.1. Bit Position Convention in the Holding Registers:

One Holding Register consists of 16 bits with the following convention:

BIT 15	BIT 14	BIT 13	BIT 12	BIT 11	BIT 10	BIT 9	BIT 8	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0

For example, if the register value in decimal is
12300
the 12300 value in hexadecimal is:
0x300C
the 0x300C hexadecimal in binary value is:
0011 0000 0000 1100
So, using the Bit convention we obtain:

BIT 15	BIT 14	BIT 13	BIT 12	BIT 11	BIT 10	BIT 9	BIT 8	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
0	0	1	1	0	0	0	0	0	0	0	0	1	1	0	0

6.2. Modbus Holding Registers Addresses (function code 3):

Register Name	Comment	Register Type	R/W	Default value or Start Value	Modbus Address	Register Offset
Machine ID	Module ID code	Unsigned 16 bits	R	-	40001	0
Firmware Revision	Firmware Revision Code	Unsigned 16 bits	R	-	40002	1
AUX 4	Parameter register for Command	Unsigned 16 bits	R/W	-	40003	2
AUX 3	Parameter register for Command	Unsigned 16 bits	R/W	-	40004	3
AUX 2	Parameter register for Command	Unsigned 16 bits	R/W	-	40005	4
AUX 1	Parameter register for Command	Unsigned 16 bits	R/W	-	40006	5
Command	This register is used for sending commands to the device. The following commands are supported: 49600 Store configuration in Flash 49568 Reset the Module 49601 Load Default parameters After the command is executed the register will return to 0 value	Unsigned 16 bits	R/W	0	40007	6
Fail Config	Bit 0 = 0 Outputs Fail Control Disabled Bit 0 = 1 Outputs Fail Control Enabled Bit 1 = Output1 value in fail (0 = not energized, 1 = energized) Bit 2 = Output2 value in fail (0 = not energized, 1 = energized) Bit 3 .. Bit 15 Not used	Unsigned 16 bits	R/W*	0	40008	7

Fail Delay [seconds]	Number of seconds after that, if there is no Modbus communication, the outputs go in fail mode. From 1 to 250 seconds	Unsigned 16 bits	R/W*	30	40009	8
Serial/Din Config	Bit 0..Bit 5 Not used Bit 6 = 0 Parity Disabled Bit 6 = 1 Parity Enabled Bit 7 = 0 Parity Odd Bit 7 = 1 Parity Even Bit 8 = 0 1 Stop Bit Bit 8 = 1 2 Stop Bit Bit 9…Bit 14 Not Used Bit 15 = 0 Din in PNP (Source) mode Bit 15 = 1 Din in NPN (Sink) mode	Unsigned 16 bits	R/W*	0	40010	9
Modbus Station Address	Modbus RTU station address	Unsigned 16 bits	RW*	1	40011	10
Baud Rate	RS485 Port Baud rate 0 = 4800 baud 1 = 9600 baud 2 = 19200 baud 3 = 38400 baud 4 = 57600 baud 5 = 115200 baud 6 = 2400 baud	Unsigned 16 bits	RW*	3	40012	11
Counters/Measures Filter [ms*10]	Filter to be used for Counters / Period / Frequency / TON / TOFF cutoff frequency [Hz] =10000/Filter Value For example: 200 means: Freq cut= 10000/200 = 50 Hz Values from 0 (filter Disabled) to 250	Unsigned 16 bits	RW*	0	40013	12
Up/Down Counter	Bit 0 = 0 Counter 1 in upcounter mode Bit 0 = 1 Counter 1 in downcounter mode Bit 1 = 0 Counter 2 in upcounter mode Bit 1 = 1 Counter 2 in downcounter mode Bit 2 = 0 Counter 3 in upcounter mode	Unsigned 16 bits	RW*	0	40014	13

	Bit 2 = 1 Counter 3 in downcounter mode Bit 3 = 0 Counter 4 in upcounter mode Bit 3 = 1 Counter 4 in downcounter mode Bit 4 = 0 Counter 5 in upcounter mode Bit 4 = 1 Counter 5 in downcounter mode					
Inputs Value / Output Fail	Bit 0 = 0 input 1 Low Bit 0 = 1 input 1 High Bit 1 = 0 input 2 Low Bit 1 = 1 input 2 High Bit 2 = 0 input 3 Low Bit 2 = 1 input 3 High Bit 3 = 0 input 4 Low Bit 3 = 1 input 4 High Bit 4 = 0 input 5 Low Bit 4 = 1 input 5 High Bit 5..6 Not Used Bit 7 = 0 Outputs Status OK Bit 7 = 0 Outputs Status FAIL	Unsigned 16 bits	R	0	40015	14
Outputs Value	Bit 0 = 0 Output Relay 1 not energized Bit 0 = 1 Output Relay 1 energized Bit 1 = 0 Output Relay 2 not energized Bit 1 = 1 Output Relay 2 energized	Unsigned 16 bits	R/W	0	40016	15
Counter 1 Value	Input 1 Counter Value	Unsigned 32 bits	R/W (Backupped in FeRAM memory)	0	40101 MSW 40102 LSW	100 MSW 101 LSW
Counter 2 Value	Input 2 Counter Value	Unsigned 32 bits	R/W (Backupped in FeRAM memory)	0	40103 MSW 40104 LSW	102 MSW 103 LSW
Counter 3 Value	Input 3 Counter Value	Unsigned 32 bits	R/W (Backupped in FeRAM memory)	0	40105 MSW 40106 LSW	104 MSW 105 LSW

Counter 4 Value	Input 4 Counter Value	Unsigned 32 bits	R/W (Backupped in FeRAM memory)	0	40107 MSW 40108 LSW	106 MSW 107 LSW
Counter 5 Value	Input 5 Counter Value	Unsigned 32 bits	R/W (Backupped in FeRAM memory)	0	40109 MSW 40110 LSW	108 MSW 109 LSW
Period 1	Input 1 Period [x100us] (for example 10 = 1ms) From firmware version 1.0.1.2: Input 1 Period [x1ms]	Unsigned 16 bits	R	0	40121	120
Period 2	Input 2 Period [x100 us] (for example 10 = 1ms) From firmware version 1.0.1.2: Input 2 Period [x1ms]	Unsigned 16 bits	R	0	40122	121
Period 3	Input 3 Period [x100us] (for example 10 = 1ms) From firmware version 1.0.1.2: Input 3 Period [x100us]	Unsigned 16 bits	R	0	40123	122
Period 4	Input 4 Period [x100 us] (for example 10 = 1ms) From firmware version 1.0.1.2: Input 4 Period [x1ms]	Unsigned 16 bits	R	0	40124	123
Period 5	Input 5 Period [x100 us] (for example 10 = 1ms) From firmware version 1.0.1.2: Input 5 Period [x1ms]	Unsigned 16 bits	R	0	40125	124
Frequency 1	Input 1 Frequency [Hz]	Unsigned 16 bits	R	0	40131	130
Frequency 2	Input 2 Frequency [Hz]	Unsigned 16 bits	R	0	40132	131
Frequency 3	Input 3 Frequency [Hz]	Unsigned 16 bits	R	0	40133	132
Frequency 4	Input 4 Frequency [Hz]	Unsigned 16 bits	R	0	40134	133
Frequency 5	Input 5 Frequency [Hz]	Unsigned 16 bits	R	0	40135	134
T high 1	Input 1 Ton [x100 us] (for example 10 = 1ms) From firmware version 1.0.1.2: Input 1 Ton [x1ms]	Unsigned 16 bits	R	0	40141	140
T high 2	Input 2 Ton [x100 us] (for example 10 = 1ms)	Unsigned 16 bits	R	0	40142	141

	From firmware version 1.0.1.2: Input 2 Ton [x1ms]					
T high 3	Input 3 Ton [x100 us] (for example 10 = 1ms) From firmware version 1.0.1.2: Input 3 Ton [x1ms]	Unsigned 16 bits	R	0	40143	142
T high 4	Input 4 Ton [x100 us] (for example 10 = 1ms) From firmware version 1.0.1.2: Input 4 Ton [x1ms]	Unsigned 16 bits	R	0	40144	143
T high 5	Input 5 Ton [x100 us] (for example 10 = 1ms) From firmware version 1.0.1.2: Input 5 Ton [x1ms]	Unsigned 16 bits	R	0	40145	144
T low 1	Input 1 Toff [x100 us] (for example 10 = 1ms) From firmware version 1.0.1.2: Input 1 Toff [x1ms]	Unsigned 16 bits	R	0	40151	150
T low 2	Input 2 Toff [x100 us] (for example 10 = 1ms) From firmware version 1.0.1.2: Input 2 Toff [x1ms]	Unsigned 16 bits	R	0	40152	151
T low 3	Input 3 Toff [x100 us] (for example 10 = 1ms) From firmware version 1.0.1.2: Input 3 Toff [x1ms]	Unsigned 16 bits	R	0	40153	152
T low 4	Input 4 Toff [x100 us] (for example 10 = 1ms) From firmware version 1.0.1.2: Input 4 Toff [x1ms]	Unsigned 16 bits	R	0	40154	153
T low 5	Input 5 Toff [x100 us] (for example 10 = 1ms) From firmware version 1.0.1.2: Input 5 Toff [x1ms]	Unsigned 16 bits	R	0	40155	154

6.3. Modbus Coil Registers Addresses (function code 1):

Register Name	Comment	Register Type	R/W	Default value or Start Value	Modbus Address	Register Offset
Input 1	Input 1 Value	Bit	R	0	1	0
Input 2	Input 2 Value	Bit	R	0	2	1
Input 3	Input 3 Value	Bit	R	0	3	2
Input 4	Input 4 Value	Bit	R	0	4	3
Input 5	Input 5 Value	Bit	R	0	5	4
Output 1	Output 1 Value	Bit	R/W	0	6	5
Output 2	Output 2 Value	Bit	R/W	0	7	6

6.4. Modbus Input Registers (read only) Addresses (function code 2):

Register Name	Comment	Register Type	R/W	Default value or Start Value	Modbus Address	Register Offset
Input 1	Input 1 Value	Bit	R	0	10001	0
Input 2	Input 2 Value	Bit	R	0	10002	1
Input 3	Input 3 Value	Bit	R	0	10003	2
Input 4	Input 4 Value	Bit	R	0	10004	3
Input 5	Input 5 Value	Bit	R	0	10005	4
Output 1	Output 1 Value	Bit	R	0	10006	5
Output 2	Output 2 Value	Bit	R	0	10007	6