D1-40A-I six current inputs acquisition module

User's guide

D1-40A-I six current inputs acquisition module
User's guide
Version: 11 February 2003

SIELCO ELETTRONICA srl
via EDISON 209 20019 SETTIMO MILANESE (MI) – Italy
http://www.sielcoelettronica.com

Contents

1 Installation

1.1 Packaging check

Before starting installation, it is necessary to check that the packaging contents is in compliance with your order. In the packaging there must be:

- # 1 D1-40A-I series module
- # 1 instruction manual

Check that the model code is in compliance with the ordered code and verify that the manual edition correspond to the purchase year.

D1-40 module provides 6 0-20mA or 4–20mA current inputs with the following features:

-	Resolution:	16 bit
-	Precision:	± 0,05% full scale
	Input impedance	246 Ω

D1 series modules are covered by 1 year of warranty except for damages caused by tampering or wrong wiring.

The label on the modules backside certificates the purchase date.

1.2 Dimensions

The D1-40A-I modules dimensions are shown in figure 1.1.

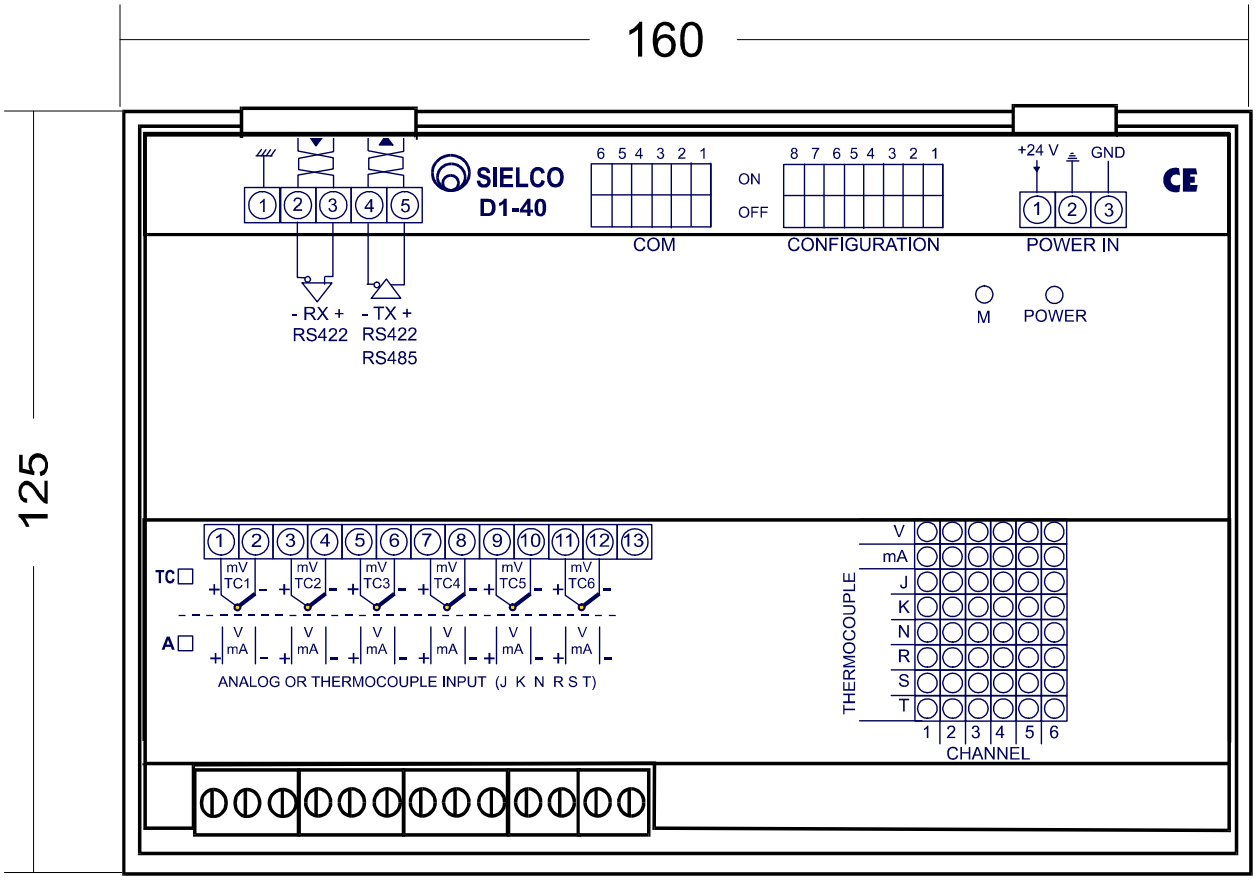

Figure 1.1 - D1-40A-I module dimensions

1.3 Fixing method

All D1 series products are provided by a plastic support for fixing on normalized DIN EN rail and by a shielding serigraphed cover.

On the cover there are schematic mounting indications; in grey areas are shown the interface circuits that are inside the module, in yellow areas common use sensors and actuators to be connected externally.

The cover serigraph provides only a general wiring diagram and cannot show every possible connection cases; for this reason it is necessary to read carefully this manual before starting module installation.

Do not use excessive pressure on the cover, mounting or dismounting the module on the rail. Remember to do these operations with supply voltage switched off or not connected.

1.4 Physical module description

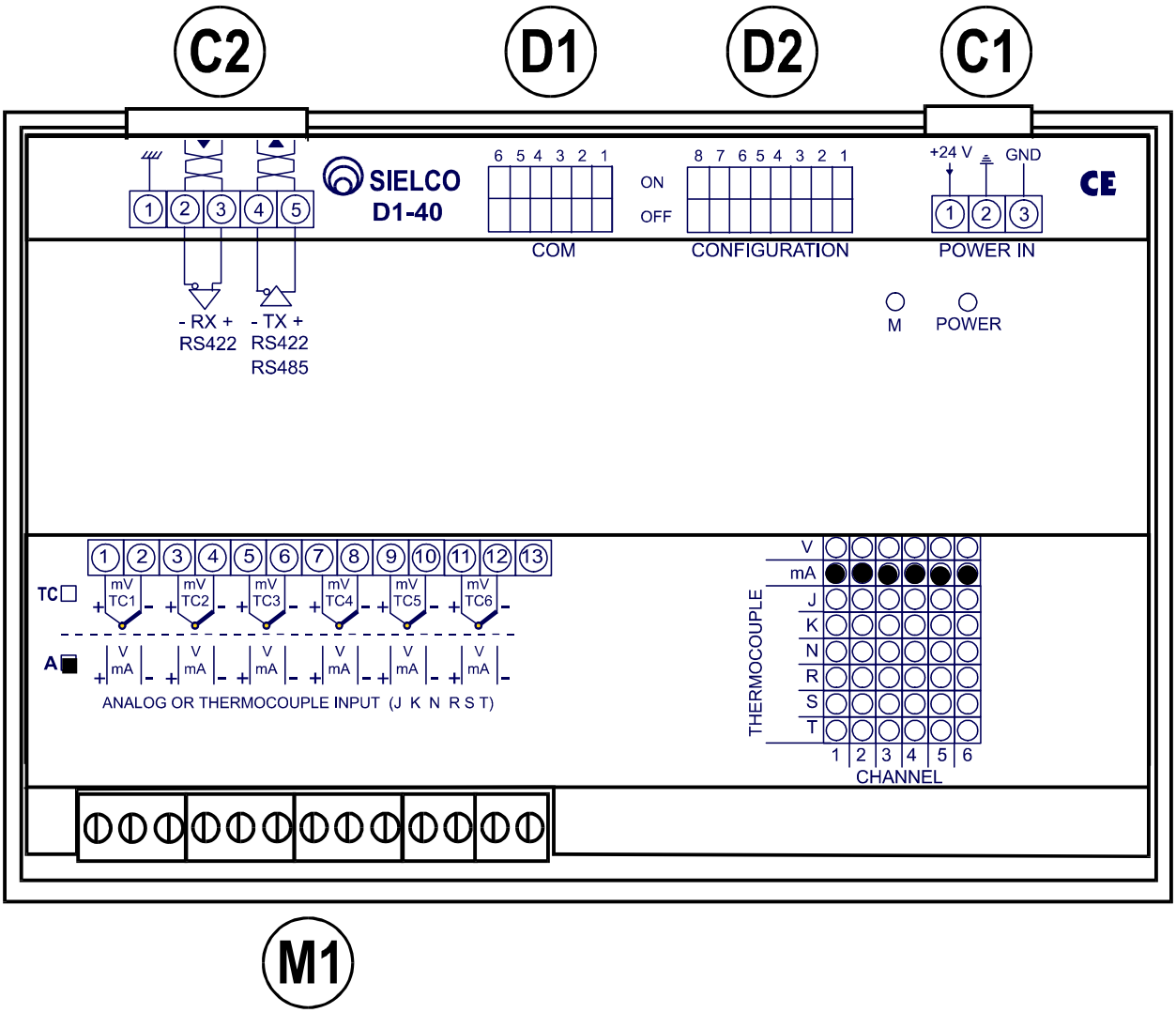

Figure 1.2 - D1-40 scheme

	Description
[C1]	+24 Vdc supply connector
[C2]	RS422/485 serial channel connector
[M1]	Input screws
[D1]	RS422 or RS485 line selection dipswitch
[D2]	Protocol and device address selection dipswitch
Power	Supply led
Led M	Selftest led (normally blinking)
Led TX	Transmitted data led
Led RX	Received data led

[M1] - Inputs screws

CURRENT INPUTS			
1	Channel 1 positive	**7**	Channel 4 positive
2	Channel 1 negative	**8**	Channel 4 negative
3	Channel 2 positive	**9**	Channel 5 positive
4	Channel 2 negative	**10**	Channel 5 negative
5	Channel 3 positive	**11**	Channel 6 positive
6	Channel 3 negative	**12**	Channel 6 negative

[C1] - +24 Vdc supply connector

	POWER
1	+24 Vdc
2	FIELD GND
3	MECH. GND

[C2] - RS422/485 serial channel connector

	RS422		**RS485**
1	SERIAL GND	1	SERIAL GND
2	RX–	2	N.C.
3	RX+	3	N.C.
4	TX–	4	TX–/RX–
5	TX+	5	TX+/RX+

1.5 Supply

The D1-40A-I module needs a 24 Vdc (9V < Vdc < 36V) supply [C1] connector and absorb a maximum current Icc=100 mA at 24 Vdc.

The negative power supply must be connected to pin #2 [C1 connector].

After power is turned on, check that Power led is on.

1.6 Analog inputs

D1-40 module provides 6 input for 0-20mA or 4-20mA current signals ([M1] screws). To mantain input optical insulation, sensor supply must be separate. Connect “positive” and “negative” sensors wires respectively to

"positive" and "negative" module screws (respectively #1 and #2 for first input) see figure 1.2.

1.7 Serial communication

1.7.1 Serial link

To connect to D1 modules, it is necessary to use a RS422/485 serial interface that usually are not standard equipment in personal computers.

SIELCO produces C1-25 model, a RS232-RS422/485 serial interface converter with triple optical isolation that can be connected to PC serial port (COM) and to D1-40A-I [C2] connector as shown in table 1.1.

	C1-25		***D1-40A-I***		
#	**RS-422**		**RS-422**	**#**	
1	GND	⟷	SERIAL GND	1	C2
2	RX–	⟷	TX–	4	C2
3	RX+	⟷	TX+	5	C2
4	TX–	⟷	RX–	2	C2
5	TX+	⟷	RX+	3	C2
6	0 V				
7	+24 V				

	C1-25		***D1-40A-I***		
#	**RS-485**		**RS-485**	**#**	
1	GND	⟷	SERIAL GND	1	C2
2	n.c.		n.c.	2	C2
3	n.c.		n.c.	3	C2
4	TX–/RX–	⟷	TX–/RX–	4	C2
5	TX+/RX+	⟷	TX+/RX+	5	C2
6	0 V				
7	+24 V				

Table 1.1 - C1-25 - D1-40A-I (RS 422/485) wiring

D1-40A-I serial communication must be set in RS422 or RS485 mode using [D1] dipswitch (table 1.2).

RS422

	6	5	4	3	2	1
ON		■				
OFF	■		■	■	■	■

RS485

	6	5	4	3	2	1
ON	■					
OFF		■	■	■	■	■

Table 1.2 - Line type (RS422/RS485) configuration using dipswitch [D1]

WARNING! Configurations in which both selectors #5 and #6 are simultaneously ON or OFF, are not permitted.

Selector from #1 to #4 are reserved and they must be kept in OFF position.

1.7.2 Communication protocol

Software communication protocol is realised according to Modbus ASCII or RTU standard: protocol selection is made by #7 selector of dipswitch [D2] (ON=RTU, OFF=ASCII).

The baudrate selection is made by #8 selector of dipswitch [D2] (ON=19200, OFF=9600).

ASCII protocol features

Baud rate	9600 / 19200
Data bits	7
Parity bit	even
Stop bit	1

RTU protocol features

Baud rate	9600 / 19200
Data bits	8
Parity bit	none
Stop bit	1

1.7.3 Device identification

To D1-40A-I module can be assigned an identification address between 1 and 63 through binary notation, using selector from 1 to 6 of dipswitch [D2] (see table 1.3).

			ADDRESS					
	8	**7**	**6**	**5**	**4**	**3**	**2**	**1**
	BAUD	*PROT.*	2^5	2^4	2^3	2^2	2^1	2^0
ON	19200	RTU						
OFF	9600	ASCII						

Table1.3 - Address configuration using [D2] dipswitch

NOTE
Address 0 is reserved.

1.7.4 Serial cable

Use shielded cable with one (RS-485) or two (RS-422) twisted pair in compliance with EIA RS-485 or EIA RS-422; using the shield for ground.

Recommended cable: *Belden 9841 (RS-485)*; *9842 (RS-422)*
Maximum signal loss: *6 dB*
Maximum line capacitance: *100 nf*
Maximum line length: *1200 m*
Line impedance: *tra 100 e 120 ohm*

1.8 Earth wiring and shielding

1.8.1 Earth wiring

It is suggested to make the following earth:

- device mechanical ground (connector [C1] pin #3) goes directly to earth;

- the power supply negative signal (connector [C1] pin #2) must be connected to a local earth;

- in case of long or disturbed serial lines, connect serial ground (connector [C2] pin #1) to earth by a 100 Ω resistance.

It is important that device grounds are connected to earth independently; it is also important to avoid to share the same wire path with power devices as inverter, drives etc.

1.8.2 Inputs shielding

To improve the sensors reading particularly in environment noise affected by power devices (motor driver, power contact etc.), follow these shielding rules:

- use shielded and twisted cables for sensors connection;
- keep connection cables as short as possible;
- it is a good thing to avoid to share the same wire path with power devices as inverter, drives etc.;
- connect all sensor cable metal shields to the controller negative screw leaving them non connected by the sensor side (parasite currents on the shields can induce disturbances that can affect sensor reading);
- connect all sensor cable metal shields to connector C1 pin #3.

2 Operation

2.1 Application

D1-40A-I module is provided with 6 input channels for current analog signals acquisition.

Analog current signals range are between 0 and 20 mA. The acquired value is recorded on a range from 0 to 65000 and is converted in a linear scale between zeroscale value and fullscale value. To obtain a milliampere unit value, set zeroscale value at 0 and fullscale value at 20330, dividing for 1000 the read value. To obtain a percentual value, set zeroscale value at 0 and fullscalevalue at 1016, dividing the read value for 10. Use this formula to obtain a generic engeneering value:

$$Fullscalevalue = fullscalevalue(20mA) \cdot \frac{20.330mA}{20.000mA}$$

The gate «sensor type» defines the sensor type connected to each input:

0	none
2	0-20mA sensor

In case of sensor type «none», a fixed zero value is shown.

The gate «reading options» define inputs reading options.

Bit 0 = 1 Active 8 samples filter

"Restart number" gate is only for diagnostic use and gives an indication of the electrical disturbances presence.

A Gates list

A.1 Numeric gates (Holding Registers)

ADDRESS	DESCRIPTION	UNIT	BYTE	MIN	MAX	FORMAT	READ ONLY
000	Device - Identification “D1”		2	0	0	SS	•
001	Device - Identification “40”	#	2	0	0	nnn	•
002	Device - firmware version	#	2	0	65535	nnn.nn	•
005	Reset counter	#	1	0	255	nnn	
006	Loop 1 – Sensor type	bit	1	0	199	xbbbxxbb	
007	Loop 2 – Sensor type	bit	1	0	199	xbbbxxbb	
008	Loop 3 – Sensor type	bit	1	0	199	xbbbxxbb	
009	Loop 4 – Sensor type	bit	1	0	199	xbbbxxbb	
010	Loop 5 – Sensor type	bit	1	0	199	xbbbxxbb	
011	Loop 6 – Sensor type	bit	1	0	199	xbbbxxbb	
012	Loop 1 – Read options	bit	1	0	1	xxxxxxxb	
013	Loop 2 –	bit	1	0	1	xxxxxxxb	
014	Loop 3 –	bit	1	0	1	xxxxxxxb	
015	Loop 4 –	bit	1	0	1	xxxxxxxb	
016	Loop 5 –	bit	1	0	1	xxxxxxxb	
017	Loop 6 –	bit	1	0	1	xxxxxxxb	
024	Ramp offset binary	#	2	0	65535	nnnnn	•
025	Voltage sample binary	#	2	0	65535	nnnnn	•
026	Voltage sample binary	#	2	0	65535	nnnnn	•
027	Voltage sample binary	#	2	0	65535	nnnnn	•

028	Loop 1 – Value		2	-30000	+30000	±nnnnn	•
029	Loop 2 – Value		2	-30000	+30000	±nnnnn	•
030	Loop 3 – Value		2	-30000	+30000	±nnnnn	•
031	Loop 4 – Value		2	-30000	+30000	±nnnnn	•
032	Loop 5 – Value		2	-30000	+30000	±nnnnn	•
033	Loop 6 – Value		2	-30000	+30000	±nnnnn	•
034	Loop 1 – Value at zero scale		2	-30000	+30000	±nnnnn	
035	Loop 2 –		2	-30000	+30000	±nnnnn	
036	Loop 3 –		2	-30000	+30000	±nnnnn	
037	Loop 4 –		2	-30000	+30000	±nnnnn	
038	Loop 5 –		2	-30000	+30000	±nnnnn	
039	Loop 6 –		2	-30000	+30000	±nnnnn	
040	Loop 1 – Value at fullscale		2	-30000	+30000	±nnnnn	
041	Loop 2 – Value		2	-30000	+30000	±nnnnn	
042	Loop 3 – Value		2	-30000	+30000	±nnnnn	
043	Loop 4 – Value		2	-30000	+30000	±nnnnn	
044	Loop 5 – Value		2	-30000	+30000	±nnnnn	
045	Loop 6 – Value		2	-30000	+30000	±nnnnn	