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# **D1-15A analog module**

**User's guide**

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***Sielco Elettronica S.r.l.***  
*via Edison 209 20019 Settimo Milanese (MI) – Italia*  
<http://www.sielcoelettronica.com>  
[info@sielcoelettronica.com](mailto:info@sielcoelettronica.com)

Tel.+39 ( 0 )2 48916252  
Fax +39( 0) 2 45329627

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# 1 Installation

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## 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 D1-15A 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.

The models are:

**D1-15A** 6 voltage sensors (from 0 to 10 V) or current sensors (from 0 to 20 mA), individually selectable by jumpers

Analog inputs have the following features:

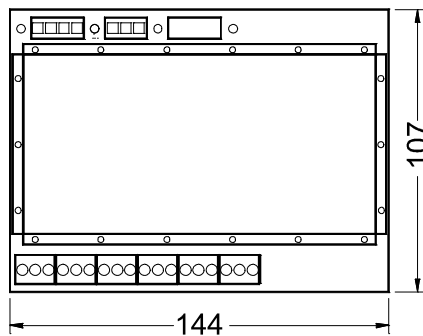
- Precision :  $\pm 0,05$  % full scale
- Resolution : 15 bit
- Input impedance (0-20mA): 20 ohm

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 certifies the purchase date.

## 1.2 Dimensions

The D1-15A modules dimensions are shown in figure 1.1.



*Figure 1.1 - D1-15A module dimensions*

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## 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

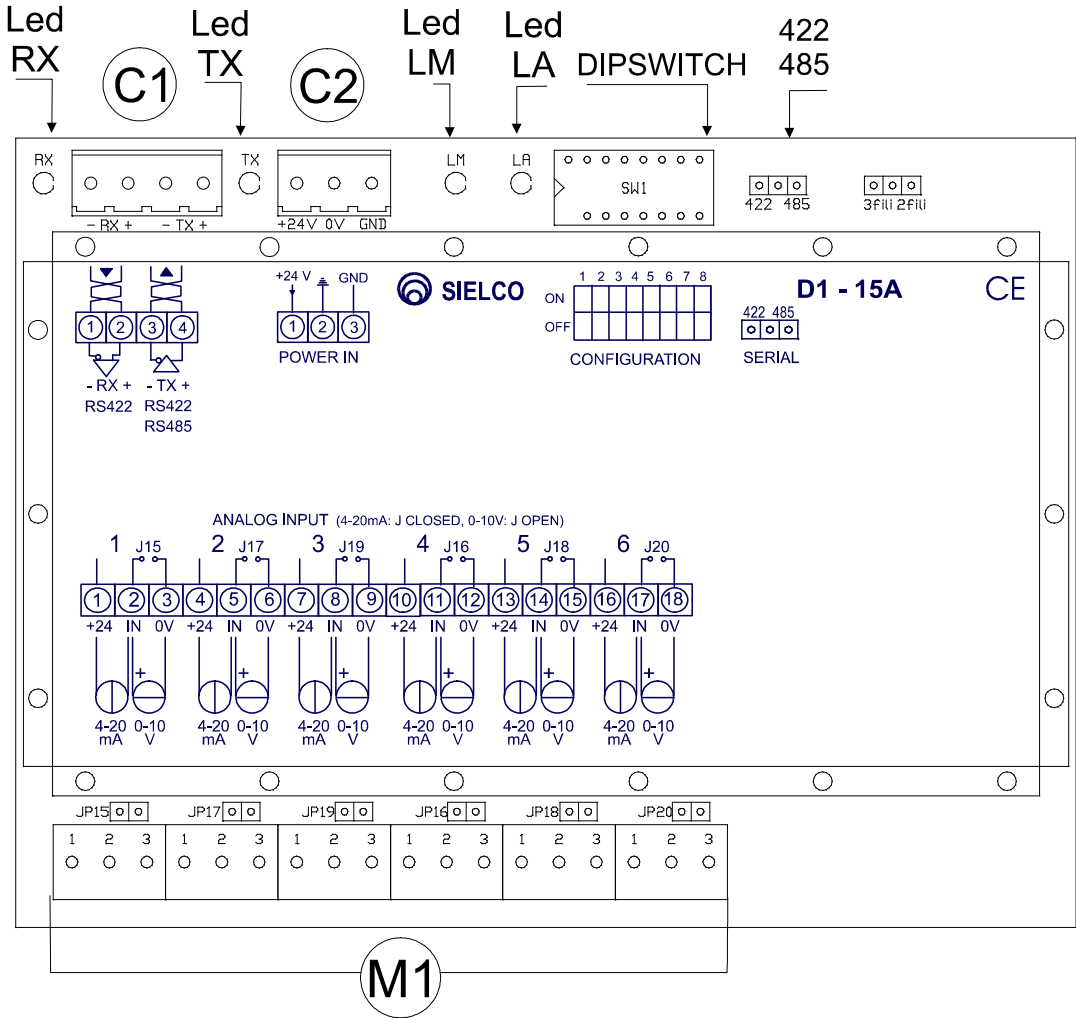


Figure 1.2 - D1-15A scheme

	<b>Description</b>
<b>[C1]</b>	RS422/485 serial channel connector
<b>[C2]</b>	+24 Vdc supply connector
<b>[M1]</b>	Analog inputs screws
<b>[M2]</b>	Analog sensors inputs screws
<b>DIPSW</b>	Protocol and device address selection dipswitch
<b>Led LA</b>	Supply led
<b>Led LM</b>	Selftest led (normally blinking)
<b>Led TX</b>	Transmitted data led
<b>Led RX</b>	Received data led
<b>422 485</b>	RS422 or RS485 line selection jumper

### **[C1] - RS422/485 serial channel connector**

	<b>RS422</b>		<b>RS485</b>
1	RX-	1	N.C.
2	RX+	2	N.C.
3	TX-	3	TX-/RX-
4	TX+	4	TX+/RX+

### **[C2] - +24 Vdc supply connector**

	<b>POWER</b>
1	+24 Vdc
2	FIELD GND
3	MECH. GND

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## **1.5 Supply**

The module needs a 24 Vdc ( $18V < Vdc < 36V$ ) supply by [C2] connector and absorb a maximum current  $I_{cc}=70$  mA at 24 Vdc.

The negative power supply must be connected to pin #2 of [C2] connector.

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

## 1.6 Inputs

### 1.6.1 Analog inputs for linear sensors

To D1-15A series modules can be connected 0-10V or 0-20mA/4-20mA linear sensors. Input channels can be configured individually as voltage or current using jumpers from J15 to J20 (closed for current inputs).

For a 0-10V output sensor connection connect, for each set of three screws, positive sensor signal to the screw called IN and the negative sensor signal to the 0V one, as shown in figure 1.3.

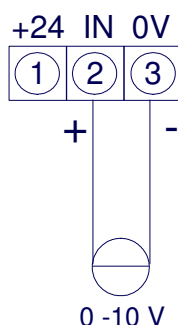


Figure 1.3 - 0-10V linear sensor wiring

For a current output sensor connection, it is necessary to distinguish 2 cases:

- A) linear sensor supplied by the D1-15A module; supply the sensor through the screw called +24V and connect the sensor signal to screw called IN (fig. 1.4A);
- B) linear sensor externally supplied; supply the sensor through an external power source and connect its negative to the screw called 0V and connect sensor signal to the screw called IN (fig. 1.4B).

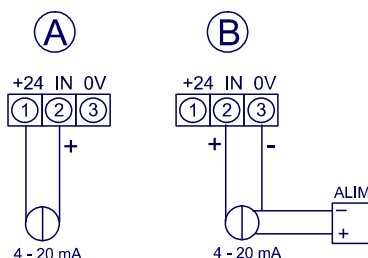


Figure 1.4 - Connection of 4-20 mA linear sensors supplied by the D1-15A module (case A) or by an external power source (case B)

In case of disturbance, can be useful to use shielded cable and connect the cable shield to the screw called 0V.

## 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 D1-15 [C1] connector as shown in table 1.1.

<b>C1-25</b>			<b>D1-15A</b>		
#	<b>RS-422</b>		<b>RS-422</b>	#	
1	GND	←→	GND	2	C2
2	RX-	←→	TX-	3	C1
3	RX+	←→	TX+	4	C1
4	TX-	←→	RX-	1	C1
5	TX+	←→	RX+	2	C1
6	0 V				
7	+24 V				

<b>C1-25</b>			<b>D1-15A</b>		
#	<b>RS-485</b>		<b>RS-485</b>	#	
1	GND	←→	GND	2	C2
2	n.c.		n.c.	1	C1
3	n.c.		n.c.	2	C1
4	TX-/RX-	←→	TX-/RX-	3	C1
5	TX+/RX+	←→	TX+/RX+	4	C1
6	0 V				
7	+24 V				

Table 1.1 - C1-25 - D1-15A (RS 422/485) wiring

D1-15A modules are provided with configurable serial interface RS422/485, normally configured as RS485. To change configuration you have to move the 422/485 jumper placed upper on the printed circuit board.

### 1.7.2 Communication protocol

Software communication protocol is realised according to ModBus ASCII or RTU standard: protocol selection is made by #2 selector of dipswitch (ON=RTU, OFF=ASCII).

The baudrate selection is made by #1 selector of dipswitch (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

#### **NOTE**

At power on, the device waits 4 seconds to communicate.

### 1.7.3 Device identification

To D1-15A can be assigned an identification address between 1 and 31 through binary notation, using selector from 4 to 8 of dipswitch (see table 1.2).

		ADDRESS							
		1	2	3	4	5	6	7	8
		<i>BAUD</i>	<i>PROT.</i>	$2^5$	$2^4$	$2^3$	$2^2$	$2^1$	$2^0$
<b>ON</b>		19200	RTU						
<b>OFF</b>		9600	ASCII						

*Table 1.2 - Address configuration using 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*

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## 1.8 Earth wiring and shielding

### 1.8.1 Earth wiring

It is suggested to make the following earth:

- device mechanical ground (pin #3 of [C2] connector) goes directly to earth;
- the power supply negative signal (pin #2 of [C1] connector) must be connected to a local earth.

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 Linear sensor wiring

Follow these shielding rules particularly in environment noise affected by power devices (motor driver , power contact etc.).

- use shielded and twisted cables for sensors connection;
- keep connection cables as short as possible;
- it's better to make different canalizations for analog signals and power signal conductors;
- connect all sensors cable metal shields at pin 3 of [C2] connector;

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# 2 Operation

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## 2.1 Application

D1-15A module is provided with 6 analog inputs

Analog signals can be voltage (0-10 V) or current (0-20 mA); in the first case the acquired value is recorded on a range from 0 to 10000; for example the value of 7500 means 7.500 Volt (V1, ..., V6 gates). In current input case, the acquired value is recorded on a range from 0 to 20000 and for example the value of 12000 means 12.000 mA(C1, ..., C6 gates). Numeric values are available through the numeric reading gates (N1, ..., N6 gates).

Error gates indicate the presence of an input signal reading

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

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# A Gates list

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## A.1 Numeric Gates (Holding Registers)

Address	Description	ID	Byte	Limits	R/W
00	Restart number	Rs	1	0: 255	R/W
08	Channel #1 numeric value	N1	2	0 - 32767	R
09	Channel #2 numeric value	N2	2	0 - 32767	R
10	Channel #3 numeric value	N3	2	0 - 32767	R
11	Channel #4 numeric value	N4	2	0 - 32767	R
12	Channel #5 numeric value	N5	2	0 - 32767	R
13	Channel #6 numeric value	N6	2	0 - 32767	R
14	Channel #1 voltage value (mV)	V1	2	0 - 10000	R
15	Channel #2 voltage value (mV)	V2	2	0 - 10000	R
16	Channel #3 voltage value (mV)	V3	2	0 - 10000	R
17	Channel #4 voltage value (mV)	V4	2	0 - 10000	R
18	Channel #5 voltage value (mV)	V5	2	0 - 10000	R
19	Channel #6 voltage value (mV)	V6	2	0 - 10000	R
20	Channel #1 current value ( $\mu$ A)	C1	2	0 - 20000	R
21	Channel #2 current value ( $\mu$ A)	C2	2	0 - 20000	R
22	Channel #3 current value ( $\mu$ A)	C3	2	0 - 20000	R
23	Channel #4 current value ( $\mu$ A)	C4	2	0 - 20000	R
24	Channel #5 current value ( $\mu$ A)	C5	2	0 - 20000	R
25	Channel #6 current value ( $\mu$ A)	C6	2	0 - 20000	R
25	Analog errors	eA	1	00h:FFh	R

<b>Analog errors – eA</b> (for each bit: 0 = OK / 1 = KO)	
bit 0	10V reference
bit 1	Analog #1
bit 2	Analog #2
bit 3	Analog #3
bit 4	Analog #4
bit 5	Analog #5
bit 6	Analog #6
bit 7	Analog #7