D1-15P analog module

User's guide

D1-15P analog module
User's guide

Sielco Elettronica S.r.l.
via Edison 209 20019 Settimo Milanese (MI) – Italia

Web site: www.sielcoelettronica.com
E-mail : ***info@sielcoelettronica.com***

Tel. 0248916252
Fax 0245329627

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 D1-15P 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:

D1-15P 6 three or two wires Pt100 inputs (with cable resistance compensation)

The Pt100/RTD sensor inputs have the following features:

- Temperature range: from -199.9 to +500.0 °C (standard model)
- Precision : ±0,05 % full scale
- Resolution : 15 bit
- Max cable resistance: 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 certificates the purchase date.

1.2 Dimensions

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

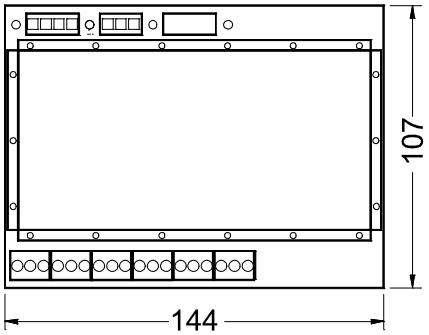

Figure 1.1 - D1-15P module dimensions

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

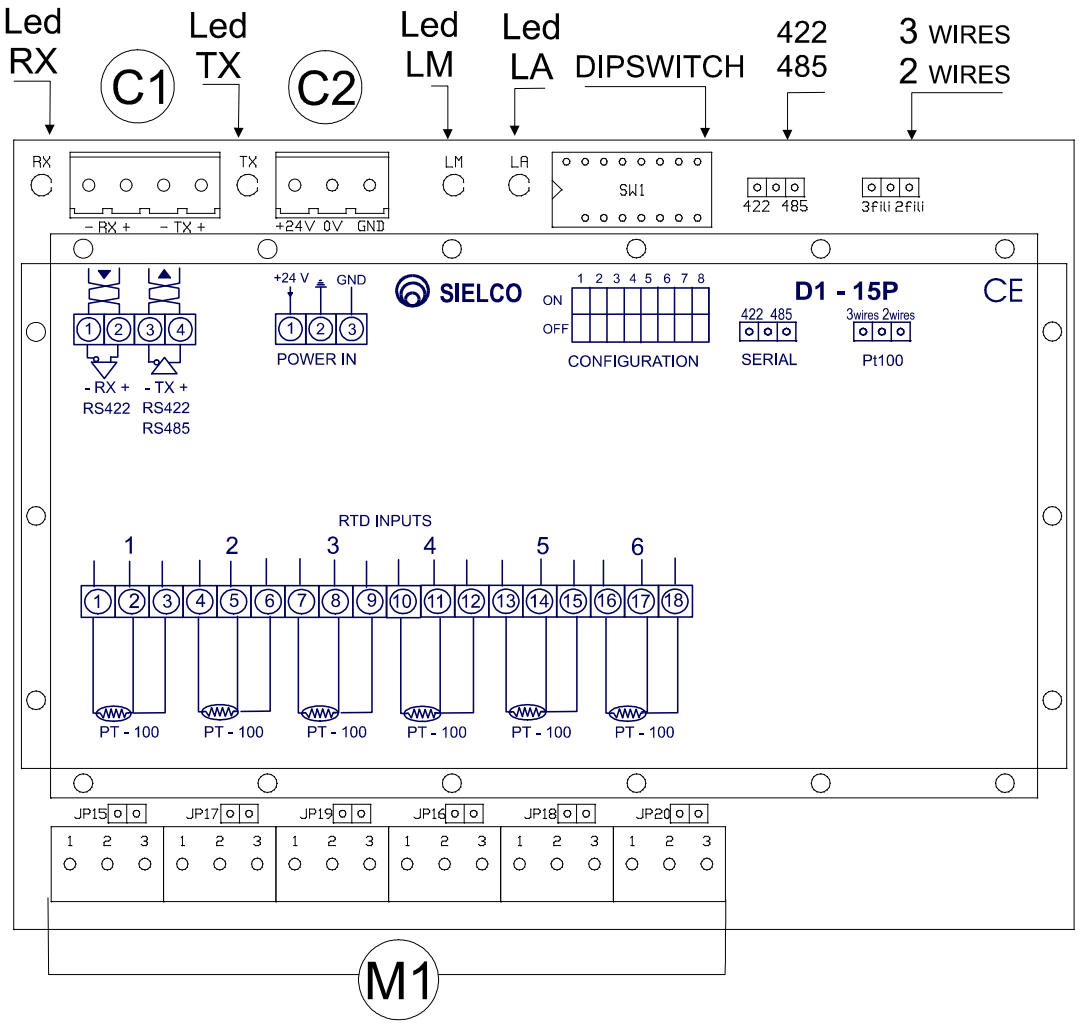

Figure 1.2 - D1-15P scheme

	Description
[C1]	RS422/485 serial channel connector
[C2]	+24 Vdc supply connector
[M1]	Analog inputs screws
[M2]	Pt100/RTD sensors inputs screws
DIPSW	Protocol and device address selection dipswitch
Led LA	Supply led
Led LM	Selftest led (normally blinking)
Led TX	Transmitted data led
Led RX	Received data led
422 485	RS422 or RS485 line selection jumper
3/2	3 with with cable resistance compensation or 2
WIRES	wires Pt100 selection jumper

[C1] - RS422/485 serial channel connector

	RS422		RS485
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

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

1.5 Supply

The module needs a 24 Vdc (18V < Vdc < 36V) supply by [C2] connector and absorb a maximum current Icc=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 Pt100/RTD sensors inputs

To D1-15P modules can be connected Pt100 sensors.

WARNING! Be sure that the sensors used are in compliance with IEC 751 standard.

Choosing the sensor, be sure that the wires connected to the sensor are electrically isolated from its metallic case. Dispersion currents towards the sensor metallic case can be detrimental to the precision of the reading. Pt100 sensors can be 2 or 3 wires type; for connection see figure 1.3.

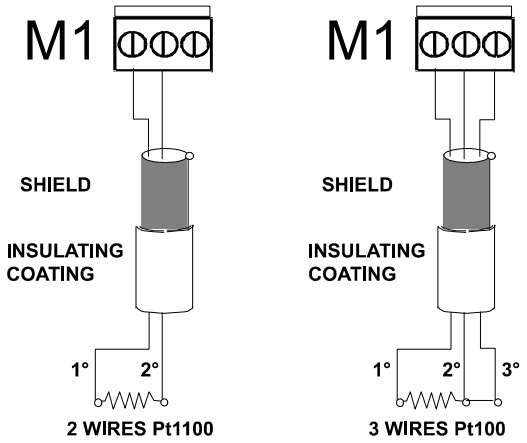

Figure 1.3 – 3 wires Pt100 connections

Sensor choice can be done setting the proper jumper on the left side (3 wires) or on the right side (2 wires)

The cable loop resistance must be less than 20 ohm (measure taken between start loop screw and the end loop screw with a short circuit instead Pt100).

The recommended cable is a twisted pairs conductors cable (the first wire must be twisted with the second) with shielding and self-extinguishing insulating coating.

Do not connect Pt100 using single wires not belonging to the same cable: the outward wire resistance (first wire connected at the first screw of each set of three) must be the same of the inward wire one (second wire connected at the second screw of each set of three).

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.

	C1-25		***D1-15P***		
#	**RS-422**		**RS-422**	**#**	
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				

	C1-25		***D1-15P***		
#	**RS-485**		**RS-485**	**#**	
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 - D1-15P (RS 422/485) wiring

D1-15P modules are provided with configurable serial interface RS422/485, normally configurated 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 D1-15P 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**
	BAUD	*PROT.*	2^5	2^4	2^3	2^2	2^1	2^0
ON	19200	RTU						
OFF	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*

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 Pt100 wiring

Temperature reading is based on low intensity signal detection coming from Pt100 sensors.

Parasite currents on the shields can induce disturbances that make reading inprecise.

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

- use shielded and twisted cables for Pt100 sensors connection;

- keep connection cables as short as possible;

- it's better to make differents canalizations for Pt100 signals and power signal conductors;

- connect all metal Pt100 connection cables shields only on the D1-15 side, leaving them non connected by the Pt100 sensor side;

- connect all the metal shield at pin 3 of [C2] connector.

PT100 configuration

The D1-15P has a jumper to configure the input channels PT100 as 3-wire or 2 wire.
The configuration is valid for all 6 channels.

- In 3-wire configuration, the module autonomously performs two readings 1 ° - 2 ° wire and 1° - 3 ° wire . Then calculates the resistance of the line (on the assumption that the resistance of the 2° wire is equal to resistance of 1° wire) then calculates the line resistance and returns the numeric value of the real temperature in the modbus message to the supervisor.

- In 2-wire configuration, the module reads 1 ° -2 ° wire and returns to the supervisor a measure of the real temperature plus the amount due to line resistance. The compensation shall be performed at the supervisor-level software on a per channel basis , It must be known in advance or measured the error due to line resistance expressed ditectly in °C (which is a constant and that will be subtracted from all measurements made). The advantage of this last solution is that the PT 100 sensor costs less and that there is a saving cost in plant management .

2 Operation

2.1 Application

D1-15P module is provided with 6 input channels for temperatures.

Temperature values are acquired using two or three wires Pt100 sensors with automatic cable resistance compensation; acquired temperature values are recorded in tenth degrees on a range from -2000 to +4000; for example, a value of 275 means a temperature of 27.5°C. Recorded values are available through the numeric reading gates T1, T2, T3, T4, T5 and T6.

Error gates indicate the presence of an input signal reading alarm; in case of Pt100 error proceed unconnecting Pt100 sensors and checking that no short circuit is present towards ground.

"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	ID	Byte	Range	R/W
00	Restart number	Rs	1	0: 255	R/W
01	Pt100 #1 temperature	T1	2	-2000:+4000	R
02	Pt100 #2 temperature	T2	2	-2000:+4000	R
03	Pt100 #3 temperature	T3	2	-2000:+4000	R
04	Pt100 #4 temperature	T4	2	-2000:+4000	R
05	Pt100 #5 temperature	T5	2	-2000:+4000	R
06	Pt100 #6 temperature	T6	2	-2000:+4000	R
07	Pt100 errors	eT	2	00h:1FFh	R

Pt100 errors– eT (for every bit: 0 = OK / 1 = KO)	
bit 0	Low sample
bit 1	High sample
bit 2	Pt100 #1 resistance numeric value
bit 3	Pt100 #1 line numeric value
bit 4	Pt100 #2 resistance numeric value
bit 5	Pt100 #2 line numeric value
bit 6	Pt100 #3 resistance numeric value
bit 7	Pt100 #3 line numeric value
bit 8	Pt100 #4 resistance numeric value
bit 9	Pt100 #5 line numeric value
bit 10	Pt100 #5 resistance numeric value
bit 11	Pt100 #5 line numeric value
bit 12	Pt100 #6 resistance numeric value
bit 13	Pt100 #6 line numeric value