

Installation Manual

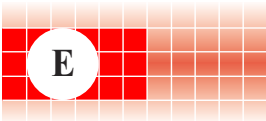
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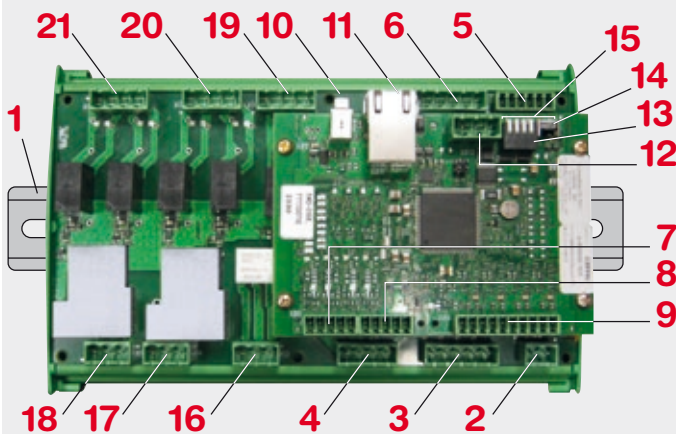
Integrated system, CPU module with on-board I/O **SAT1** model



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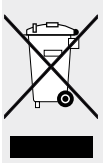


General description



- 1 DIN RAIL 35 x 7.5 (EN50022);
- 2 X1: 2 poles plug to connect the power supply;
- 3 X2: 5 poles plug to connect DI5... DI8 High Voltage Digital Inputs;
- 4 X3: 4 poles plug to connect OP9... OP11 SPST-NO 5 A output relays;
- 5 X4: 6 poles plug to connect DI1... DI4 Digital Inputs;
- 6 X5: 5 poles plug to connect OP4, OP5 (SPST-NO 5 A) and OP6 (SPDT 8 A) output relays;
- 7 X6: 5 poles plug to connect AO1... AO4 analogue outputs (0/4... 20 mA, PWM and Hz);
- 8 X7: 5 poles plug to connect CN1... CN4 High speed Digital Inputs;
- 9 X8: 10 poles plug to connect AI1... AI4 Analogue Inputs (mA, TC, PT100, PT1000, NTC)
- 10 X10: USB type A receptacle to connect a flash drive;
- 11 X11: RJ45 plug to connect the Ethernet TCP/IP network for programming purposes or for the MODBUS through the TCP port;
- 12 X12: 3 poles plug to connect COM1 serial port (RS485);
- 13 - 4 μ switches to configure the serial port parameters;
- 14 - Reset button;
- 15 - Status/diagnostic LEDs: **COM1** (green, COM1 traffic), **USB** (white, USB activity), **MSG** (red, message), **RUN** (green, program status run/stop), **PWR** (blue, power supply ON);
- 16 X13: 3 poles plug to connect OP3 (SPDT 16 A) output relay;
- 17 X14: 3 poles plug to connect OP2 (SPDT 16 A or SPST-NO 30 A) output relay;
- 18 X15: 3 poles plug to connect OP1 (SPDT 16 A or SPST-NO 30 A) output relay;
- 19 X16: 4 poles plug to connect OP14... OP16 SPST-NO 5 A output relays;
- 20 X17: 4 poles plug to connect OP12... OP13 (SPST-NO 5 A output relays or 12 V outputs for SSR drives or 4 A/250 Vdc SSR outputs);
- 21 X18: 4 poles plug to connect OP7... OP8 (SPST-NO 5 A output relays or 12 V outputs for SSR drives or 4 A/250 Vdc SSR outputs).

Disposal



The appliance (or the product) must be disposed of separately in compliance with the local standards in force on waste disposal.

Accessories



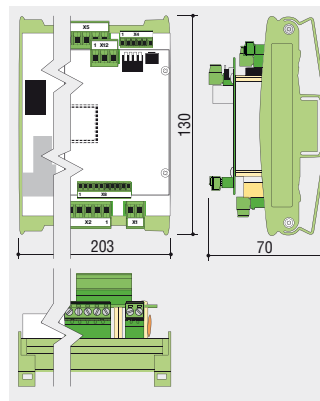
24 Vdc Power supply
 APS2ALEDR12024 (120 W, 5.0 A),
 APS2ALNDR75-24 (75 W, 3.2 A),
 APS2ALMDR20-24 (20 W, 1.0 A)

Screw Terminal Blocks
 KIT_SAT1_00



Installation

Dimensions (mm)



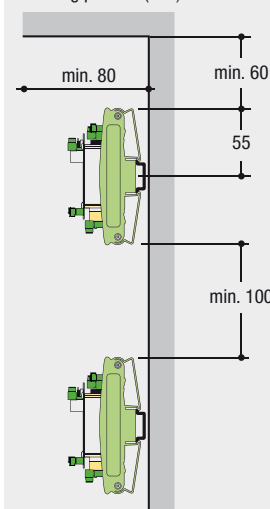
Operating conditions

Environmental condition		ACCE	Suggestion
Operating conditions	Temperature	0...+50°C	
	Umidity:	5... 95% Rh non condensing	
Special conditions	Temperature	> 50°C	Use forced ventilation
	%Rh	> 95% RH	Warm up
Forbidden conditions	Conducting atmosphere		Use filter
	Corrosive atmosphere		
	Explosive atmosphere		

Mounting position

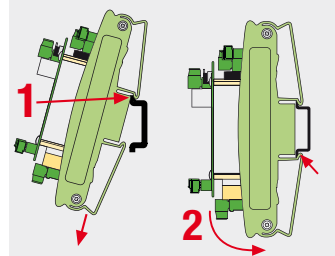
- Mount the module vertically;
- In order to help the ventilation flow of air, respect the distances between modules and walls or other modules.

Mounting position (mm)



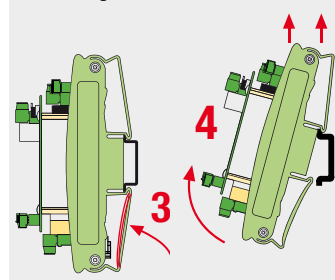
Mounting/removing the modules on/from the DIN rail

Mounting the module



- 1 Clip the upper part of the module to the rail;
- 2 Rotate the module downwards until the lower hook engages the DIN rail;

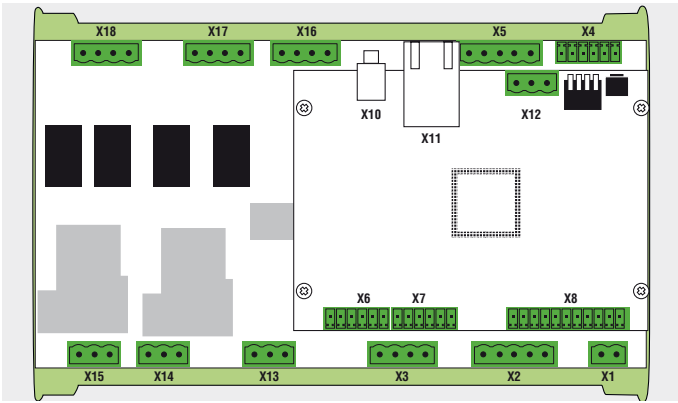
Removing the module



- 3 Switch OFF the Power Supply
 With two fingers, press in the area indicated by the arrow until the hook is freed from the DIN guide;
- 4 Turn and lift the module upwards to remove the CPU from the DIN rail.

Electrical connections

Terminals connections and plugs



Conn.	Label	Signals
X1	1	24 Vac/dc Power Supply
	2	
X2	1	Neutral (high voltage input)
	2	DI5 Line (high voltage input)
	3	DI6 Line (high voltage input)
	4	DI7 Line (high voltage input)
	5	DI8 Line (high voltage input)
X3	1	NO pole of OP9 relay
	2	NO pole of OP10 relay
	3	NO pole of OP11 relay
	4	Common pole of the relays

Conn.	Label	Signals
X12	1	RS485 D+ connection
	2	RS485 D- connection
	3	RS485 Ground connection
X13	1	NC pole of OP3 relay
	2	Common pole of OP3
	3	NO pole of OP3 relay
X14	1	NC pole of OP2 SPDT relay. Not connected for SPST-NO 30 A relay
	2	Common pole of OP2
	3	NO pole of OP2 relay (SPDT 16 A or SPST-NO 30 A)

Description	Plugs of all terminals	
Flexible cable section:	0.2... 2.5 mm ² (AWG24... AWG12)	
Stripped wire	Screw: 7mm	Spring: 10mm
Flat blade screwdriver	0.6 x 3.5 mm	0.4 x 2.5 mm
Tightening torque	0.5... 0.6 Nm	-

Conn.	Label	Signals
X4	1	Ground
	2	DI1
	3	DI2
	4	DI3
	5	DI4
X5	6	24 V for Digital Inputs
	1	Common pole of the relays
	2	NC pole of OP6 relay
	3	NO pole of OP6 relay
	4	NO pole of OP5 relay
X6	5	NO pole of OP4 relay
	1	A04 Positive pole
	2	A03 Positive pole
	3	A02 Positive pole
	4	A01 Positive pole
	5	Common pole of the AOs

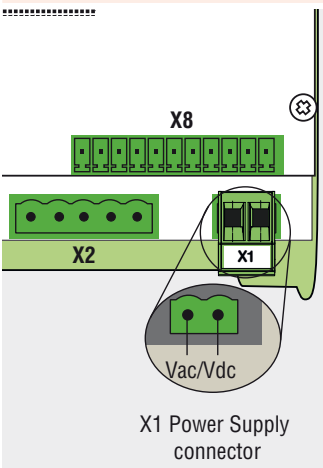
Conn.	Label	Signals
X15	1	NC pole of OP2 SPDT relay. Not connected for SPST-NO 30 A relay
	2	Common pole of OP2
	3	NO pole of OP2 relay (SPDT 16 A or SPST-NO 30 A)
X16	1	NO pole of OP14 relay
	2	NO pole of OP15 relay
	3	NO pole of OP16 relay
	4	Common pole of the relays
X17	1	OP12 5 A relay common Negative pole of OP12 SSR Pole of OP12 SSR Drive
	2	OP12 5 A relay NO pole Positive pole of OP12 SSR Pole of OP12 SSR Drive

Technical data:

- The green terminals are male connectors (pitch 3.5 or 5 mm), the corresponding female plugs are snap-on connectors with screw or spring terminals for connecting the wires. The connectors terminals are labelled;
- Made with self extinguishing material as required by UL94 V0 standard;
- Overvoltage category/pollution degree II/2;
- Max. load current/section 8 A/2.5mm² at 65°C;
- Test pulse voltage: 4 kVp.

- ⚠ Make sure that the overall current absorption (modules and field devices) matches the power supply;
- ⚠ In order to avoid excessive voltage drops, install the most power consuming modules closer to the power supply.

Power supply (X1 connector)

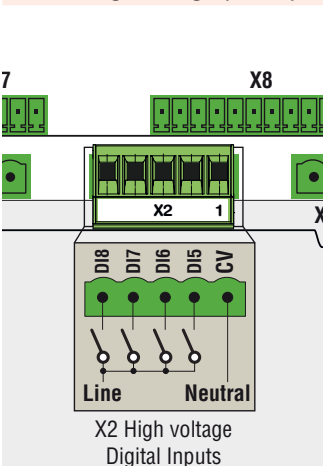


- Connector **X1**: 24 Vac/dc (-10...+10%), 15W max.;
- The power supply terminals (**X1-1** and **X1-2**) are not polarized as the CPU accepts both the 24 Vac and 24 Vdc.

Conn.	Label	Signals
X7	1	CN4 Positive pole
	2	CN3 Positive pole
	3	CN2 Positive pole
	4	CN1 Positive pole
	5	Ground
X8	1	Ground
	2	Transmitters PWS (12 V)
	3	AI1 Negative pole
	4	AI1 Positive pole (TC)
	5	AI2 Negative pole
	6	AI1 Positive pole (TC)
	7	AI3 Negative pole
	8	AI3 Positive pole (TC)
	9	AI4 Negative pole
	10	AI4 Positive pole (TC)
X10	USB	USB Type A port
X11	ETH	RJ45 Ethernet port

Conn.	Label	Signals
X17 (cnt.)	3	OP13 5 A relay common Negative pole of OP13 SSR Pole of OP13 SSR Drive
	4	OP13 5 A relay NO pole Positive pole of OP13 SSR Pole of OP13 SSR Drive
X18	1	OP7 5 A relay common Negative pole of OP7 SSR Pole of OP7 SSR Drive
	2	OP7 5 A relay NO pole Positive pole of OP7 SSR Pole of OP7 SSR Drive
	3	OP8 5 A relay common Negative pole of OP8 SSR Pole of OP8 SSR Drive
	4	OP8 5 A relay NO pole Positive pole of OP8 SSR Pole of OP8 SSR Drive

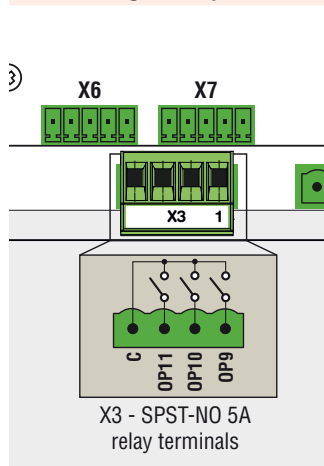
High Voltage (mains) Digital Inputs (X2 connector)



- Connector **X2**: DI5... DI8 High Voltage Digital Inputs;
- Terminal 1 (CV) is the common (neutral) terminal of the 100... 240 Vac digital inputs DI5... DI8;
- Respect the connection shown, the common terminal is shared by the 4 digital inputs.

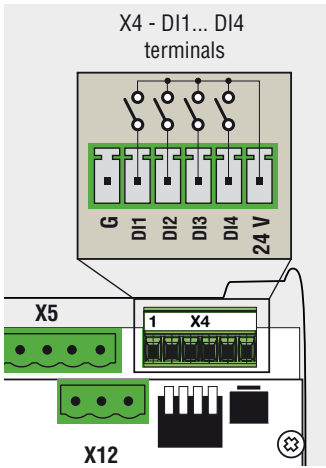
- ⚠ **Danger!** High voltage inputs, remove the mains and pay extreme attention while performing these input connections.

Digital outputs: SPST-NO Relays (X3 connector)



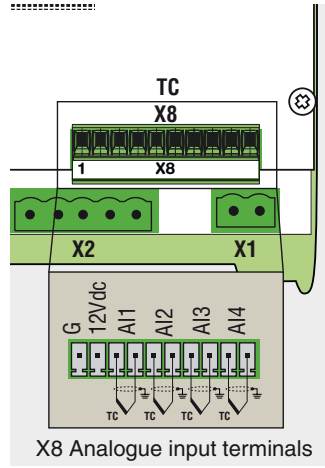
- Connector **X3**: OP9... OP11 SPST-NO relays outputs;
- Rate: Nominal 5 A (for resistive loads);
- Max. common (C) current: 6 A;
- Insulation: 2500 V between channel and Power Supply and between channel and main electronics.

DI1... DI4 Digital Inputs (X4 connector)



- Connector **X4**: DI1... DI4 digital inputs;
- Insulation: 800 V between channel and Power Supply.

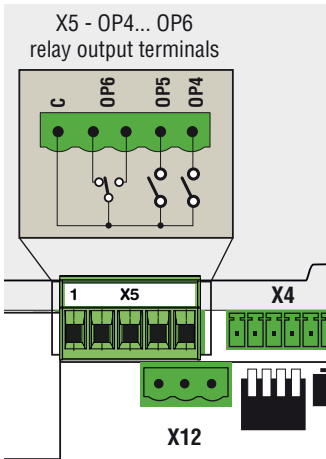
AI1... AI4 Analogue Input (X8 connector)



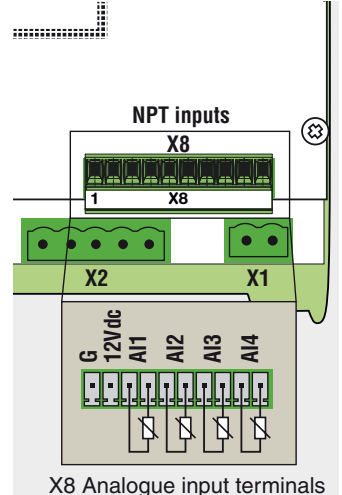
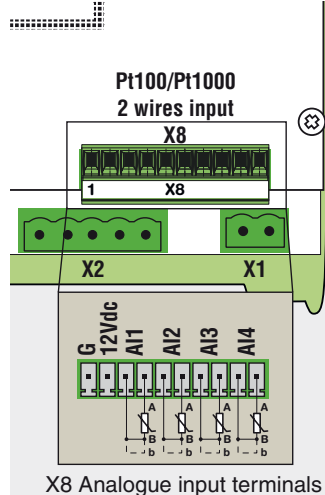
- Connector **X8**: AI1... AI4 digital inputs;
- Respect the polarity shown;
- Pay attention to correctly connect the power source (12 Vdc);
- Type: 0/4... 20 mA, TC (J, K, L, N, R, S, T) PT100 (2 wires), PT1000, NTC;
- Resolution: 16 bit;
- Accuracy: 0.5% of span (linear inputs), 0.5% (temp.) $\pm 1^\circ\text{C}$ (cold junction);
- Input impedance: 120 k Ω (V), <200 Ω (mA).

! Verify the option ordered for AI1... AI4 Inputs.

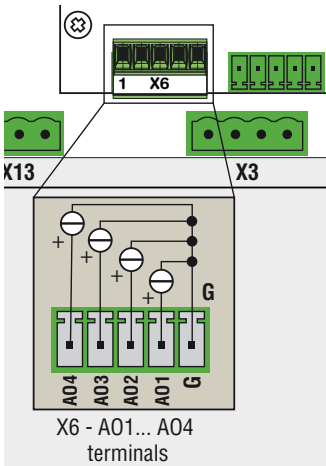
OP4... OP6 Digital Outputs (X5 connector)



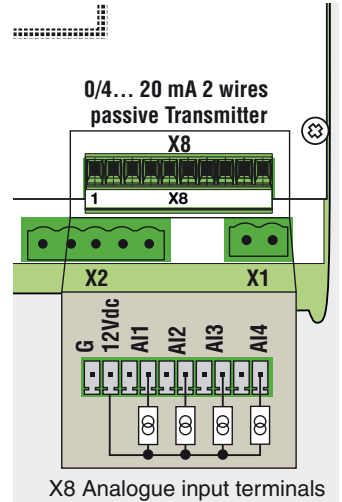
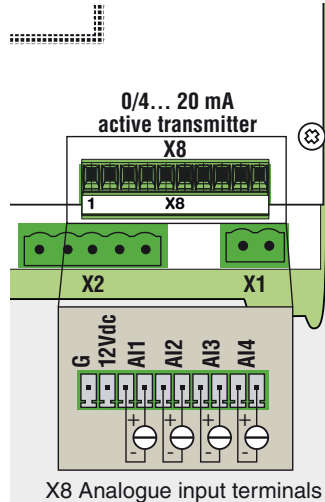
- Connector **X5**:
2 SPST NO relays (OP4, OP5) + 1 SPDT relay (OP6);
- Rate: Nominal 5 A for SPST relays, 8 A for SPDT relay (for resistive loads);
- Max. common (**C**) current: 6A;
- Insulation: 2500 V between channel and Power Supply and between channel and main electronics.



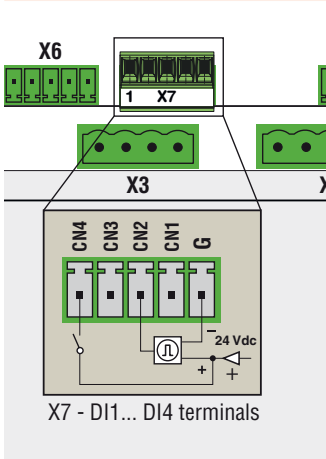
AO1... AO4 Analogue Output (X6 connector)



- Connector **X6**: AO1... AO4 analogue outputs;
- For the analogue output, respect the polarity shown;
- Type: 0/4... 20 mA, 0/10 V, PWM and Hz;
- Load: > 1k Ω ;
- Resolution: 16 bit;
- Accuracy: 0.5%;
- Insulation: 800 V Channel-Power supply, 50 V channel-main electronics;
- !** These outputs are ordered in pairs (AO1/AO2 and AO3/AO4). Verify the option ordered for AO1/AO2 and AO3/AO4 Inputs.

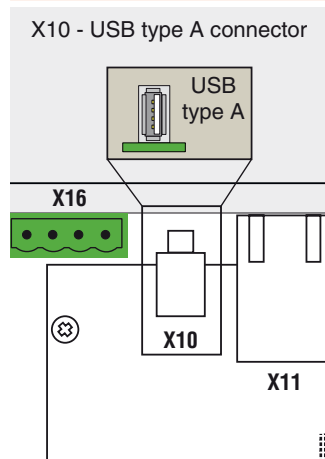


Special (High Speed) Digital Inputs (X7 connector)



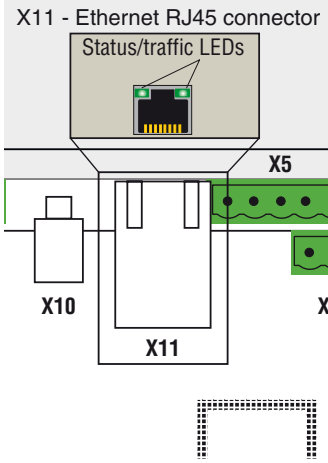
- In the drawing are connected only 2 counter inputs as an example (CN2 and CN4).
- Frequency meter input:**
- The channels can manage up to 10 kHz signals having a duty-cycle that guarantees minimum of ON signal of 20 ms;
- Impulse counter input:**
- The minimum time of an impulse must be 20 ms;
- Digital input:**
- The input circuit is internally closed to System Ground.
- !** Verify the option ordered for CN1... CN4 Inputs.

USB port (X10 connector)



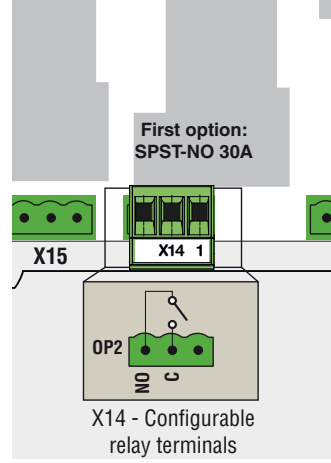
- USB type A receptacle (**X10**) to connect a flash drive (system files upload or data logging download).

Ethernet connector (X11 connector)



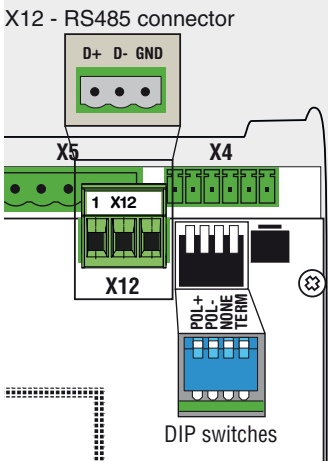
- Connector **X11**: The Ethernet connection is made through a standard J45 connector;
- The 2 green LEDs near the Ethernet connector show the port status and the communication traffic.

OP1 Digital Output: SPST-NO 30 A or SPDT 16 A Relay (X14 connector)



- Connector **X14**: **OP2 first option SPST-NO** relay output;
 - Rate: Nominal 30 A (for resistive loads);
 - Max. common (**C**) current: 8 A;
 - Insulation: 2500 V between channel and Power Supply and between channel and main electronics.
- ⚠ Verify the option ordered for OP2 output.

Serial Communications Port (X12 connector)



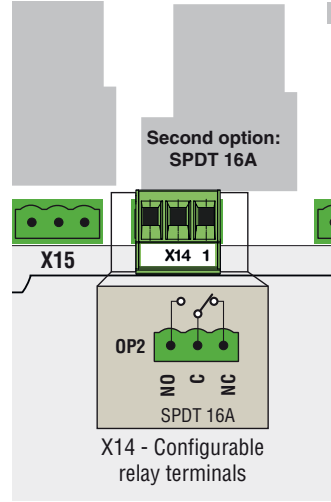
- Connector **X12**: RS485 port to connect a fieldbus network using the Modbus protocol (master/slave) or serial ASCII;
- The line settings can be configured using the specific DIP switches:

SW	Description	Default
1	Line polarization Pull-Up	OFF
2	Line polarization Pull-Down	OFF
3	Not used	
4	110 Ω line termination	OFF

DIP switch settings

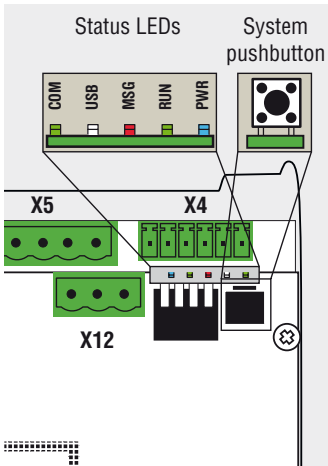


- Insulation from other electronics: 1.6 kV.



- Connector **X14**: **OP2 second option SPDT** relay output.
 - Rate: Nominal 16 A (for resistive loads).
 - Max. common (**C**) current: 8 A;
 - Insulation: 2500 V between channel and Power Supply and between channel and main electronics.
- ⚠ Verify the option ordered for OP2 output.

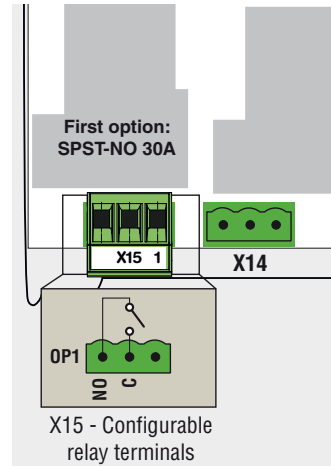
System Pushbutton and Status LEDs



- The 5 Status LEDs are: COM (green), USB (white), MSG (RED), RUN (green) and PWR (blue).
- The meaning of the various LEDs behaviours are fully described in the "SAT1 User Manual".

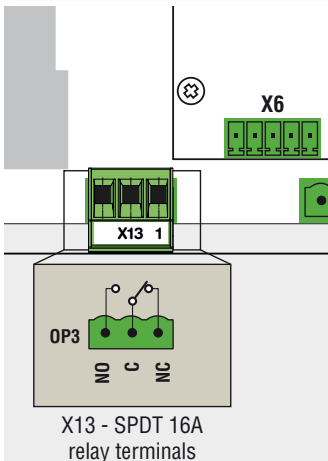
- ⚠ The system pushbutton performs different operations accordingly to the system status but does not restart the CPU or the 1131 application.

OP2 Digital output: SPST-NO 30 A or SPDT 16 A Relay (X15 connector)

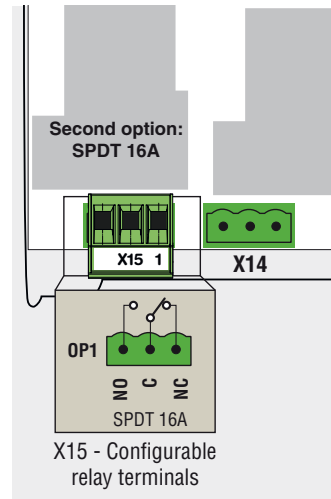


- Connector **X15**: **OP1 first option SPST-NO** relay output.
 - Rate: Nominal 30 A (for resistive loads).
 - Max. common (**C**) current: 8 A;
 - Insulation: 2500 V between channel and Power Supply and between channel and main electronics.
- ⚠ Verify the option ordered for OP1 output.

Digital Output: SPDT 16 A Relay (X13 connector)

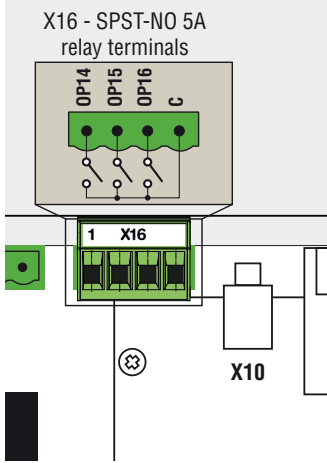


- Connector **X13**: OP3 SPDT relay output;
- Rate: Nominal 16 A (for resistive loads);
- Max. common (**C**) current: 8 A;
- Insulation: 2500 V between channel and Power Supply and between channel and main electronics.



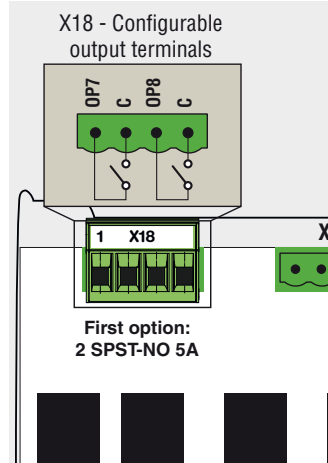
- Connector **X15**: **OP1 second option SPDT** relay output;
 - Rate: Nominal 16 A (for resistive loads);
 - Max. common (**C**) current: 8 A;
 - Insulation: 2500 V between channel and Power Supply and between channel and main electronics.
- ⚠ Verify the option ordered for OP1 output.

Digital outputs: SPST Relays (X16 connector)



- Connector **X16**: OP14... OP16 SPST-NO relays outputs;
- Rate: Nominal 5 A (for resistive loads);
- Max. common (C) current: 6 A;
- Insulation: 2500 V between channel and Power Supply and between channel and main electronics.

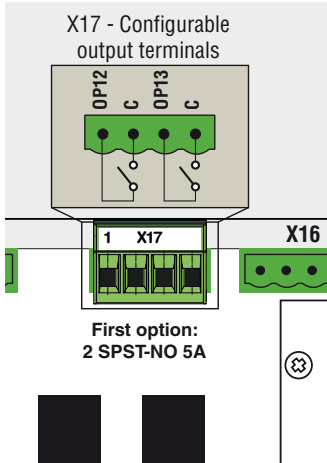
Digital outputs: Configurable Outputs (X18 connector)



- Connector **X18**: **OP7, OP8 first option 2 relays outputs;**
 - Relays:**
 - 2 SPST-NO relays;
 - Rate: Nominal 5 A (for resistive loads);
 - Max. common (C) current: 4 A;
 - Insulation: 2500 V between channel and Power Supply and between channel and main electronics.
- ⚠ Verify the option ordered for OP7 and OP8 outputs.

First option:
2 SPST-NO 5A

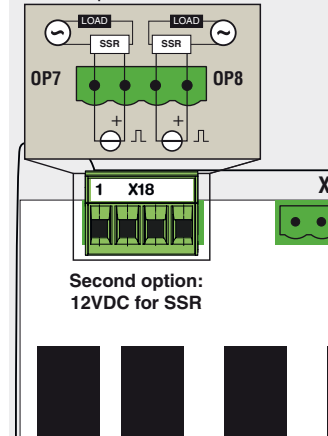
Digital outputs: Configurable Outputs (X17 connector)



- Connector **X17**: **OP12, OP13 first option 2 relays outputs;**
 - Relays:**
 - 2 SPST-NO relays;
 - Rate: Nominal 5 A (for resistive loads);
 - Max. common (C) current: 4 A;
 - Insulation: 2500 V between channel and Power Supply and between channel and main electronics.
- ⚠ Verify the option ordered for OP12 and OP13 outputs.

First option:
2 SPST-NO 5A

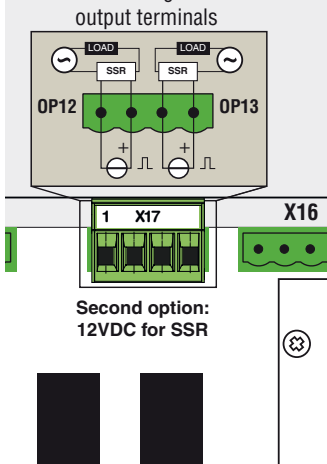
X18 - Configurable output terminals



- Connector **X18**: **OP7, OP8 second option: 2 x 12 Vdc for SSR;**
 - SSR drives:**
 - Voltage output 0/12 Vdc;
 - Respect the polarity shown;
 - Outputs not isolated.
- ⚠ Verify the option ordered for OP7 and OP8 outputs.

Second option:
12VDC for SSR

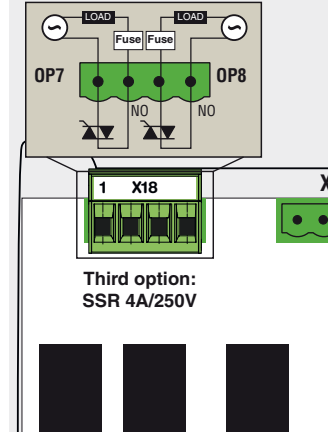
X17 - Configurable output terminals



- Connector **X17**: **OP12, OP13 second option: 2 x 12 Vdc for SSR.**
 - SSR drives:**
 - Voltage output 0/12 Vdc;
 - Respect the polarity shown;
 - Outputs not isolated.
- ⚠ Verify the option ordered for OP12 and OP13 outputs.

Second option:
12VDC for SSR

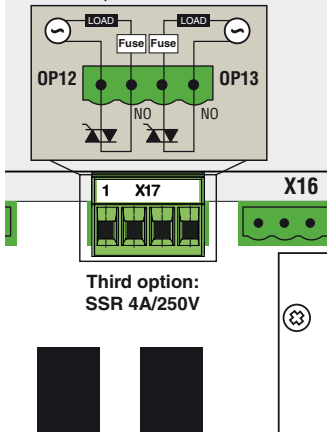
X18 - Configurable output terminals



- Connector **X18**: **OP7, OP8 third option: Solid State Relays.**
 - SSR:**
 - Rate: 4 A, 250 Vac;
 - Zero Crossing Function;
 - Insulation: 2500 V between channel and main electronics.
- ⚠ Verify the option ordered for OP7 and OP8 outputs.

Third option:
SSR 4A/250V

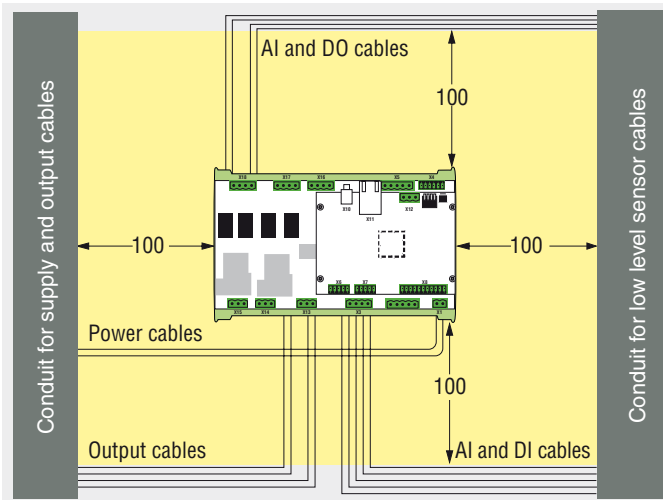
X17 - Configurable output terminals



- Connector **X17**: **OP12, OP13 third option: Solid State Relays.**
 - SSR:**
 - Rate: 4 A, 250 Vac;
 - Zero Crossing Function;
 - Insulation: 2500 V between channel and main electronics.
- ⚠ Verify the option ordered for OP12 and OP13 outputs.

Third option:
SSR 4A/250V

SUGGESTED WIRES ROUTING



Despite the fact that the instrument has been designed to work in an harsh and noisy environment, it is strongly recommended to follow the following suggestions.

All the wiring must comply with the local regulations.

The supply wiring should be routed away from the power cables. Avoid to use electromagnetic contactors, power relays and high power motors nearby.

Avoid power units nearby, especially if controlled in phase angle. Keep the low level sensor input wires away from the power lines and the output cables.

Power lines and output cables must also be at 100 mm (min.) away from the CPU.

If this is not achievable, use shielded cables on the sensor input, with the shield connected to earth.



Warning!

Whenever a failure or a malfunction of the device may cause dangerous situations for persons, things or animals, please remember that the plant must be equipped with additional devices which will guarantee safety.

SAT1 = CPU of the Programmable Logic Controller with 24 Vac/Vdc Power Supply

AI1: Analogue Input 1 Pre-Configured

A = mA
 C = Pt100
 M = PT1000
 N = NTC
 T = TC

AI2: Analogue Input 2 Pre-Configured

- = Not provided
 A = mA
 C = Pt100
 M = PT1000
 N = NTC
 T = TC

AI3: Analogue Input 3 Pre-Configured

- = Not provided
 A = mA
 C = Pt100
 M = PT1000
 N = NTC
 T = TC

AI4: Analogue Input 4 Pre-Configured

- = Not provided
 A = mA
 C = Pt100
 M = PT1000
 N = NTC
 T = TC

A0102: Analogue Outputs 1 and 2

- = Not provided
 A = mA Outputs
 D = Digital Outputs
 F = PWM/Frequency Outputs
 V = Voltage Outputs

A0304: Analogue Outputs 3 and 4

- = Not provided
 A = mA Outputs
 D = Digital Outputs
 F = PWM/Frequency Outputs
 V = Voltage Outputs

DIGFI: High Speed Digital Inputs CN1... CN4

- = Not provided
 T = 4 High Speed Digital Inputs

ID: Free of Voltage Digital Inputs DI1... DI4

- = Not provided
 L = 4 Free of Voltage Digital Inputs

DIGVI: Main Voltage Digital Inputs DI5... DI8

- = Not provided
 V = 4 Main Voltage Digital Inputs

OO1: Digital Output OP1

H = Relay SPST-NO 30 A
 S = Relay SPDT 16 A

OO2: Digital Output OP2

H = Relay SPST-NO 30 A
 S = Relay SPDT 16 A

OO3: Digital Output OP3

S = Relay SPDT 16 A

OO456: Digital Outputs OP4... OP6

R = 2 relays SPST-NO 5 A + 1 relay SPDT 8 A

OO78: Digital Outputs OP7... OP8

O = 2 digital outputs 12 VDC for SSR drive
 Q = 2 SSR digital outputs
 R = 2 relays SPST-NO 5 A

OO9AB: Digital Outputs OP8... OP11

- = Not provided
 R = 3 relays SPST-NO 5 A

OOCD: Digital Outputs OP12 and OP13

- = Not provided
 O = 2 digital outputs 12 VDC for SSR drive
 Q = 2 SSR digital outputs
 R = 2 relays SPST-NO 5 A

OOEFG: Digital Outputs OP14... OP16

- = Not provided
 R = 3 relays SPST-NO 5 A


SCM: Serial Communications Port

- = Not provided
 I = Insulated RS485
 S = Not Insulated RS485

SAT1



Connector map

 SAT1 is a complex instrument with a very limited space for the connection labels. Refer to the image that follows to identify each connector and find the position of terminal 1. All the connections previously described are based on these 2 details

