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E

model **eP4**

21.06 - Code: ISTR_I_eP4_E_01_--
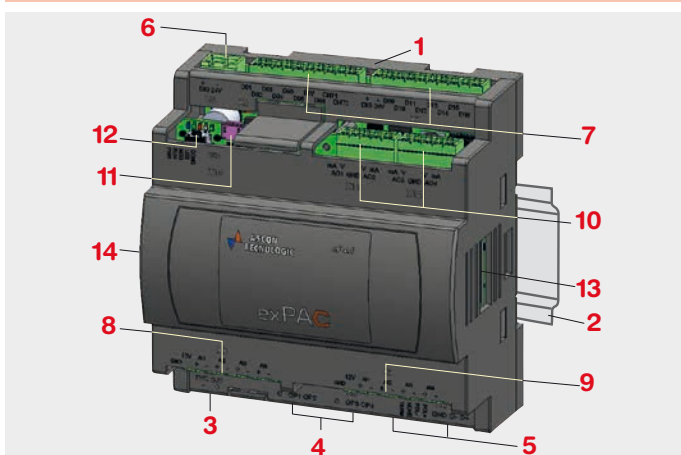
Installation Manual

Contents
- General description
- Accessories
- Installation
- Electrical connections
- Electric safety

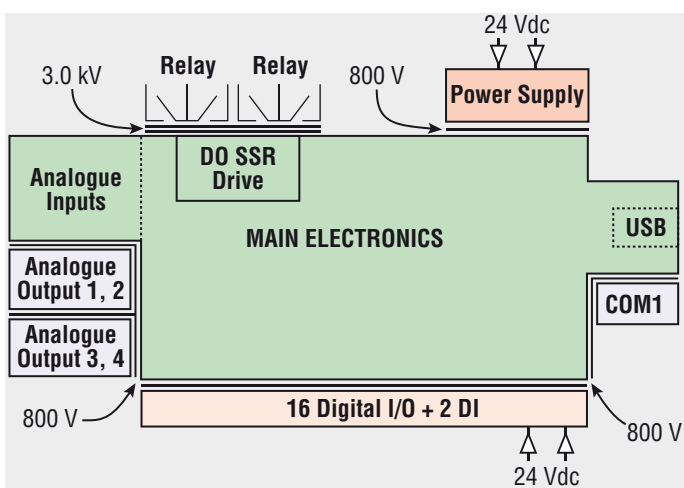# I/O expansion module with 3 connection options
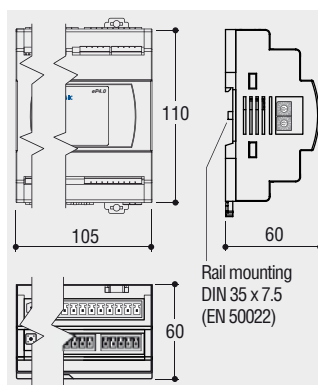
L I N E

General description

1. Model identification label (**on the back side of the module**);
2. DIN RAIL 35 x 7.5 (EN50022);
3. **X1** 24 Vdc Power Supply plug;
4. **X2** OP1... OP2 Digital Output SPST relay or 24 Vdc SSR drive;
   X3 OP3... OP4 Digital Output SPST relay or 24 Vdc SSR drive;
5. **X4** COM1 RS485 serial port and SW1 switches for line settings;
6. **X5** 24 Vdc input for DØ1... DØ8 when configured as Digital Output;
7. **X6** DØ1... DØ8 configurable DI/DO + 2 DI pulse counters (CNT1, CNT2);
   X7 24 Vdc input + DØ9... D16 configurable DI/DO;
8. **X8** AI1... AI4 universal analogue input and 12 Vdc AI Power;
9. **X9** AI5... AI8 universal analogue input and 12 Vdc AI Power;
10. **X11** AØ1... AØ2 mA or V analogue outputs;
    X12 AØ3... AØ4 mA or V analogue outputs;
11. **X10** USB micro C type port;
12. **Status/diagnostic LED**s (PWR, RUN, MSG, USB, COMS) + **System Push Button** (the LED statuses are described in the eP4 User Manual);
13. Local Connection Port;
14. Local Connection Port or Remote Connection Address Rotary Selection Switches (Modbus).

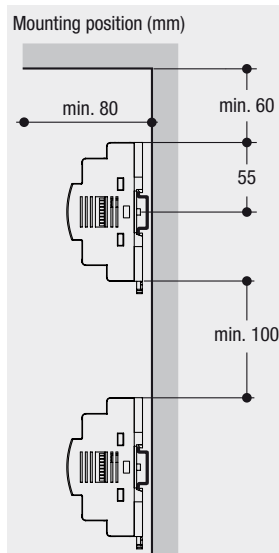## Isolation scheme

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Installation

Dimensions (mm)

110

105   60

60

Rail mounting
DIN 35 x 7.5
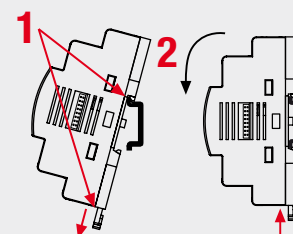(EN 50022)

Mounting position

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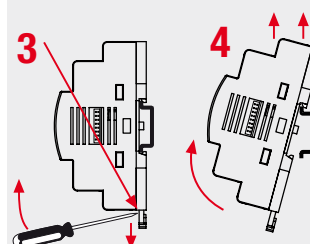- In order to help the air ventilation flow, respect the distances between modules and walls or other modules.

Mounting position (mm)

min. 80   min. 60

55

min. 100

Disposal

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

Operating conditions

Environmental condition ⚠CE			Suggestion
Operating conditions	°C	Temperature -20...+50°C	
	%Rh	Rh: 5... 95% non condensing	
Special conditions	°C	Temperature > 50°C	Use forced ventilation
	%Rh	> 95% RH	Warm up
		Conducting atmosphere	Use filter
Forbidden conditions		Corrosive atmosphere	
		Explosive atmosphere	

⚠ For indoor use only, max. usage altitude: 2000 m on the sea level.

Mounting/removing the modules on/from the DIN rail

1. Open the 2 spring slides on the lower part of the box, clip the upper part of the module to the rail;
2. Rotate the module downwards, then close the 2 spring slides;
3. Switch OFF the Power Supply. Lower the spring slide by inserting a flat-blade screwdriver as indicated;
4. Turn and lift the module upwards to remove the eP4 from the DIN rail.

Mounting the module
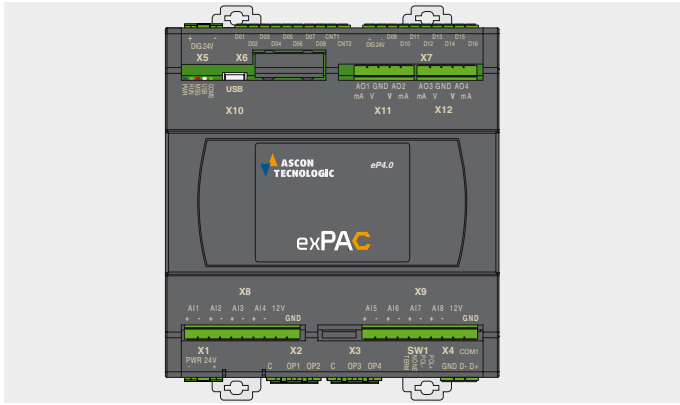

Removing the module

Electrical connections

Terminals connections and plugs

Conn.	Label	Signals
X1	Supply 24 Vdc	0 V Power Supply
		+24 V Power Supply
X2	C	OP1, OP2 common
	OP1	SPST NO pole/SSR drive
	OP2	SPST NO pole/SSR drive
X3	C	OP3, OP4 common
	OP3	SPST NO pole/SSR drive
	OP4	SPST NO pole/SSR drive
X4	GND	
	D-	COM1- RS485
	D+	

Conn.	Label	Signals
X10	USB	C type MicroUSB port
X11	mA	AO1 Current output
	V	AO1 Voltage output
	GND	AO1, AO2 ground
	V	AO2 Voltage output
	mA	AO2 Current output
X12	mA	AO3 Current output
	V	AO3 Voltage output
	GND	AO3, AO4 ground
	V	AO4 Voltage output
	mA	AO4 Current output

Description	Plugs of all terminals	
Flexible cable section:	Pitch 5 mm:	0.2... 2.5 mm² (AWG24... AWG12)
	Pitch 3.5 mm:	0.14... 1.5 mm² (AWG28... AWG16)
	Stripped wire	**Screw:** 7mm
	Flat blade screwdriver	Pitch 5 mm: 0.6 x 3.5 mm
		Pitch 3.5 mm: 0.4 x 2.5 mm
	Tightening torque	Pitch 5 mm: 0.5... 0.6 Nm
		Pitch 3.5 mm: 0.22... 0.25 Nm

Technical data:
- The green terminals are male connectors (pitch 3.5 or 5 mm), the correspondent female connectors have screw or spring terminals for connecting the wires;
- Made with self extinguishing material as required by UL94 V0 standard;
- Overvoltage cathegory/pollution degree II/2;
- Max. load current/section 8A/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.

Conn.	Label	Signals
X5	+ (24 V)	For DØ1... DØ8 digital I/O
	- (0 V)	For DØ1... DØ8 when DO
X6	DØ1... DØ8	Configurable Digital I/O
	CNT1... 2	Digital pulse count
X7	+ (24 V)	For DØ9... D16 when DO
	-	For DØ9... D16 when DO
	DØ9... D16	Configurable Digital I/O
X8	AI1... AI4 (+ -)	Universal analog input channels
	12V	12 V power for sensor excitation
	GND	Ground reference
X9	AI5... AI8 (+ -)	Universal analog input channels
	12V	12 V power for sensor excitation
	GND	Ground reference

X1 - Power supply
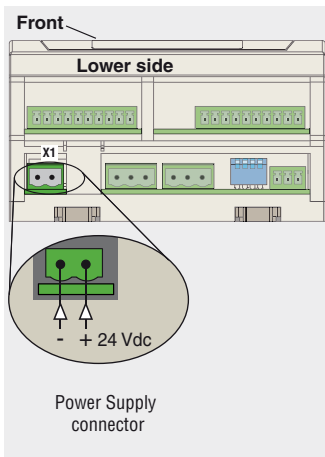
- Connector **X1**: 24 VDC (−10... +15%), 15 W max..

X5/X7 - Power supply for Digital Channels
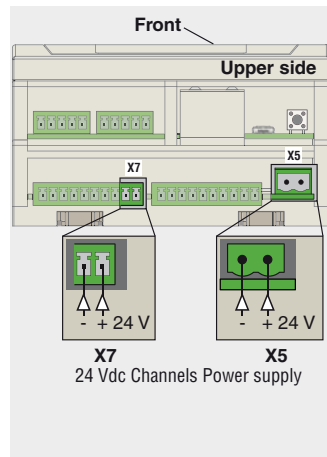
- **X5** and **X7** connectors (**+** and **−** terminals): 24 Vdc Digital Channels Power Supply;
- These 2 power supply terminals are internally connected.

⚠ The amount of current that must be supplied to this connectors depends by the number of channels configured as outputs (DØ1... D16).
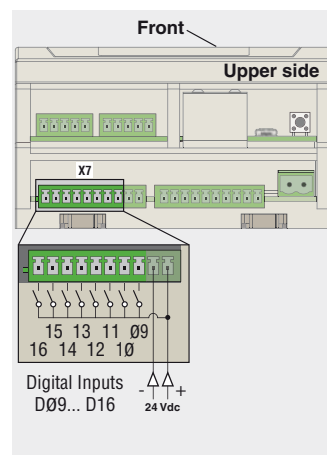
X6 - Digital Inputs DØ1... DØ8 Connections
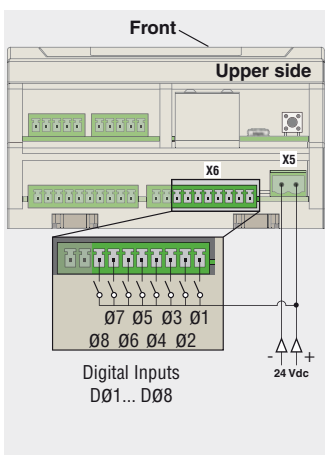
- Example of connection when DØ1... DØ8 are configured as Digital Inputs;
- Isolation: 800V between the Digital Inputs and the Main Electronics;

⚠ For proper electrical connection, refer to **X5/X7 - Power supply for Digital Channels**.
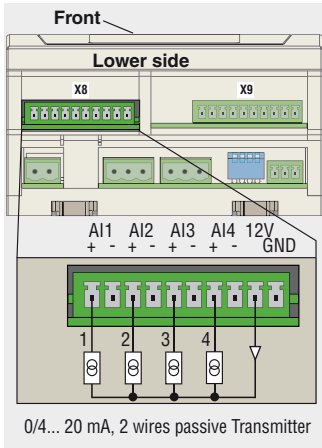
X7 - Digital Inputs DØ9... D16 Connections

- Example of connection when DØ9... D16 are configured as Digital Inputs;
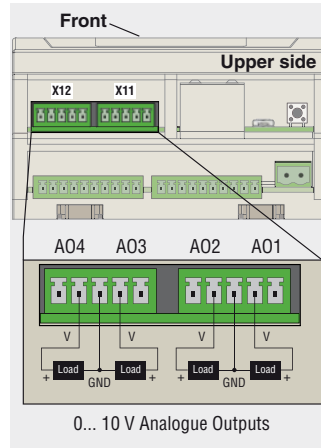- Isolation: 800V between the Digital Inputs and Main electronics;

⚠ For proper electrical connection, refer to **X5/X7 - Power supply for Digital Channels**.

X8, X9 - AI1... AI8 Analogue Input connection

Front
Lower side
X8 X9

AI1 AI2 AI3 AI4 12V
+ - + - + - + - GND

1 2 3 4

0/4... 20 mA, 2 wires passive Transmitter

- The connections of connector X9 terminals are the same, but the cannels are AI5, AI6, AI7 and AI8;
- For the analogue input, respect the polarity shown;
- Pay attention to connect the power source to each external sensor;
- Types: 0/4... 20 mA, 0/1... 5 V, 0/2... 10 V, T/c (J, K, L, N, R, S, T) PT100 (2 wires), PT1000, NTC, Potentiometer;
- Resolution: 16 bit;
- Accuracy: 0.1% of span (linear inputs), 0.2% (temperature);
- Input impedance: 120 kΩ (V), <200 Ω (mA).

AI1 AI2 AI3 AI4
+ - + - + - + -

4... 20 mA Active Transmitter

AI1 AI2 AI3 AI4
+ - + - + - + -

Potentiometer Inputs

AI1 AI2 AI3 AI4
+ - + - + - + -

0/1/2... 5/10 V Active Transmitter

AI1 AI2 AI3 AI4
+ - + - + - + -
TC TC TC TC

TC Inputs

AI1 AI2 AI3 AI4
+ - + - + - + -

NTC Inputs

AI1 AI2 AI3 AI4
+ - + - + - + -
A A A A
B B B B
b b b b

PT100/PT1000 2 wires Inputs

⚠ **When AI1… AI8 are configured as: TC, NTC, Pt100 or Pt1000, it is MANDATORY to short-circuit the terminals (+, -) of the unused channels.**

X11, X12 - AO1... AO4 Voltage Analogue Output Connections

Front
Upper side
X12 X11

AO4 AO3 AO2 AO1
V V V V
Load Load Load Load
GND GND

0... 10 V Analogue Outputs

- Respect the polarity shown;
- Type: 0/1... 5 V, 0/2... 10 V;
- Load: > 1 kΩ;
- Resolution: 12 bit;
- Accuracy: 0.1%;
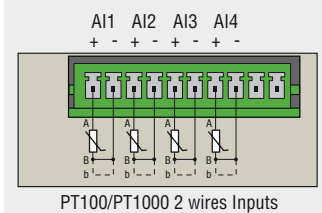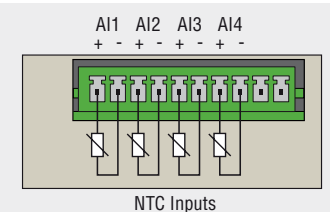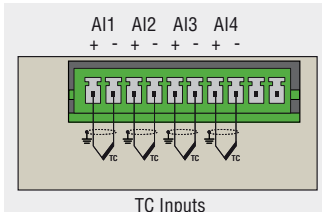- Isolation: 800V between the Analogue Ouputs and the Main Electronics.
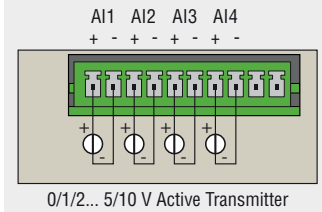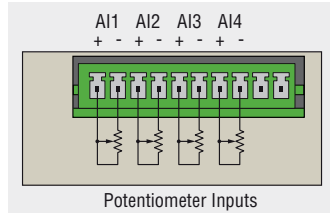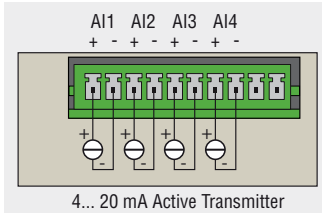
X6 - D01... D08 Digital Outputs Connections

Front
Upper side
X6 X5

LOAD
LOAD

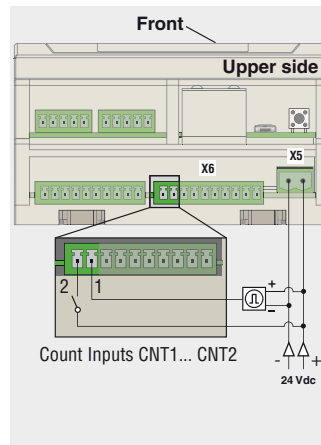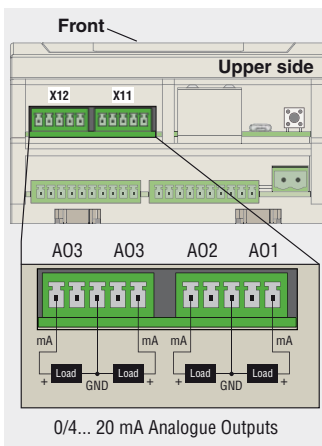Digital Outputs D01... D08

24 Vdc
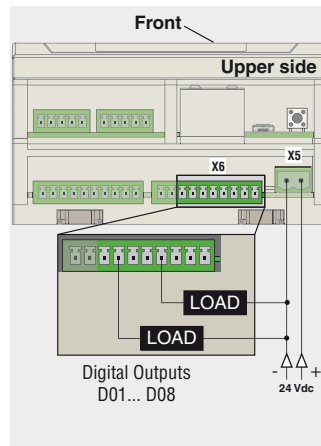
- The Digital Outputs number of the terminals are: D01... D08
- The 8 output loads should not exceed **0.7 A each**;
- In the drowing are connected only 2 loads as an example;
- Isolation: 800V between the Digital Outputs and the Main Electronics.

⚠ For proper electrical connection, refer to **X5/X7 - Power supply for Digital Channels**.

X6 - CNT1... CNT2 Pulse Count Inputs Connections

Front
Upper side
X6 X5

2 1

Count Inputs CNT1... CNT2

24 Vdc

- Both channels can manage signals up to 5 kHz;
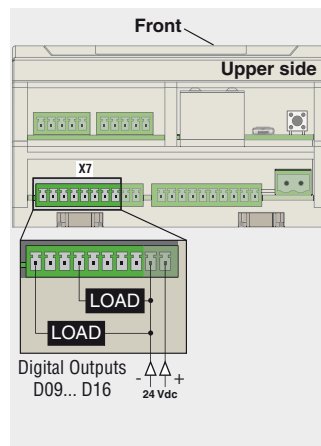- Isolation: 800V between the Count Input channels and Main Electronics.

⚠ For proper electrical connection, refer to **X5/X7 - Power supply for Digital Channels**.

X11, X12 - AO1... AO4 Current Analogue Output Connections

Front
Upper side
X12 X11

AO3 AO3 AO2 AO1
mA mA mA mA
Load Load Load Load
GND GND

0/4... 20 mA Analogue Outputs

- Respect the polarity shown;
- Type: 0/4... 20 mA;
- Load: < 500 Ω;
- Resolution: 12 bit;
- Accuracy: 0.1%;
- Isolation: 800V between the Analogue Ouputs and the Main Electronics.

X7 - 09... 16 Digital Outputs Connections

Front
Upper side
X7

LOAD
LOAD

Digital Outputs D09... D16

24 Vdc

- The Digital Outputs number of the terminals are: DO9... D16;
- The 8 output loads should not exceed **0.7 A each**;
- In the drowing are connected only 2 loads as an example;
- Isolation: 800V between the Digital Ouputs and the Main Electronics.

⚠ For proper electrical connection, refer to **X5/X7 - Power supply for Digital Channels**.

X2, X3 - Digital outputs OP1... OP4: SPST Relays/SSR drive
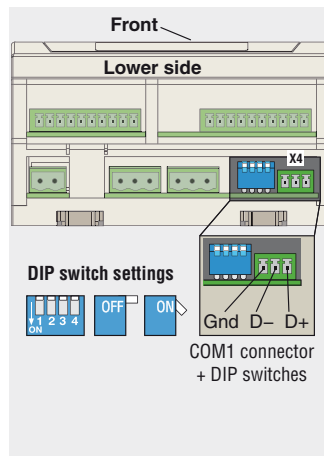
Front

Lower side

X2   X3
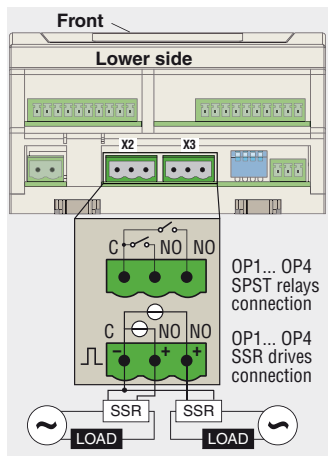
Relays:
- Rate: 2 A (for resistive loads);
- Isolation: 3 kV rms beween each channel and Power Supply and between each channel and Main electronics.

SSR drives:
- Voltage output 0/12 Vdc;
- Respect the polarity shown;
- Output not isolated.

C — NO NO

OP1... OP4 SPST relays connection

C — NO NO

OP1... OP4 SSR drives connection

SSR   SSR

LOAD   LOAD

X4 - COM1 RS485 Serial Communication Port

Front

Lower side

X4

DIP switch settings

OFF   ON

1 2 3 4

Gnd D− D+

COM1 connector + DIP switches

- RS485 port to connect a fieldbus network using the Modbus protocol (slave);
- Isolation from Main electronics: always 800 V.
- RS485 (COM1) line settings can be configured using the specific DIP switches:

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

Local side connection

The Expansion modules must be connected beside the last module mounted. It is possible to use up to **2 expansion modules**.
Prior to plug/unplug an expansion unit, **remove the power from the system.**
The connection between the modules is performed by the specific **16 pins dual in line connector**.
Please mechanically secure the modules by using the specific **plastic clips**.

Rotary Switches

Hi   Lo
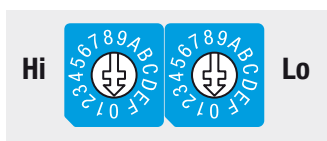
Baud Rate and Node ID configuration

Baud rate			Node ID		
Lo SW	Baud rate		Lo SW	Hi SW	Node ID
0	2400		0	0	0x00
1	4800		0	1	0x01 (addr. 1)
2	9600		0	2	0x02 (addr. 2)
3	19200		↓	↓	↓
4	38400				
5	57600				
6	115200		F	7	0xF7 (addr. 247)

Modbus setup procedure

The **HI** and **LO** hexadecimal rotary swithches set the **module Baud Rate** and **Modbus Node Address** (Node ID). To configure them the procedure is:
1. **Power OFF** the unit;
2. **Set both** the rotary switches to "**F**";
3. Power ON the unit and wait until the **PWR** and **RUN** leds become **steady ON**;
4. Use the **Lo** switch to set the **desired baud rate speed** (see the Baud Rate table values beside);
5. To confirm the set made, **turn the Hi switch to "E"** and wait until the **RUN**, **USB** and **COMS** leds **start blinking**;
6. Power OFF the unit;

7. **Set the desired Node ID** by using both the **Hi** and **Lo** switches;
8. **Power ON** the unit.

Alternatively, at step 7 set value 00h, at next Power ON, the last valid stored value will be resumed as Node ID.
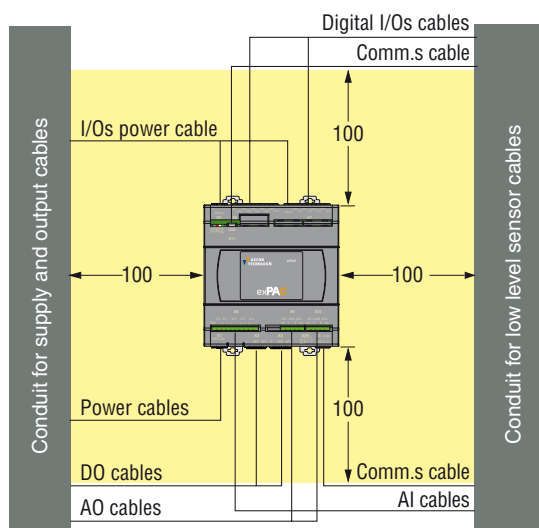Default values are:
Baud Rate = 38400, **Node ID = 201**.

⚠ Pay attention to the **rotary switches codification** which is **exhadecimal**.

⚠ The **Node ID** of each module **must be unique**, on the same network cannot coexist 2 units with the same Node ID.

Suggested wires routing

Digital I/Os cables

Comm.s cable

Conduit for supply and output cables

I/Os power cable

100

100   100

Power cables

100

DO cables

Comm.s cable

AO cables

AI cables

Conduit for low level sensor cables

⚠ 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 inputs, with the shield connected to earth at one side only.

⚠ **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.

How to order

eP4 =	Expansion Module for PAC CPUs

A: Display
- = No Display

B: Optional Digital Outputs
- = No Digital Outputs
M = 2 Relay + 2 SSR drive
R = 4 Relay
S = 4 SSR Drive

C: Analogue Inputs
- = No Analogue Inputs
4 = 4 Universal AI
8 = 8 Universal AI

D: Analogue Outputs
- = No Analogue Output
2 = 1 isolated module with 2 not isolated AOs
4 = 2 isolated modules with 2 not isolated AOs each

E: Digital Channels
-- = No Digital Channels
88 = 8 Inputs + 8 Outputs + 2 DI Pulse Counters
16 = 16 configurable + 2 DI Pulse Counters

FG: Field bus + Serial COM
--- = Local Bus
M4I = Insulated RS485 ModBus RTU slave

Reserved

eP4	-										