



Metermatic

EM6

Installation Manual

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1. Introduction

The EM6 System, designed and manufactured by Metermatic (Pty.) Ltd. South Africa, is intended to control and meter liquid product transports for custody transfer. The EM6 is mounted on bulk petroleum vehicles or gantries and is designed to electronically measure and control all loading/offloading processes.

The EM6 is housed in a combined Exd and Intrinsic safe enclosure, which has approximate dimensions of 347mm x 226mm x 91mm. Four M10 bolts secure the EM6 onto the vehicle or gantry installation. The EM6 enclosure has seven M20x1.5 gland entries, the first three providing cable entries to the Intrinsic Safe side and four providing cable entries to the Exd side. There is also an M16x1.5 gland entry at the top providing an entry for the M16 Exd Antenna Bush assembly, when GSM connectivity is required (DPM-100 powered).

2. Pre installation precautions



Failure to adhere to the operating conditions and considerations described below could result in the equipment malfunctioning.

2.1. General

- a) Installation and maintenance shall be carried out in accordance with the applicable code of practice and by suitably trained personnel.
- b) The enclosure shall be installed so that they are not subjected to direct spray from the vehicles wheels.
- c) The equipment is only certified for use in ambient temperatures in the range -20°C to $+60^{\circ}\text{C}$ and should not be used outside this range.
- d) If welding is to be done on a vehicle or structure after the EM6 has been installed, then all connections to the EM6 must be isolated.
- e) No additional holes may be drilled into any enclosure as this will invalidate the certification of the system.
- f) No additional components may be installed in any enclosure as this will invalidate the certification of the system.
- g) The equipment may be used with gases and vapors associated with Group IIA in category 2 and 3 locations. The intrinsic safety outputs may be connected to suitable equipment is category 1 locations
- h) Repair of this equipment shall be carried out in accordance with the applicable code of practice.
- i) The certificate number has an 'X' suffix which indicates that special conditions of installation and use apply. Those installing or inspecting this equipment must have access to the contents of the certificate.
- j) If the equipment is likely to come into contact with aggressive substances, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected, thus ensuring that the type of protection is not compromised.
 - Aggressive substances - e.g. acidic liquids or gases that may attack metals, or solvents that may affect polymeric materials.
 - Suitable precautions - e.g. regular checks as part of routine inspections or establishing from the material's data sheet that it is resistant to specific chemicals.
- k) There are no special checking or maintenance conditions other than a periodic check

3. Installation

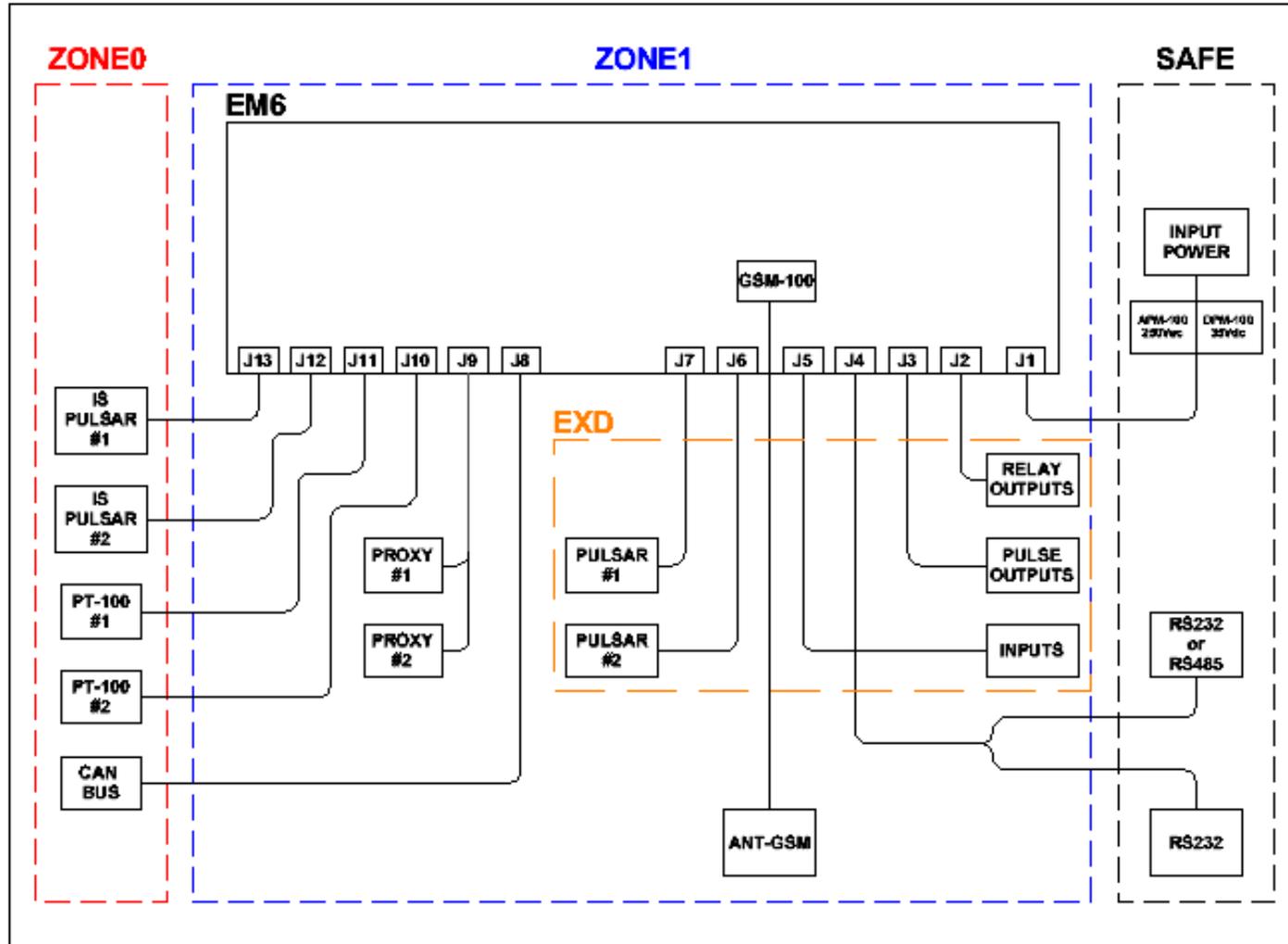
3.1. Mechanical installation

3.1.1. EM6

- a) The installed location height of the unit should permit easy viewing of the display, and provide convenient access to the keypad and the M16 Exd Antenna Bush assembly located on the top of the enclosure.
- b) Access for servicing the unit is through the front cover. Complete access by service personnel for repair and removal of parts should be provided. For ease of service the cover must swing open more than 100°. The enclosure is hinged on the left.
- c) Cable entry to the unit is through the bottom. There are seven M20 gland entries provided.
- d) The M16 entry at the top (external) must be fitted with either the Exd Antenna Bush assembly or a suitable Exd blanking plug if no Exd Antenna Bush is fitted.
- e) Only certified Ex d IIA (at least) glands and/or blanking elements must be utilized in the flameproof entries.
- f) The EM6 enclosure must be earthed to the vehicle's chassis or structure by means of either the connecting bolts or bonding point provided.
- g) The flameproof cover is secured with sixteen M6 x 1.0 x 25mm – grade 12.9 SHCH (socket head cap screws). Washers are fitted to the fasteners up to a maximum of 3.1mm thick
- h) The EM6 System is group IIA equipment and may connect to group IIA equipment. It may be used with flammable gases and vapors with apparatus group IIA and with the temperature classes T1, T2, T3 and T4.

3.2. Electrical installation

3.2.1. EM6 Installation Block diagram



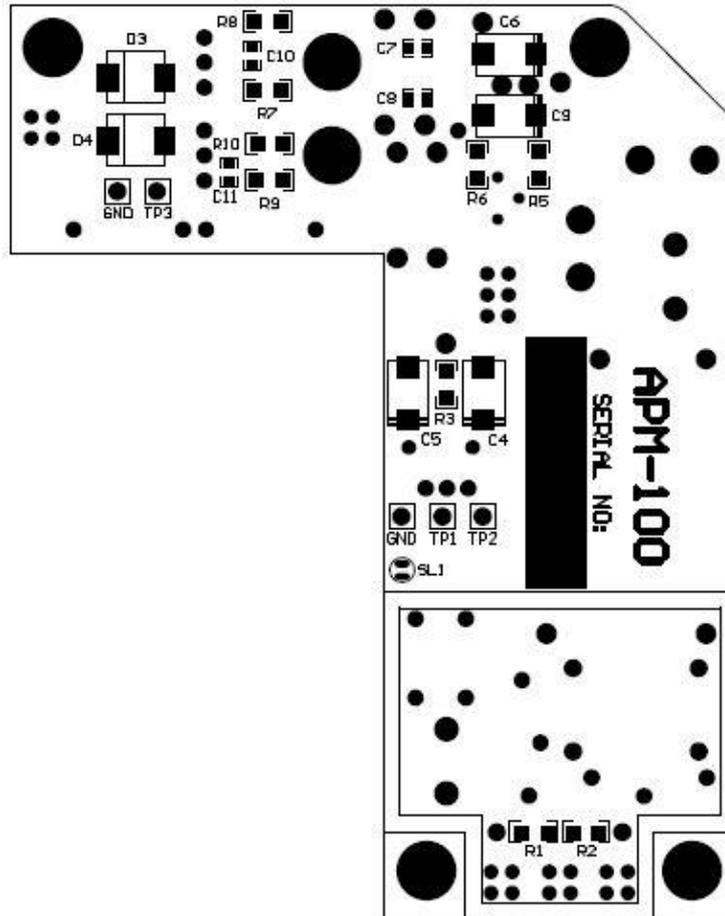


Failure to follow the instructions flagged with the icon shown on the left will invalidate the Intrinsically Safe (IS) approvals of the equipment. This could result in dangerous conditions.

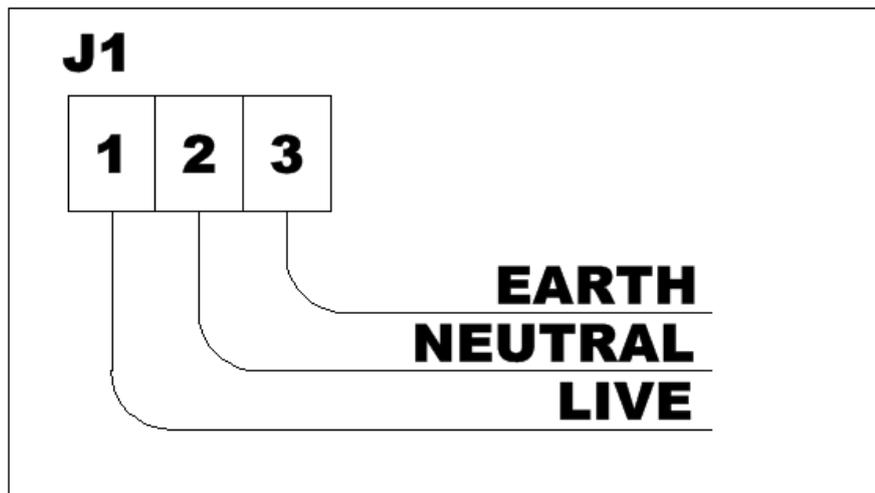
3.2.2. J1 – Input power

3.2.2.1. APM-100

- Identified with “APM-100” marking on the silkscreen of the PCB
- 250V_{AC} Input Only
- Minimum 0.5mm² wire required

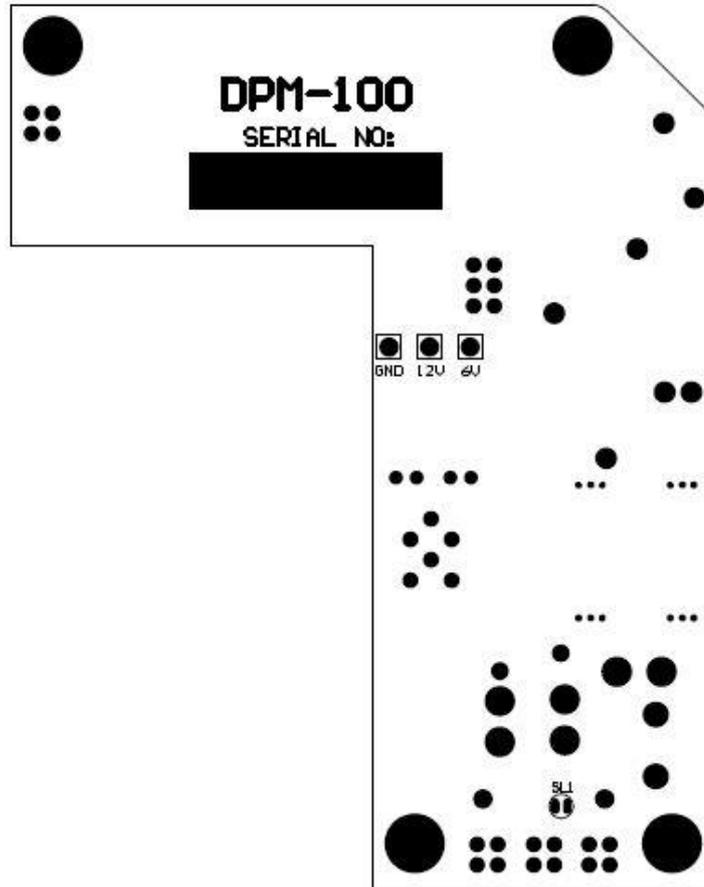


It is important not exceed the SAFETY PARAMETS of J1 (see section 7.1 below). Failure to do this will invalidate the IS certification.

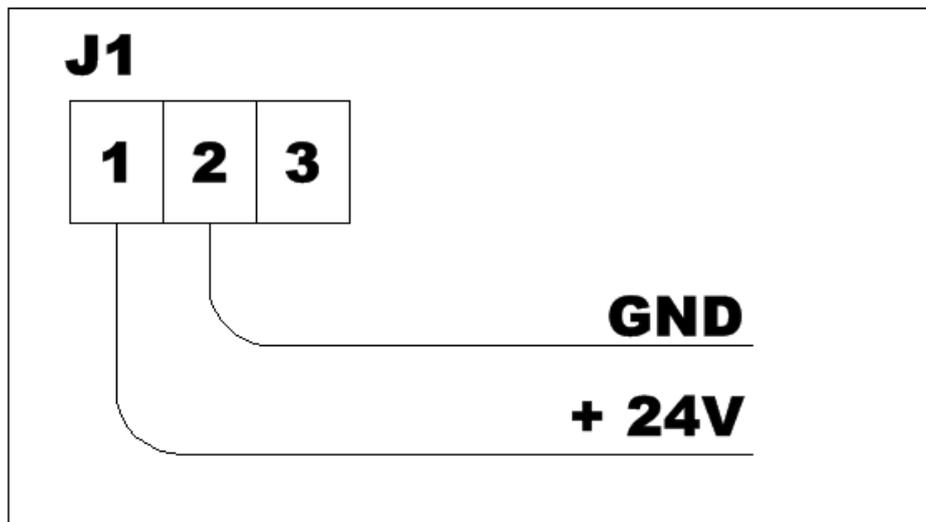


3.2.2.2. DPM-100

- Identified with “DPM-100” marking on the silkscreen of the PCB
- 24V_{DC} Input Only
- Minimum 0.5mm² wire required

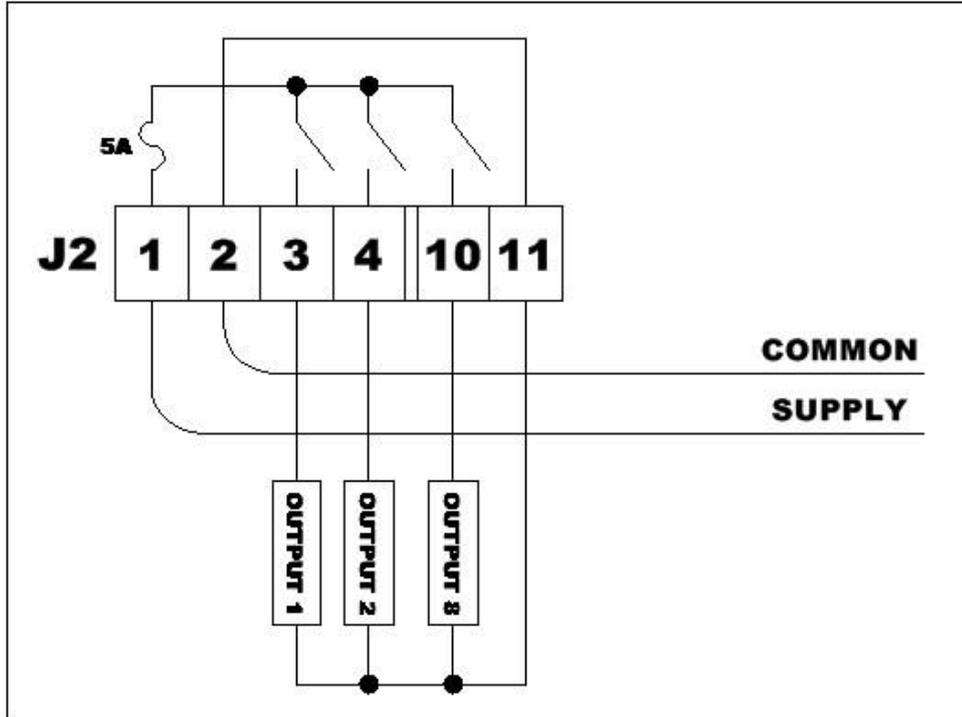


It is important not exceed the SAFETY PARAMETS of J1 (see section 7.1X below). Failure to do this will invalidate the IS certification.



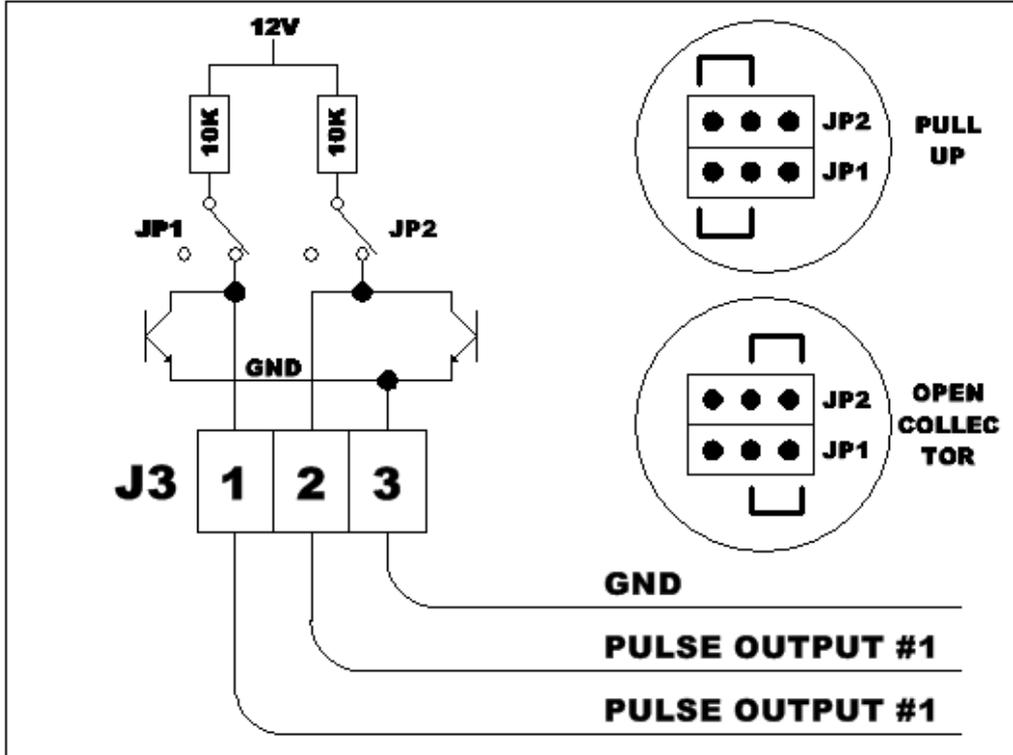
3.2.3. J2 – Relay outputs

- The relays are internally limited with a 5A fuse – F8
- Minimum 0.5mm² wire required



3.2.4. J3 – Pulse outputs

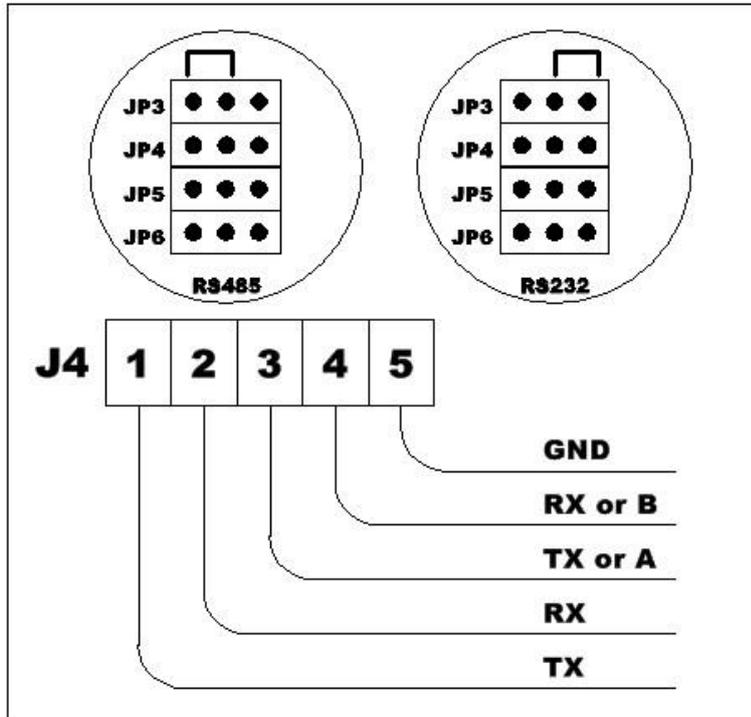
- The Pulse Outputs can be set to be an open collector or internal pull up (10K) configuration with JP1 and JP2 respectively.
- Minimum 0.5mm² wire required



3.2.5. J4 – Communication Interfaces

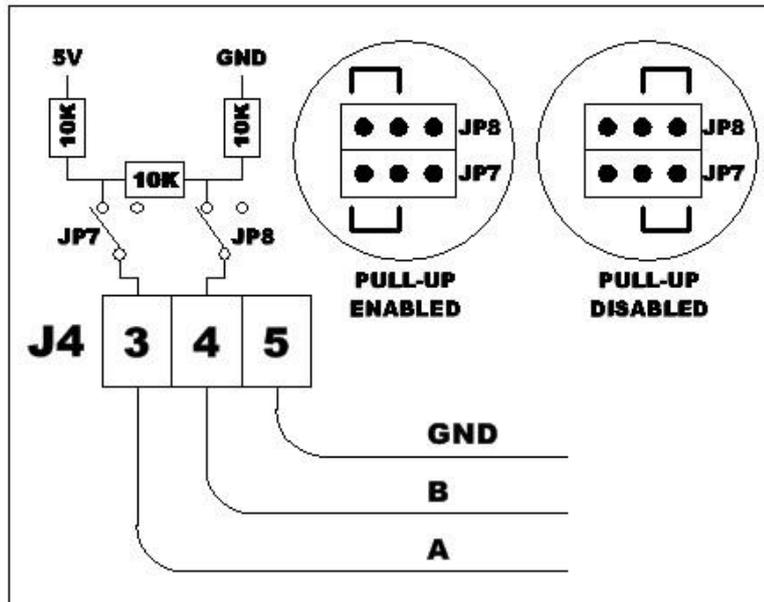
3.2.5.1. RS232 or RS485 setup

- Dedicated RS232 output (Pins 1, 2 and 5)
- Selectable RS485 or RS232 output (Pins 3,4 and 5) via JP3-JP6
- Minimum 0.5mm² wire required



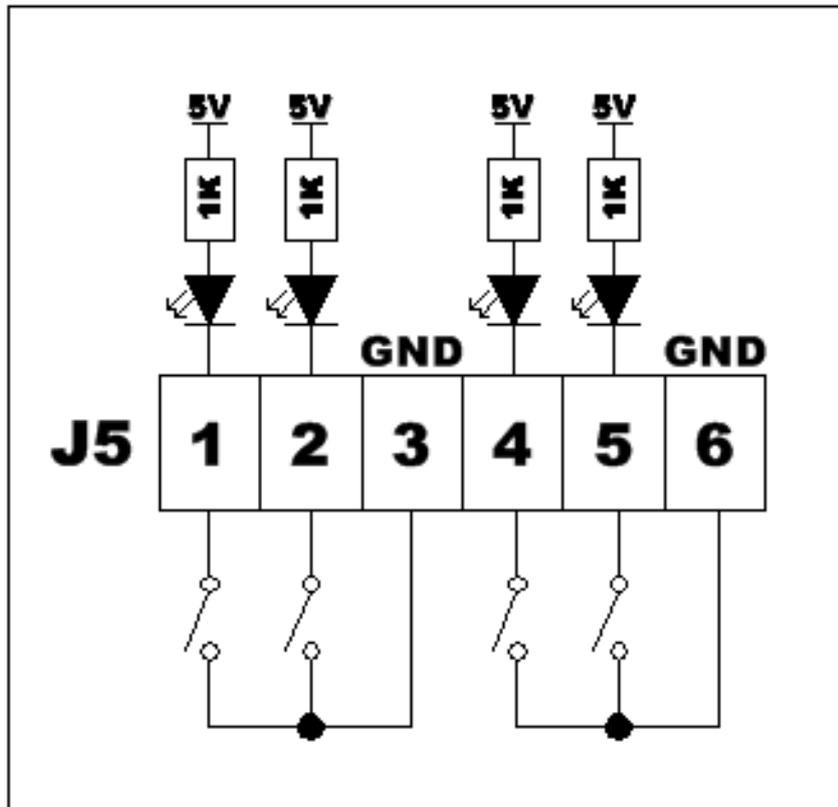
3.2.5.2. RS485 Terminating resistor setup

- 1K terminating resistor selection available via JP7 and JP8



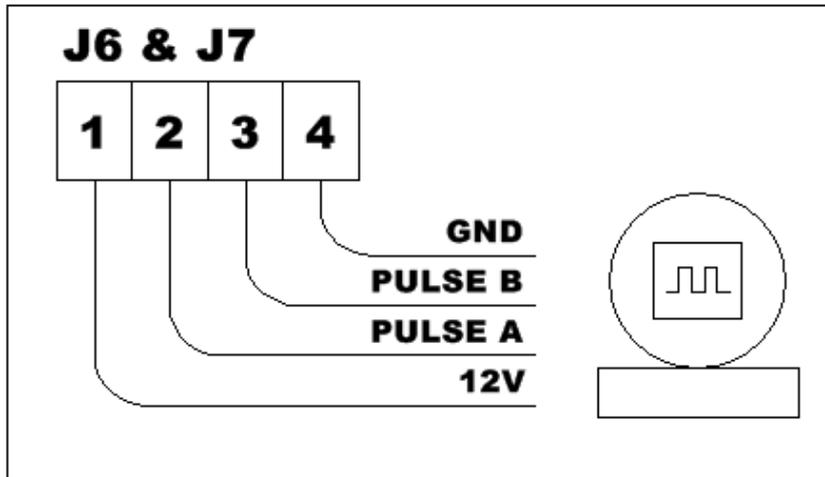
3.2.6. J5 – Inputs

- Minimum 0.5mm² wire required



3.2.7. J6 and J7 – EXD pulsars

- Minimum 0.5mm² wire required



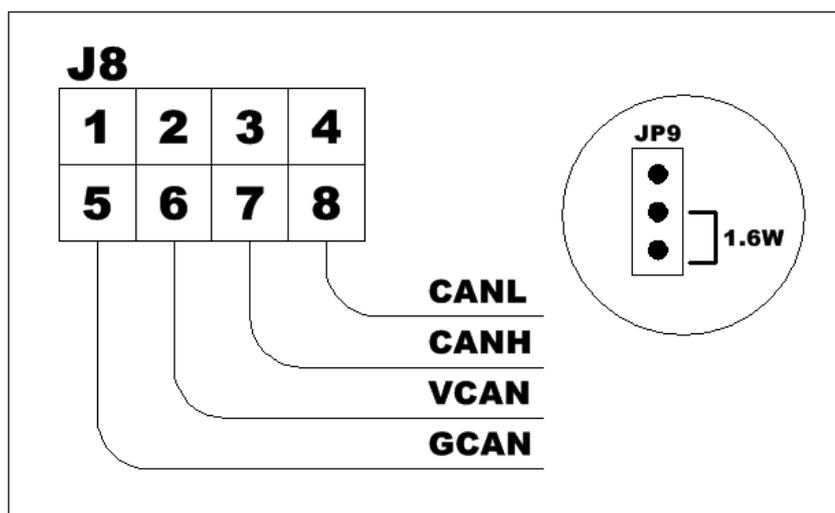
3.2.8. J8 – CAN BUS

3.2.8.1. 1.6W output selection (JP9 bottom)

- JP10 to be terminated at start and end of bus individually
- Minimum 0.34mm² wire required



It is important to be aware of the SAFETY PARAMETS of J8 (see section 7.1 below) with this configuration. Not taking this into account during installation can invalidate the IS certification.

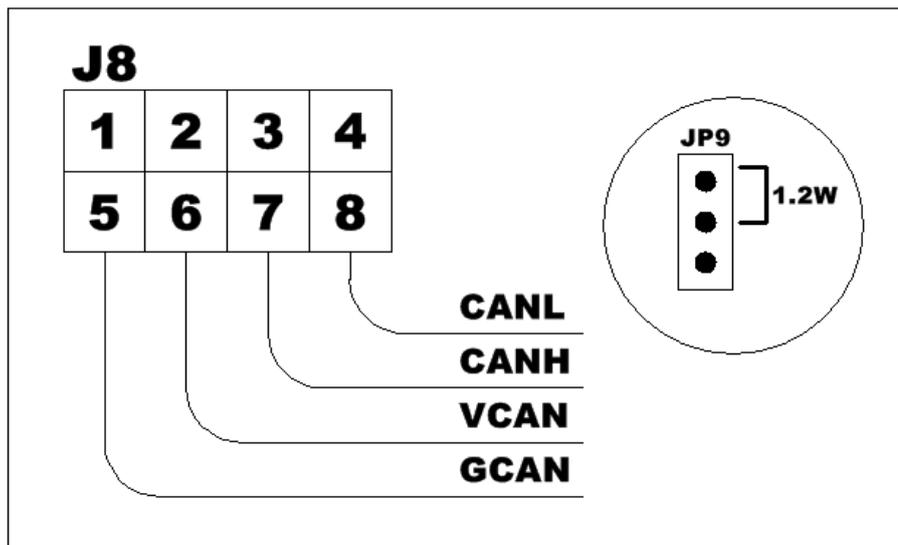


3.2.8.2. 1.2W output selection (JP9 top)

- JP10 to be terminated at start and end of bus individually
- Minimum 0.34mm² wire required



It is important to be aware of the SAFETY PARAMETS of J8 (see section 7.1 below) with this configuration. Not taking this into account during installation can invalidate the IS certification.

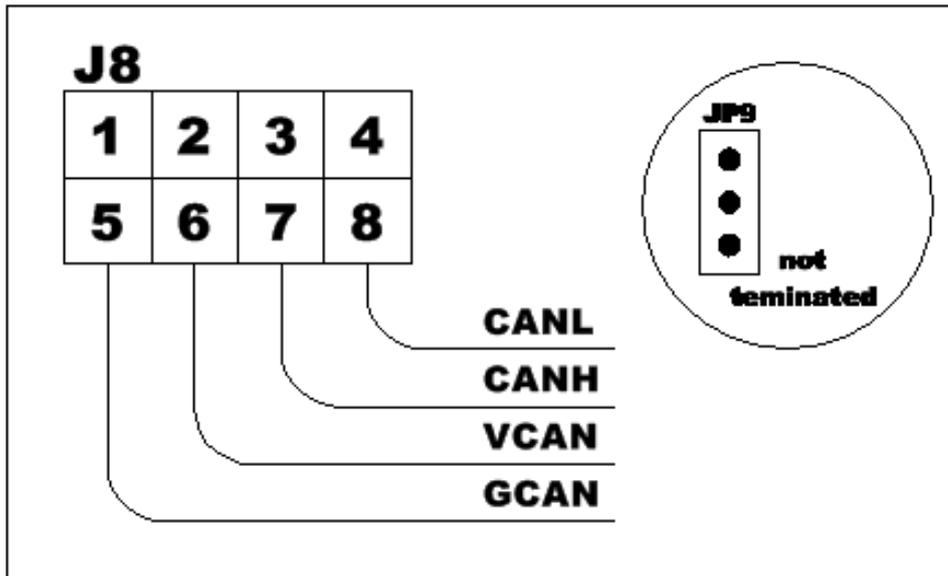


3.2.8.3. Passive input (JP9 not terminated)

- JP10 to be terminated at start and end of bus individually
- Minimum 0.34mm² wire required



It is important to be aware of the SAFETY PARAMETS of J8 (see section 7.1 below) with this configuration. Not taking this into account during installation can invalidate the IS certification.

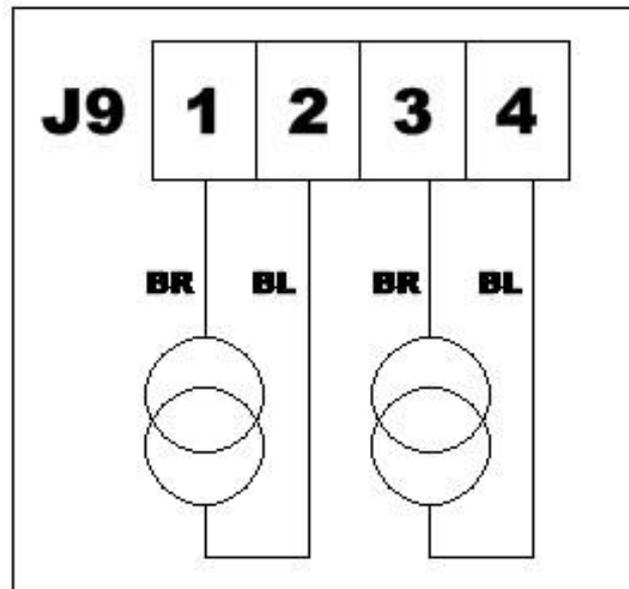


3.2.9. J9 – Proxy sensor interface

- Minimum 0.34mm² wire required



It is important not exceed the SAFETY PARAMETS of J9 (see section 7.1 below). Failure to do this will invalidate the IS certification.

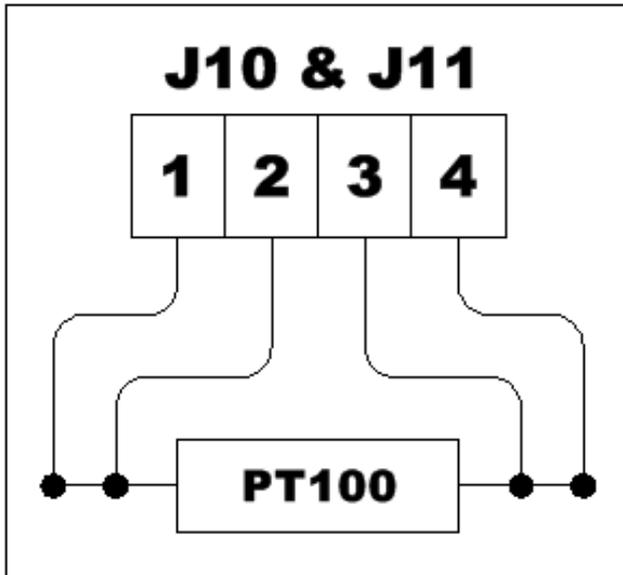


3.2.10. J10 and J11 – Temperature interface

- Minimum 0.5mm² wire required



It is important not exceed the SAFETY PARAMETS of J10 and J11 (see section 7.1.3 below). Failure to do this will invalidate the IS certification.



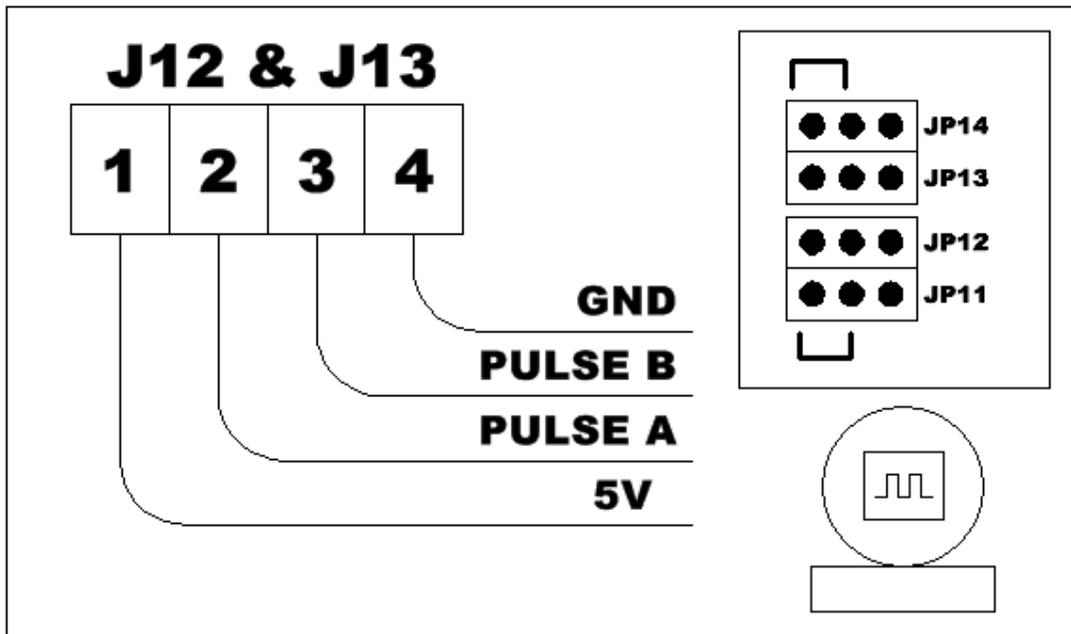
3.2.11. J12 and J13 – IS Pulsars

3.2.11.1. Normal selection (Active)

- JP11, JP12 and JP13, JP14 individually set to LEFT
- Minimum 0.34mm² wire required



It is important to be aware of the SAFETY PARAMETS of J12 and J13 (see section 7.1 below) with this configuration. Not taking this into account during installation can invalidate the IS certification.

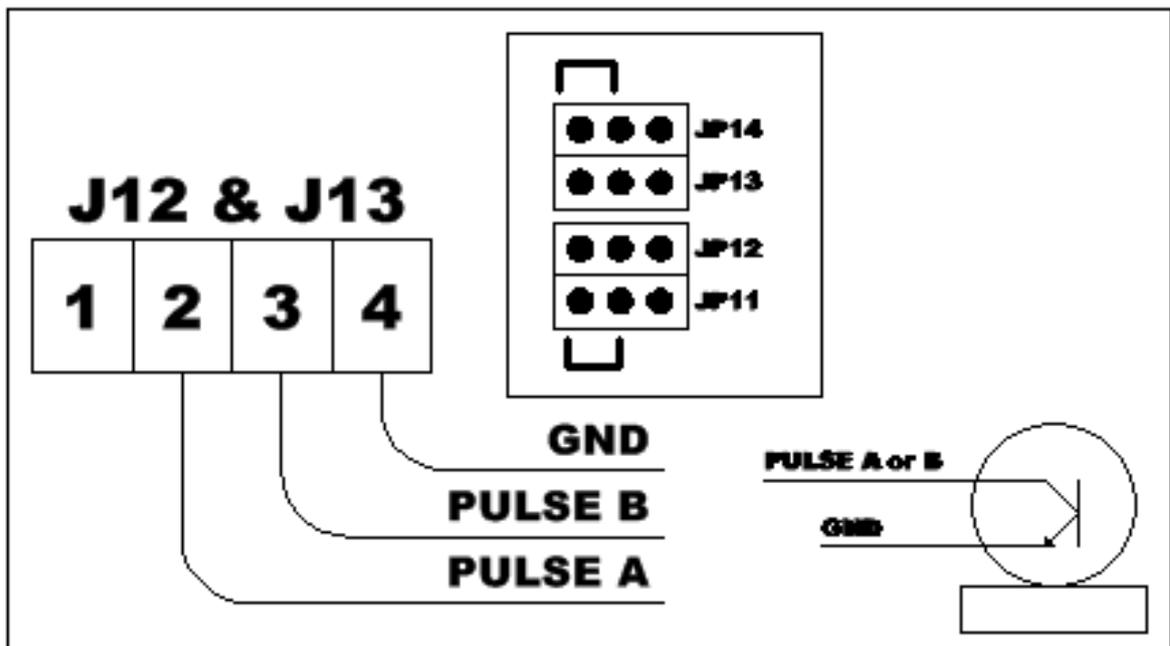


3.2.11.2. Normal selection (open collector)

- JP11, JP12 and JP13, JP14 individually set to LEFT
- Minimum 0.34mm² wire required



It is important to be aware of the SAFETY PARAMETS of J12 and J13 (see section 7.1 below) with this configuration. Not taking this into account during installation can invalidate the IS certification.

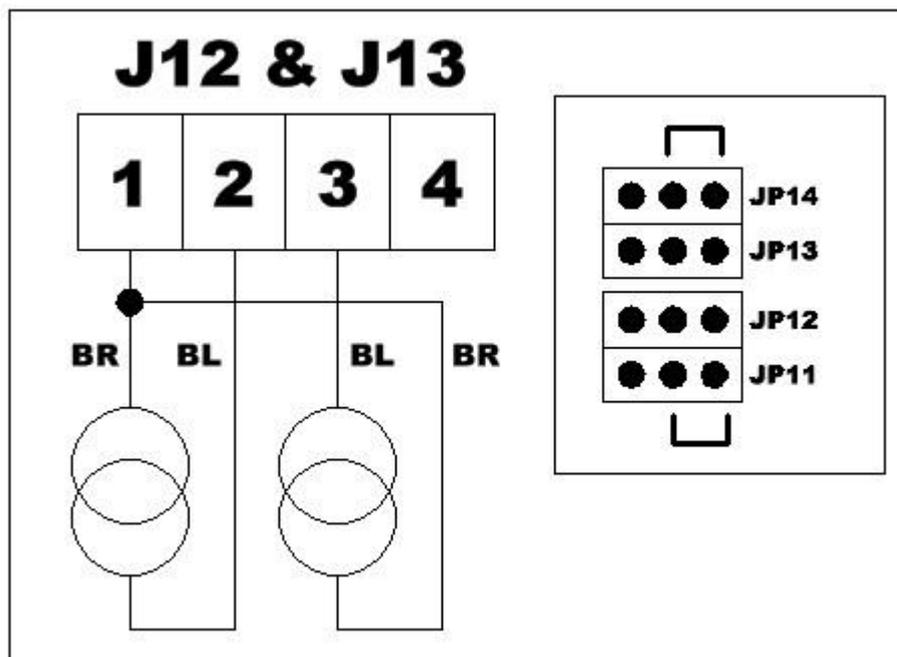


3.2.11.3. Namur selection

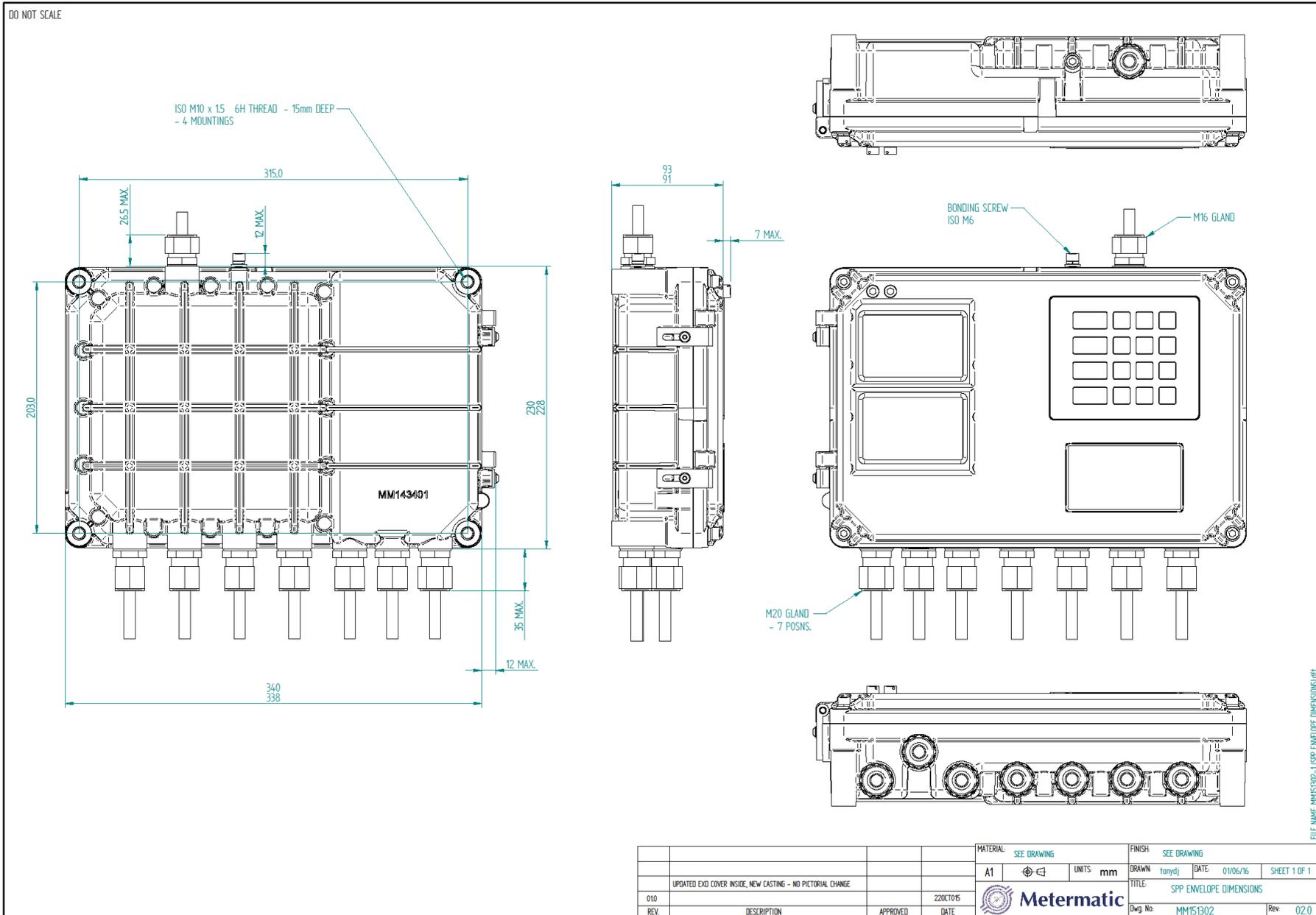
- JP11, JP12 and JP13, JP14 individually set to LEFT
- Minimum 0.34mm² wire required



It is important to be aware of the SAFETY PARAMETS of J12 and J13 (see section 7.1 below) with this configuration. Not taking this into account during installation can invalidate the IS certification.



4. Dimensional drawing

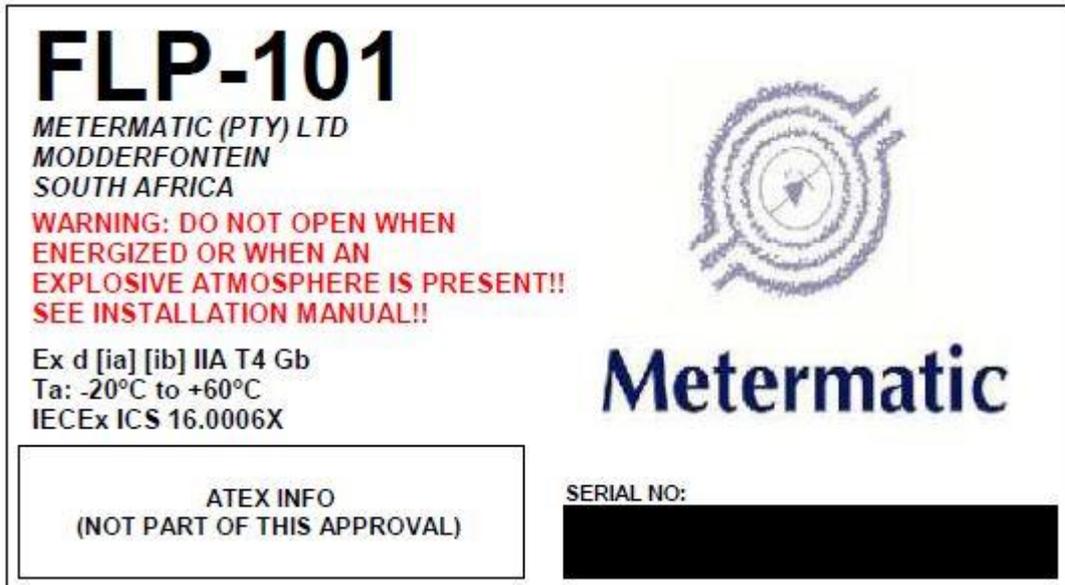


5. Instructions

5.1. Flameproof (EXD)

The following instructions apply to equipment covered by certificate number **IECEX ICS 16.0006X**. Referring to the FLP-101 (EXd Enclosure specifically)

Marking and Labelling:



Certification Number:	IECEX ICS 16.0006X
Classification:	Exd [ia] [ib] IIA T4 Mb Gb
Ambient temperature:	-20°C to +60 deg °C
PART No.	FLP-101
VOLTAGE:	DPM-100 Powered: 24Vdc APM-100 Powered: 220Vac
WATT:	7.5W

Installation Safety Instructions:

Manager's site rules and guidelines to be followed to install equipment.

Refer to Installation drawings for the flameproof dimensions and correct wiring.

Inspection of the FLP-101 Enclosure (EM6 and EM6-X) should be performed prior to powering of the system.

The following items should be inspected, but inspection should not be limited to,

- Flameproof bolted joints for missing or loose fasteners,
- Flameproof joint gaps,
- Flameproof compression glands, blanking plugs and certified bushings,
- Check all terminations for loose connections.

Only qualified personnel are allowed to be installing, inspecting and maintaining equipment.

5.2. Intrinsic safety

The following instructions apply to equipment covered by certificate number **IECEX ICS 16.0006X**. Referring to the EM6 / EM6-X

Marking and Labelling:

<h1 style="margin: 0;">EM6</h1> <p style="margin: 0;">METERMATIC (PTY) LTD MODDERFONTEIN SOUTH AFRICA</p> <p style="margin: 0;">WARNING: SEE INSTALLATION MANUAL</p> <p style="margin: 0;">Ex d ia [ia Ga] [ib Gb] IIA T4 Gb Ta: -20°C to +60°C IECEX ICS 16.0006X</p>	<div style="border: 1px solid black; width: 100%; height: 30px; margin-bottom: 5px;"></div> <p style="text-align: right; margin: 0;">CONFIGURATION</p>	<div style="border: 1px solid black; width: 100%; height: 150px; margin-bottom: 5px;"></div> <p style="text-align: center; margin: 0;">OIML INFO (NOT PART OF THIS APPROVAL)</p>
<div style="border: 1px solid black; width: 100%; height: 50px; margin-bottom: 5px;"></div> <p style="text-align: center; margin: 0;">ATEX INFO (NOT PART OF THIS APPROVAL)</p>	<p style="margin: 0;">SERIAL NO:</p> <div style="background-color: black; width: 100%; height: 30px;"></div>	 <p style="margin: 0;">Metermatic</p>

<h1 style="margin: 0;">EM6-X</h1> <p style="margin: 0;">METERMATIC (PTY) LTD MODDERFONTEIN SOUTH AFRICA</p> <p style="margin: 0;">WARNING: SEE INSTALLATION MANUAL</p> <p style="margin: 0;">Ex d ia [ia Ga] [ib Gb] IIA T4 Gb Ta: -20°C to +60°C IECEX ICS 16.0006X</p>	<div style="border: 1px solid black; width: 100%; height: 30px; margin-bottom: 5px;"></div> <p style="text-align: right; margin: 0;">CONFIGURATION</p>	<div style="border: 1px solid black; width: 100%; height: 150px; margin-bottom: 5px;"></div> <p style="text-align: center; margin: 0;">OIML INFO (NOT PART OF THIS APPROVAL)</p>
<div style="border: 1px solid black; width: 100%; height: 50px; margin-bottom: 5px;"></div> <p style="text-align: center; margin: 0;">ATEX INFO (NOT PART OF THIS APPROVAL)</p>	<p style="margin: 0;">SERIAL NO:</p> <div style="background-color: black; width: 100%; height: 30px;"></div>	 <p style="margin: 0;">Metermatic</p>

Certification Number:	IECEX ICS 16.0006X
Classification:	Exd [ia] [ib] IIA T4 Mb Gb
Ambient temperature:	-20°C to +60 deg °C
PART No.	EM6 / EM6-X
VOLTAGE:	DPM-100 Powered: 24Vdc APM-100 Powered: 220Vac
WATT:	7.5W

Installation Safety Instructions:

Manager's site rules and guidelines to be followed to install equipment.

Refer to Installation drawings for the safe and correct wiring/installation.

1. The equipment may be used with gases and vapours associated with Group IIA in category 2 and 3 locations, with temperature classes T1, T2, T3 and T4. The intrinsic safety outputs may be connected to suitable equipment in category 1 locations.
2. The equipment is only certified for use in ambient temperatures in the range -20°C to +60°C and should not be used outside this range.
3. Installation shall be carried out in accordance with the applicable code of practice by suitably-trained personnel in accordance with the System Manual provided.
4. Repair of this equipment shall be carried out in accordance with the applicable code of practice.
5. Programming connectors JJ1, JJ7 and JJ8 are only used during manufacturing, repair or overhaul
6. The BR2330 coin cell is not replaceable
7. The certificate number has an 'X' suffix which indicates that special conditions of installation and use apply. Those installing or inspecting this equipment must have access to the contents of the certificate.

6. Special conditions of use

The following special conditions of use are applicable

- Earth (High Quality Earth) / circuit Ground is infallibly electrically connected/bonded to the enclosure. This must be considered for the intrinsic safe installation. (Therefore, the 500Vrms isolation is not maintained.)
- When connecting intrinsically safe equipment to the GSM barrier device where the transient current for the rating of internal components are required to be considered the principles of ExTAG DS 2006/008 (December 2006) with capacitance 100pF($\pm 20\%$) for a single series capacitor and the applicable Um value must be used.
- A GSM Module and flameproof certified B-ANT-EXD bushing in the side of the flameproof enclosure may be fitted only when the DPM-100 power module is fitted.
- The intrinsic safety system approval of peripheral devices is not part of the certification.
- The bushing material may not be subjected to direct UV exposure or mechanisms of generating static electricity.
- The B-ANT-EXD shall be installed as to not be subjected to any mechanical stress on the cable.
- Only suitably certified glands / blanking elements, with additional rating of at least IP54 may be utilized on the equipment. All unused entries must be blanked.
- Some flamepaths are more restrictive than the minimum requirements in the standard. Information w.r.t. the flamepaths must be obtained from the manufacturer as required.

7. Labels

7.1. EM6

EM6	<input type="text"/>	CONFIGURATION
METERMATIC (PTY) LTD MODDERFONTEIN SOUTH AFRICA		OIML INFO (NOT PART OF THIS APPROVAL)
WARNING: SEE INSTALLATION MANUAL	Metermatic	
Ex d ia [ia Ga] [ib Gb] IIA T4 Gb Ta: -20°C to +60°C IECEX ICS 16.0006X		
ATEX INFO (NOT PART OF THIS APPROVAL)	SERIAL NO: <input type="text"/>	

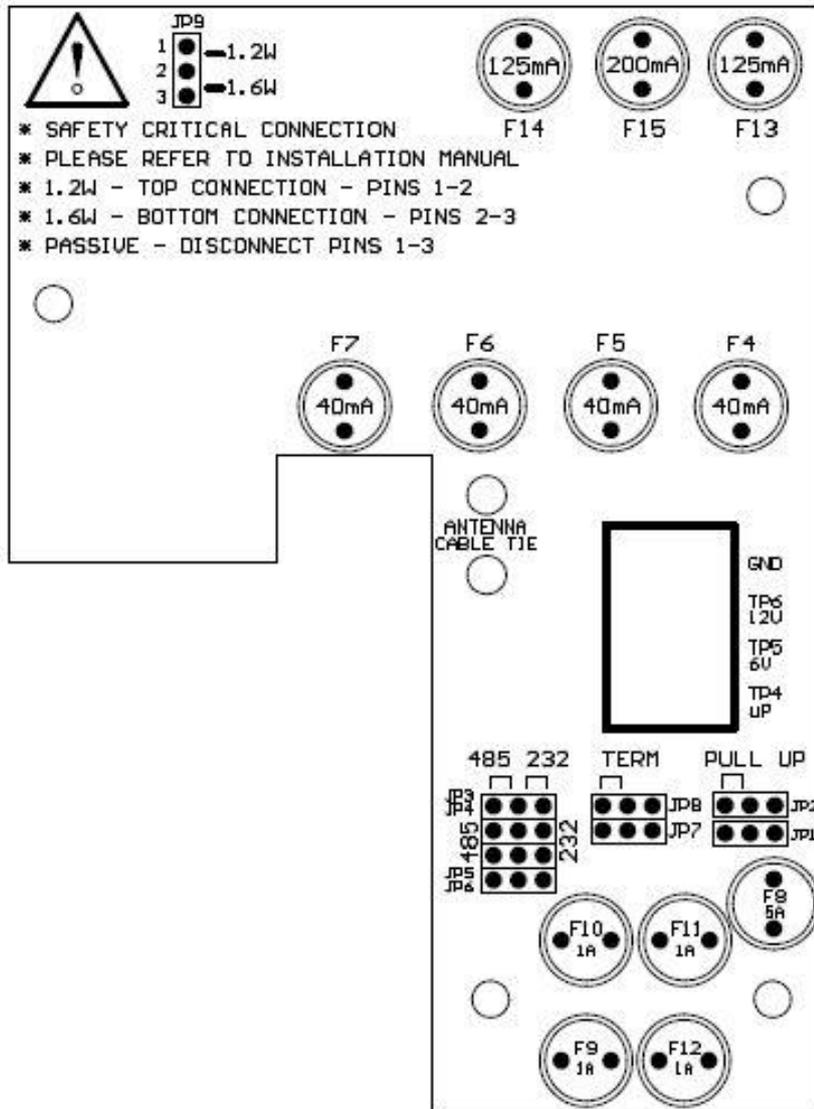
7.2. EM6-X

EM6-X	<input type="text"/>	CONFIGURATION
METERMATIC (PTY) LTD MODDERFONTEIN SOUTH AFRICA		OIML INFO (NOT PART OF THIS APPROVAL)
WARNING: SEE INSTALLATION MANUAL	Metermatic	
Ex d ia [ia Ga] [ib Gb] IIA T4 Gb Ta: -20°C to +60°C IECEX ICS 16.0006X		
ATEX INFO (NOT PART OF THIS APPROVAL)	SERIAL NO: <input type="text"/>	

7.3. FLP-101

<p>FLP-101 METERMATIC (PTY) LTD MODDERFONTEIN SOUTH AFRICA WARNING: DO NOT OPEN WHEN ENERGIZED OR WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT!! SEE INSTALLATION MANUAL!! Ex d [ia] [ib] IIA T4 Gb Ta: -20°C to +60°C IECEX ICS 16.0006X</p>	 Metermatic
<p>ATEX INFO (NOT PART OF THIS APPROVAL)</p>	<p>SERIAL NO: </p>

7.4. EM6 Fuseplate



8. Safety parameters

8.1. EM6 and EM6-X

8.1.1. J1 Input power – APM-100

$$U_m = 250V_{ac}$$

8.1.2. J1 Input power– DPM-100

$$U_m = 35V_{dc}$$

8.1.3. J8 CAN BUS – 1.6W (see section 3.2.8.1)

$$\begin{aligned} U_o &= 5.88V \\ I_o &= 1.800A \\ P_o &= 1.622W \\ C_o &= 980\mu F \\ L_o &= 87.7\mu H \\ L_o/R_o &= 107\mu H/\Omega \end{aligned}$$

8.1.4. J8 CAN BUS – 1.2W (see section 3.2.8.2)

$$\begin{aligned} U_o &= 5.88V \\ I_o &= 844mA \\ P_o &= 1.194W \\ C_o &= 980\mu F \\ L_o &= 399\mu H \\ L_o/R_o &= 229\mu H/\Omega \end{aligned}$$

8.1.5. J8 CAN BUS – Passive (see section 3.2.8.3)

$$\begin{aligned} U_i &= 8V \\ I_i &= 3.33A \\ C_i &= 12.1\mu F \\ L_i &= 0 \end{aligned}$$

8.1.6. J9 Proxy interface

$$\begin{aligned} U_o &= 7.88V \\ I_o &= 14.82mA \\ P_o &= 29.2mW \\ C_o &= 120\mu F \\ L_o &= 1.29H \\ L_o/R_o &= 9.74mH/\Omega \end{aligned}$$

8.1.7. J10 and J11 Temperature interface

U _o	=	6.88V
I _o	=	553mA
P _o	=	1.04W
C _o	=	400uF
L _o	=	930uH
L _o /R _o	=	261uH/Ω

8.1.8. J12 & J13 Pulsar interface (see section 3.2.11.1)

U _o	=	7.88V
I _o	=	435mA
P _o	=	857mW
C _o	=	990uF
L _o	=	1.5mH
L _o /R _o	=	332uH/Ω

8.1.9. J12 & J13 Pulsar interface (see section 3.2.11.2)

U _o	=	7.88V
I _o	=	4.11mA
P _o	=	8.1mW
C _o	=	990uF
L _o	=	16.8H
L _o /R _o	=	35mH/Ω

8.1.10. J12 & J13 Pulsar interface (see section 3.2.11.3)

U _o	=	7.88V
I _o	=	6.8mA
P _o	=	13.51mW
C _o	=	990uF
L _o	=	6.15H
L _o /R _o	=	21mH/Ω

8.1.11. J14 Dallas iButton interface

U _o	=	7.88V
I _o	=	553mA
P _o	=	1.04W
C _o	=	100uF
L _o	=	930uH
L _o /R _o	=	261uH/Ω

8.1.12. GSM-100

824MHz to 1990MHz
U_o = 3.3V
I_o = 2.5A
P_o = 45mW
C_o = 1.2uF
L_o = 45uH