



Mining And Surface Certification CC

CC 2008/202081/23



Certificate Number: MASC M/11-220X
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IA – CERTIFICATE (Revision 3 – Revised for annual review)

IN TERMS OF REGULATION 21.17.2 OF THE MINERALS ACT (INCORPORATION THE MINE HEALTH AND SAFETY ACT) AND REGULATION 9 (1) OF THE ELECTRICAL MACHINERY REGULATIONS OF THE OCCUPATIONAL HEALTH AND SAFETY ACT

Ex – Type Examination

Certificate number: **MASC M/11-220X**
Equipment: TX913x Trip Amplifiers
Serial No: (See “Conditions of Certification”)
Applicant: Trolex Ltd.
Address: Hazel Grove
Stockport
Cheshire
SK7 5DY
United Kingdom

Manufacturer: Trolex Ltd.
Address: Hazel Grove
Stockport
Cheshire
SK7 5DY
United Kingdom

DESCRIPTION:

The TX913x Programmable Trip Amplifiers are intended to accept signals from a range of external sensors (e.g. 4-20mA signals, 0.4-2V signals, temperature sensors, flammable gas sensors, accelerometers, etc.)

The TX913x Trip Amplifiers are housed in an ABS enclosure and contain a standard Control PCB that is connected to one of a range of I/O PCBs depending on the application. The different versions of the Trip Amplifiers listed below each contain the control PCB connected to a different I/O PCB:

TX9131 4-20 mA Input Trip Amplifiers
TX9132 Voltage Input Trip Amplifiers
TX9133 Thermocouple Input Trip Amplifiers
TX9134 PT100 Temperature Sensor Input Trip Amplifiers
TX9135 Semiconductor Temperature Sensor Input Trip Amplifiers
TX9136 Bridge Input Trip Amplifiers

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TX9137 A.C. (Peak) Input Trip Amplifiers
TX9137 A.C. (RMS) Input Trip Amplifiers
TX9139 Interposing Relay Trip Amplifier

Apart from the TX9139, each version of the Trip Amplifier has 4 variants:

Dual relay output
4-20 mA output
0.4-2 V output
5-15 Hz output

The control PCB remains the same for all versions and contains a micro-controller, EPROM and EEPROM memories, other logic circuits and an alpha-numeric LCD module, which is mounted directly onto the PCB. A keypad is fitted to the front panel of the Trip Amplifier and is connected to the Control PCB via a flexible ribbon cable.

The I/O PCBs contain some common circuitry as well as circuitry specific to the application. Some versions are based on the same artwork but with different builds to achieve the desired configuration; other versions use different artwork and builds. The safety description of the equipment is shown below.

Terminals T1-T8, T11-T12

TX9131/2/5 (see more detailed safety description in variation 4)

T1-T4 (sensor)	T5-T6 (supply)	7-T8 (relay)	T11-T12 (relay reset/power on delay)
$U_o = 16.5 \text{ V}$	$U_i = 16.5 \text{ V}$	$U_o = 0$	$U_o = 16.5 \text{ V}$
$C_i = 3.6 \text{ nF}$	$C_i = 3.6 \text{ nF}$	$U_i = 20\text{V}$	$U_i = 0$
$L_i = 0$	$L_i = 0$	$C_i = 0$	$C_i = 0$
		$L_i = 0$	$L_i = 0$

Note: terminals T1 and T2 are connected directly to the supply terminals T5-T6, so have the same output parameters as the mining power supply.

TX9133

T1-T4 (sensor)	T5-T6 (supply)	T7-T8 (relay)	T11-T12 (relay reset/power on delay)	
$U_o = 16.5 \text{ V}$	$U_i = 16.5 \text{ V}$	$U_o = 0$	$U_o = 16.5 \text{ V}$	
$C_i = 2.4 \text{ nF}$	$C_i = 2.4 \text{ nF}$	$U_i = 20\text{V}$	$U_i = 0$	
$L_i = 0$		$L_i = 0$	$C_i = 0$	$C_i = 0$
			$L_i = 0$	$L_i = 0$

Note: terminals T1 and T2 are connected directly to the supply terminals T5-T6, so have the same output parameters as the mining power supply.

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TX9134

T1-T4 (sensor)	T5-T6 (supply)	T7-T8 (relay)	T11-T12 (relay reset/power on delay)
$U_o = 16.5 \text{ V}$	$U_i = 16.5 \text{ V}$	$U_o = 0$	$U_o = 16.5 \text{ V}$
$I_o = 1.163 \text{ A}$	$C_i = 1.2 \text{ nF}$	$U_i = 20 \text{ V}$	$U_i = 0$
$P_o = 1.75 \text{ W}$	$L_i = 0$	$C_i = 0$	$C_i = 0$
$C_o = 80 \text{ nF}$		$L_i = 0$	$L_i = 0$
$L_o/R_o = 52 \text{ } \mu\text{H}/\Omega$			
$C_i = 3.6 \text{ nF}$			
$L_i = 0$			

TX9136

T1-T4 (sensor)	T5-T6 (supply)	T7-T8 (relay)	T11-T12 (relay reset/power on delay)
$U_o = 16.5 \text{ V}$	$U_i = 16.5 \text{ V}$	$U_o = 0$	$U_o = 16.5 \text{ V}$
$I_o = 1.163 \text{ A}$	$C_i = 1.2 \text{ nF}$	$U_i = 20 \text{ V}$	$C_o = 12 \text{ } \mu\text{F}$
$C_o = 300 \text{ nF}$	$L_i = 245 \text{ } \mu\text{H}^*$	$C_i = 0$	$L_o/R_o = 52 \text{ } \mu\text{H}/\Omega$
$L_o = 80 \text{ } \mu\text{H}$		$L_i = 0$	$U_i = 0$
$C_i = 12.48 \text{ } \mu\text{F}$			$C_i = 0$
$L_i = 165 \text{ } \mu\text{H}$			$L_i = 0$

Note: the internal inductance is in series with a resistance of at least 14.25 Ω . This is inductively non-incentive when the apparatus is used in conjunction with a power supply having a peak output voltage (U_o) not exceeding 16.5 V.

TX9137

T1-T4 (sensor)	T5-T6 (supply)	T7-T8 (relay)	T11-T12 (relay reset/power on delay)
$U_o = 16.5 \text{ V}$	$U_i = 16.5 \text{ V}$	$U_o = 0$	$U_o = 16.5 \text{ V}$
$I_o = 183 \text{ mA}$	$C_i = 1.2 \text{ nF}$	$U_i = 20 \text{ V}$	$U_i = 0$
$P_o = 752 \text{ mW}$	$L_i = 0$	$C_i = 0$	$C_i = 0$
$C_o = 80 \text{ nF}$		$L_i = 0$	$L_i = 0$
$L_o/R_o = 52 \text{ } \mu\text{H}/\Omega$			
$C_i = 1.2 \text{ nF}$			
$L_i = 0$			

TX9139

T4 & T6 (sensor)	T5-T6 (supply)	T1-T3, T7-T12 (relay)
$U_o = 16.5 \text{ V}$	$U_i = 16.5 \text{ V}$	$U_o = 0$
$I_o = 8 \text{ mA}$	$C_i = 1.2 \text{ nF}$	$U_i = 20 \text{ V}$
$P_o = 33 \text{ Mw}$	$L_i = 0$	$C_i = 0$
$C_o = 11 \text{ } \mu\text{F}$		$L_i = 0$

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$L_o/R_o = 52 \mu\text{H}/\Omega$
 $C_i = 0$
 $L_i = 0$

Terminals T9-T10 (excluding the TX9139)

The parameters depend on the variant as follows:

Dual relay	4-20 mA	0.4-2 V	5-15 Hz
$U_o = 0$	$U_o = 16.5 \text{ V}$	$U_o = 16.5 \text{ V}$	$U_o = 0$
$U_i = 20 \text{ V}$	$C_i = 0$	$C_i = 0$	$U_i = 20 \text{ V}$
$C_i = 0$	$L_i = 0$	$L_i = 0$	$P_i = 2.5 \text{ W}$
$L_i = 0$			$C_i = 0$
			$L_i = 0$

MARKING

Trolex Ltd.

TX913x Trip Amplifiers

Ex Rating: Ex ia I (Ta = -20°C + 70°C)

IA No: MASC M/11-220X

Serial No: (see "Conditions of Certification")

COMPLIANCE:

The unit as described above and in MASC letter **11-220** is hereby certified "Explosion Protected" Ex ia I (Ta = -20°C + 70°C) and is suitable for use in hazardous locations as stated below and as tested, assessed and inspected in accordance with the relevant requirements of SANS Standards:

The evaluation was conducted according to the requirements of:

- **SANS/(IEC) 60079-0 : 2002/ EN50014:1997 (amendments A1-A2) "General Requirements";**
- **SANS/(IEC) 60079-11 : 1999 / EN50020:1994 (amendments A1) "Intrinsic Safety 'i'";**
- **ARP 0108 (Edition 1.1) "Regulatory requirements for explosion protected apparatus".**

Location	Zone 0 & 1	Gas / coal dust: Underground.
Hazard Frequency operating Environment	---	Continuous as could occur under normal conditions in hazardous area
Limiting Temperature	Group I	Methane and coal dust
Ambient Temperature	-20°C to +70°C	450°C (methane gas) / 150°C (coal dust)

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The use of apparatus in hazardous locations is subject to the following provisions as applicable, which shall be adhered to:

- i) SANS 10086 requirements;
- ii) Any conditions mentioned in the above report;
- iii) Codes of Practice enforced in terms of Regulations 21.17.2 of Minerals Act, by Chief Inspector of Mines;
- iv) Any restrictions and conditions enforced by Chief Inspectors of Mines, Principal Inspector (Group I equipment) of Chief Inspector of Factories (Group II equipment);
- v) Any relevant requirements of the MHS Act or the OHS Act.

SPECIAL CONDITIONS OF SAFE USE (X)

1. The TX913x Trip Amplifiers shall be installed in an outer enclosure that provides an ingress protection of at least IP54 to EN 60529:1991. Metallic enclosures shall also comply with clause 8.1 of EN 50014:1997.

The outer enclosure shall be marked in a visible, external location with an additional label that displays at least the following information:

Contains Trolex TX913x Programmable Trip Amplifiers
Ex ia I (T_a = -20°C to + 70°C)
MASC M/11-220X

If the enclosure is manufactured from plastics or incorporates a plastic component with a surface area in excess of 100 cm², then it shall also be marked with a static warning label:

“STATIC HAZARD! DO NOT RUB WITH A DRY CLOTH”

2. If the outer enclosure has a static warning label, then it shall not be installed in a location where it is likely to be subjected to conditions that may induce static charges, e.g. high velocity dust laden air.
3. This certificate (approval) only relates to the TX913x Trip Amplifiers and does not cover the function of any other electrical apparatus installed in the outer enclosure.
4. The internal temperature of this apparatus may rise above 150°C under normal or fault conditions; therefore, care shall be taken when the enclosure is opened to ensure that no dust enters the apparatus.

CONDITIONS OF CERTIFICATION:

1. According to the relevant requirements of the MHS Act and the OHS Act, production units of explosion protected equipment are required to comply with third party quality assurance (an approved mark scheme or batch testing by an accredited test laboratory).

/ 2. In affixing...

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2. In affixing the certificate number(s) to the apparatus the applicant attests on his own responsibility that the apparatus conforms to the documents listed in the original SAEx certificate (up to variation 5).

If the marked apparatus is found not to comply MASC should be notified immediately.

3. This approval/certificate relies on the following previously-certified products. When used as part of the TX913x, the key attributes listed in the table below shall still be maintained by their original certificate.

Product	Certificate number	Key attributes
Littelfuse fuse	BAS Ex 832302U	EEx ia IIC
Bedford OPI11264D opto-isolator	BAS Ex 89C2096U/2	EEx ia IIC

4. It is the manufacturer's responsibility to take all reasonable steps to ensure that the user or installer complies with the requirements detailed in Special Conditions for Safe Use 15.1 and retains evidence to this effect.

This **approval is valid for twelve months** from the date of issue when are evaluation will be conducted, especially with regards of the quality assurance notification, possible changes in the standard, and requirements in national codes of practice or regulations.

Approved on behalf of MASC



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TECHNICAL SPECIALIST

Mining And Surface Certification

This document is issued based on Mining And Surface Certification's Standard Contract terms and conditions available on request.

While every endeavour is made to ensure that a test / assessment is representative and accurately performed, and that a report is accurate in the quoted results and conclusions drawn from the test / assessment, MASC or its members/employees shall in no way be liable for any error made in carrying out the test / assessment or for any erroneous statement, whether in fact or in opinion, contained in a report issued pursuant to a test / assessment.

MASC takes no responsibility for any non-conformances, exclusions or any results / assessments not in compliance with the standards. By marking the equipment in accordance with the documentation / standard, the manufacturer attests on his own responsibility that the equipment has been constructed in accordance with the applicable requirements of the relevant standards and that the routine verifications and routine tests have been successfully completed and the product complies with the documentation and standard(s).

This document is only for use and application in South Africa. It is issued based on National interpretations and accepted practises.

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