1 **EU-TYPE EXAMINATION CERTIFICATE**

2 Equipment intended for use in Potentially Explosive Atmospheres Directive 2014/34/EU

3 Certificate Number: **Sira 99ATEX2136X** Issue: **11**

4 Equipment: **TX913x Trip Amplifiers**

5 Applicant: **Trolex Limited**

6 Address: Newby Road
Hazel Grove
Stockport
Cheshire SK7 5DY
UK

7 This equipment and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

8 CSA Group Netherlands B.V., notified body number 2813 in accordance with Articles 17 and 21 of Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in the confidential reports listed in Section 14.2.

9 Compliance with the Essential Health and Safety Requirements, with the exception of those listed in the schedule to this certificate, has been assured by compliance with the following documents:

EN 50014:1997 (amendments A1-A2) EN 50020:1994 (amendment A1)

10 If the sign 'X' is placed after the certificate number, it indicates that the equipment is subject to Specific Conditions of Use identified in the schedule to this certificate.

11 This EU-Type Examination Certificate relates only to the design and construction of the specified equipment. If applicable, further requirements of this Directive apply to the manufacture and supply of this equipment.

12 The marking of the equipment shall include the following:

I M1
EEx ia I (T_a = -20°C to +70°C)

Project Number 80025892

Signed: J A May

Title: Director of Operations

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6812 AR, Arnhem,
Netherlands

13 **DESCRIPTION OF EQUIPMENT**

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

Terminals T1-T8, T11-T12

TX9131/2/5

T1–T4 (sensor)	T5-T6 (supply)	T7-T8 (relay)	T11-T12 (relay reset/power on delay)
Uo = 16.5 V Ci = 3.6 nF Li = 0	Ui = 16.5 V Ci = 3.6 nF Li = 0	Uo = 0 Ui = 20 V Ci = 0 Li = 0	Uo = 16.5 V Ui = 0 Ci = 0 Li = 0

Note: Terminals T1 and T2 are connected directly to the supply terminals T5-6, 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)
Uo = 16.5 V Ci = 2.4 nF Li = 0	Ui = 16.5 V Ci = 2.4 nF Li = 0	Uo = 0 Ui = 20 V Ci = 0 Li = 0	Uo = 16.5 V Ui = 0 Ci = 0 Li = 0

Note: Terminals T1 and T2 are connected directly to the supply terminals T5-6, 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)
Uo = 16.5 V Io = 1.163 A Po = 1.75 W Co = 80 nF Lo/Ro = 52 µH/Ω Ci = 3.6 nF Li = 0	Ui = 16.5 V Ci = 1.2 nF Li = 0	Uo = 0 Ui 20 V Ci = 0 Li = 0	Uo = 16.5 V Ui = 0 Ci = 0 Li = 0

TX9136

T1–T4 (sensor)	T5-T6 (supply)	T7-T8 (relay)	T11-T12 (relay reset/power on delay)
Uo = 16.5 V Io = 1.163 A Co = 300 nF Lo = 80 µH Ci = 12.48 µF Li = 165 µH	Ui = 16.5 V Ci = 1.2 nF Li = 245 µH*	Uo = 0 Ui = 20 V Ci = 0 Li = 0	Uo = 16.5 V Co = 12 µF Lo/Ro = 52 µH/Ω Ui = 0 Ci = 0 Li = 0

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

TX9137

T1–T4 (sensor)	T5-T6 (supply)	T7-T8 (relay)	T11-T12 (relay reset/power on delay)
Uo = 16.5 V Io = 183 mA Po = 752 mW Co = 80 nF Lo/Ro = 52 µH/Ω Ci = 1.2 nF Li = 0	Ui = 16.5 V Ci = 1.2 nF Li = 0	Uo = 0 Ui = 20 V Ci = 0 Li = 0	Uo = 16.5 V Ui = 0 Ci = 0 Li = 0

TX9139

T4 & T6 (signal)	T5-T6 (supply)	T1-T3, T7-T12 (relay)
Uo = 16.5 V Io = 8 mA Po = 33 mW Co = 11 µF Lo/Ro ≤ 52 µH/Ω Ci = 0 Li = 0	Ui = 16.5 V Ci = 1.2 nF Li = 0	Uo = 0 Ui = 20 V Ci = 0 Li = 0

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Terminals T9-T10 (excluding the TX9139 and the TX9131)

The parameters depend on the variant as follows:

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

Terminals T9-T10 (TX9131 only)

Dual relay	4-20 mA	0.4-2V	5-15 Hz
Uo =0 Ui = 20 V Ci = 0 Li = 0	Uo = 16.5 V Io = 0.8 A Po = 1.632 W Ci = 0 Li = 0 Ui = 5.4 V Ii = 0.9 mA Pi = 1.2 mW	Uo = 16.5 V Ci = 0 Li = 0	Uo = 0 Ui = 20 V Pi = 2.5 W

Description of TX9151

The TX9151 Liquid Flow Trip Amplifier is typically designed to interface with a Liquid Flow Sensor (LFS) via a sensor measuring the differential pressure inside the LFS, this parameter is then used to calculate the flow rate. This gives a voltage output up to 5 V at 10 mA maximum. In conjunction with this, a second sensor measures the line pressure. The Control PCB, which is the same for all Trip Amplifiers, contains a micro-controller, EPROM & EEPROM memories, other logic circuits and an alpha-numeric LCD module that 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 TX9151 has 5 variants, depending on the output at terminals T9-10:

Dual relay output; 4-20 mA output; 0.4-2 V output – standard; 0.4-2 V output – PD543; 5-15 Hz output

The TX9151 has the following safety description:

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Terminals T1-T8, T11-T12.

T1 (sensor 1 supply), T2 (sensor 1 signal in) & T6 (zero volts)	T4 (sensor 2 signal in) & T3 (signal out) [See note 1]	T5-T6 (supply)	T7-T8 (relay)	T11 (relay reset) & T6	T12 (power on delay) & T6
Uo = 7.14 V Io = 75 mA Po = 0.31 W Co = 5 µF Lo = 100 µH	Ui = 16.5 V Ci = 1.2 nF Li = 0 Uo = 16.5 V Io = 5 mA Po = 20 mW Co = 120 nF Lo/Ro = 50 µH/Ω	Ui = 16.5 V Ci = 1.2 nF Li = 0	Uo = 0 Ui = 20 V Pi = 2.3W Ci = 0 Li = 0	Uo = 16.5 V Io = 5 mA Po = 20 mW Co = 120 nF Lo/Ro = 50 µH/Ω Ui = 0 Ci = 0 Li = 0	Uo = 16.5 V Io = 5 mA Po = 20 mW Co = 120 nF Lo/Ro = 50 µH/Ω Ui = 0 Ci = 0 Li = 0

Note 1: For the purpose of system assessment, it should be noted that cable connected to terminal T5 from the supply also feeds sensor 2 (typically a line pressure sensor).

Terminals T9/T10: the parameters depend on the variant as follows:

Dual relay (TX9151.31)	4-20 mA (TX9151.32)	0.4-2 V (TX9151.33) [standard version]	0.4-2 V (TX9151.33.PD543)	5-15 Hz (TX9151.34)
Uo = 0 Ui = 20 V Pi = 2.3W Ci = 0 Li = 0	Uo = 16.5 V Io = 472 mA Po = 1.95 W Co = 120 nF Lo/Ro = 50µH/Ω	Uo = 16.5 V Io = 50 mA Po = 0.21 W Co = 120 nF Lo/Ro = 50µH/Ω	Uo = 7.14 V Io = 50 mA Po = 0.21 W Co = 56 µF Lo/Ro = 20 µH/Ω	Uo = 0 Ui = 20 V Pi = 2.5 W Ci = 0 Li = 0

Variation 1 - This variation introduced the following change:

i. The use of pad printing as an alternative method of marking was recognised.

Variation 2 - This variation introduced the following change:

i. The addition of the TX9151 Liquid Flow Trip Amplifier to the existing range of Trip Amplifiers was allowed, the description being amended accordingly..

Variation 3 - This variation introduced the following changes:

i. The recognition of minor drawing modifications; these amendments are administrative or involve changes to the design that do not affect the aspects of the product that are relevant to explosion safety.
ii. The removal of the input voltage from the marking drawing.
iii. The name of the equipment was changed to become the TX91xx Series Trip Amplifiers, thereby encompassing the type TX9151.

Variation 4 - This variation introduced the following change:

i. A more detailed safety description for the TX9131/2/5 was specified.

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Terminals T1-T8, T11-T12

T1–T2 (sensor power)	T3-4 (sensor signal)	T5-T6 (supply)	T7-T8 (relay)	T11-T12 (relay reset/power on delay)
Uo = 16.5 V Ci = 2.4 nF Li = 0	Uo = 16.5 V Io = 33 mA Po = 135 mW Ci = 1.2 nF Li = 0	Ui = 16.5 V Ci = 3.6 nF Li = 0	Uo = 0 Ui = 20 V Ci = 0 Li = 0	Uo = 16.5 V Ui = 0 Ci = 0 Li = 0

Note: terminals T1 and T2 are connected directly to the supply terminals T5-6, so have the same output parameters as the mining power supply.

Terminals T9-T10

Dual relay	4-20 mA	0.4-2 V	5-15 Hz
Uo = 0 Ui = 20 V Ci = 0 Li = 0	Uo = 16.5 V Ci = 0 Li = 0	Uo = 16.5 V Ci = 0 Li = 0	Uo = 0 Ui = 20 V Pi = 2.5 W Ci = 0 Li = 0

Variation 5 - This variation introduced the following changes:

i. To recognise that the value of the output voltage of any terminal that has a previously designated Uo of 16.5 V to be equal to the Uo of the equipment connected to the supply terminals T5-T6 up to a maximum of 16.5 V.

Variation 6 - This variation introduced the following change:

i. To allow a modification to the TX9136 Programmable Trip Amplifier circuit so as to remove the fuse and replace it with resistive current limitation. Other minor circuit changes will enable the TX9136 to provide sensor cable fault diagnosis.

Variation 7 - This variation introduced the following change:

i. The control PCB was redesigned.

Variation 8 - This variation introduced the following change:

i. Assessment of the existing parameters for the TX9131 Trip amplifier (defining Io and Po parameters at terminal T9/T10 for the existing 4-20 mA output), the Product Description being amended.
ii. Assessment of the addition of input parameters for the TX9131 Trip Amplifier at terminal T9/T10 for connection with a certified barrier, as a result the Product Description was amended and a Specific Condition Of Use was introduced.

Variation 9 - This variation introduced the following change:

i. Recognise the new version, TX9131.xx.xx.SV Trip amplifier with reduced Io and Po parameters at the 40-20mA output terminals T9/T10 and subsequently the product description was amended.
ii. Recognise modification of the safety components for the TX9131.xx.xx.SV Trip amplifier model for providing the reduced parameters for Io and Po at terminals T9/T10.

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New set of parameters for Terminals T9-T10 for the model TX9131.xx.xx.SV

Terminals T9-T10 (TX9131.xx.xx.SV only)

4-20 mA

Uo = 16.5 V	Io = 0.1 A	Po = 0.413 W	Ci =0	Li = 0
Ui = 5.4V	Ii = 0.9 mA	Pi = 1.2 mW		

Refer to Certificate Annexe.

Variation 10 - This variation introduced the following change:

i. To permit the use of an alternative LCD module and the corresponding Control PCB layout changes.
ii. To permit minor BOM modifications of the Control PCB.

14 DESCRIPTIVE DOCUMENTS

14.1 Drawings

Refer to Certificate Annexe.

14.2 Associated Sira Reports and Certificate History

Issue	Date	Report number	Comment
0	2 December 1999	R52X6308A	The release of the prime certificate.
1	16 November 2000	52V6983	The introduction of Variation 1.
2	4 July 2001	R52A6519A	The introduction of Variation 2. (Re issued 15 March 2002 to correct the safety parameters, report R52A8478A refers)
3	5 March 2002	R52A8478A	The introduction of Variation 3.
4	9 August 2002	52V9206	The introduction of Variation 4.
5	14 March 2005	R52V13167A	The introduction of Variation 5.
6	25 February 2010	R20650A/00	This Issue covers the following changes: • All previously issued certification was rationalised into a single certificate, Issue 6, Issues 0 to 5 referenced above are only intended to reflect the history of the previous certification and have not been issued as documents in this format. • The introduction of Variation 6.
7	17 August 2017	R70135369A	This Issue covers the following changes: • EC Type-Examination Certificate in accordance with 94/9/EC updated to EU Type-Examination Certificate in accordance with Directive 2014/34/EU. *(In accordance with Article 41 of Directive 2014/34/EU, EC Type-Examination Certificates referring to 94/9/EC that were in existence prior to the date of application of 2014/34/EU (20 April 2016) may be referenced as if they were issued in accordance with Directive 2014/34/EU. Variations to such EC Type-Examination Certificates may continue to bear the original certificate number issued prior to 20 April 2016.)* • The introduction of Variation 7.
8	26 June 2018	R70176480A	The introduction of Variation 8.
9	22 March 2019	R70216373A	The introduction of Variation 9

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Issue	Date	Report number	Comment
10	31 October 2019	0433	Transfer of certificate Sira 99ATEX2136X from Sira Certification Service to CSA Group Netherlands B.V.
11	06 January 2020	R80025892A	The introduction of Variation 10

15 **SPECIFIC CONDITIONS OF USE** (denoted by X after the certificate number)

15.1 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.

15.2 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
EEx ia I (T_a = -20ºC to +70ºC)
Sira 99ATEX2136X

If the enclosure is manufactured from plastics or orporates a plastics component with a surface area in excess of 100 cm^2, then it shall also be marked with a static warning label:

"STATIC HAZARD! DO NOT RUB WITH A DRY CLOTH"

15.3 If the outer enclosure has a carries 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.

15.4 This certificate only relates to the TX913x Trip Amplifiers and does not cover the function of any other electrical apparatus installed in the outer enclosure.

15.5 The internal temperature of this apparatus may rise above 150ºC under normal or fault conditions; therefore, care shall be taken when the enclosure is opened to ensure that no dust enters the apparatus.

15.6 Connection to any external supply at terminals T9/T10 for the TX9131 Trip amplifier shall be done in a parallel configuration only.

16 **ESSENTIAL HEALTH AND SAFETY REQUIREMENTS OF ANNEX II** (EHSRs)

The relevant EHSRs that are not addressed by the standards listed in this certificate have been identified and individually assessed in the reports listed in Section 14.2.

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Certificate Annexe

Certificate Number: **Sira 99ATEX2136X**

Equipment: **TX913x Trip Amplifiers**

Applicant: **Trolex Limited**

Issue 0

Drawing	Sheet	Rev.	Date	Title
P5093.27	1 of 1	C	21 Jan 97	Reed Relay
P5460.01	1 of 1	A	07 Jul 97	Circuit Diagram Control P.C.B.
P5460.07	1 of 2	B	25 Feb 99	General Assembly
P5460.07	2 of 2	B	25 Feb 99	General Arrangement of Enclosure
P5460.45	1 of 1	A	21 Jan 98	Interconnection Block Diagram
P5460.109	1 of 1	A	18 May 98	Circuit Diagram 5-15 Hz ModulebP.C.B.
P5460.111	1 of 1	A	25 Sep 98	Circuit Diagram Modifications for 5-15 Hz Modules Output P.C.B.
P5460.127	1 of 1	A	25 Nov 99	Label Details
P5460.29	1 to 7	A	09 Jan 98	Output PCB
P5460.38	1 to 3	A	09 Jan 98	Circuit Diagram Output P.C.B. (V, I, KTY81 Input)
P5460.40	1 to 7	A	09 Jan 98	Output PCB
P5460.100	1 to 3	A	09 Jan 98	Circuit Diagram Output P.C.B. (Thermocouple Input)
P5460.41	1 to 3	A	09 Jan 98	Circuit Diagram Output P.C.B. (PT100 Input)
P5460.82	1 to 7	A	09 Jan 98	Output PCB
P5460.28	1 to 7	A	09 Jan 98	Output PCB
P5460.37	1 to 3	A	09 Jan 98	Circuit Diagram Output P.C.B. (Bridge Input)
P5460.02	1 of 3	A	09 Jan 98	Circuit Diagram Output P.C.B. (A.C. RMS Input)
P5460.02	2 of 3	A	09 Jan 98	Circuit Diagram Output P.C.B. (A.C. RMS Input)
P5460.02	3 of 3	B	26 Nov 99	Circuit Diagram Output P.C.B. (A.C. RMS Input)
P5460.5	1 to 7	A	09 Jan 98	Output PCB
P5460.23	1 to 7	A	09 Jan 98	Output PCB
P5460.26	1 to 3	A	09 Jan 98	Circuit Diagram Output P.C.B. (A.C. Peak Input)
P5460.113	1 to 4 of 5	A	25 Feb 99	Output PCB
P5460.114	1 of 1	A	26 Feb 99	Certified Circuit Diagram

Issue 1

Drawing	Sheet	Rev	Date	Title
P5460.07	1 of 1	C	13 Jun 00	General Assembly

Issue 2

Drawing	Sheets	Rev.	Date	Title
P5460.07	1 of 1	C	13 Jun 00	General Assembly
P5514.01	1 to 3	B	04 Feb 02	Certified Circuit Diagram Output PCB (Flow Sensor Input)
P5514.03	1 of 1	B	04 Feb 02	Output PCB, Flow Sensor Input *[artwork]*

Issue 3

Drawing	Sheets	Rev.	Date	Title
P5460.07	1 of 2	D	20 Feb 02	All versions: general assembly
P5460.02	3 of 3	C	06 Feb 02	TX9137 (RMS) output board parts list
P5460.26	3 of 3	B	06 Feb 02	TX9137 (Peak) output board parts list
P5460.37	3 of 3	B	06 Feb 02	TX9136 output board parts list
P5460.38	3 of 3	B	06 Feb 02	TX9131/2/5 output board parts list
P5460.41	3 of 3	B	06 Feb 02	TX9134 output board parts list
P5460.100	3 of 3	B	06 Feb 02	TX9133 output board parts list

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Certificate Annexe

Certificate Number: **Sira 99ATEX2136X**

Equipment: **TX913x Trip Amplifiers**

Applicant: **Trolex Limited**

Drawing	Sheets	Rev.	Date	Title
P5460.127	1 of 1	B	26 Feb 02	Label details
P5514.01	3 of 3	B	06 Feb 02	TX9151 output board parts list

Issues4 and 5 - No new drawings were introduced.

Issue 6

Drawing	Sheets	Rev.	Date (Sira stamp)	Title
P5460.142	1 of 3	A	16 Feb 10	TX9136 Circuit Diagram – Strain Gauge Output PCB

Issue 7

Drawing	Sheets	Rev.	Date(Sira stamp)	Title
P5460-01.ATEX.IECEX	1 to 2	A	07 Aug 17	ATEX/IECEx Certification Schematic Control PCB
P5460-03.ATEX.IECEX	1 to 3	A	16 Aug 17	Control PCB ATEX/IECEx Certification PCB Layout

Issue 8 - No new drawings were introduced.

Issue 9

Drawing	Sheets	Rev.	Date (Sira stamp)	Title
P5460.38.SV	2	A	18 March 19	Circuit Diagram Output P.C.B (4 to 20mA Input)
P5460.1800	2	A	18 March 19	Certification Information for User Manual (ATEX)

Issue 10. No new drawings were introduced.

Issue 11

Drawing	Sheets	Rev.	Date (Sira stamp)	Title
P5460.200.ATEX.IECEx	1 to 2	A	16 Dec 19	Control PCB – Revised Display Schematic and BOM
P5460.201.ATEX.IECEx	1 to 3	A	16 Dec 19	Control PCB- Revised Display PCB layout

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