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/11-359X**
Equipment:	**TX9042 Programmable Sensor Controller**
Serial No:	(See Conditions of Certification)
Applicant:	Trolex Limited.
Address:	10a Newby Road Hazel Grove Stockport Cheshire SK14 6NG United Kingdom
Manufacturer:	Trolex Limited.
Address:	10a Newby Road Hazel Grove Stockport Cheshire SK14 6NG United Kingdom

DESCRIPTION OF EQUIPMENT OR PROTECTIVE SYSTEM

(According to the Baseefa Certificate):

The Programmable Sensor Controller Type TX9042 provides signal conditioning and monitoring for up to 8 transducers. Each transducer is connected via a dedicated input PCB that provides the signal conditioning. A programmable microprocessor circuit monitors the conditioned signals to provide local display, monitoring and control signals, and digital data transmission.

The electronic circuitry, comprising up to 13 PCBs (Power Supply module, Display PCB, Control PCB, Input PCB, Comms Module and up to 8'Input' Modules), is housed in a moulded plastic enclosure which is itself housed in a stainless steel outer enclosure that provides facilities such as gland entries for restraining incoming cables. The enclosure has been assessed as providing a degree of protection of not less than IP54.

The Control PCB carries the microprocessor circuitry and the control relays and is mounted in the centre of the moulded enclosure, mounted over this, fixed to the top of the enclosure and connected to the Control PCB by a flat ribbon connector, is the Display PCB. An LCD is fitted on the Display PCB along with a connector to interface with a membrane keypad moulded into the top of the unit; the relay status LED's and a piezo- electric buzzer are also mounted on the Display PCB.

/. Optional...

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Optional data link circuitry is fitted onto a small daughter board (Digital Comms, RS485 Comms) which has pins for connection onto the Control PCB.

Beneath the Control PCB is fitted an Input PCB which carries up to eight transducer 'Input Modules' which can be selected from the following list and which may be fitted in any position on the Input PCB. Each Input Module is a small PCB fitted with input terminals and signal processing circuitry.

The Input Modules comprise:

- DC Analogue Input (that can be configured for voltage, current or temperature input)
- Digital Input (with an option of Vortex input)
- Digital Input (Failsafe)
- AC (RMS) Analogue Input
- Thermocouple Input
- Strain Gauge Input
- Flow Sensor Input
- Alternative Flow Sensor Module (Variation 1)

A Power Supply Module connects to the underside of both the Input PCB and the Control PCB.

Connections between the modules, Input PCB, Power Supply Module and Control PCB are by PCB mounted two part connectors.

Connections to external power sources can be made at:

a) Terminals A17, A18 – input to Power Supply Module
b) Terminals B1 to B6 – Digital comms
c) Terminals B7 to B18 – Relay contacts (3 contacts per relay)
d) Terminals A1 to A16, A19 to A34 – Input Modules (4 terminals per module)

Power Supply Connections

Terminals A17, A18 (Power)

Ui = 16.5
Ci = 0
Li = 0

Terminals A35, A36 (Control Function)

Ui = 0
Ii = 0
Pi = 0
Ci = 0
Li = 0

DC Analogue Input Module Connections

This module may be configured, when ordered, for any one of three types of signal Input – voltage, current or temperature:

/. Voltage...

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Voltage Input

Power Output Terminal T1 w.r.t T4

Uo = Ui (power supply connections)
Io = *
Po = *
Co = *
Lo = *
Lo/Ro = *

Input Terminals T2, T3 w.r.t T4

Ui = 16.5V
Ci = 120nF
Li = 0

Uo = 6.51V
Io = 1.3mA
Co = 300µF
Lo = 100mH

Note: parameters marked * are obtained from the certification of the power supply connected.

Current Input

Power Output Terminal T1 w.r.t T2

Uo = Ui (power supply connections)
Io = *
Po = *
Co = *
Lo = *
Lo/Ro = *

Input Teminals T2 w.r.t T3 or T4

Ui = 16.5V
Ci = 120nF
Li = 0

Uo = 6.51V
Io = 1.3mA
Co = 300µF
Lo = 100mH

Note: parameters marked * are obtained from the certification of the power supply connected.

Temperature Input

Power Output Terminal T1 w.r.t T2, T3 or T4

Uo = Ui (power supply connections)
Io = *
Po = *
Co = *
Lo = *
Lo/Ro = *

Input Terminal T2 w.r.t T3 or T4

Ui = 16.5V
Ci = 120nF
Li = 0

Uo = 6.51V
Io = 1.3mA
Co = 100µF
Lo = 100mH

Note: parameters marked * are obtained from the certification of the power supply connected.

Digital Input Module Connections

This module can be configured as either of two versions, digital and vortex:

/. Digital...

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Digital Input

Power Output Terminal T1 w.r.t T4

Uo = Ui (power supply connections)
Io = 40mA
Po = 163mW
Co = 5µF
Lo = 5mH
Lo/Ro = 100µH/Ω

Input Terminals T2, T3

Ui = 16.5V
Ci = 0
Li = 0

Uo = 6.51V
Io = 16mA
Co = 100µF
Lo = 100mH

Vortex Input

Power Output Terminal T1 w.r.t T4

Uo = 6.51V
Io = 40mA
Po = 153mW
Co = 100µF
Lo = 26mH
Lo/Ro= 240µH/Ω

Input Terminals T2, T3

Ui = 16.5V
Ci = 0
Li = 0

Uo = 6.51V
Io = 7mA
Co = 100µF
Lo = 100mH

Digital Input (Failsafe) Module Connections

Power Output Terminals T1 or T3 w.r.t T2 or T4

Uo = 12.51V Ui = 0V
Io = 3.4mA
Po = 10.5mW
Co = 5µF
Lo = 10mH

Input Terminals T2, T4

Ui = 16.5V
Ci = 12nF
Li = 0

Uo = 6.51V
Io = 3.6mA
Co = 100µF
Lo = 100mH

AC (rms) Analogue Input Module Connections

Power Output Terminals T1 w.r.t T4

Uo = Ui (power supply connections)
Io = *
Po = *
Co = *
Lo = *
Lo/Ro = *

Loop power Output Terminals T2 w.r.t T3 or T4

Ui = 16.5V
Ci = 12nF
Li = 0

Uo = Ui (PSU Connections)
Io = 121mA at Ui = 16.5V
Po = 497mW at Ui = 16.5V
Co = *
Lo = 30mH

Note: parameters marked * are obtained from the certification of the power supply connected.

/. Thermocouple...

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Thermocouple Input Module Connections

Power output Terminals T1 w.r.t T4

Uo = Ui (power supply connections)
Io = *
Po = *
Co = *
Lo = *
Lo/Ro = *

Input Terminals T2, T3 w.r.t T4

Ui = 6.88V
Ci = 0
Li = 0

Uo = 6.51V
Io = 16mA
Co = 100µF
Lo = 100mH

Note: parameters marked * are obtained from the certification of the power supply connected

Strain Gauge Input Module Connections

Power Output Terminal T1 w.r.t T4

Uo = Ui (power supply connections)
Io = 129mA at Ui = 16.5V
Po = 0.53W at Ui = 16.5V
Co = *
Lo = *
Lo/Ro = *

Input Terminals T2, T3 w.r.t T4

Ui = 16.5V
Pi = 0.53W
Ci = 10nF
Li = 0

Uo = 6.88V
Io = 21mA
Co = 100µF
Lo = 100mH

Note: parameters marked * are obtained from the certification of the power supply connected.

Flow Sensor Input Module Connections

Power Output Terminal T1 w.r.t T4

Uo = 7.14V
Io = 131mA
Po = 234mW
Co = 100µF
Lo = 10mH
Lo/Ro = 1834µH/Ω

Input Terminal T2 w.r.t T4

Ui = 7.14V
Ci = 1.1nF
Li = 0

Uo = 6.88V
Io = 3.3mA
Co = 100µF
Lo = 100mH

Input Terminal T3 w.r.t T4

Ui = 16.5V
Ci = 1.1nF
Li = 0

Uo = 6.88V
Io = 3.3mA
Co = 100µF
Lo = 100mH

/. Alternative...

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Alternative Flow Sensor Input Module Connections for connection to a Rosemount Pressure Senor 3051S to Certificate No. Baseefa05ATEX0193U.

Uo	= 16.5V	
Io	= 242mA	
Po	= 1W	
Ci	= 0	
Li	= 0	
Co	= 6.9µF	Based on Uo = 16.5V using tables for Group I, and reducing to 50%
Lo	= 4.4mH	Based on Io = 242mA using 0.5 x L x I ² = 260µJ and reducing to 50%
Lo/Ro	= 468µH/Ω	Based on formula in standard using R_S = 68.4Ω, e = 525µJ, Uo = 16.5V

RS485 Comms Connections

Terminals B2, B3 w.r.t B1

Uo	= 6.88V	Ui	= 12V
Io	= 154mA	Pi	= 1.41W
Po	= 265mW	Ci	= 0
Co	= 10µF	Li	= 0
Lo	= 4mH		
Lo/Ro	= 139µH/Ω		

Relay Output Connections

The relay contacts may be connected to an IS circuit which is powered by the same IS Power Supply as the PSC.

Ui = 23V

SPECIAL CONDITIONS OF USE ("X") (According to the Baseefa Certificate):

- The programmable Sensor Controller Type TX9042 must be mounted in a secondary enclosure as shown on drawing P5423.02 or in an alternative metal enclosure (not light alloys) which is appropriately certified as providing a degree of protection of IP54.
- Up to 11 RS485 Comms Modules (in separate Programmable Sensor Controllers type TX9042) may be daisy-chained together (i.e terminals B1 all linked together, terminals B2 all linked together and terminals B3 all linked together). Provided that the number of daisy-chained PSC's is reduced to 10, these comms lines may be connected to unspecified safe area equipment via an appropriately certified shunt zener diode safety barrier (dual channel a.c) whose output parameters do not exceed the following per channel:

  Uo = 9V, Io = 100mA, Po = 225mW

  OR Uo = 12V, Io = 80mA, Po = 240mW

  e.g. suitably certified MTL761, MTL766 to BAS01ATEX7202 or MTL7761ac, MTL7766ac to BAS01ATEX7217

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For the purpose of this certificate, these shunt zener safety barriers may be considered equivalent to Category I (M1) equipment.
The cable parameters shall not exceed the following: Cc = 2.8µF, Lo/Ro = 222µH/Ω

- For the purposes of this certificate, a P+F inductive sensor to PTB00ATEX2048X to category II 1G EEx ia IIC T6 connected to terminals T1 to T4 of a Digital Input Module may be considered equivalent to Category I M1. In this instance, the power supply selected to power the PSC must have an output voltage not exceeding 16V.

MARKING:

The marking of the units are as follows:

Trolex Limited
TX9042 Programmable Sensor Controller

Ex Rating	Ex ia I
IA No:	MASC M/11-359X
Serial No:	(See conditions of Certification)

COMPLIANCE:

The unit as described above and in MASC Letter **11-359** is hereby certified "Explosion Protected" Ex ia I, 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:

SANS / IEC 60079: "Electrical apparatus for explosive gas atmospheres",

- **Part-0: 2005 "General requirements", and**
- **Part-11:2007 "Equipment protected by intrinsic safety 'i' "**
- **ARP 0108 (Edition 1.1) "Regulatory requirements for explosion protected apparatus".**

Location	Zone 0 & 1	Gas/ Coal dust: Underground
Hazard Frequency		Continuous as could occur under normal operating conditions in hazardous area
Environment	Group I	Methane and coal dust
Limiting Temperature	450°C/150°C	(Methane gas) / (Coal dust)
Ambient Temperature		-20°C to +40°C

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.

/. Conditions...

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CONDITIONS OF CERTIFICATION:

1. This Certificate remains valid based on an annual review indicated in an official MASC letter.
2. The apparatus must be additionally marked in a clear, legible, visible and indelible manner with the MASC marking details above.
3. This certificate of approval only covers the equipment as certified above and does not include any scheduled additions or variations/amendments/new issues to the certificate(s), made after the above date.
4. The equipment does not need to be re-tested when used on the conditions and with such restrictions as prescribed by BASEEFA and in this approval.
5. The BASEEFA certification must remain valid.
6. The bearing of the requirements in the ARP 0108 (or regulations) and SANS 10108 on the certification of the equipment must remain unchanged.
7. All production units must be covered by a QAN, Mark Scheme or Batch Evaluation.

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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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