1) **Ex EQUIPMENT TYPE EXAMINATION REPORT**

2) TE Report Number: **KLPL/Ex/24-094 Issue no.00** **Dated: 02.12.2024**

3) **Ex Equipment:** **Temperature Convertor Models: MTL4573, MTL4573Y, Resistance Isolator Model: MTL5582B & Two Channel Fire / Smoke Detector Interface Model: MTL5561**

4) **Manufacturer:** **MTL Instruments Private Limited,**
#3, Old Mahabalipuram Road, Shollinganallur, Chennai – 600119, INDIA.

5) This equipment and any acceptable variation thereto are specified in the schedule to this report and the documents therein referred to

6) Karandikar Laboratories Pvt. Ltd. reports that this equipment has been found to comply with requirements of the following standards relating to the design and construction of equipment for explosive gas/dust atmospheres as applicable.

7) This TE Report was issued as verification that a sample, was assessed, tested and found to comply with the IS / IEC standards listed below.
IS/IEC 60079-0: 2017 & IS/IEC 60079-11: 2023

8) The Examination and Test results are recorded in KLPL's confidential
Report No.: KLPL/Ex/MTL-24/005 Dated: 02.12.2024

9) The sign X if placed after the TE report number; it indicates that the equipment is subject to specific conditions of use specified in the schedule to this TE Report.

10) This Report does not indicate compliance with electrical safety and performance requirements other than those expressly included in the above listed standards.

11) The marking of the Equipment shall include the following:
Ex Code:
[Ex ia Ma] I (-20°C ≤ Ta ≤ +60°C)
[Ex ia Ga] IIC (-20°C ≤ Ta ≤ +60°C)
[Ex ia Da] IIIC (-20°C ≤ Ta ≤ +60°C)

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A. V. Karandikar

Ajit Karandikar
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12) Details of Type Examination Reports Issued: -

TE Report No.	Issue No.	Report No.	Date	Reason for Issue
KLPL/Ex/24-094	00	KLPL/Ex/MTL-24/005	02.12.2024	Original issue

13) Description of equipment

MTL4573 & MTL4573Y Temperature Converter

The MTL4573 & MTL4573Y Temperature Converters are designed to restrict the transfer of energy from unspecified non-hazardous area apparatus to either thermocouples or RTD's located in the hazardous area by limitation of voltage and current. A transformer and opto-isolator provide galvanic isolation between the hazardous and non-hazardous area circuitry. The MTL4573 & MTL4573Y Temperature Converters are designed for connection to thermocouples or two, three or four wire RTD's situated in the hazardous area. The apparatus converts the low level d.c. signal from the sensor mounted in the hazardous area into a 4/20mA current for driving a load in the non-hazardous area. An optional cold junction compensation (CJC) plug can be fitted to the hazardous area connections which alters the internal connections and affects the output parameters. The apparatus comprises an isolating transformer, an opto-isolator, duplicated zener diode chains and current limiting resistors to provide voltage and current limitation. The above, together with other electronic components are mounted on a printed circuit board (PCB) and housed in a moulded plastic enclosure. Polarised plugs and sockets are provided for hazardous and non-hazardous area connections. A jack socket is provided for the connection of a suitably certified data terminal for programming the equipment. The MTL4573Y Temperature Converter differs from the MTL4573 with regard to the configuration of the non-hazardous area circuitry. In terms of intrinsic safety, both are identical.

MTL5582B Resistance Isolator

The MTL5582B Resistance Isolator is designed to restrict the transfer of energy from unspecified non-hazardous area apparatus to a Resistance Temperature Device (RTD) or other resistance located in the hazardous area by limitation of voltage and current. A transformer and opto-isolator provide galvanic isolation between the hazardous and non-hazardous area circuitry. The MTL5582B Resistance Isolator is designed for the connection to a 2-wire, 3-wire or 4-wire RTD or other resistance situated in the hazardous area. The equipment repeats the resistance on the non-hazardous area output terminals for connection to a monitoring system. The apparatus comprises an isolating transformer, opto-isolator, duplicated zener diodes and current limiting resistors to provide voltage and current limitation. The above, together with other electronic components are mounted on a single printed circuit board (PCB) and housed in a moulded plastic enclosure. Polarised plugs and sockets are provided for hazardous and non-hazardous area connections. A jack socket is provided for connection of a suitably certified data terminal for programming the equipment. An LED is fitted to provide power on indication.

MTL5561 Two Channel Fire / Smoke Detector Interface

The MTL5561 Two Channel Fire / Smoke Detector Interface is designed to provide two separate loop powered interface channels for the connection of fire and smoke detectors located in the hazardous area to unspecified apparatus in the non-hazardous area whilst restricting the transfer of energy from unspecified non-hazardous area apparatus to the intrinsically safe circuits by limitation of voltage and current. The MTL5561 Two Channel Fire / Smoke Detector Interface comprises two isolating transformers that provide

galvanic isolation between the hazardous and non-hazardous area circuitry, fuses, zener diodes and resistors providing voltage and current limitation on each channel. The above, together with other electronic components are mounted on a single printed circuit board and housed in a moulded plastic enclosure. Polarised plugs and sockets are provided for hazardous and non-hazardous area connections.

The electronic circuitry is housed in a plastic enclosure, which provides a degree of protection of not less than IP20 in accordance with IS/IEC 60529: 2001.

14) Model Designation:

Model No.	Product	Rating
MTL4573	Temperature Converter.	Refer Point 17 below
MTL4573Y	Temperature Converter.	
MTL5582B	Resistance Isolator	
MTL5561	Two Channel Fire / Smoke Detector Interface.	

15) Drawings & Documents

Document Number	No. of Pages	Rev. No.	Date	Drawing Title
CI4500-3 (I)	1	1	12.10	MTL4500 and MTL5500- Alternate Zener Diode (Panjit)
CI4500-6 (I)	1	1	12.10	MTL4500 and MTL5500 Conformal Coating
CI4500-100 (I)	1	2	01.13	New 4500 Case
CI4573-1 (I)	1	2	10.14	CIRCUIT DIAGRAM FOR MTL4573
CI4573-2 (I)	1	2	10.14	MTL4573 PARTS LIST
CI4573-3 (I)	1	2	10.14	MTL4573 TRACK LAYOUT
CI4573-4 (I)	1	2	10.14	MTL4573 COMPONENT ASSEMBLY
CI4573-6 (I)	1	1	10.13	PCB DETAIL FOR TPL301
CI4573-7 (I)	1	1	05.14	MTL4573 Certification Label Details
CI4500-5 (I)	1	1	11.10	MTL5500- Alternative DIN rail mechanism
CI5500-100 (I)	1	3	1.13	New 5500 outline
CI4561-1 (I)	1	5	08.21	MTL4561 Certification Label Details
CI4561-1 (I)	1	2	09.09	MTL4561 and MTL5561 CIRCUIT DIAGRAM
CI4561-1 (I)	1	3	01.13	MTL4561 COMPONENT ASSEMBLY
CI4561-1 (I)	1	1	03.09	PARTS LIST FOR MTL4561/MTL5561
CI4561-1 (I)	1	2	09.09	MTL4561 TRACK LAYOUT
CI4561-1 (I)	1	1	03.09	MTL4561 Two channel fire/smoke detector interface, loop powered Transformer Winding Details
CI5582B-1 (I)	1	3	08.21	MT5582B Certification Label Details and DIN rail fittings
CI4582B-1 (I)	2	1	02.16	CERTIFICATION DRAWING FOR MTL4582B

CI4582B-2 (I)	3	1	02.16	MTL4582B PARTS LIST
CI4582B-3 (I)	1	1	02.16	MT4582B TRACK LAYOUT
CI4582B-4 (I)	1	1	02.16	MTL5582B COMPONENT LAYOUT
CI4582B-7 (I)	1	1	09.15	PCB DETAIL FOR TPL301
CL4500-2(I)	1	2	08.09	MTL4500 SERIES SINGLE TOROID I.S. TRANSFORMER

Drawings listed above are finally accepted as accurately representing the product for which *this evaluation report has been prepared. These drawings provide necessary information as required by the above referred standards.*

16) Temperature Class:

Temperature Convertor Models: MTL4573, MTL4573Y, Resistance Isolator Model: MTL5582B & Two Channel Fire / Smoke Detector Interface Model: MTL5561 are an associated apparatus which will be placed in a non-Hazardous area and does not require a temperature class.

17) Electrical Rating:

For MTL4573 & MTL4573Y:

Non-Hazardous Area Terminals 8, 9, 11, 13 & 14

Um = 253V r.m.s.

The apparatus is designed to operate on the above terminals from a d.c. Supply voltage of up to 35 V.

Hazardous Area Terminals 1 to 6 (forming part of the same intrinsically safe circuit)

Uo = 6.6 V, Io = 76 mA, Po = 0.13 W, Ci = 0, Li = 0

Hazardous Area Terminals 3 w.r.t. 1 (WITHOUT the Cold Junction Compensation (CJC) plug fitted)

Uo = 1.1 V, Io = 7 mA, Po = 2 mW, Ci = 0, Li = 0

Hazardous Area Terminals 3, 2 & 1 (with or without CJC plug fitted)

Uo = 6.6 V, Io = 10 mA, Po = 17 mW, Ci = 0, Li = 0

Programming / Configuration Port (Jack Socket)

Uo = 8 V, Io = 14.6 mA, Po = 26 mW, Ui= 9.1 V, Ci = 0, Li = 0

Due to the fitting of current limiting resistors R1, R4, R5 (all 1 kΩ ± 1 %), R2, R3 (both 160 Ω ± 0.5 %) and R6 (1.5 kΩ ± 1%), the capacitive components fitted on the hazardous area side of the circuit cannot be considered connected to the hazardous area terminals 1 to 6 even under two fault conditions. Similarly, due to the fitted of current limiting resistors R12, R13, R14 & R15 (all 1 kΩ ± 1 %), the capacitive components fitted on the hazardous area side of the circuit cannot be considered connected to the programming / configuration jack socket even under two fault conditions. Therefore, in both cases it is considered that Ci = 0.

Inductors L1, L2, L3, L10 & L11 (all < 5 µH) are connected to hazardous area terminals 1 to 6. It is considered the inductance is very small in comparison to the permitted inductance at 76 mA, therefore it is considered that Li = 0 for these terminals. No inductive components are fitted on the terminals of the programming / configuration jack socket, therefore L = 0 is defined for this socket.

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SCHEDULE

The capacitance and either the inductance or inductance to resistance ratio (L/R) of the hazardous area load connected to hazardous area terminals 1 to 6 and the programming / configuration port must not exceed the following values:

TABLE 1

GROUP	CAPACITANCE (µF)	INDUCTANCE (mH)	L/R RATIO (µH/ohm)
Hazardous Area Terminals 1 to 6			
IIC	22	6.42	288
IIB*	500	25.6	1057
IIA	1000	53.0	2228
I	1000	77.2	3402
Programming I Configuration Port (Jack Socket)			
IIC	0.367	153	349
IIB*	2.15	591	1355
IIA	8.8	1000	1453
I	12.32	1000	1453

* Group IIB parameters also applicable for associated apparatus [Ex ia Da] IIIC

Note:

1. The above load parameters apply when one of the two conditions below is given:
   the total Li of the external circuit (excluding the cable) is < 1 % of the Lo, value or
   the total Ci of the external circuit (excluding the cable) is < 1 % of the Co, value.
2. The above parameters are reduced to 50% when both of the two conditions below are given:
   the total Li of the external circuit (excluding the cable) is ≥ 1 % of the Lo, value and
   the total Ci of the external circuit (excluding the cable) is ≥ 1 % of the Co value.

The reduced capacitance of the external circuit (including cable) shall not be greater than 1 µF for Groups IIB, IIA & I and 600 nF for Group IIC.

For MTL5582B:

Non-Hazardous Area Terminals 9, 10, 11, 12, 13 & 14

Um = 253 Vr.m.s.

The circuit connected to non-hazardous area terminals 9, 10, 11, 12, 13 & 14 is designed to operate from a d.c. supply voltage of up to 35V.

Hazardous Area Terminals 1, 3, 4 & 5

Uo = 6.51 V, Io = 10 mA, Po = 16.1 mW, Ci = 0, Li = 0

Hazardous Area Terminals 1, 3 & 4

Uo = 6.51 V, Io = 6mA, Po = 9.2mW, Ci = 0, Li = 0

Hazardous Area Terminals 3 w.r.t. 1

Uo = 1.2V, Io = 4mA, Po = 1.2mW, Ui = 5V, Ci = 0, Li = 0

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Although the apparatus does not comply with the simple apparatus requirements of Clause 5.5 of IS/IEC 60079-11: 2023, when terminals 3 w.r.t. 1 are connected in an intrinsically safe circuit the internal

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stored
energy, voltage and current of the interface will not add more than the values specified in Clause 5.5 of IS/IEC 60079-11: 2023 to the parameters of the circuit into which it is connected.

Programming / Configuration Port (Jack Socket)

Uo = 6.68V, Io = 12mA, Po = 17.7mW, Ui = 9.1V, Ci = 0, Li = 0

The capacitive components in the apparatus cannot be considered to be connected to hazardous area terminals 1 to 5 and the programming / configuration port jack socket even under two fault conditions due to the fitting of current limiting resistors R100, R101 (both 160Ω ± 0.5%), R102, R103 (both 1kΩ ± 0.5%), R104 and R105 (both 1kΩ ±1%). It is therefore considered that Ci is zero. Inductors L100, L101, L102 and L103 (all <5µH) are fitted to the hazardous area side of the circuit. These are considered negligible in comparison to the permitted inductance and therefore it is considered that Li is zero.

Load Parameters

The capacitance and either the inductance or inductance to resistance ratio (L/R) of the load connected to the hazardous area terminals must not exceed the following values: -

TABLE 2

GROUP	CAPACITANCE (µF)	INDUCTANCE (mH)	L/R RATIO (µH/ohm)
Hazardous Area Terminals 1, 3, 4 & 5			
IIC	22	355.5	1536
IIB*	500	1000	1536
IIA	1000	1000	1536
I	1000	1000	1536
Hazardous Area Terminals 1, 3 & 4			
IIC	22	987.6	921
IIB*	500	1000	921
IIA	1000	1000	921
I	1000	1000	921
Hazardous Area Terminals 3 w.r.t. 1			
IIC	100	1000	3333
IIB*	1000	1000	3333
IIA	1000	1000	3333
I	1000	1000	3333
Programming I Configuration Port (Jack Socket)			
IIC	0.478	79.4	448
IIB*	2.88	317.9	1412
IIA	11.6	635.8	1412
I	15.8	1000	1412

* Group IIB parameters also applicable for associated apparatus [Ex ia Da] IIIC

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Note:

1. The above load parameters apply when one of the two conditions below is given:
   the total Li of the external circuit (excluding the cable) is < 1 % of the Lo, value or
   the total Ci of the external circuit (excluding the cable) is < 1 % of the Co, value.
2. The above parameters are reduced to 50% when both of the two conditions below are given:
   the total Li of the external circuit (excluding the cable) is ≥ 1 % of the Lo, value and
   the total Ci of the external circuit (excluding the cable) is ≥ 1 % of the Co value.

The reduced capacitance of the external circuit (including cable) shall not be greater than 1 µF for Groups IIB, IIA & I and 600 nF for Group IIC.

For MTL5561:

Non-Hazardous Area Terminals 8, 9, 11 & 12

Um = 253V r.m.s.

The circuit connected to non-hazardous area terminals 8, 9, 11 & 12 is designed to operate from a d.c. supply voltage of up to 35V.

Hazardous Area Terminals 2 & 3 w.r.t. 1 (Channel 1) Or
Hazardous Area Terminals 5 & 6 w.r.t. 4 (Channel 2)

Uo = 28 V, Io = 93mA, Po = 0.65W, Ci = 0, Li = 0

Each channel must be considered as a separate intrinsically safe circuit.

The capacitance and either the inductance or inductance to resistance ratio (L/R) of the hazardous area load connected to either channel of the apparatus must not exceed the following values:

TABLE 3

GROUP	CAPACITANCE (µF)	INDUCTANCE (mH)	L/R RATIO (µH/ohm)
IIC	0.083	4.2	56
IIB*	0.65	12.6	210
IIA	2.15	33.6	444
I	3.76	53.7	668

* Group IIB parameters also applicable for associated apparatus [Ex ia Da] IIIC

Note:

1. The above load parameters apply when one of the two conditions below is given:
   the total Li of the external circuit (excluding the cable) is < 1 % of the Lo, value or
   the total Ci of the external circuit (excluding the cable) is < 1 % of the Co, value.
2. The above parameters are reduced to 50% when both of the two conditions below are given:
   the total Li of the external circuit (excluding the cable) is ≥ 1 % of the Lo, value and
   the total Ci of the external circuit (excluding the cable) is ≥ 1 % of the Co value.

The reduced capacitance of the external circuit (including cable) shall not be greater than 1 µF for Groups IIB, IIA & I and 600 nF for Group IIC

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18) **Specific conditions of use:** Nil

19) **Routine test:**

- Routine test is to be carried out on each infallible switching transformer, it shall comply the dielectric test of Cl 10.3.1 IS/IEC 60079-11: 2023.
  - At 1500 Vac between the primary and secondary windings.
  - At 500 Vac between all the windings and the core or screen.

  During these tests, there shall be no breakdown of the insulation between windings.
- Apply two coats of HumiSeal® 1B73EPA Acrylic Conformal Coating after cleaning the surface. Visual inspection after cure time shall be conducted for
  - Cracks
  - Non-homogenous covering

END OF DOCUMENT

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