Instruction manual
MTL Industrial Network Solutions

June 2023
INM 9478 -ETX(G) Rev 3

9478-ETX(G)

Intrinsically Safe Gigabit Ethernet Galvanic Isolator

Powering Business Worldwide

DECLARATION OF CONFORMITY

A printed version of the Declaration of Conformity has been provided separately within the original shipment of goods. However, you can find a copy of the latest version at -

http://www.mtl-inst.com/certificates

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GENERAL SAFETY INFORMATION

Safety instructions for installation and operating personnel

The operating instructions provided here contain **essential safety instructions** for installation personnel and those engaged in the operation, maintenance and servicing of the equipment.

WARNING !

A 'WARNING' marked in this way is provided for operator and plant safety and MUST be followed.

CAUTION !

A Caution is provided to prevent damage to the instrument.

NOTE

These are used to guide the user in the operation of the instrument.

Before commencing installation or commissioning:

- Read and understand the contents of this manual
- Ensure installation and operating personnel have received adequate training for this task
- Ensure that any operating instructions are fully understood by the personnel responsible.
- Observe national and local installation and mounting regulations (e.g. IEC 60079-14).

WARNING !

These assemblies may not be used in explosion-hazard area applications if they have been used previously in general electrical installations.

WARNING !

The responsibility for planning, installation, commissioning, operation and maintenance, particularly with respect to applications in explosion-hazard areas, lies with the plant operator.

During operation:

- Make the relevant instructions available at all times to the operating personnel.
- Observe safety instructions.
- Observe national safety and accident prevention regulations.
- Operate the equipment within its published specification.
- Servicing, maintenance work or repairs not described in this manual must not be performed without prior agreement with the manufacturer.
- Any damage to this equipment may render its explosion protection null and void.
- No changes to any of the components that might impair their explosion protection are permitted.

If any information provided here is not clear:

Contact **Eaton's MTL product line** or an authorised distributor or sales office.

NOTE

Improper installation and operation of the enclosure can result in the invalidation of the guarantee.

1 FEATURE

- Intrinsically Safe ATEX / UKEX / IECEx / North America ($MET_{C/US}$) approvals
- Galvanically Isolated Safe and Hazardous Area connections (Um=250V)
- Single IS Ethernet Switch Port 10/100/1000Mbps LAN
- Safe and Hazardous sides link independently with auto-negotiation
- Status LEDs
- Single 12VDC or 24VDC (10-30V) supply
- Compact dimensions (W: 100 x H: 75 x D: 116 mm)
- [Ex ia Ga] IIB, [Ex ia Da] IIIC (non-mining)
  [Ex ia Ma] I (mining) - ETXG version
- [Ex ia Ga] IIC, [Ex ia Da] IIIC (non-mining)
  [Ex ia Ma] I (mining) - ETX version
- Ta -40ºC to 70ºC
- Safe Area or Zone 2 / Zone 22 mounting

2 DESCRIPTION

The 9478-ETX(G) Gigabit Ethernet Isolator allows the interconnection of a Zone 2 or uncertified Safe Area device to the Intrinsically Safe 9400/9600/947x series of Ethernet networking products and other compatible devices operating in the Hazardous Area or to another 9478 device in the Zone 2 or Safe Area with the IS Cat5 cable passing through Zone 1 or 0 Hazardous Areas.

The isolator provides a compact alternative solution to fibre optic cable and media converters and for when it is desirable to use Cat5e cables in preference to fibre while still providing total galvanic isolation.

The module requires a single supply from the Safe Area of 24Vdc at 110mA or 12Vdc at 200mA (approx).

Electrical connections are via cage-clamp and/or screw type plug/socket terminals along with RJ45 type connectors for the Ethernet LAN ports.

The 10/100Mbps 9478-ETX version supports PoEx. A 12V IS power supply is required for this option (9492-PS-PLUS recommended)

3 CONNECTIONS

3.1 POWER TERMINALS (CON1)

Pin	Function
T1	Power +12V/24V
T2	Power +12V/24V
T3	Power 0V
T4	Power 0V
T5-13	No connections
T14	PoEx +12V*
T15	PoEx 0V*

Note: Power terminals 1+2 and 3+4 internally connected to allow looping to other units

3.2 LAN (RJ45 - SK1, SK2) 10/100/1000 BASE-T Ethernet

Pin	10/100 Function	Gigabit Function
1	Tx +	BI_DA+
2	Tx-	BI_DA-
3	Rx +	BI_DB+
4	PoEx +12V*	BI_DC+
5	PoEx +12V*	BI_DC-
6	Rx-	BI_DB-
7	PoEx 0V*	BI_DD+
8	PoEx 0V*	BI_DD-

*Note – PoEx only on SK2 of ETX model
Hazardous Area RJ45 SK2 is marked BLUE

3.3 LED indicators

	OFF	FLASH	ON
12V/24V PWR (green)	Power Fail	N/A	Power OK
HAZ PWR (green)	Internal Supply Fail	N/A	Power OK
STAT (green)	Fault	Healthy	Healthy
WDG (green)	Fault	Healthy (10Hz)	Fault
RJ45 ACT (yellow)	Ethernet link disconnected	Ethernet link activity	Ethernet link connected
RJ45 1000 (green)	10/100Mbps	N/A	1000Mbps

4 ORDERING INFORMATION

Part Number	Description	Comments
9478-ETXG	**Ethernet Isolator - 10/100/1000Mbps Gigabit**	**Standard**
9478-ETX	Ethernet Isolator- 10/100Mbps + PoEx	Special Order

5 DIMENSIONS

Width	100mm
Height	75mm
Depth	116mm
Weight	400g
Mounting	Din Rail

6 ENVIRONMENTAL

Operating Temperature

-40°C...+70°C

Storage Temperature

-40°C...+70°C

Humidity

0...95% RH, non-condensing

Ingress Protection

Select enclosure to suit application, see certificates for information

7 WASTE REMOVAL INFORMATION

The electronic equipment within must not be treated as general waste. By ensuring that this product is disposed of correctly you will be helping to prevent potentially negative consequences for the environment and human health, which could otherwise be caused by incorrect waste handling of this product. For more detailed information about the take-back and recycling contact Controlled Systems Ltd

8 INSTALLATION

WARNING !

See Special Conditions of Safe Use in the folllowing section regarding ATEX, UKEX & IECEx & $MET_{C/US}$ Approval Information before installation

The 12V/24V supply to the module connects via screw terminals 1 + 3 as shown above.

As the 9478 Ethernet Isolator supports Auto MDI/MDI-X, a straight connected RJ45 Cat5e cable is used to connect to any device on both the Safe and Hazardous Area ports.

Both the Safe and Hazardous RJ45 ports have integrated Ethernet switches sothat each side will auto-negotiate speed and link independantly of each other.

It is recommended that Cat5e cables for Hazardous Area Zone 1 use are 'Blue' in colour and are of good quality (see accessories section), the Safe Area cables being a colour other than blue to aid identification.

The operating parameters must not exceed those as detailed on the certificate.

This apparatus must only be installed or replaced by a competent person who must ensure that existing IS segregation is maintained.

NOTE: For North America, also see Control Drawing 9478-MET included at the end of this manual.

9 ATEX, UKEX & IECEx & MET$_{C/US}$ APPROVAL INFORMATION

The following information is in accordance with the Essential Health and Safety Requirements (Annex II) of the EU Directive 2014/34/EU [the ATEX Directive- safety of apparatus] and SI 2016 No.1107 [UKEX Statutory Requirements] and is provided for those locations where the ATEX Directive and/or UKEX requirements are applicable.

General

a) This equipment must only be installed, operated and maintained by competent personnel. Such personnel shall have undergone training, which included instruction on the various types of protection and installation practices, the relevant rules and regulations, and on the general principles of area classification. Appropriate refresher training shall be given on a regular basis. [See clause 4.2 of EN 60079-17].

b) This equipment has been designed to provide protection against all the relevant additional hazards referred to in Annex II of the directive, such as those in clause 1.2.7. This equipment has been designed to meet the requirements of intrinsically safe electrical apparatus in accordance with EN 60079-0 and EN 60079-11.

Installation

a) Reference to the IEC code of practice IEC 60079-14. In addition particular industries or end users may have specific requirements relating to the safety of their installations and these requirements should also be met. For the majority of installations the Directive 1999/92/EC [the ATEX Directive- safety of installations] is also applicable.

b) Unless already protected by design this equipment must be protected by a suitable enclosure against

   i) mechanical and thermal stresses in excess of those noted in the certification documentation and the product specification.

   ii) aggressive substances excessive dust moisture and other contaminants

c) This is associated apparatus having intrinsically safe (IS) ports and is normally mounted in a Safe or Zone 2 Hazardous Area with the IS cables in or through Zone 1 or 0.

Inspection and maintenance

a) Inspection and maintenance should be carried out in accordance with European, national and local regulations which may refer to the IEC standard IEC 60079-17. In addition specific industries or end users may have specific requirements which should also be met.

b) Access to the internal circuitry must not be made during operation.

Repair

This product cannot be repaired by the user and must be replaced with an equivalent certified product.

NOTE: For North America, also see Control Drawing 9478-MET included at the end of this manual.

9.1 9.1 Specific Conditions of Use (Special Conditions)

The following conditions relate to safe installation and/or use of the equipment.

i. When installed in a zone 2 environment, the apparatus must be housed in an appropriately certified enclosure as defined in EN IEC 60079-0 & EN IEC 60079-7 with the minimum dimensions of 180mm (H) × 45 mm (W) × 145mm (D) and IP54

ii. The external combinations of capacitance and inductance have not been assessed for spark Ignition. With reference to IEC 60079-11 CL 10.1.5.2, the following Special Condition of Safe Use has been added:

The values of Co and Lo 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.

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) > 1% of the Lo and
- The total Ci of the external circuit (excluding the cable) > 1% of the Co.

Note: the reduced capacitance of the external circuit (including cable) shall not be greater than 1uF for IIB and 600nF for IIC.

The Ethernet Isolator has the following safety parameters:

Non-IS Connections: Supply (T1-T4), LAN RJ45 (SK1)

Un = 30 V (SELV)
Um = 250 V

IS Connections: PoEx (T14 wrt T15)

Ui = 15.5 V on LAN RJ45 (SK2)
Ci = 0.48 µF
Li = 0

IS Connections: LAN RJ45 (SK2)

Uo = 5.88 V (or PoEx power supply Uo parameter when connected)
Io = 2.18A (10/100) or 4.36A (Gigabit)
Po = 0.83 W
Ci = 0.48 µF
Li = 0

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

10/100 Ethernet Ports

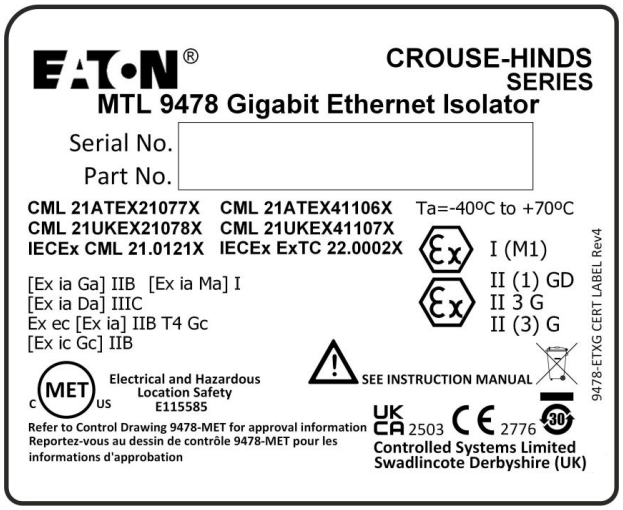
Group	Capacitance (µF)	Inductance (µH)	or	L/R Ratio (µH/Ohm)
IIC	43	7.5		11
IIB/III	1000	29.9		44
IIA	1000	59.9		89
I	1000	98.2		146

Gigabit 10/100/1000 Ethernet Ports

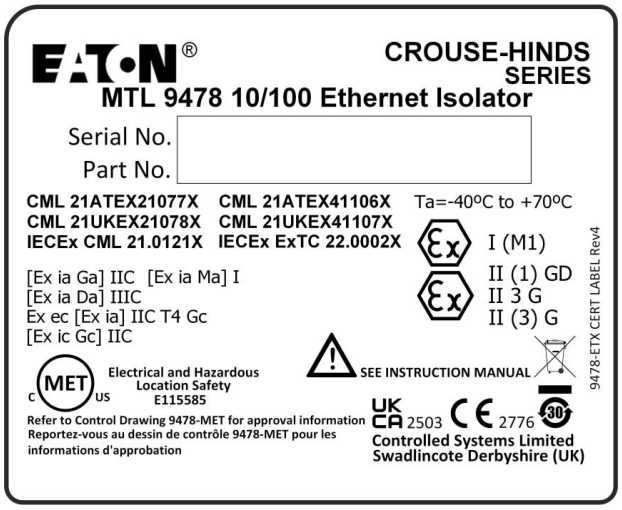
Group	Capacitance (µF)	Inductance (µH)	or	L/R Ratio (µH/Ohm)
IIB/III	1000	7.5		22
IIA	1000	15.0		44
I	1000	24.5		73

Marking

Each device is marked in accordance with the Directive/Statutory Requirements and CE and UKCA marked with the Notified/Approved Body Identification Number.



9478-ETXG Product Label



9478-ETX Product Label

10 Specification

Power supplies

12VDC/24VDC Power Supply Input (10...30V)
Typically 24V @ 110mA or 12V @ 200mA

Ethernet

Intrinsically Safe 10/100/1000Base-T

Connector

RJ45 (x1) Safe Area
RJ45 (x1) Hazardous Area (marked BLUE)

Cable Length

Up to 100m Cat5e

11 APPROVALS

Location of Unit

Zone 2, IIB T4 hazardous area (9478-ETXG)
Zone 2, IIC T4 hazardous area (9478-ETX)
Safe Area

Certification Code

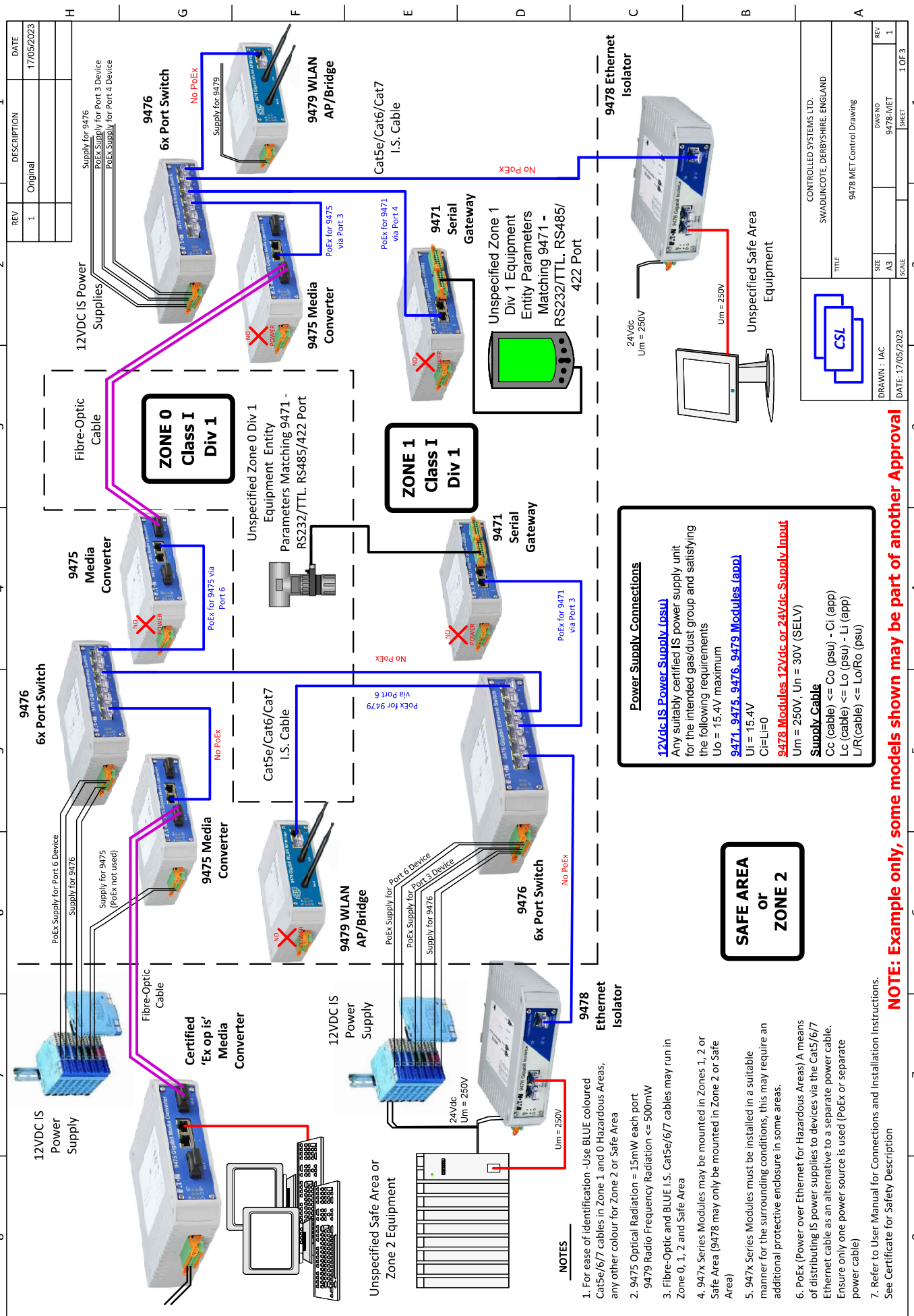
[Ex ia Ga] IIB (9478-ETXG)
[Ex ia Ga] IIC (9478-ETX)
Ex ec [Ex ia] IIB T4 Gc (9478-ETXG)
Ex ec [Ex ia] IIC T4 Gc (9478-ETX)
[Ex ic Gc] IIB (9478-ETXG)
[Ex ic Gc] IIC (9478-ETX)
[Ex ia Da] IIIC (non-mining)
[Ex ia Ma] I (M1 mining)
Ta =-40ºC to +70ºC

Certificate numbers

CML 21ATEX21077X
CML 21ATEX41106X
CML 21UKEX21078X
CML 21UKEX41107X
IECEx CML 21.0121X
IECEx ExTC 22.0002X
See certificates for further information

NOTE: Certificate IECEx ExTC 22.0002X is only for use in Group I mining applications with the following coding

[Ex ia Ma] I


REV
DESCRIPTION
DATE
1
Original
17/05/2023
9476
6x Port Switch
No PoEx
9479 WLAN
AP/Bridge
Supply for 9479
Supply for 9476
PoEx Supply for Port 3 Device
PoEx Supply for Port 4 Device
12VDC IS Power
Supplies
Cat5e/Cat6/Cat7
I.S. Cable
9478 Ethernet
Isolator
No PoEx
9475 Media
Converter
PoEx for 9475 via
Port 6
PoEx for 9475
via Port 3
PoEx for 9471
via Port 4
9471
Serial
Gateway
Unspecified Zone 1
Div 1 Equipment
Entity Parameters
Matching 9471 -
RS232/TTL. RS485/
422 Port
24Vdc
Um = 250V
Um = 250V
Unspecified Safe Area
Equipment
Fibre-Optic
Cable
ZONE 0
Class I
Div 1
Unspecified Zone 0 Div 1
Equipment Entity
Parameters Matching 9471 -
RS232/TTL. RS485/422 Port
ZONE 1
Class I
Div 1
Cat5e/Cat6/Cat7
I.S. Cable
PoEx for 9479
via Port 6
PoEx Supply for Port 6 Device
Supply for 9476
Supply for 9475
(PoEx not used)
No PoEx
PoEx Supply for Port 3 Device
Supply for 9476
No PoEx
12VDC IS
Power
Supply
Certified
'Ex op is'
Media
Converter
Fibre-Optic
Cable
9475 Media
Converter
9479 WLAN
AP/Bridge
9476
6x Port Switch
9478
Ethernet
Isolator
24Vdc
Um = 250V
Um = 250V
Unspecified Safe Area or
Zone 2 Equipment
SAFE AREA
or
ZONE 2
Power Supply Connections
12Vdc IS Power Supply (psu)
Any suitably certified IS power supply unit
for the intended gas/dust group and satisfying
the following requirements
Uo = 15.4V maximum
9471, 9475, 9476, 9479 Modules (app)
Ui = 15.4V
Ci=Li=0
9478 Modules 12Vdc or 24Vdc Supply Input
Um = 250V, Un = 30V (SELV)
Supply Cable
Cc (cable) <= Co (psu) - Ci (app)
Lc (cable) <= Lo (psu) - Li (app)
L/R(cable) <= Lo/Ro (psu)
NOTES
1. For ease of identification -Use BLUE coloured Cat5e/6/7 cables in Zone 1 and 0 Hazardous Areas, any other colour for Zone 2 or Safe Area
2. 9475 Optical Radiation = 15mW each port
9479 Radio Frequency Radiation <= 500mW
3. Fibre-Optic and BLUE I.S. Cat5e/6/7 cables may run in Zone 0, 1, 2 and Safe Area
4. 947x Series Modules may be mounted in Zones 1, 2 or Safe Area (9478 may only be mounted in Zone 2 or Safe Area)
5. 947x Series Modules must be installed in a suitable manner for the surrounding conditions, this may require an additional protective enclosure in some areas.
6. PoEx (Power over Ethernet for Hazardous Areas) A means of distributing IS power supplies to devices via the Cat5/6/7 Ethernet cable as an alternative to a separate power cable. Ensure only one power source is used (PoEx or separate power cable)
7. Refer to User Manual for Connections and Installation Instructions. See Certificate for Safety Description
NOTE: Example only, some models shown may be part of another Approval
CONTROLLED SYSTEMS LTD.
SWADLINCOTE, DERBYSHIRE. ENGLAND
TITLE
9478 MET Control Drawing
CSL
DRAWN : IAC
DATE: 17/05/2023
SIZE
A3
SCALE
DWG NO
9478-MET
REV
1
SHEET
1 OF 3

9478-ETG and 9478-ETXG : Gigabit Ethernet Isolator

9478-ET and 9478-ETX : 10/100 Ethernet Isolator

9478-ET(G) Non-IS Connections: Supply (CON1), LAN RJ45 (SK1, SK2)

9478-ETX(G) Non-IS Connections: Supply (T1-T4), LAN RJ45 (SK1)

Un = 30 V (SELV)
Um = 250 V

9478-ET(G)

IS Connection: LAN RJ45 (SK3)

Uo = 5.88 V
Io = 2.18A (10/100) or 4.36A (Gigabit)
Po = 0.83 W
Ci = 0.48 µF
Li = 0

9478-ETX(G)

IS Connections: PoEx (T14 wrt T15)

Ui = 15.5 V on LAN RJ45 (SK2)
Ci = 0.48 µF
Li = 0

IS Connection LAN RJ45 (SK2)

Uo = 5.88 V (or PoEx power supply Uo parameter when connected)
Io = 2.18A (10/100) or 4.36A (Gigabit)
Po = 0.83 W
Ci = 0.48 µF
Li = 0

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

10/100 Ethernet Ports

Group	Capacitance (µF)	Inductance (µH)	or	L/R Ratio (µH/Ohm)
IIC	43	7.5		11
IIB/III	1000	29.9		44
IIA	1000	59.9		89
I	1000	98.2		146

Gigabit 10/100/1000 Ethernet Ports

Group	Capacitance (µF)	Inductance (µH)	or	L/R Ratio (µH/Ohm)
IIB/III	1000	7.5		22
IIA	1000	15.0		44
I	1000	24.5		73

Equivalent Groups for Zones and Divisions:

IIC = Groups A, B, C, D
IIB = Groups C, D
IIA = Group D
IIIC = Groups E, F, G

CSL

CONTROLLED SYSTEMS LTD.
SWADLINCOTE, DERBYSHIRE. ENGLAND

TITLE: 9478 MET Control Drawing

DRAWN : IAC
DATE: 17/05/2023
SIZE: A3
DWG NO: 9478-MET
REV: 1
SCALE:
SHEET: 2 OF 3

General

The installation must be in accordance with the National Electrical Code (NEC), ANSI/ NFPA 70, Articles 504 and 505, the Canadian Electric Code (CEC), Part 1, Appendix F and ANSI/ISA-RP12.6.

Tamb = -40°C to +70°C

9478-ETG and 9478-ETXG : Gigabit Ethernet Isolator

US / Canada (Zones)

Associated Apparatus for use in Unclassified Locations providing Intrinsically Safe outputs for Class I, Zone 0, Group IIB Hazardous Locations when installed in accordance with Control Drawing 9478-MET
- [AEx ia Ga] IIB / [Ex ia Ga] IIB

Associated Apparatus for use in Unclassified Locations providing Intrinsically Safe outputs for Class I, Zone 2, Group IIB Hazardous Locations when installed in accordance with Control Drawing 9478-MET
- [AEx ic Gc] IIB / [Ex ic Gc] IIB

Associated Apparatus for use in Unclassified Locations providing Intrinsically Safe outputs for Class II, Zone 20, Group IIIC Hazardous Locations when installed in accordance with Control Drawing 9478-MET
- [AEx ia Da] IIIC / [Ex ia Da] IIIC

For use in Class I, Zone 2, Group IIB Hazardous Locations when installed in accordance with Control Drawing 9478-MET
- AEx ec [AEx ia] IIB T4 Gc / Ex ec [Ex ia] IIB T4 Gc

US / Canada (Divisions)

Associated Aparatus for use in Unclassified Locations providing Intrinsically Safe outputs for Class I, Division 1 or Class I, Division 2, Groups C-D, Hazardous Locations when installed in accordance with Control Drawing 9478-MET

Associated Aparatus for use in Unclassified Locations providing Intrinsically Safe outputs for Class II, Division 1 or Class II, Division 2, Groups F-G, Hazardous Locations when installed in accordance with Control Drawing 9478-MET

For use in Class I, Division 2, Groups C-D, T4 Hazardous Locations when installed in accordance with Control Drawing 9478-MET

9478-ET and 9478-ETX : 10/100 Ethernet Isolator

US / Canada (Zones)

Associated Apparatus for use in Unclassified Locations providing Intrinsically Safe outputs for Class I, Zone 0, Group IIC Hazardous Locations when installed in accordance with Control Drawing 9478-MET
- [AEx ia Ga] IIC / [Ex ia Ga] IIC

Associated Apparatus for use in Unclassified Locations providing Intrinsically Safe outputs for Class I, Zone 2, Group IIC Hazardous Locations when installed in accordance with Control Drawing 9478-MET
- [AEx ic Gc] IIC / [Ex ic Gc] IIC

Associated Apparatus for use in Unclassified Locations providing Intrinsically Safe outputs for Class II, Zone 20, Group IIIC Hazardous Locations when installed in accordance with Control Drawing 9478-MET
- [AEx ia Da] IIIC / [Ex ia Da] IIIC

For use in Class I, Zone 2, Group IIC Hazardous Locations when installed in accordance with Control Drawing 9478-MET
- AEx ec [AEx ia] IIC T4 Gc / Ex ec [Ex ia] IIC T4 Gc

US / Canada (Divisions)

Associated Aparatus for use in Unclassified Locations providing Intrinsically Safe outputs for Class I, Division 1 or Class I, Division 2, Groups A-D, Hazardous Locations when installed in accordance with Control Drawing 9478-MET

Associated Aparatus for use in Unclassified Locations providing Intrinsically Safe outputs for Class II, Division 1 or Class II, Division 2, Groups E-G, Hazardous Locations when installed in accordance with Control Drawing 9478-MET

For use in Class I, Division 2, Groups A-D, T4 Hazardous Locations when installed in accordance with Control Drawing 9478-MET

CSL	CONTROLLED SYSTEMS LTD. SWADLINCOTE, DERBYSHIRE. ENGLAND		
	TITLE: 9478 MET Control Drawing		
DRAWN : IAC	SIZE: A3	DWG NO: 9478-MET	REV: 1
DATE: 17/05/2023	SCALE:	SHEET: 3 OF 3	

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Publication No. INM 9478-ETX(G) Rev 2 290623
June 2023

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