# your safe link to the hazardous area

# MTL2000 SERIES



- Mains or 24V dc supply
- 250V input/output/power supply isolation

The MTL2000 Series is the original range of MTL IS isolating devices for handling on/off or analogue signals between hazardous-area process instrumentation and safe-area control equipment. It includes IS relays for bringing back status or command signals from switches or proximity detectors, on/off units for driving solenoids, alarms or LEDs, temperature trip amplifiers, and 4/20mA analogue units which will energise and bring back the signal from a 2-wire transmitter, or drive an I/P converter.

Each design is available in three versions, 240V, 120V ac mains and 24V dc, and is mechanically compatible with the MTL3000 Series of 24V dc powered units. Both series provide an alternative to the shunt-diode safety barrier in applications where isolation is essential or preferred for its ease of application or where a high-integrity 'safety earth' is not easily available. Isolation between input, output, and power supply circuits eliminates the need to consider relationships to earth, makes system hookups easier to arrange and allows hazardous-area circuits to be left floating or earthed at any one point. The removal of earth requirements reduces many installation costs and enables some systems to be implemented that would otherwise be impossible. All units are certified intrinsically safe by the major authorities for connection into Zone O, IIC, T4 (or T6) hazardous areas worldwide.

- No high-integrity earth needed
- Broken line and earth fault protection

**High integrity** is a key feature of the series. As far as possible, each design provides protection against power supply failure, field circuit breaks and field line faults to earth. For example, a break in any of the three lines of an RTD trip amplifier de-energises the relays to give an alarm.

**Each unit is housed** in a robust moulded plastic case fitted with vibration-proof terminals for field cables. Terminals can be annotated by two 18-digit rows of alpha-numeric tagging information. Where appropriate, LEDs are fitted to indicate relay status.

**Units can be mounted** directly on standard symmetrical 35mm (top-hat) rail, or alternatively on flat surfaces using SMC2 mounting clips. Accessories and enclosures are shared with the MTL3000 Series. For details, see the MTL2000 & 3000 series enclosures and accessories data sheet.



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# MTL2210B SWITCH OPERATED RELAY

1-channel

The MTL2210B enables two 500VA safe-area loads to be controlled in separate circuits simultaneously by one light-duty on/off switch in a hazardous area. Alternatively, it can be arranged to latch for pushbutton stop/start control of an electric motor, the relay then being energised by brief closure of one switch contact and de-energised by the brief opening of another. The stop switch overrides the start switch, even if the start circuit is closed, making sure that the motor can be turned off under all conditions. In this application, the second pair of changeover output contacts enables the status of the motor to be fed to a computer or data logger.

# **SPECIFICATION**

#### See also 'Common specification'

#### Number of channels

#### One, fully floating

#### Location of switch(es)

Zone 0, IIC, T6 hazardous area Div 1, Group A, hazardous location

# Voltage applied to switch(es) 5.6V dc from $1.5k\Omega$

#### Input/output characteristics

 Relay energised if <200Ω between tmnls 1 & 2 and 3 & 4</td>

 Relay de-energised if >500Ω between tmnls 1 & 2\* or 3 & 4

 Hysteresis, nominal
 100Ω

 \*Non-latching mode

# Latching facility

(Enabled by linking terminals 5 & 6) Relay then latches ON when energised (shorts tmnls 1 & 2) Relay de-energised if unlatch circuit broken (latching)

#### Power supply failure protection Relay de-energised if supply fails

# Broken line protection

Relay de-energised if either line broken (non-latching) Relay de-energised if unlatch circuit broken (latching)

#### 'Fail-safe' earth fault protection

(Enabled by connecting terminal 8 to earth) Relay de-energised if <1k $\Omega$  to earth, total for all 3 lines Relay not de-energised if >7.5k $\Omega$  to earth, total for all 3 lines

# 'No-fail' earth fault protection

(Enabled by connecting terminal 8 to MTL4220) Fault on any line proclaimed: unit continues working

# Response time

#### 50ms, nominal

Contacts

2-pole changeover

#### Contact rating

 $250V:5A:5\overline{0}0VA$  (ac) (resistive loads, reactive loads must be suppressed)

250V:5A:250W (dc) (resistive loads, reactive loads must be suppressed)

### **Contact life expectancy**

2 x 10<sup>5</sup> operations at maximum load

#### LED indicator

ON when relay energised

# Consumption

0.9 to 1.4W (ac versions) 60mA (24V dc version)



All contacts shown in alarm condition (relay de-energised)

#### **Ambient temperature limits**

-20 to +55°C (all versions, close packed)
-20 to +60°C (all versions, at least 5mm apart)
-40 to +80°C (all versions, storage)

#### **Safety description**

### 7V, 300Ω, 22mA

FM max entity parameters

 $V_{oc} = 8.3V$ ,  $I_{sc} = 26mA$ ,  $C_a = 7\mu$ F,  $L_a = 47mH$ 



# MTL2211 SWITCH OPERATED RELAY

2-channel

The MTL2211 enables two 500VA safe-area loads to be controlled independently through two relays by two light-duty on/off switches in a hazardous area. The two input circuits are independently fully floating and are unaffected by each other. Each relay is provided with two sets of changeover contacts, which are connected in parallel within the unit for maximum reliability. Applications include the operation of medium-powered electrical equipment such as alarms, lights, and small electrical motors, or contactors for controlling higherpowered equipment.

# **SPECIFICATION**

See also 'Common specification'

#### Number of channels

Two, independently fully floating **Location of switches** Zone 0, IIC, T6 hazardous area Div 1, Group A, hazardous area

- Voltage applied to each switch
- 2.5V dc from 680Ω

**Input/output characteristics (each channel)** Relay energised if <200Ω in switch circuit Relay de-energised if >500Ω in switch circuit Hysteresis, nominal 100Ω

**Power supply failure protection** Both relays de-energised if supply fails

Broken line protection (each channel) Relay de-energised if either line broken

Fail-safe earth fault protection (each channel) (Enabled by connecting terminal 3 or 7 to earth) Relay de-energised if <1kΩ to earth, total for both lines Relay not de-energised if >7.5kΩ to earth, total for both lines

#### **'No-fail' earth fault protection (each channel)** (Enabled by connecting terminal 3 or 7 to MTL4220)

Fault on either line proclaimed: unit continues working **Response time (each channel)** 

#### 50ms, nominal Contacts (each channel)

1-pole changeover, duplicated within unit

# **Contact rating**

250V:5A:500VA (ac), resistive loads, reactive loads must be suppressed

250V:5A:250W (dc), resistive loads, reactive loads must be suppressed

# Contact life expectancy

 $3 \times 10^5$  operations at maximum load

#### LED indicator (each channel) ON when associated relay energised (safe condition)

Consumption

1.7 to 2.5W (ac versions)

# 110mA (24V dc version)

# Ambient temperature limits

-20 to +50°C (ac versions, close packed)

- -20 to +45°C (24V dc versions at 26V, close packed)
- -20 to  $+60^{\circ}$ C (all versions, at least 5mm apart)
- -40 to  $+80^{\circ}$ C (all versions, storage)

#### **Safety description (each channel)** 7V, 300Ω, 22mA

FM max entity parameters (each channel)  $V_{oc} = 8.3V$ ,  $I_{sc} = 21.7$ mA,  $C_a = 5.5\mu$ F,  $L_a = 75$ mH



Safe area

Hazardous area



All contacts shown in alarm condition (relay de-energised)



# MTL2213 SWITCH/ **PROXIMITY DETECTOR** RELAY

# 3-channel

The MTL2213 enables three 100VA safe-area loads to be controlled independently by three light-duty on/off switches or certified proximity detectors in a hazardous area. Switches and proximity detectors may be mixed. The three input circuits are interconnected but fully floating. For proximity-detector and some switch applications, a phase-reverse link allows alarm conditions to be signalled for either state of the sensors. 'Alarm' means relays de-energised with their on/off contacts open, and all three circuits have to operate in the same fashion. This compact low-cost unit is suitable for a wide variety of applications. The MTL2213 supersedes the MTL2212 for which it is a direct replacement, except that only terminal 8 can be used for connecting to earth.

# **SPECIFICATION**

### See also 'Common specification'

#### Number of channels

Three, interconnected, fully floating Location of switches

Zone O, IIC, T6 hazardous area

Div 1, Group A, hazardous location

Location of proximity detectors Zone 0, IIC, T4-T6 if suitably certified Div 1, Group A, hazardous location

Voltage applied to each sensor 7.7 to 9.0V dc from  $1k\Omega$ 

Input/output characteristics (each channel) Relay energised if >2.1mA\* (<2kΩ) in sensor circuit Relay de-energised if <1.2mA\* (>10k $\Omega$ ) in sensor circuit Hysteresis:  $200\mu A$  (650 $\Omega$  ) nominal \*NAMUR and DIN 19234 standards for proximity detectors

Phase reverse facility

Operation of all 3 relays reversed by linking terminals 7 & 8 Power supply failure protection

- All three relays de-energised, contacts open, if supply fails Broken line protection (each channel, normal phase only)
- Relay de-energised, contacts open, if either line broken Fail-safe earth fault protection (each channel, normal phase

#### only)

(Enabled by connecting terminal 8 to earth) Relay de-energised if  $<25\Omega$  to earth, total for both lines Relay not de-energised if >52k $\Omega$ to earth, total for both lines

# 'No-fail' earth fault protection (either phase)

(Enabled by connecting terminal 8 to MTL4220) Fault on any line proclaimed: unit continues working

**Response time (each channel)** 

50ms, nominal

Contacts (each channel) On/off, open when relay de-energised

# **Contact rating**

250V,5A,100VA (ac), resistive loads, reactive loads must be suppressed

250V,5A,100W (dc), resistive loads, reactive loads must be suppressed

# Contact life expectancy

1.5 x 10<sup>5</sup> operations at maximum load

> 10<sup>6</sup> operations at 200V ac peak or dc, 10VA (resistive load)



All contacts shown in alarm condition (relay de-energised)

# LED indicator (each channel)

ON when associated relay energised

- Consumption
  - 1.7 to 2.5W (ac versions)
  - 110mA (24V dc version)
- **Ambient temperature limits** 
  - -20 to +50°C (ac versions, close packed)
  - -20 to +45°C (24V dc versions at 26V, close packed) -20 to +60°C (all versions, at least 5mm apart)

  - -40 to +80°C (all versions, storage)

#### Safety description (each channel) 10.5V, 800Ω, 14mA

# FM max entity parameters (each channel)

 $V_{oc} = 10.5$ ,  $I_{sc} = 14.0$ mA,  $C_a = 3.0$ µF,  $L_a = 165$ mH



# MTL2215 SWITCH-OPERATED RELAY

**IS-output** 

The MTL2215 enables either one or two separate IS circuits in a hazardous area to be relay-contact controlled by a single on/off switch or logic signal in a safe area. Applications include the calibration of strain-gauge bridges, changing the tone of an IS sounder, the testing of IS fire alarms, and the transfer of safe-area signals into an annunciator with IS input terminals not segregated from each other. The output-relay contacts are certified as 'non-energystoring' apparatus, and can be connected to any IS circuit without further certification, provided that separate IS circuits are such that they would still remain safe if connected together.

# **SPECIFICATION**

See also 'Common specification'

Number of channels One, fully floating Location of control circuit Safe area Input/output characteristics Relay energised if  $<27k\Omega$  or <1V applied Relay de-energised if >54k $\Omega$  or >2V applied (50V maximum) Hysteresis, nominal:  $16k\Omega$  or 0.6VPower supply failure protection Relay de-energised if supply fails **Response time** 50ms, nominal Contacts (suitable for connection to IS circuits) 2-pole changeover Contact rating (non-IS applications) 250V,5A,500VA (ac), resistive loads, reactive loads must be suppressed 250V,5A,250W (dc), resistive loads, reactive loads must be suppressed **Contact life expectancy (non-IS applications)** 2 x 10<sup>5</sup> operations at maximum load **LED** indicator ON when relay energised Consumption 0.9 to 1.4W (ac versions) 60mA (24V dc version)

# Ambient temperature limits

-20 to +55°C (all versions, close packed)

-20 to +60°C (all versions, at least 5mm apart) -40 to +80°C (all versions, storage)

# Safety description (each channel)

Non-energy-storing apparatus: relay contacts may be connected to any certified IS circuit in Zone 0 without further certification

Note: The 2-pole changeover contacts may be used to switch separate IS circuits only if these remain intrinsically safe when interconnected, since the two sets of relay contacts are not segregated from each other.



All contacts shown in alarm condition (relay de-energised)



# MTL2441B 4/20mA REPEATER POWER SUPPLY

The MTL2441B provides a floating dc supply for energising a 2- or 3wire transmitter in a hazardous area and repeats the transmitter current in another floating circuit to drive a safe-area load. The unit can be used with all 2-wire transmitters certified as suitable for operation with safety barriers having a safety description of 28V,  $300\Omega$ . Other applications include repeating the current flowing in an existing barrier-protected loop to provide a fully isolated output with a high load handling capability and passing measurement or control signals (when used with an MTL2442B isolating driver) through a hazardous area separating two safe areas. The MTL2441B supersedes the MTL2441 but is designed for 240/120V ac supplies only. For a dc powered model choose the MTL5042 or MTL5045.

# **SPECIFICATION**

# See also 'Common specification'

Number of channels One, fully floating Location of transmitter Zone O, IIC, T4-T6 hazardous area if suitably certified Div 1, Group A hazardous location if suitably certified Voltage available for transmitter and lines 2-wire transmitter: 17.5V at 20mA (terminal 3 or 4 and 5) 3-wire transmitter: 18V at 20mA (terminal 3 or 4, and 6) Note: maximum open-circuit voltage 28V Maximum permitted line resistance 2-wire transmitter:  $50 \times (17.5 \text{V} - \text{transmitter voltage requirement}) \Omega$ 3-wire transmitter: dependent on transmitter characteristic Input and output signal range 0 to 20mA Input resistance (terminals 5 and 6) ≤32Ω (640mV at 20mA) Safe-area circuit load resistance 1kΩ max Safe area circuit output resistance >1MΩ Safe-area circuit ripple <100µA peak-to-peak Transfer accuracy at 20°C Better than 20µA between 4 to 20mA **Temperature drift** <1µA/°C **Response time** Settles within 200µA of final value after 200ms **Power supply** 240V ac nominal, 180-260V, 48-65Hz 120V ac nominal, 90–130V, 48–65Hz **Power consumption** 5VA Ambient temperature limits -20 to +50°C close packed -20 to +60°C at least 5mm apart Safety description Terminals 5 and 6 or 7 Non-energy storing allowing insertion into existing loops without further certification





Note: MTL5042 and MTL5045 are recommended for applications using 24V dc supplies.



# MTL2442B 4/20mA ISOLATING DRIVER

The MTL2442B isolates and passes on a 4/20mA signal from a safearea controller to drive a hazardous-area load such as a current-topressure (I/P) converter, a position actuator, or an electrically-driven valve, etc. Input and output circuits float independently to ensure compatibility with all types of drive instrumentation and permit the use of earthed or poorly insulated loads. In conjunction with an MTL2441B repeater power supply, the unit can be used to pass measurement or control signals through a hazardous area between two safe areas. The MTL2442B supersedes the MTL2442 but is designed for 240/120V ac supplies only. For a 24V dc powered model refer to the MTL5045.

### **SPECIFICATION**

# See also 'Common specification'

#### Number of channels

One, fully floating Location of load Zone O, IIC, T4-T6 hazardous area if suitably certified Div 1, Group A hazardous location if suitably certified Input and output signal range 4 to 20mA dc Input resistance ≤200Ω (4V at 20mA) **Maximum load resistance** 800Ω(16V at 20mA) **Output resistance** -1MΩ Input and output circuit ripple <100µA peak-to-peak Transfer accuracy at 20°C Better than 20µA **Temperature drift** <1µA/°C **Response time** Settles within 200µA of final value after 200ms **Power supply** 240V ac nominal, 180-260V, 48-65Hz 120V ac nominal, 90–130V, 48–65Hz **Power consumption** 5VA Ambient temperature limits -20 to +50°C close packed -20 to +60°C at least 5mm apart **Safety description** 28V, 300Ω, 93mA FM maximum entity parameters  $V_{oc} = 28Vdc$ ,  $I_{sc} = 93mA$ ,  $C_a = 0.13\mu$ F,  $L_a = 4.2mH$ 



Note: MTL5045 is recommended for applications using 24V dc supplies



# **MAXIMUM CABLE PARAMETERS**

Model	Group	BASEEFA ( μF	CENELEC) mH	or	μH/Ω	Group	FM µF	mH
MTL2210B	IIC IIB IIA	13 (0.9*) 39 (2.7*) 104 (7.2*)	69 207 552		600 1800 4800	A & B C D	7 21 56	47 190 370
MTL2211	IIC IIB IIA	13 (0.9*) 39 (2.7*) 104 (7.2*)	69 207 552		600 1800 4800	A & B C D	5.5 16.5 44	75 270 600
MTL2213	IIC IIB IIA	2.4 (0.44*) 7.2 (1.32*) 19.2 (3.52*)	165 495 1320		825 2475 6600	A & B C D	3 9 24	165 495 1320
MTL2215	Maximum cable parameters defined by the associated circuit							
MTL2442B	Terminals IIC IIB IIA	4 or 5 to 6 or 7 0.13 0.39 1.04	4.2 12.6 33.6		55 165 440	Terminals 4 A & B C D	or 5 to 6 or 7 0.13 0.39 1.94	4.2 12.6 33.6
MTL2441B	Terminals IIC IIB IIA	3 or 4 to 5 0.13 0.39 1.04	4.2 12.6 33.6		55 165 440	Terminals 3 A & B C D	or 4 to 5 0.17 0.52 1.39	5.1 20.2 40.4

\* Value when unit connected to MTL2220

# **COMMON SPECIFICATION**

### Location of unit

#### Safe area

#### Isolation

250V ac between input, output and power supply terminals Tested at 1500V rms minimum between safe and hazardous-area terminals

#### **Power supply**

Each model\* is available in three versions:

240V ac nominal, 180–260V, 48–65Hz

120V ac nominal, 90–130V, 48–65Hz

24V dc nominal, 20–32.5V (including transients and ripple) \*(except the MTL2441B/2442B which are available only for ac

supplies)

# Replaceable fuse (24V dc units only)

160mA, 5 x 20mm glass, DIN 41571 sheet 2

# Maximum safe-area voltage (U<sub>m</sub>)

250V rms or dc, nominal (absolute maximum in USA)

#### Humidity

5–95% RH

**Terminals** For conductors up to 4mm<sup>2</sup> (12AWG)

#### Mountina

On 35mm rail to EN 50 022, BS 5584 and DIN 46277, or on a flat surface using an SMC2 surface mounting clip

#### Tagging

Two 18-digit rows of Klippon BSG ½ marking tags

Weight

#### 500g approximately

# **DIMENSIONS (mm) and MOUNTING DETAILS**



# **ENCLOSURES and ACCESSORIES**

A range of enclosures is available which provides IP65 protection for up to 2, 4, 8, or 18 units. Alternatively, units can be installed in users' own racks or panels with MTL700 Series accessories which also provide full tagging and cable screen earthing facilities.

# **CONDITIONS of USE**

Conditions governing the use of MTL2000 Series interface units are given in the relevant certificates and schedules, copies of which are available on request.

# TO ORDER, specify:

### 1) Model number, eg:

MTL2210B 1-channel switch-operated relay

- 2) Power supply version, ie:
- 240V ac, 120V ac, 24V dc (except the MTL2441B/2442B which are available only for ac supplies)

#### 3) Literature

AN9008 A user's guide to MTL3000 and 2000 Series interface units

#### **APPROVALS** - for the latest certification information visit www.mtl-inst.com/certs\_1.nsf

