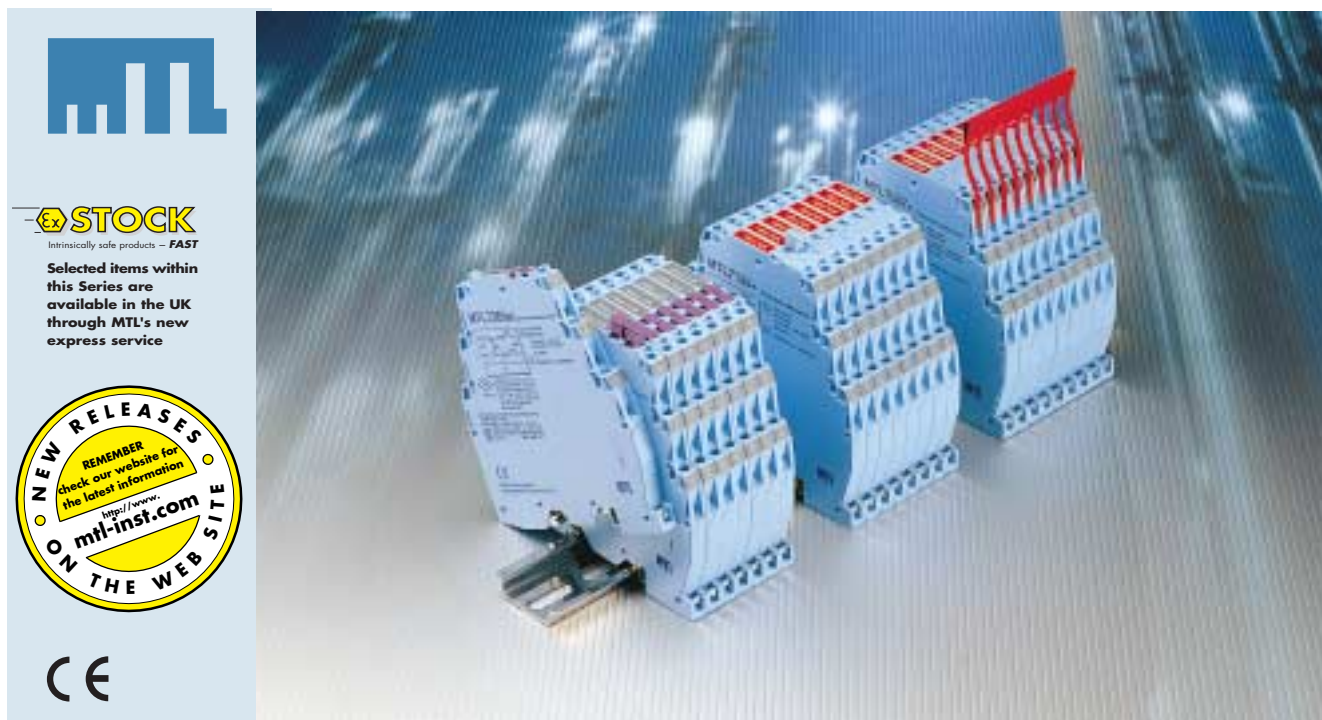


**Ultra-slim safety barriers
that can be used like
terminals**

MTL7000 SERIES

Shunt-diode safety barriers



EX STOCK
Intrinsically safe products – FAST

Selected items within
this Series are
available in the UK
through MTL's new
express service



- ◆ **Exceptionally high packing densities – only 7mm barrier width**
- ◆ **Quickly and easily installed – clamp securely onto DIN rail in one simple operation**
- ◆ **Commissioning and maintenance simplified – secondary replaceable fuse (MTL7100 barriers) and removable link (MTL7200 barriers) provide 'disconnect' features**
- ◆ **24V dc supply connections simplified – optional power comb feeds many barriers**
- ◆ **Direct connection of cable screens and OV lines – third terminal on both hazardous and safe sides**
- ◆ **Reduce need for separate field terminals – many features common to conventional terminals**



Telematic

Telematic Ltd offers surge protection devices which are mechanically compatible with the MTL7000 Series

Ask for the SD Series data sheet!

MTL7000 Series award-winning, intrinsically safe shunt-diode safety barriers are innovative devices designed to provide exceptionally high packing densities, straightforward 'single-operation' installation and simplified connection, commissioning and maintenance facilities. Many of the MTL7000 Series' features duplicate the functions of conventional field terminals and the barriers can, therefore, 'double up' as terminals for many applications, saving even more space.

A barrier width of only 7mm enables maximum packing densities due to the use of surface mount and thick-film hybrid circuit technologies (subjects of patent applications).

Barriers clamp simply and securely onto standard T-section DIN rail, simultaneously making a reliable IS earth connection. Earth terminals, insulating spacers and corrosion-resistant DIN rail are available to satisfy individual IS earthing requirements.

Extra terminals on each side of the barrier allow cable screens from field wiring and OV returns to be terminated on the barrier. 'Dummy' barriers handle spare hazardous-area cable screens and signal lines. Additionally, and as an alternative, an earth rail accessory is available for terminating and securing cable screens, or earth returns and spare cores.

Barrier identification is provided by one or both of two methods. The first consists of tagging strips mounted on posts located at each end of a row of barriers while the other consists of separate identifiers attached to the tops of individual barriers. Of these, the first can be used to tag locations as well as barriers and is recommended for large installations

while the second is better suited to installations of a few barriers only.

An optional power comb simplifies installations where multiple barriers are powered from a common 24V dc source (via a power feed module or a dummy barrier). The comb replaces individual power supply connections to each barrier, yet allows single barriers to be removed without affecting the others. The power feed module powers up to 40 barriers and incorporates a trip which switches off the supply to the barriers if a fault (such as an overvoltage) occurs in the power source circuit.

Secondary replaceable fuse versions of many barriers are available and form the MTL7100 sub-series. These are useful where there is a possibility of faults occurring during commissioning which would otherwise blow the barriers' internal safety fuses. One secondary replaceable fuse for each barrier channel is provided and is lower in value than the related safety fuse. Fuses are packaged in small mouldings which can be latched in a 'disconnect' position to break the safe and hazardous areas during commissioning, maintenance or fault finding, thus avoiding the need for additional disconnect terminals.

Where a fuse is less likely to be necessary, the MTL7200 sub-series uses a latching-out link only, to provide the basic loop disconnection of the MTL7100 sub-series.

New for 1998/99

MTL7106 fuse disconnect barrier for transmitters

MTL7299 link-disconnect dummy barrier

MTL7000 Series accessories

MTL7000 Series enclosures

MTL7000 SERIES

Specifications

CERTIFICATION

MTL7000 Series barriers protect devices located in all normally occurring explosive atmospheres, including air/flammable gas-mixtures, dusts and fibres. MTL7000 Series barriers are certified [EEx ia] IIC (except MTL7129P+, certified IIB) BY BASEEFA to CENELEC standards, by FM in the USA, CSA in Canada and also by other authorities, providing worldwide certification. MTL7000 Series barriers are designed to the same safety descriptions as MTL700 Series equivalents (in some cases slightly stricter) and can therefore be used for the same applications.

HOW THEY WORK

All MTL7000 Series barriers are based on the same simple principle. Each channel contains three stages of Zener or forward-connected diodes and an 'infallible' terminating resistor. In the event of an electrical fault in the safe area, the diodes limit the voltage that can reach the hazardous area and the resistor limits the current: active output-current limiting circuits are not used. An internal fuse protects the diodes, and the three stages of voltage limitation ensure continued safety if the first or second stage should fail. MTL7100 barriers have an additional replaceable fuse which protects the internal fuse.

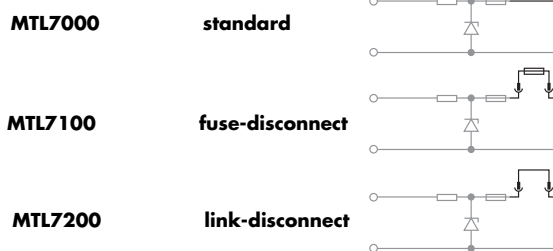
The MTL7000 Series includes seven key barrier types which cover the majority of applications, simplifying barrier selection and the maintenance of spares stocks.

KEY BARRIERS SUMMARISED

TYPE	APPLICATION	KEY BARRIER
Analogue input (low level)	Resistance temperature detectors Thermocouples, ac sensors	7055ac 7060ac 7160ac
Analogue output	Controller outputs, one line earthed Controller outputs, neither line earthed	7028+ 7128+ 7087+ 7187+
		dc power supply
		26.0V 20-35V
Analogue input (high level)	Transmitters, 2-wire, 4/20mA	7087+ 7187+
Digital (on/off) input	Switches	7087+ 7187+
Digital (on/off) output	Solenoids, alarms, LEDs	7028+ 7128+

SUB-SERIES

MTL7000 Series barrier circuits are based on the well-proven designs originally developed for the MTL700 Series. To simplify identification for those familiar with the latter, part numbers are the same for equivalent barriers, but with a '0', '1' or '2' inserted after the initial '7' to identify the relevant sub-series:



Note: the circuit shown is as an example only. Standard, fuse- or link-disconnect options are shown shaded in the 'basic circuits' below.

MTL7000 SERIES – SPECIFICATIONS

Key barriers shown in blue

Model No. MTL	Safety description			Application	Basic circuit	Max. end-to-end resistance (Ω)	V _{wkg} at 10μA (V)	V _{max} (V)	Internal safety fuse/fuse-resistance (FD)† (mA)
	(V)	(Ω)	(mA)						
SINGLE CHANNEL +VE									
7122+	22	150	147	18V dc systems Controller outputs, solenoids		189	19.0	21.7	50 (FD)
7028+	28	300	93			332	26.0	27.0	50
7128+	28	300	93			342	26.0	27.2	50 (FD)
7128P+	28	234	120	Controller outputs, solenoids (IIB)		275	26.0	27.1	50 (FD)
7129P+	28	164	171			211	25.0	26.5	50 (FD)
SINGLE CHANNEL -VE									
7028-	28	300	93	For negative/floating power supplies		332	26.0	27.0	50
7128-	28	300	93			342	26.0	27.2	50 (FD)
DOUBLE CHANNEL +VE									
7162+	10	50	200	6V dc systems Low-level/logic return signals 12V dc systems		87	8.0	9.1	50 (FD)
7164+	10	50	200			87	8.0	9.1	50 (FD)
	12	1k	12			1058	9.0	10.0	50 (FD)
7167+	12	1k	12			1058	9.0	10.0	50 (FD)
	15	100	150			140	13.0	14.2	50 (FD)
	15	100	150	140	13.0	14.2	50 (FD)		
DOUBLE CHANNEL (NON-SYMMETRICAL) -VE									
7096-	26	300	87	Vibration probes		332	23.5	24.4	50
7196-	20	390	51			424	18.5	19.2	50
	26	300	87			342	23.5	24.6	50 (FD)
	20	390	51			434	18.5	19.3	50 (FD)

Model No. MTL	Safety description			Application	Basic circuit	Max. end-to-end resistance (Ω)	V _{wkg} at 10μA (V)	V _{max} (V)	Internal safety fuse†/fuse-disconnect (FD) (mA)		
	(V)	(Ω)	(mA)								
RETURN-DIODE TYPE											
7087+	28	300 diode	93	Transmitters, controller outputs, switches		332	26.0	26.8	50		
7187+	28	300 diode	93			33 + 0.9V	26.0	26.8	50		
7087P+	28	234 diode	120			43 + 0.9V	26.0	26.9	50 (FD)		
7187P+	28	234 diode	120			261	26.0	26.8	80		
	28	234 diode	120	Transmitters, controller outputs, switches		30 + 0.9V	26.0	26.8	80		
	28	234 diode	120			274	26.0	26.9	50 (FD)		
	28	234 diode	120			43 + 0.9V	26.0	26.9	50 (FD)		
SIMPLE AC, LOW LEVEL											
7251ac	1	10	100	Active dc & ac sensors		25	0.3	2.0	100		
	1	10	100			25	0.3	2.0	100		
7055ac	3	10	300	2-wire RTDs		24 ¹	0.6 at 1μA	3.0	100		
	3	10	300			24 ¹	0.6 at 1μA	3.0	100		
7056ac	3	10	300	3-wire RTDs		24	0.3 at 1μA	2.3	100		
	3	10	300			24 ¹	0.3 at 1μA	2.3	100		
	3	10	300			24 ¹	0.3 at 1μA	2.3	100		
SIMPLE AC, HIGHER VOLTAGE											
7261ac	9	90	100	Strain-gauge bridges 4-wire RTD's		115	7.2	8.3	80		
	9	90	100			115	7.2	8.3	80		
7061Pac	9	350	26	Strain-gauge bridge, sense, output		384	7.2	8.5	50		
7161Pac	9	350	26			384	7.2	8.5	50		
7264ac	12	1k	12			393	7.2	8.8	50 (FD)		
	12	1k	12			393	7.2	8.8	50 (FD)		
7066Pac	12	75	160	Strain-gauge bridge sense		1048	10.0	11.1	50		
	12	75	160			1048	10.0	11.1	50		
7166Pac	12	75	160			Strain-gauge bridge supply		97.2	9.8	10.9	80
	12	75	160					97.2	9.8	10.9	80
	12	75	160			110.1	9.8	11.2	50 (FD)		
	12	75	160			110.1	9.8	11.2	50 (FD)		
STAR-CONNECTED AC²											
7060ac	9	75	120	Active dc and ac sensors, thermocouples		101	7.2	8.5	50		
	9	75	120			101	7.2	8.5	50		
7160ac	9	75	120			110.1	7.2	8.8	50 (FD)		
	9	75	120			110.1	7.2	8.8	50 (FD)		
7265ac	15	100	150	2-wire dc/ac systems		131	12.0	13.0	50		
	15	100	150			131	12.0	13.0	50		
7278ac ³	28	600	47			640	+24.0	+25.9	50		
	28	600	47			640	-22.3	-23.8	50		
	28	600	47			+24.0	+25.9	50			
	28	600	47			-22.3	-23.8	50			
ACTIVE BARRIERS											
7206	28	300	93	Transmitters	See 'Active barriers'	-	-	35	50		
7207+	28	300 diode	93	Switches		348 + 1.2V	-	35	50		
7208+	28	300 diode	93	Solenoids, alarms, LEDs		31 + 0.9V	-	-	50		
	28	300 diode	93		348 + 1.2V	-	35	50			
DUMMY BARRIERS											
7099	-	-	-	Securing and earthing unused cables and screens.		-	-	-	-		
7299	-	-	-	Feed-through connections for power comb.		-	-	-	-		

†All barriers have internal, inaccessible, safety fuses. MTL7100 barriers have additional replaceable fuses, lower in value than the internal fuses. It is the value of the replaceable fuse that is quoted for MTL7100 barriers.
 Note 1: 24Ω ± 0.15Ω at 20°C, channels track within 0.15Ω from -20 to +60°C.
 Note 2: In star-connected barriers (eg, MTL7060/7160), the two channels are interlocked such that the voltage between them cannot exceed the working voltage, V_{wkg}.
 Note 3: MTL7278ac: the working voltage between the two interlocked channels is 24.0V; V_{max} is 25.3V.

'P' SUFFIX – Barriers with a 'P' suffix are higher-power versions of the standard devices with lower end-to-end resistance, except the MTL7061Pac/7161Pac. They are suitable for type IIC gas groups, except MTL7129P+ which is designed for IIB.

WARNING – Check compatibility of the electrical safety parameters of the field equipment with those of the barriers to make sure that the combination is safe.

ACTIVE BARRIERS

MTL7106/MTL7206, MTL7207+ and 7208+ active barriers

The MTL7106/MTL7206, MTL7207+ and 7208+ barriers have built-in overvoltage protection, allowing their use with unregulated power supplies. In many applications, eg, sensor inputs or controller outputs, there is insufficient power available to blow the barrier fuse and this additional protection is not necessary. But, where the barrier is connected to a power supply, eg, for energising transmitters, switches, solenoids or local alarms, overvoltage protection allows the barriers to be used with unregulated supplies up to 35V dc and also gives protection against faulty wiring during commissioning. The MTL7206, 7207+, 7208+ are equipped with a loop disconnect at power supply terminal 1 while the MTL7106 has a fuse-disconnect.

Nearest equivalent passive barriers

MTL7106	nearest equivalent	MTL7128-/7187+
MTL7206	nearest equivalent	MTL7028-/7087+
MTL7207+	nearest equivalent	MTL7087+/7187+
MTL7208+	nearest equivalent	MTL7028+/7128+

MTL7106/7206

for 2-wire 4/20mA and 'smart' transmitters

The MTL7106/MTL7206 is a single-channel barrier designed primarily for energising a conventional or 'smart' 2-wire 4/20mA hazardous-area transmitter. They can be thought of as an MTL7128- or an MTL7028- barrier with a built-in floating power supply and electronic over-voltage protection. It provides a high voltage output (which is negative with respect to earth) to power the transmitter and delivers a 4/20mA signal into an earthed load in the safe-area. The novel design is noted for its extreme accuracy.

SPECIFICATION

Supply voltage

20 to 35V dc

Supply current

40mA typical at 20mA with 28V dc supply

45mA typical at 20mA with 24V dc supply

60mA maximum at 20mA with 20V dc supply

Voltage for transmitter and lines

16.0V minimum at 20mA with 250Ω load

11.25V minimum at 20mA with 500Ω load

Note that the output voltage is negative with respect to earth.

Safe-area load resistance

0 to 500Ω

Output current

0 to 23.6mA

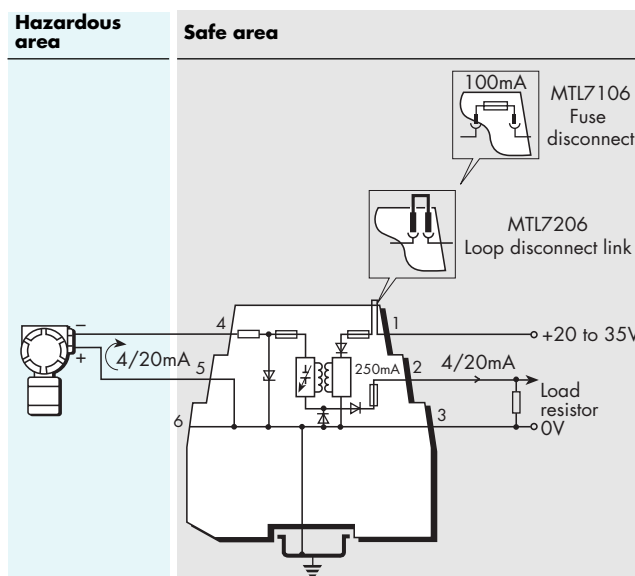
Accuracy

±2μA (4 to 20mA)

Out of range capability

Over-range; >20mA to 23.6mA

Under-range; <4mA to 0mA



'Smart' compatibility

HART Communication Foundation HART®

Honeywell DE

Yokogawa BRAIN

Foxboro 'smart'

Fuji 'smart'

Chessel 3500 Series

Patent Nos

UK: 2205699

European (Germany, France, Italy): EP 0 294 139 BI

USA: 4967302

MTL7207+

for digital (switch) inputs

SPECIFICATION

Supply voltage, terminal 1

+10 to +35V dc

Normal operation

In normal operation the protection circuit introduces only a small voltage drop and shunts less than 1.5mA to earth, so its overall effect is minimal

Supply voltage >27V

If the supply voltage exceeds about 27V, causing the Zener diodes to conduct, or if the safe-area load has a very low resistance, the supply current is limited automatically to <50mA. This protects the fuse and power supply and enables the loop to continue working.

Supply current

At $V_s < 26V$; $I_{out} + 1.5mA$ max

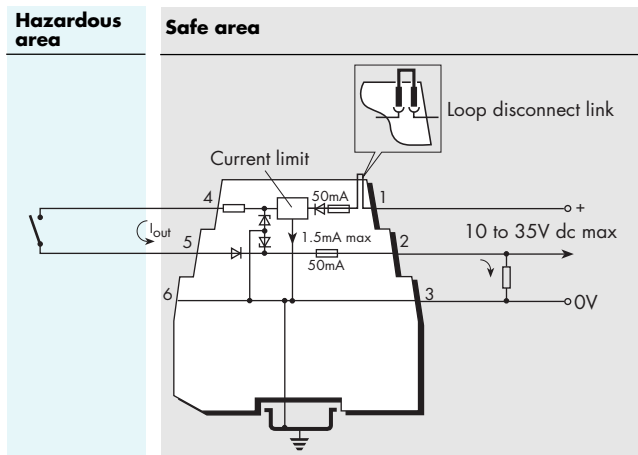
At $V_s > 28V$ or low load resistance; limited to <50mA

Internal fuse, terminal 1

50mA

Reverse voltage protection, terminal 1

Yes



Maximum voltage drop, terminals 1 to 4

$[(I_{out} \times 348\Omega) + 1.2]V$ (current not limited)

Output current (I_{out}), terminal 4

Up to 35mA

Leakage to earth

1.5mA max

Internal fuse, terminal 2

50mA

Maximum voltage drop, terminals 5 to 2

$[(I_{out} \times 31\Omega) + 0.9]V$

MTL7208+

for digital (switched) outputs

SPECIFICATION

Supply voltage, terminal 1

+10 to +35V dc

Normal operation

In normal operation the protection circuit introduces only a small voltage drop and shunts less than 1.5mA to earth, so its overall effect is minimal

Supply voltage >27V

If the supply voltage exceeds about 27V, causing the Zener diodes to conduct, or if the safe-area load has a very low resistance, the supply current is limited automatically to <50mA. This protects the fuse and power supply and enables the loop to continue working.

Supply current

At $V_s < 26V$; $I_{out} + 1.5mA$ max

At $V_s > 28V$ or low load resistance; limited to <50mA

Internal fuse, terminal 1

50mA

Reverse voltage protection, terminal 1

Yes

Maximum voltage drop, terminals 1 to 4

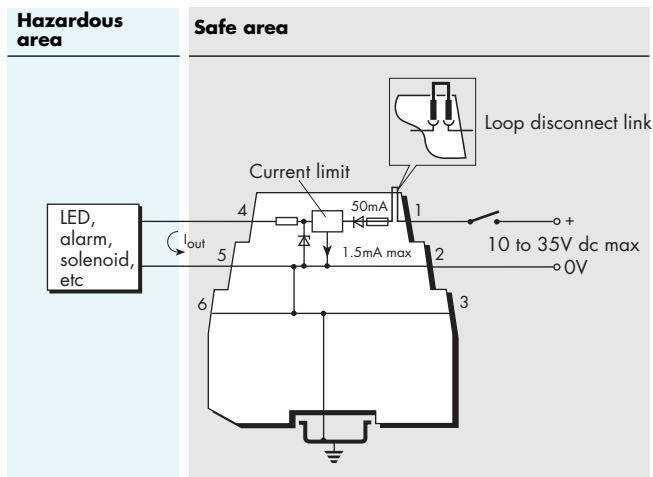
$[(I_{out} \times 348\Omega) + 1.2]V$ (current not limited)

Output current (I_{out}), terminal 4

Up to 35mA

Leakage to earth

1.5mA max



MTL7991

power feed module

The MTL7991 power feed module incorporates both voltage and current sense mechanisms to protect barrier circuits by activating a solid-state trip mechanism when fault or overload conditions occur in the power source circuit. Resetting the module after tripping is done by interrupting the supply to the unit. A red LED indicates a circuit trip condition and a green LED the availability of power at the outputs.

SPECIFICATION

Input voltage range (terminals 2 and 3)

20 to 26.8V

Maximum input voltage capability

35V

Power source requirement

Power source must be capable of delivering at least 1.8A

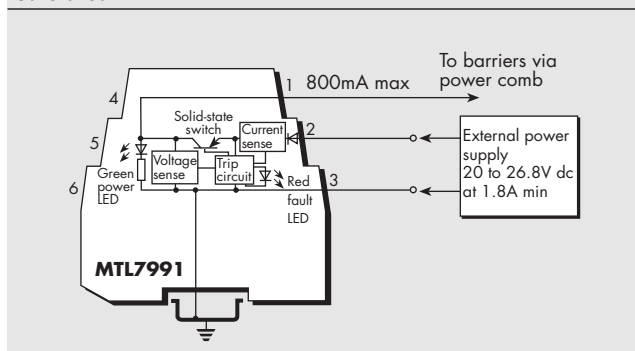
Trip mechanism

Minimum trip operating voltage: 26.8V (at 20°C ambient) at output terminal 1 wrt earth

Temperature coefficient:

+18.4mV/°C

Safe area



Output current range (terminal 1 wrt earth)

0 to 800mA

LED indication

Green: indicates power at output terminals (ie, power being fed to barriers)

Red: indicates trip condition (ie, overvoltage or overcurrent state)

Maximum voltage drop

20mV at 0mA load, -20 to +60°C

1.0V at 800mA load, -20 to +60°C

Maximum number of barriers powered

Load dependent, eg:-

40 x MTL7087+* at 20mA (4/20mA loops)

* Or fuse-disconnect or 'P' versions

GENERAL SPECIFICATION

Ambient temperature limits

-20 to +60°C (FM/CSA) continuous working

-20 to +40°C (BASEEFA) continuous working

-40 to +80°C storage

Humidity limits

5 to 95% RH

Case flammability

UL94: V-2

Terminations

Terminals accommodate conductors up to 2.5mm²

Hazardous-area terminals are identified as dark blue

Colour coding of barrier type (label on top surface)

Red: Positive polarity (+)

Black: Negative polarity (-)

Black (with red text): MTL7106/7206

Grey: Non-polarised (ac)

White: MTL7099/7299 dummy barrier

Orange: MTL7991 power feed module

Weight

100g approximately

Mounting and earthing

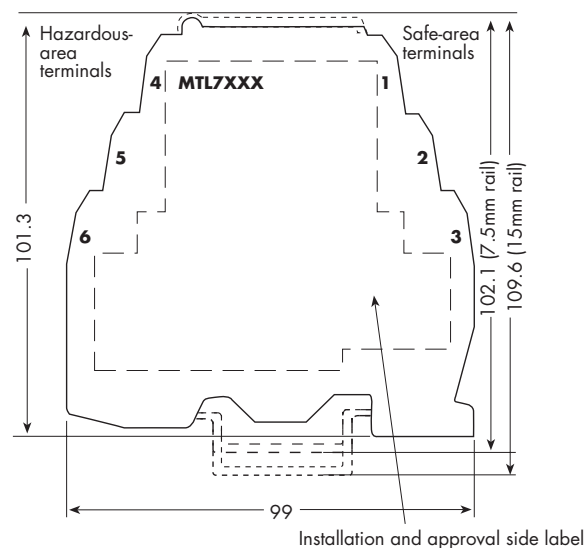
Clamping onto standard 35mm 'top-hat' DIN-rail: 7.5mm (low profile) or 15mm (high profile)

EMC compliance

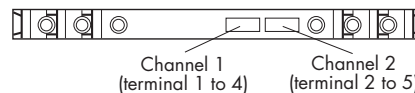
EN 50 081-2/EN 50 082-2, generic emission/immunity standards. These refer to appropriate IEC/CISPR standards.

Note: All specifications quoted at 20°C ambient unless otherwise stated.

DIMENSIONS (mm)



Fuse/link positions (MTL7100/7200)



Colour-coded top label



MTL7000 SERIES APPLICATIONS AND BARRIER SELECTION

2-wire transmitters, 4/20mA, conventional and smart

Recommended barriers for use with 'conventional' and 'smart' 4/20mA transmitters (fed by a regulated supply) are the MTL7087+ / 7187+ or MTL7087P+ / 7187P+. These provide up to 14.2V at V_{wkg} and 20mA for a transmitter and its lines as well as 5V for the typical 250Ω load. This application and these barriers are suitable for use with the optional power comb.

The MTL7106/7206 is recommended for applications where an unregulated supply of up to 35V is used. It provides 16.0V for transmitter and lines at 20mA as well as 5V for a typical 250Ω load. With the MTL7106/7206 terminal 4 is negative with respect to earth, so the connections to terminals 4 and 5 should be reversed.

Vibration probes

The 3-wire transmitters used with vibration monitoring equipment are invariably supplied by a -24V dc power supply – hence the recommended barrier choice is the negatively-polarised MTL7096- / 7196-. The 'third terminal' makes this choice ideal for these 3-wire applications.

Thermocouples and mV sources

The recommended barrier for thermocouples and mV sources is the MTL7060ac/7160ac. This 2-channel non-polarised barrier retains the 'earth-free' nature of the signal and, providing the receiver's input 'floats', rejects common-mode ac and dc interference up to at least 7V and is unaffected by earth faults on the primary element.

ac sensors, photocells, microphones and turbine flowmeters

The MTL7060ac/7160ac is the recommended choice for these devices. While many of these are designated 'simple apparatus' and thus do not need certification, note that some ac sensors may be subject to a significant level of inductance and will therefore need to be designed and certified for hazardous-area locations.

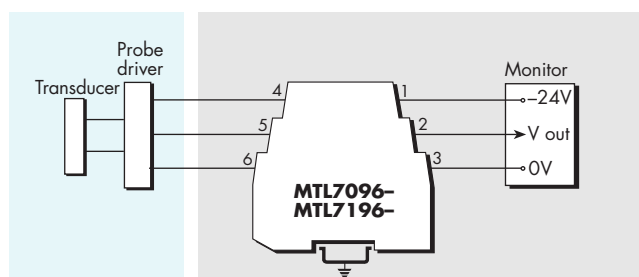
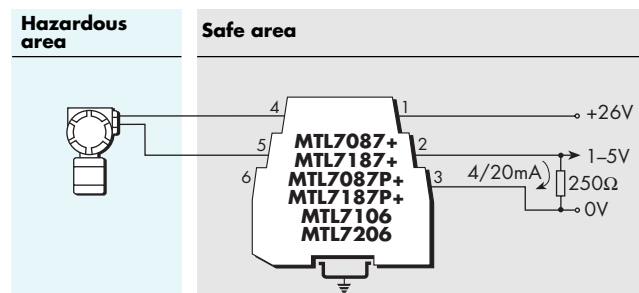
Slidewire displacement transducers

The simplest choice is the MTL7060ac/7160ac. This barrier supplies power and brings back a unipolar signal.

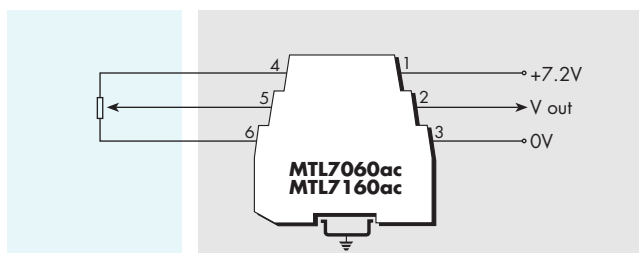
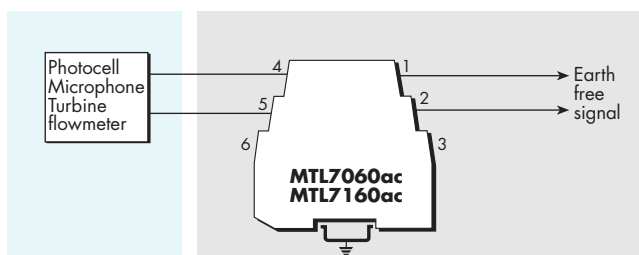
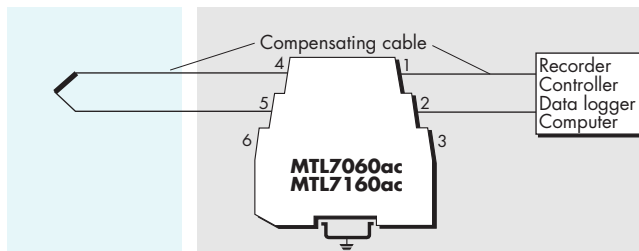
MTL7000 Series barriers protect devices located in all normally occurring explosive atmospheres, including air/flammable gas mixtures, dusts and fibres. Applications covered include the protection of installations incorporating uncertified devices ('simple apparatus') such as thermocouples, switches and resistive sensors, or separately certified 'energy storing' (or 'voltage producing') apparatus including ac sensors, transmitters and current-to-pneumatic (I/P) converters. Recommended choices for specific applications are discussed briefly in the following pages.

These are examples, and many other configurations will suggest themselves. For advice on a particular application, please contact MTL.

ANALOGUE INPUTS (HIGH-LEVEL)



ANALOGUE INPUTS (LOW-LEVEL)



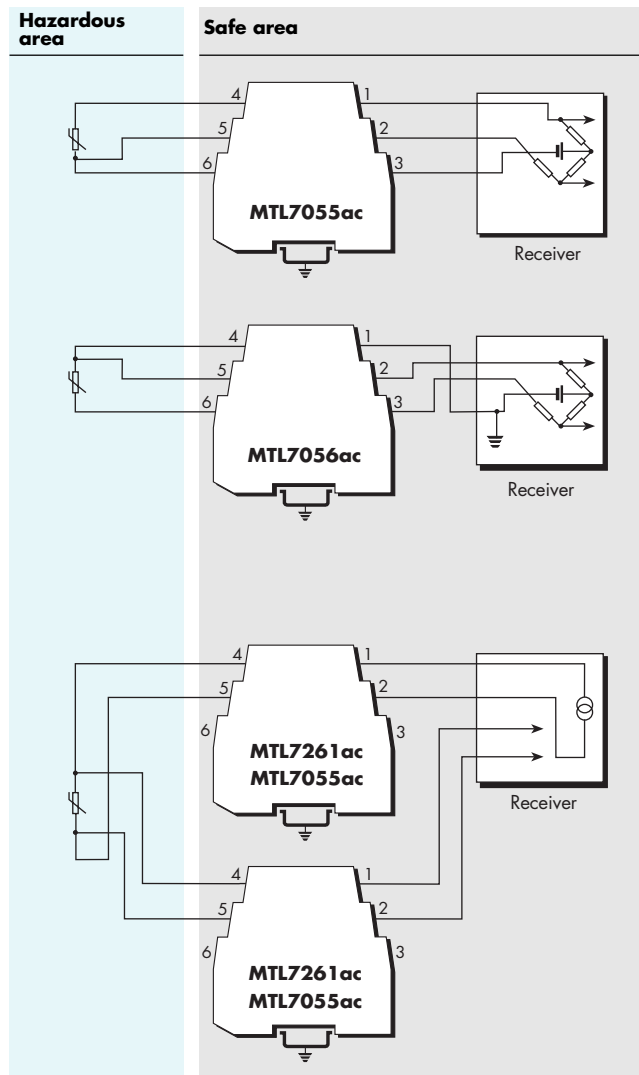
RTDs

For 3-wire RTDs, a single MTL7055ac barrier is the most economical choice. This is suitable for use with a floating bridge – the two leads from the bridge arms are protected by the barrier with the third (supply) lead being earthed through the barrier. The barrier has a low end-to-end resistance of only 24Ω/channel to minimise span changes and its channels track within 0.15Ω (between –20 to +60°C) to minimise zero shift with temperature.

If the bridge circuit is already earthed, the third barrier channel provided by an MTL7056ac is needed. For extreme accuracy, 3 channels and an earth-free bridge can be used, a configuration that cancels out the small errors due to barrier leakage.

Channels 2 and 3 (those between terminals 5 & 2, and 6 & 3 respectively) track to within 0.15Ω between –20 and 60°C

4-wire constant-current circuits do not need matched barrier resistances and can be protected more economically by two MTL7261ac barriers. If the increase in loop resistance is too great, use two MTL7055ac barriers instead.



STRAIN-GAUGE BRIDGES

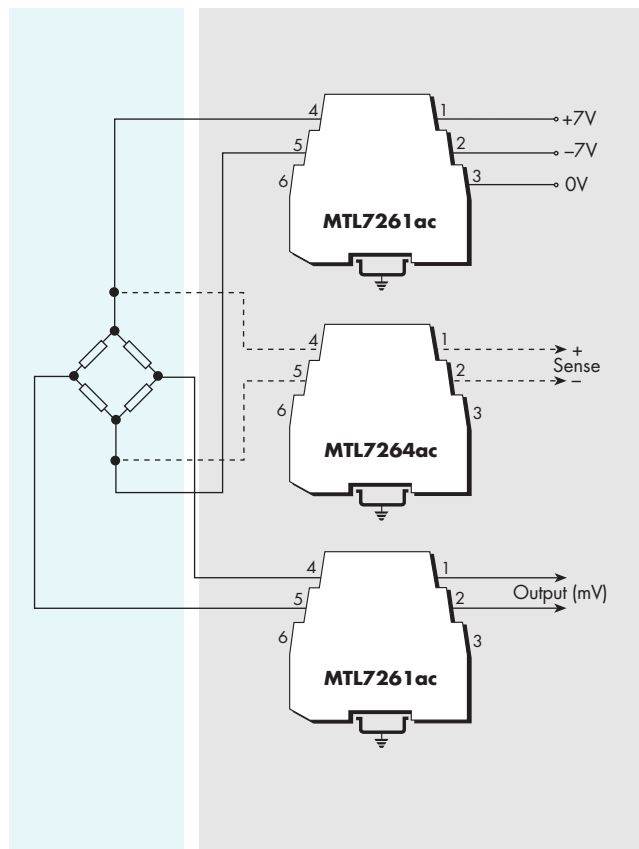
Single strain-gauge bridges

This shows an arrangement using two or three barriers, which is safe in IIC gases. With the MTL7261ac, the circuit is powered from a 14V, 230Ω source; if the bridge resistance is 230Ω, then the bridge voltage is 7V. If the bridge resistance is 350Ω, then the bridge voltage is 8.4V.

An MTL7264ac can be used to sense the bridge supply voltage.

An MTL7261ac is used here for the mV output.

An MTL7166Pac provides 12.3V for a 350Ω bridge with a 20V supply. MTL7161Pac's can be used for the sense and pick-off circuits.



Double strain-gauge bridges

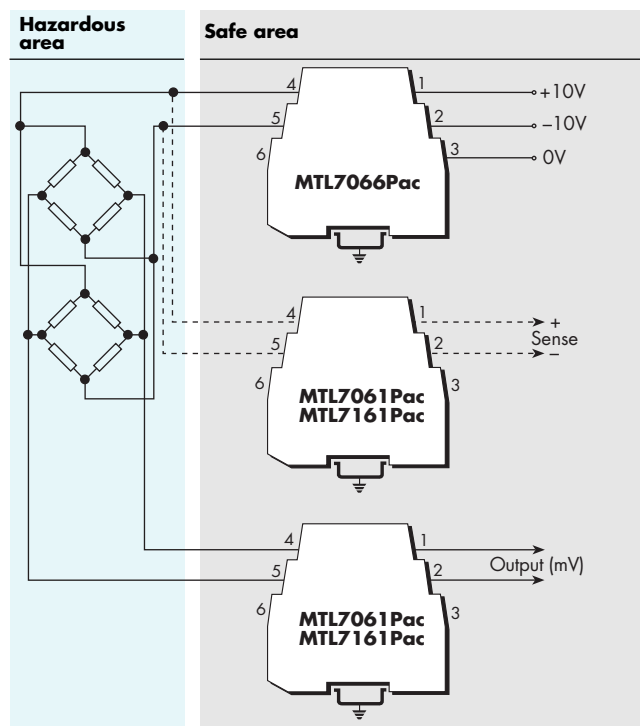
Quite frequently there is a demand to monitor two load cells, and a possible circuit, safe in IIC, is shown.

Here, the lower voltage drop of the MTL7066Pac is an advantage.

The MTL7066Pac supplies power to the bridge(s) whilst two MTL7061Pac/7161Pac barriers interface with the sense and pick-off circuits.

Using 350Ω bridge systems, the following voltages are available from an MTL7066Pac with a ±10V supply:

- 1 bridge: 12.8V
- 2 bridges: 9.4V



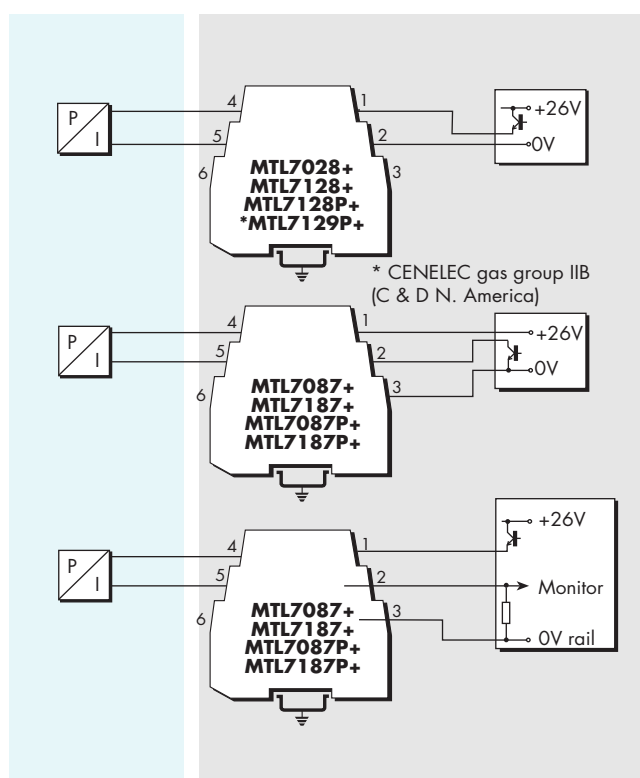
Controller outputs (I/P converters)

The single-channel MTL7028+/7128+ with a voltage drop of 6.7V/6.9V is the recommended choice for most controller outputs. Higher-power versions are available: the MTL7128P+ (5.5V drop) is suitable for IIC applications; the MTL7129P+ (4.22V drop) for IIB applications.

For controllers with an output circuit separated from the 0V rail by the control transistor, the 2-channel MTL7087+/7187+ is the preferred choice as the return channel can handle up to 26.0V/26.0V allowing the control signal to be turned off completely. The voltage drop is 8.2V/8.6V at 20mA. A higher-power version of the latter, the MTL7087P+ /7187P+, is also available. The return channel of these barriers handle up to 26.0V/26.0V and the maximum voltage drop is only 6.72V/7.24V.

The MTL7087+/7187+ and MTL7087P+/7187P+ are also suitable for controllers containing a resistor which enables the return current to be monitored for high-integrity operation.

ANALOGUE OUTPUTS



Switches

The normal choice is the MTL7087+/7187+ with a regulated supply. The MTL7207+ is recommended for applications where an unregulated supply of up to 35V is used.

For optimum power transfer, with relays the resistance of the load should be approximately equal to the combined resistance of the two channels and the relay coil should then be rated at about half the supply voltage.

Alarms, LEDs, solenoids valves, etc

For these applications, the MTL7028+/7128+ is recommended. Higher-powered versions are available: the MTL7128P+ is suitable for IIC applications; the MTL7129P+ for IIB applications.

The MTL7208+ is recommended for applications where an unregulated supply of up to 35V is used.

If the control switch is to earth, then the 2-channel MTL7087+ /7187+ barrier should be used, or, alternatively, the MTL7087P+/7187P+ higher-power version. If the supply is poorly regulated use the MTL7207+.

Low-level to 12V dc systems

The two channels of the MTL7162+, MTL7164+ and MTL7167+ can be combined safely in IIC.

The MTL7164+ can be used for low-level logic return signals. The MTL7162+ and MTL7167+ are used for 6V dc and 12V dc systems respectively.

18V dc systems

The single-channel MTL7122+ is recommended for 18V dc systems.

Low-level ac and dc systems

The MTL7251 ac can be used with moving-coil or other low impedance receivers. It can also be used with 'simple apparatus'.

High-level ac and dc systems

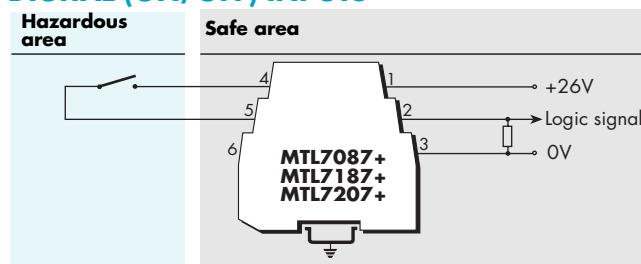
The versatile star-connected MTL7265ac and MTL7278ac allow V_{wkg} to be developed from each channel to ground but only allow V_{wkg} to be developed between channels. This provides some common-mode voltage capability and can allow higher cable parameters to be used.

Digital (on/off) outputs

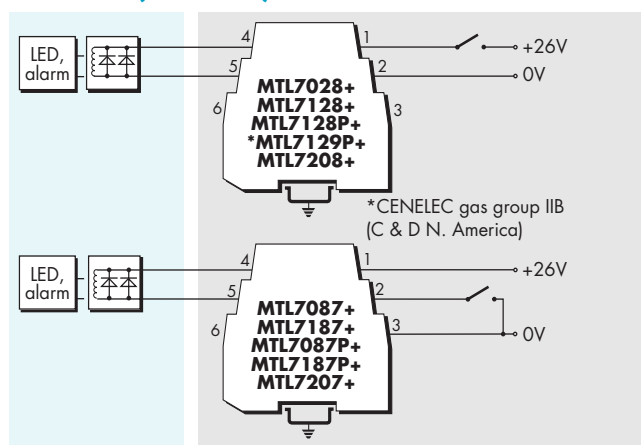
The MTL7028- /7128- is used with a negative power supply and positive earth. Typically used for digital inputs or outputs, as shown.

The MTL7028-/7128- can also be used with floating power supplies, for transmitters.

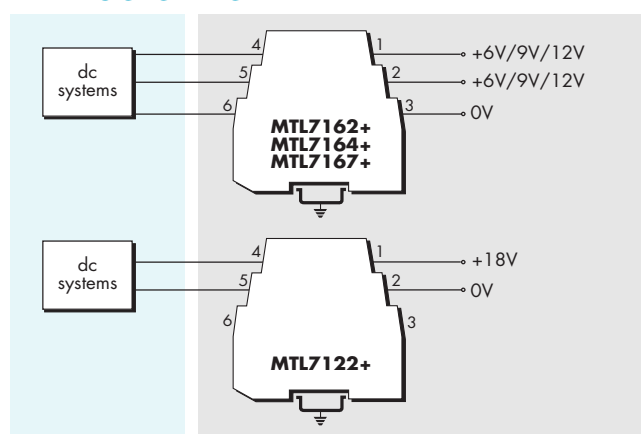
DIGITAL (ON/OFF) INPUTS



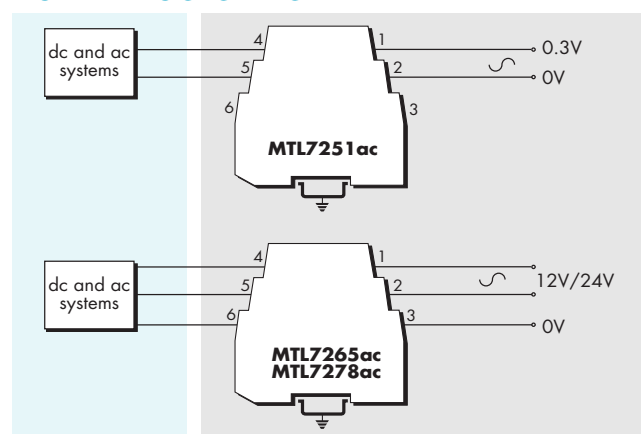
DIGITAL (ON/OFF) OUTPUTS



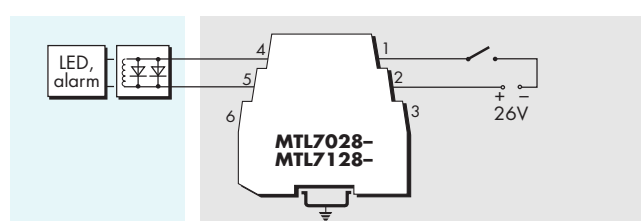
+VE DC SYSTEMS



AC AND DC SYSTEMS



NEGATIVE AND FLOATING POWER SUPPLIES



Power comb applications

The PWC7000 power comb is invaluable for saving installation time and wiring when connecting a 24V dc power source to a number of barriers.

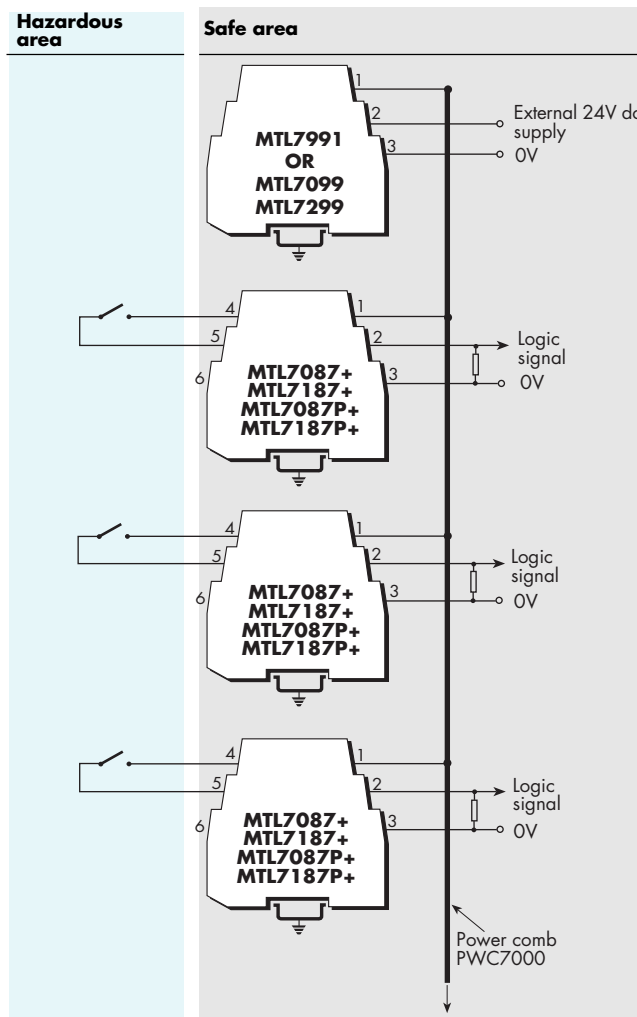
Typical applications include hazardous-area switches, 4/20mA transmitters and solenoids. The diagram illustrates the configuration for 3 barriers but up to 40 barriers can be served by this method.

The MTL7991 power feed module would normally be used with standard barriers such as MTL7087+ and MTL7087P+ because the current/voltage trip protection mechanism of the MTL7991 removes the need for replaceable fuses in the barriers.

The MTL7099/7299 dummy barriers can be used instead of the MTL7991 for direct 'feed-through' connection of a 24V dc supply. In these circumstances, replaceable fuse barriers such as MTL7187+ and MTL7187P+ may be preferred.

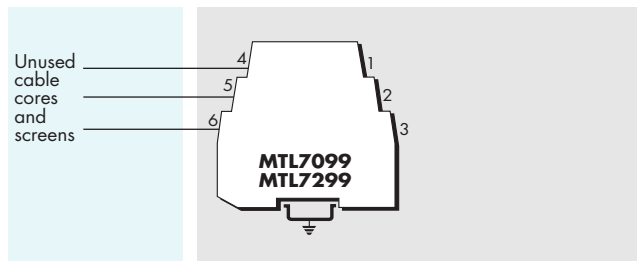
The MTL7299 dummy barrier has a removable link between terminals 1 and 2 for easy disconnection of the supply.

Other units which can use the power comb:
 MTL7106
 MTL7206
 MTL7207+



Spare cable cores and screens

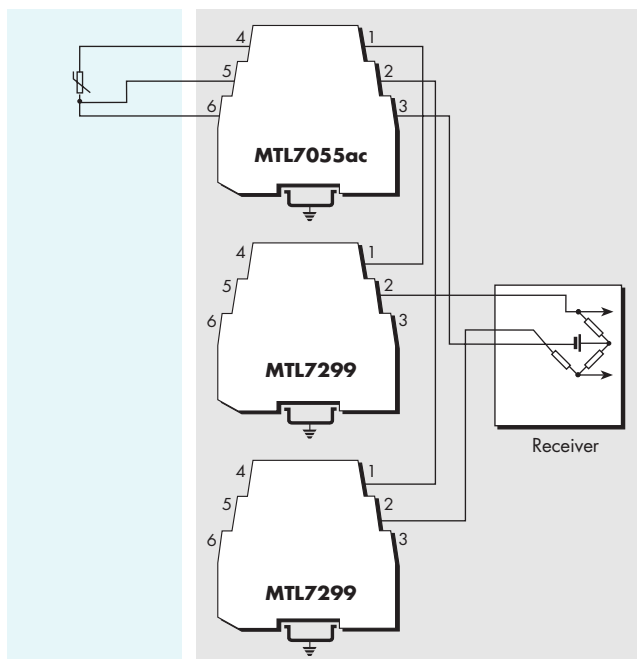
The MTL7099/7299 dummy barriers are used primarily for securing and earthing unused cables and screen connections. Hazardous area terminals 4, 5 and 6 (and safe area terminal 3) are internally connected to the DIN-rail mounting/earth connection.



Wired in applications

MTL7299's can be 'looped-in' to provide link-disconnects for MTL70xx barriers, eg. as shown here with an MTL7055ac and an RTD.

For high accuracy or sensitive low level applications check that the additional connections do not degrade the signals.



MAXIMUM CABLE PARAMETERS

Model no.	Number of single channels inter-connected within hazardous area	Earth ¹ return used?	Maximum permissible cable parameters ²					Matched power ³ (W)
			BASEEFA (group IIC (hydrogen))			FM (Groups A & B)		
			Capacitance (µF)	Inductance (mH)	L/R ratio (µH/Ω)	Capacitance (µF)	Inductance (mH)	
MTL7106	1	Yes	0.13	4.2	55	0.14	4.27	0.65
MTL7206	1	Yes	0.13	4.2	55	0.14	4.27	0.65
MTL7207+	2	Yes	0.13	4.2	55	0.12	4.0	0.65
MTL7208+	1	Yes	0.13	4.2	55	0.12	4.0	0.65
MTL7122+	1	Yes	0.26	1.75	46	0.2	1.4	0.81
MTL7028+/7128+	1	Yes	0.13	4.2	55	0.12	4.0	0.65
MTL7128P+	1	Yes	0.13	2.47	42	0.16	2.86	0.83
MTL7028-/7128-	1	Yes	0.13	4.2	55	0.13	4.0	0.65
MTL7129P+	1	Yes	0.39	5	121	0.49	6.25	1.19 IIB (C&D) only
MTL7251ac*	1	Yes	1000	3.6	1450	1000	4.5	0.025
	2	Yes	1000	0.95	540	1000	1.2	0.05
	2	No	1000	3.6	725	1000	4.5	0.05
MTL7055ac	1	Yes	1000	0.46	165	1000	0.4	0.23
	2	Yes	1000	0.125	69	150	0.1	0.45
	2	No	40	0.46	70	150	0.1	0.45
	3	No	40	0.125	48	-	-	0.68
	4	Yes	40	0.035	31.25	-	-	0.92
		No	40	0.06	42	-	-	0.92
MTL7056ac	1	Yes	1000	0.46	165	-	-	0.23
	3	No	40	0.125	48	-	-	0.68
MTL7060ac/7160ac	1	Yes	4.0	2.5	133	4.50	2.50	0.27
	2	Yes	4.0	0.62	66.6	-	-	0.54
MTL7061Pac/7161Pac	2	Yes	0.42	13	214	0.42	13.0	0.11
MTL7261ac	1	Yes	5.0	3.6	161	3.1	3.5	0.23
	2	Yes	5.0	0.95	60	0.4	1.0	0.45
MTL7162+	1	Yes	3.0	0.95	72	3.0	1.0	0.50
	2	Yes	-	-	-	-	-	1.0
MTL7164+	1	Yes	1.6	230	900	1.5	200	0.04
	2	Yes	1.0	60	345	1.0	60	0.08
MTL7264ac	1	Yes	1.6	230	900	1.5	200	0.04
	2	Yes	1.6	60	345	0.18	60	0.08
		No	0.2	230	450	0.18	60	0.08
MTL7265ac	1	Yes	0.75	1.65	65	0.7	1.3	0.56
	2	Yes	0.75	0.32	24.75	0.7	1.4	1.13
MTL7066Pac/7166Pac	2	Yes	0.2	0.34	30	1.80	1.27	0.96
MTL7167+	1	Yes	0.75	1.65	65	0.7	1.7	0.56
	2	Yes	0.50	0.32	24.75	0.5	0.4	1.12
MTL7278ac	1	Yes	0.13	16	106	0.12	14	0.33
	2	Yes	0.13	4.2	41	0.12	4.2	0.66
MTL7087+/7187+	2	Yes	0.13	4.2	55	0.13	4.2	0.65
MTL7087P+/7187P+	2	Yes	0.13	2.47	42	0.13	2.47	0.84
MTL7096-/7196-	2	Yes	0.16	1.9	34.5	0.14	1.71	0.82

Notes

*Certification pending

¹If values are not quoted for when on earth return is not used, then those for an earth return ('Yes' in the tables) are applicable

²For most practical purposes, the values of the parameters for groups IIB and IIA are respectively 3 and 8 times the values for group IIC

³The maximum power that can be drawn from the barrier or barrier combination under fault conditions; used for assessing the temperature classification of 'simple' hazardous-area apparatus

TERMINOLOGY

Safety description

The description of a barrier, eg, '10V 50Ω 200mA', refers to the maximum voltage of the terminating Zener or forward diode when an internal safety fuse is blowing, the minimum value of the terminating resistor, and the corresponding maximum short-circuit current. It is an indication of the fault energy that can be developed in the hazardous area and not of the working voltage or end-to-end resistance.

Polarity

Barriers may be polarised positive ('+') or negative ('-') or non-polarised ('ac'). Polarised barriers accept and/or deliver safe-area voltages of the specified polarity only. Non-polarised barriers support voltages of either polarity applied at either end. The exception is the MTL7206 which takes a positive supply but provides an output voltage which is negative with respect to earth.

End-to-end resistance

The resistance between the two ends of a barrier channel at 20°C, ie, of the resistor and the fuse(s). If diodes or transistors are present, the voltage drop of these is also quoted.

Working voltage (Vwkg)

The greatest steady voltage, of appropriate polarity, that can be applied between the safe-area terminal of a 'basic' barrier channel and earth at 20°C for the specified leakage current, with the hazardous-area terminal open circuit.

Maximum voltage (Vmax)

The greatest steady voltage, of appropriate polarity, that can be applied continuously between the safe-area terminal of any barrier channel and earth at 20°C without blowing the internal safety fuse/external replaceable fuse (MTL7100). For 'basic' barriers it is specified with the hazardous-area terminal open circuit; if current is drawn in the hazardous area, the maximum voltage for these barriers is reduced. The 'ac' channels of 'basic' barriers withstand voltages of the opposite polarity also – see the circuit diagrams included under 'Applications'.

Fuse ratings

The greatest current that can be passed continuously through the fuse for 1000 hours at 35°C.

Maximum safe-area voltage (U_m)

The maximum permissible safe-area voltage (U_m) for MTL7000 Series barriers is 250V ac/dc

APPROVALS

Country (Authority)	Standard	Certificate /file no.	Approved for
Australia (SA)	AS2380.1/7	pending	Class I, II, III Div 1, Gps A-G
Canada (CSA)	C22.2, No. 157	LR36637-95 ^a LR36637-106 ^b LR36627-107 ^c	
China (NEPSI)	GB3836.1-83/3836.4-83	G'YJ97139 ^d	Ex[ia] IIC
CIS(VNIIVE)	EN 50 020 GOST22782-5-78	D.97C.256 ^p	Ex ia IIC
Czechoslovakia (FTZU)	EN 50 020	J03139 ^d	[EEEx ib] IIC
UK (BASEEFA)	EN 50 014 & 020 BS 5501: Pts 1 & 7, 1977	Ex97D2022 ^e	[EEEx ia] IIC
UK (BASEEFA) (Systems)	EN 50 039 BS 5501: Pt 9, 1982	Ex95C2352 Ex97D2025 ^e	[EEEx ia] IIC
USA (FM)	3610 Entity 3611	J1.2Y6A3.AX-1 ^e J1.2Z8A6.AX-1 ^f J1.2Z9A5.AX-1 ^g J1.3Z2A1.AX-1 ^h J1.2B8A7.AX ⁱ J1.4B0A0.AX ^k J1.4Z1A7.AX ^l 1D1A3.AX-1 ^m	Class I, II, III Div 1, Grps A-G Div 2, Class I, II, III

a: MTL7028-/7128-, 7028+/7128+, 7055ac, 7056ac, 7060ac/7160ac, 7061Pac/7161Pac, 7066Pac/7166Pac, 7087+, 7087P+, 7096-/7196-, 7162+, 7164+, 7167+, 7187P+, 7261ac, 7264ac, 7265ac, 7278ac

b: MTL7106/7206

c: MTL7122+, 7128P+, 7129P+, 7207+, 7208+, 7278ac

d: MTL7028+/7128+, 7028-/7128-, 7055ac, 7060ac/7160ac, 7061Pac/7161Pac, 7066Pac/7166Pac, 7087+/7187+, 7087P+/7187P+, 7096-/7196-

e: MTL7028+/7128+, 7087+/7187+, 7087P+/7187P+

f: MTL7055ac, 7060ac/7160ac, 7061Pac/7161Pac, 7066Pac/7166Pac

g: MTL7096-/7196-

h: MTL7028-/7128-

i: MTL7056ac, 7162+, 7164+, 7167+, 7261ac, 7264ac, 7265ac

k: MTL7122+, 7128P+, 7129P+, 7207+, 7208+, 7278ac

l: MTL7206

m: MTL7106

n: MTL7129P+

p: MTL7087+, 7187+, 7056ac

MTL7000 SERIES EARTH RAIL, TAGGING AND POWER ACCESSORIES

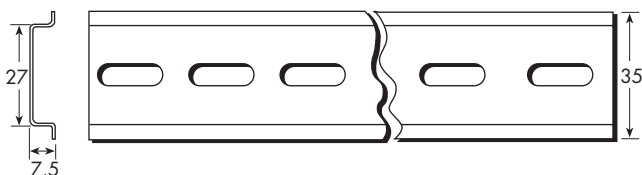
MOUNTING/EARTHING ACCESSORIES

MTL7000 Series barriers mount easily and quickly onto standard DIN rail which also acts as the intrinsically safe earth.

THR2 standard DIN rail

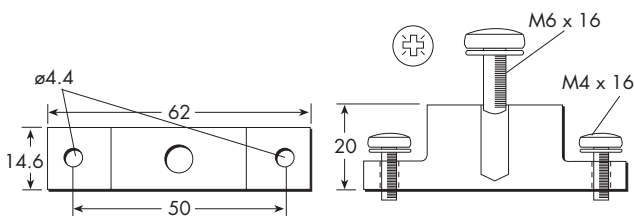
THR7000 plated rail

Specially nickel-plated T-section (35 x 7.5mm) DIN rail for use in potentially corrosive atmospheres. Supplied in 1m lengths



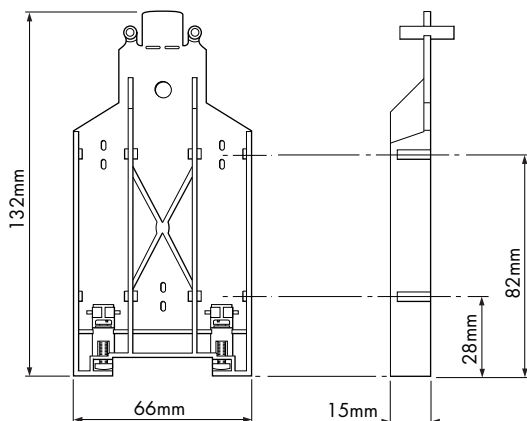
ISP7000 insulating spacers

Attached to the base of a DIN rail at either end or at intervals (depending upon DIN-rail length) to isolate the IS earth from a structural earth.



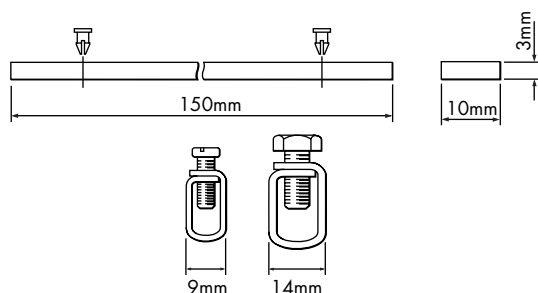
IMB57 Insulating mounting block

One required at each end of a tagging strip/earth rail. Suitable for low-profile (7.5mm) and high-profile (15mm) symmetrical DIN rail.



ERB57S Earthing-rail bracket, straight

Nickel-plated; supplied with two push fasteners, one 14mm earth-rail clamp and one 9mm earth clamp for cables ≤ 16mm².



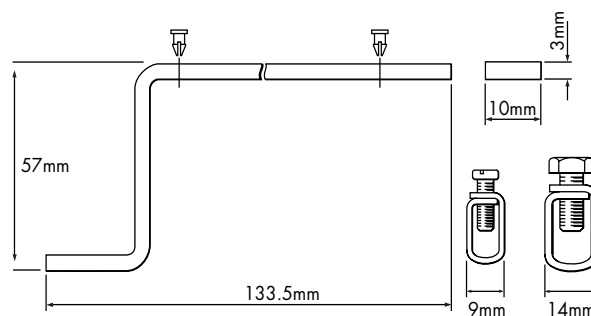
Notes: ERB57S is the preferred choice of earth-rail bracket. It may be fitted in either of two positions on insulating mounting block IMB57; usually in the upper slot for use with MTL5000 Series isolators, in the lower for use with MTL7000 Series Barriers.

However, to allow access to the mounting screws, the straight earth-rail bracket ERB57S can be inserted in the lower slot only after insulating mounting blocks IMB57 are clamped to the DIN rail. This may not be possible if, for example, trunking is fitted.

In this case, fit offset earth-rail bracket ERB57O (see below) in the upper slot: the mounting blocks can then be fitted in a restricted space with this bracket already fitted.

ERB57O Earth-rail bracket, offset

Nickel-plated; supplied with two push fasteners, one 14mm earth-rail clamp and one 9mm earth clamp for cables ≤ 16mm².



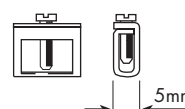
ERL7 earth rail

Nickel plated 3 x 10mm rail supplied in 1m lengths which can be cut to size.



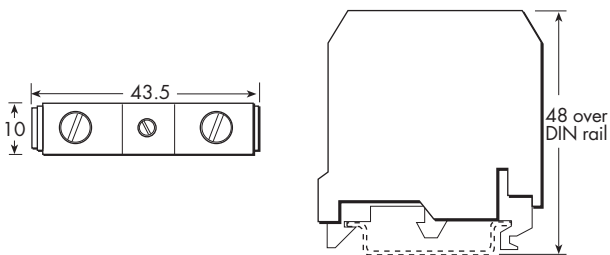
ETM7 earth terminal

For terminating cable screens and 0V earth returns and securing spare cores to the earth rail. A maximum of one ETM7 per barrier can be accommodated.



ETL7000 earth terminal

Provides connection for routing the IS earth from the DIN rail to an appropriate plant earth. Maximum cable cross-section is 10mm². Two recommended per discrete length of DIN rail. See instruction manual INM7000 for more details



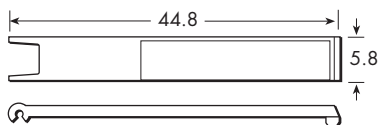
TAGGING ACCESSORIES

Two methods of tagging are available which can be used separately or together:

1) Individual barrier identification

BRI7000 barrier identifiers

BRIL7000 barrier identifiers are supplied with one label and mount on the top of individual barriers to identify barrier details. Use with BIL7000 or BIL7000L barrier identification labels.



BIL7000 barrier identification labels

Supplied as tractor feed sheets, for pre-printing by user. 120 (peel off) labels per sheet.

BIL7000L barrier identification labels

Supplied as A4 sheets of 126 (peel off) labels suitable for laser printing by user.

2) Tagging strip method

TAG57 Tagging strip, 1m length

Cut to size. Supplied with reversible tagging strip label suitable for either MTL5000 or MTL7000 Series module spacing.



TGL57 Tagging strip labels, set of 10 x 0.5m

Spares replacement, for use with TAG57 tagging strip. Labels are reversible – one side for MTL5000, the other for MTL7000.

POWER ACCESSORIES

RFA7050 replaceable fuse pack

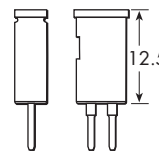
Spare secondary 50mA fuses, blue, for MTL7100 sub-series barriers, supplied in packs of 5

RFA7100 replaceable fuse pack

Spare secondary 100mA fuses, green, for MTL7106, supplied in packs of 5

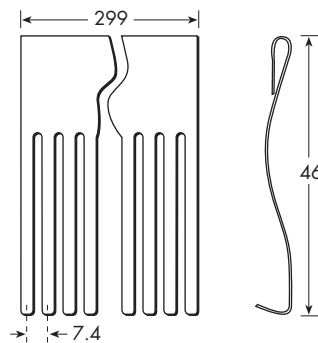
RLA7000 removable links

Spare 'latch-out' links for MTL7200 sub-series barriers, purple, supplied in packs of 5



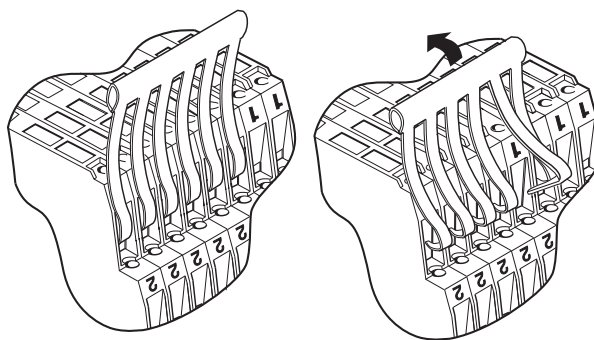
PWC7000 power comb

Feeds a 24V dc supply to a maximum of 40 barriers from an MTL7991 power feed module or an MTL7099/7299 dummy barrier (see A below). The comb and its teeth are shaped so that by deflecting the comb, (see B below) barriers may be inserted or removed without having to disturb the remaining connections. It can be sub-divided easily to feed smaller numbers of barriers.



A

B



MTL7000 SERIES MOUNTING INFORMATION

MOUNTING DETAILS

MTL7000 Series barriers pack closely together on DIN rails, permitting up to 132 barriers per metre of rail, depending on the accessories used. When calculating how many barriers will fit onto a given length of rail, considering the following:

- Barrier packing pitch: 7.4mm
- ETL7000 earth terminal: 10mm (min of 2)
- IMB57 insulating mounting block: 15mm (min of 2)
- ISP7000 insulating spacer: 14.7mm (min of 2)

Notes:

- 1) barriers and accessories cannot be mounted directly above an ISP7000 spacer when using 7.5mm rail. If the space above the spacer is needed, use a) high-profile (15mm) rail or b) low-profile screws, M6 x 16 with 1mm heads.
- 2) to maintain rigidity of DIN-rail when using ISP7000 spacers, the distance between spacers should not exceed 500mm for 15mm high-profile rail and 250mm for 7.5mm low-profile rail.

EARTH RAIL

There is provision to terminate a cable screen or earth return on the third terminal (6 or 3) of MTL7000 Series barriers. Spare cores may be terminated on the MTL7099/7299 dummy barrier. An earth rail provides an alternative method for terminating cable screens and OV earth returns, and securing spare cable cores. It is mounted on ERB57S/O brackets.

The earth rail (ERL7) must be electrically bonded to the IS earthing DIN rail (eg, THR2 or THR7000) on which the barriers are mounted and earthed. Copper cable, no less than 4mm² in cross-section and 80mm long when finished, should be connected between an earth terminal (ETM7) on the earth rail and an earth terminal (ETL7000) on the IS earthing DIN-rail. A minimum of two such connections, one at each end, is recommended for each discrete length of earth rail.

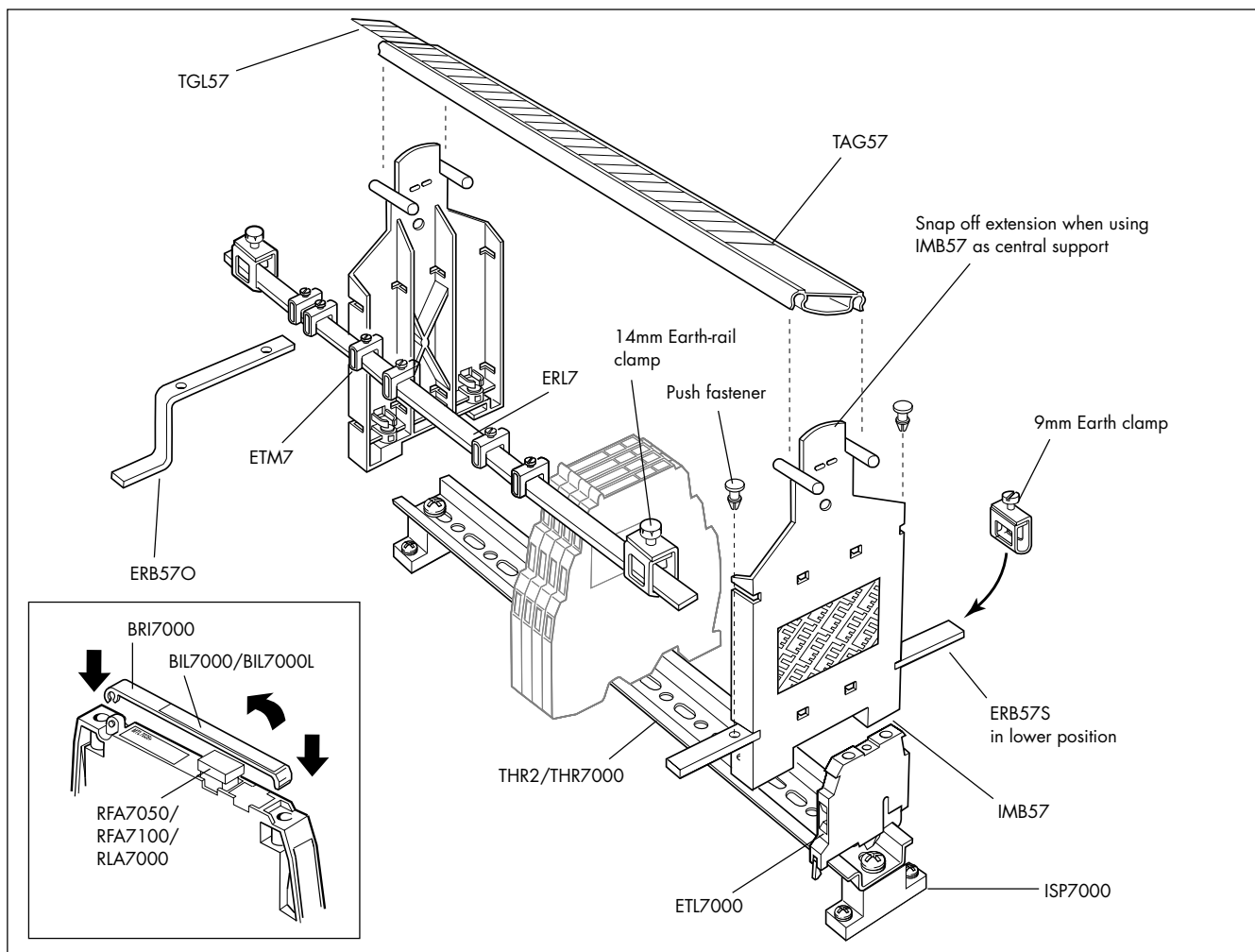
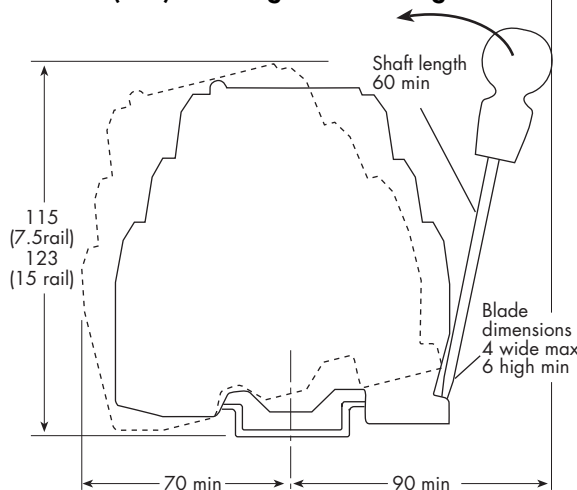
Note:

For lengths of earth rail greater than 500mm, provide additional support by installing a third IMB57 mounting block and earth rail bracket, mid-way between the end mounting blocks.

Snap out the perforated extension between the lugs on this mounting block if a continuous tagging strip is to be fitted.

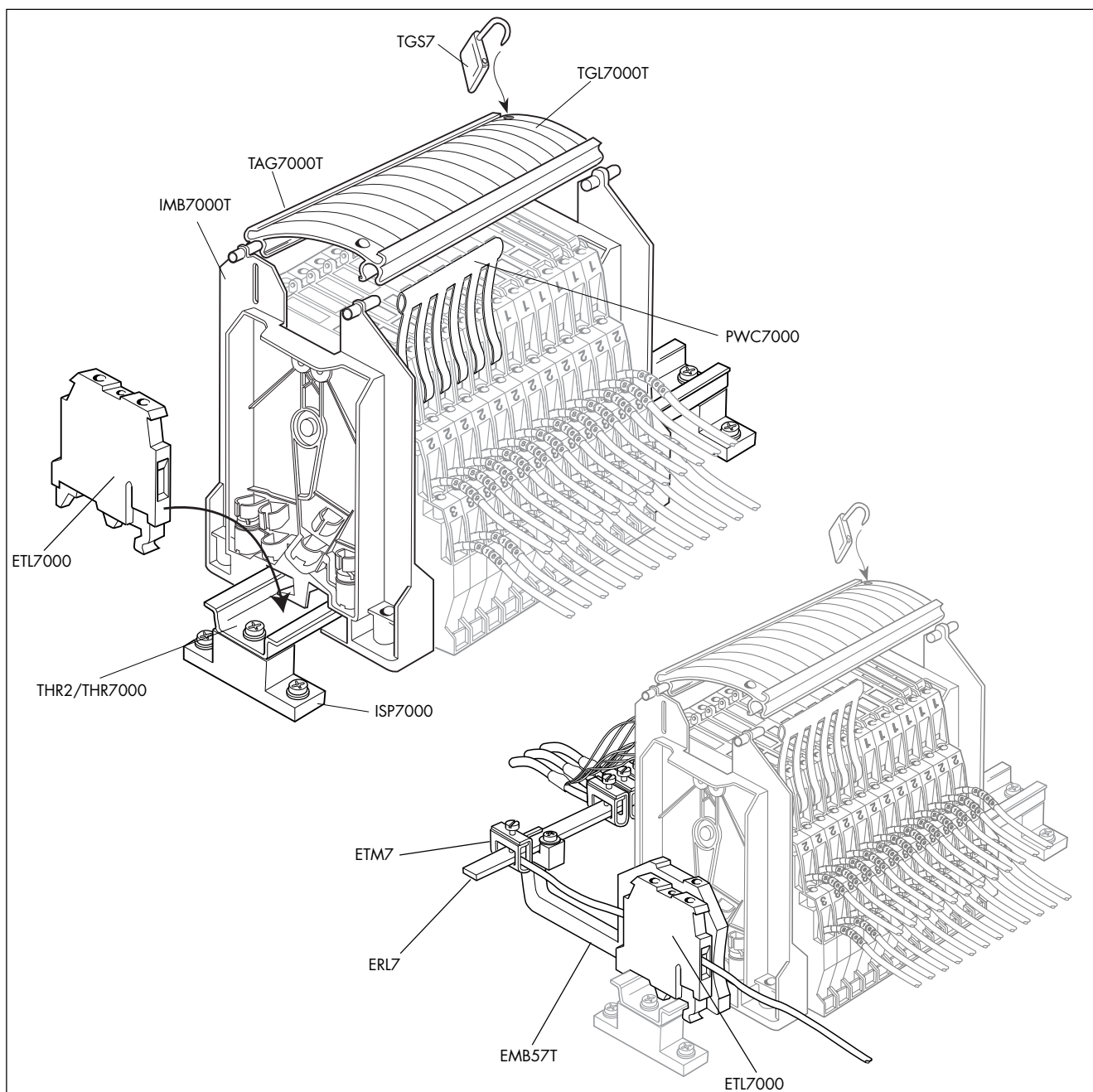
There is room for a maximum of one ETM7 earth terminal per barrier on the earth rail.

Clearances (mm) for fitting and removing barriers



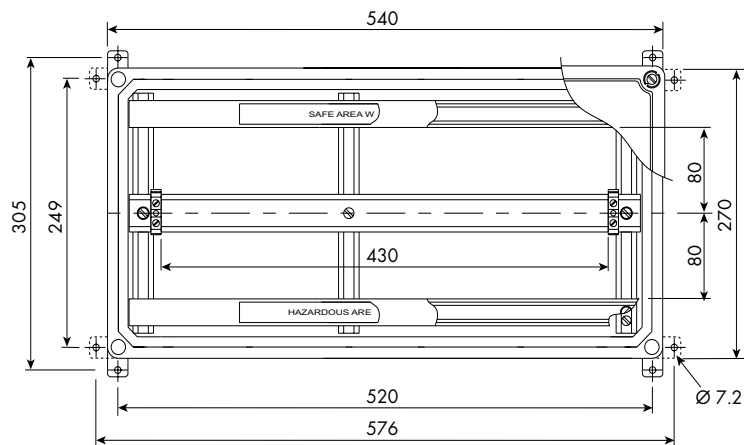
MOUNTING, EARTHING AND TAGGING ALTERNATIVE SYSTEM

The illustration shows an alternative system that can be used for mounting, earthing and tagging. Some of the accessories are common to the system in sections MTL7000 series earth rail, tagging and power accessories, and MTL7000 series mounting information.

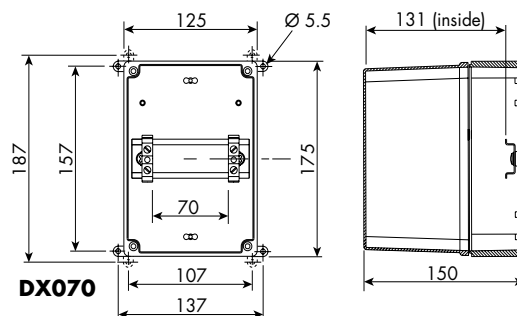
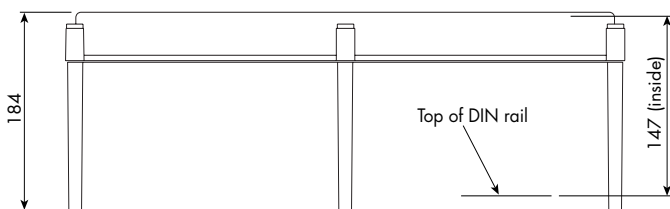


MTL7000 SERIES ENCLOSURES

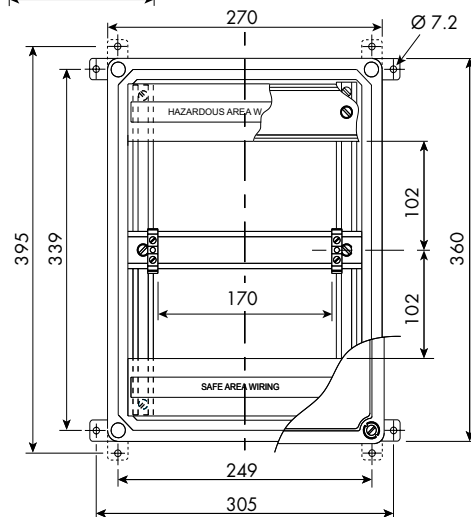
DIMENSIONS (MM) AND MOUNTING



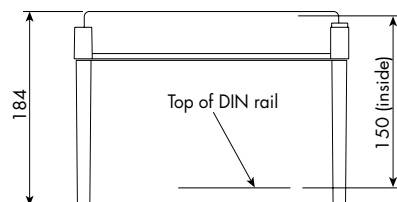
DX430



DX070



DX170



SPECIFICATION

Construction

- Glass reinforced polycarbonate base - DX070
- Glass reinforced polyester base - DX170, DX430
- Transparent polycarbonate lid

Protection

- Dust-tight and water-jet proof to IEC529:IP65

Lid fixing

- Captive fixing screws

Weight (excluding barrier/isolators) kg.

- DX070 0.8
- DX170 2.6
- DX430 4.1

Items provided

- DIN rail - fitted
- ETL7000 Earth terminals (2 x) - fitted
- "Take care IS" front adhesive label
- Cable trunking (except DX070)

Mounting

- Wall fixing lugs provided. For mounting arrangement drawing refer to INM57ENC.

Tagging and earth rail

- Accommodates MTL7000 Series accessories.

Permitted location

- Safe area
- FM and CSA Div. 2, Class I (gases)
- Not** Div. 2, Class II (dust ignition proof)

Approximate capacities (on DIN rail between earth terminals)

MTL7000 barriers		
DX070	9	(5)*
DX170	22	(18)*
DX430	58	(54)*

* Use these figures when mounting brackets for tagging/earth are included.

Ambient temperature limits

- Dependent on units fitted. See instruction manual INM57ENC.

MTL700 AND MTL7000 SERIES EQUIVALENTS

MTL700 Series	MTL7000	MTL7100	MTL7200
MTL706 MTL707+ MTL708+ MTL722+ MTL728+ MTL728P+ MTL728- MTL729P+ MTL751ac MTL755ac MTL755ac x 1 1/2 MTL760ac MTL761ac MTL761Pac MTL710+ x 2 MTL764+ MTL764ac MTL765ac MTL766Pac MTL767+ MTL778ac MTL787S+ MTL787SP+ MTL796- MTL799	MTL7028+ MTL7028- MTL7055ac MTL7056ac MTL7060ac MTL7061Pac MTL7066Pac MTL7087+ MTL7087P+ MTL7096- MTL7099	MTL7106 MTL7122+ MTL7128+ MTL7128P+ MTL7128- MTL7129P+ MTL7160ac MTL7161Pac MTL7162+ MTL7164+ MTL7166Pac MTL7167+ MTL7187+ MTL7187P+ MTL7196-	MTL7206 MTL7207+ MTL7208+ MTL7251ac MTL7261ac MTL7264ac MTL7265ac MTL7278ac MTL7299

'Key' barriers shown in bold.

HOW TO ORDER



MTL7000/7100/7200 barriers

Select by barrier number and polarity, e.g. **MTL7028+**



Mounting accessories

THR2 Standard DIN-rail, 35 x 7.5mm
THR7000 T-section DIN-rail, specially-plated, 35 x 7.5mm, 1m length
ISP7000 Insulating spacer

Standard earthing/earth-rail accessories

ETL7000 Earth terminal, DIN-rail mounted
IMB57 Insulating mounting block
ERB57S Earth-rail bracket, straight
ERB57O Earth-rail bracket, offset
ERL7 Earth rail, 1m length
ETM7 Earth terminal, pack of 50

Standard tagging accessories

TAG57 Tagging strip, 1m length
TGL57 Tagging strip labels, set of 10 x 0.5m
BRI7000 Barrier identifier
BIL7000 Barrier identification labels, sheet of 120
BIL7000L Barrier identification labels, A4 sheet of 126

Alternative earth-rail/tagging accessories

EMB57T Earth rail mounting bracket
TAG7000T Tagging strip and label, 1m length
TGL7000T Tagging strip label, 10 x 0.5m lengths
IMB7000T Tagging strip mounting block
TGS7 Tagging strip seal, pack of 10

Replaceable fuses/removable links

RFA7050 Replaceable fuse assemblies, 50mA, pack of 5
RFA7100 Replaceable fuse assemblies, 100mA, pack of 5
RLA7000 Removeable link, pack of 5

Enclosures

DX070 Enclosure, for MTL7000 x 9
DX170 Enclosure, for MTL7000 x 22
DX430 Enclosure, for MTL7000 x 58



Literature

INM7000 Instruction manual, MTL7000 Series
INM57ENC Instruction manual, MTL5000/7000 Series Enclosures
CD700... Customer drawings