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ultra-slim safety barriers that can be used like terminals

MTL7000 SERIES





- **Exceptionally high packing densities – only 7mm barrier width**
- **24V dc supply connections simplified – optional power comb feeds many barriers**
- **Direct connection of cable screens and 0V lines – third terminal on both hazardous and safe sides**
- **Patent US 5838547**

MTL7000 Series award-winning, intrinsic safety 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).

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.

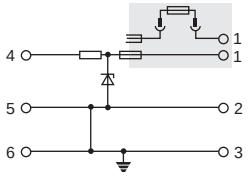
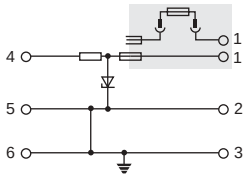
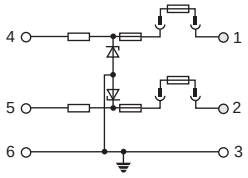
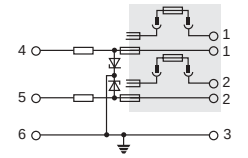
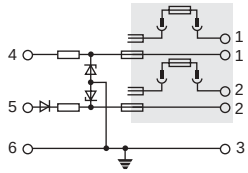
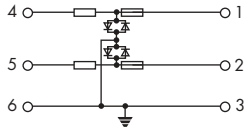
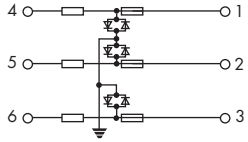
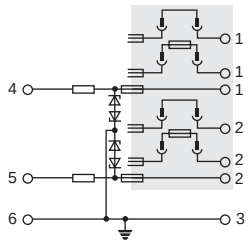
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MTL7000 SERIES – SPECIFICATIONS

Key barriers shown in blue

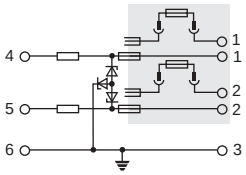
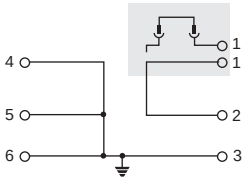
Model No. MTL	Safety description (V)	(Ω)	(mA)	Application	Basic circuit	Max. end-to-end resistance (Ω)	Vwkg at 10µA (V)	Vmax (V)	Internal safety fuse/fuse-disconnect(FD)† (mA)
SINGLE CHANNEL +VE									
7122+	22	150	147	18V dc systems		189	19.0	21.7	50 (FD)
7028+	**28**	**300**	**93**			**332**	**26.0**	**27.0**	**50**
7128+	**28**	**300**	**93**	**Controller outputs, solenoids**		**342**	**26.0**	**27.2**	**50 (FD)**
7128P+	28	234	120			275	26.0	27.1	50 (FD)
7129P+	28	164	171	Controller outputs, solenoids (IIB)		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		87	8.0	9.1	50 (FD)
	10	50	200			87	8.0	9.1	50 (FD)
7164+	12	1k	12	Low-level/logic		1058	9.0	10.0	50 (FD)
	12	1k	12	return signals		1058	9.0	10.0	50 (FD)
7167+	15	100	150	12V dc systems		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
	20	390	52			424	18.5	19.2	50
7196–	26	300	87			342	23.5	24.6	50 (FD)
	20	390	52			434	18.5	19.3	50 (FD)
RETURN-DIODE TYPE									
7087+	**28**	**300**	**93**	**Transmitters, controller outputs, switches**		**332**	**26.0**	**26.8**	**50**
	28	**diode**	**–**			**33 + 0.9V**	**26.0**	**26.8**	**50**
7187+	**28**	**300**	**93**			**342**	**26.0**	**26.9**	**50 (FD)**
	28	**diode**	**–**			**43 + 0.9V**	**26.0**	**26.9**	**50 (FD)**
7087P+	28	234	120	Transmitters, controller outputs, switches		261	26.0	26.8	80
	28	diode	–			30 + 0.9V	26.0	26.8	80
7187P+	28	234	120			274	26.0	26.9	50 (FD)
	28	diode	–			43 + 0.9V	26.0	26.9	50 (FD)
SIMPLE AC, LOW LEVEL									
7055ac	**3**	**10**	**300**	**2- or 3-wire (floating) RTDs**		**241**	**0.6 at 1µA**	**3.0**	**100**
	3	**10**	**300**			**241**	**0.6 at 1µA**	**3.0**	**100**
7056ac	3	10	300	3-wire (grounded) 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
	9	350	26			384	7.2	8.5	50
7161Pac	9	350	26			393	7.2	8.8	50 (FD)
	9	350	26			393	7.2	8.8	50 (FD)
7264ac	12	1k	12	Strain-gauge bridge sense		1048	10.0	11.1	50
	12	1k	12			1048	10.0	11.1	50
7066Pac	12	75	160	Strain-gauge bridge supply		97.2	9.8	10.9	80
	12	75	160			97.2	9.8	10.9	80
7166Pac	12	75	160			110.1	9.8	11.2	50 (FD)
	12	75	160			110.1	9.8	11.2	50 (FD)

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SPECIFICATIONS (continued)

Model No. MTL	Safety description (V)	(Ω)	(mA)	Application	Basic circuit	Max. end-to-end resistance (Ω)	Vwkg at 10µA (V)	Vmax (V)	Internal safety fuse†/fuse-disconnect (FD) (mA)
***STAR-CONNECTED AC*[2]**									
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 –22.3	+25.9 –23.8	50
	28	600	47			640	+24.0 –22.3	+25.9 –23.8	50
ACTIVE BARRIERS									
7106[4]	**28**	**300**	**93**	**Transmitters**		**–**	**–**	**35**	**50**
7206[4]	**28**	**300**	**93**	**Transmitters**		**–**	**–**	**35**	**50**
7207+	**28**	**300**	**93**	**Switches**		**348 + 1.2V**	**–**	**35**	**50**
	28	**diode**				**31 + 0.9V**	**–**	**–**	**50**
7208+	**28**	**300**	**93**	**Solenoids, alarms, LEDs**		**348 + 1.2V**	**–**	**35**	**50**
DUMMY BARRIERS									
7099	–	–	–	Securing and earthing unused cables and screens. Feed-through connections for power comb.		–	–	–	–
7299	–	–	–			–	–	–	–

†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.

Note 4: Limited availability. Use MTL7706+ as an alternative.

'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.

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.

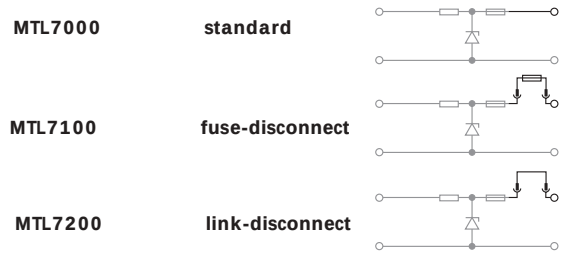
HOW THEY WORK

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.

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' in the specifications tables.

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	**7028+**	**7128+**
	Controller outputs, neither line earthed	**7087+**	**7187+**
		dc power supply	
		26.0V	20-35V
Analogue input (high level)	Transmitters, 2-wire, 4/20mA	**7087+ 7187+**	**7206**
Digital (on/off) input	Switches	**7087+ 7187+**	**7207+**
Digital (on/off) output	Solenoids, alarms, LEDs	**7028+ 7128+**	**7208+**

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ACTIVE BARRIERS

MTL7106/MTL7206, MTL7207+ and 7208+ active barriers
The MTL7106/MTL7206, MTL7207+ and 7208+ barriers have built-in overvolt 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, overvolt 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.

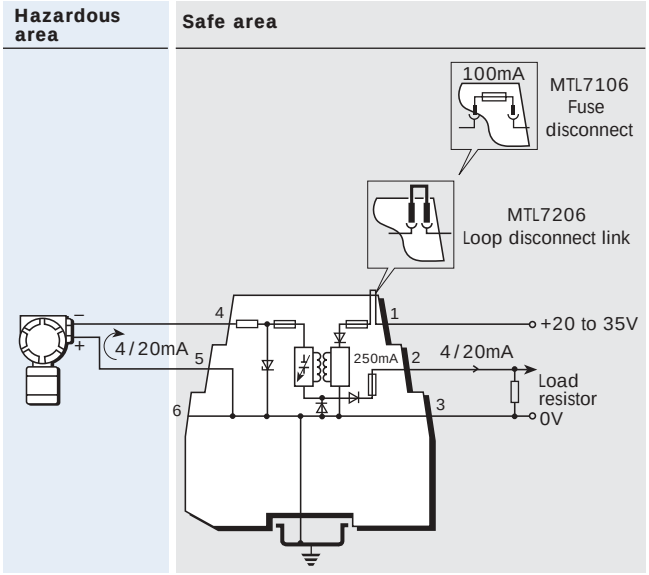
Nearest equivalent passive barriers

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

CE

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-volt 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

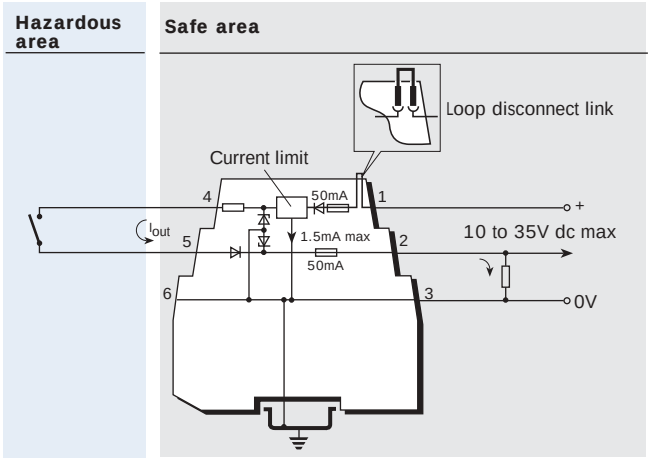
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MTL7207+
for digital (switch) inputs



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 Vs <26V; Iout + 1.5mA max
At Vs >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
[(Iout x 348Ω) + 1.2]V (current not limited)

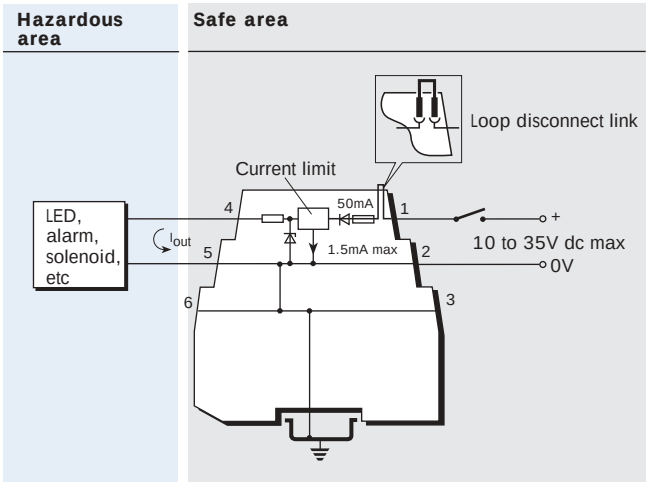
Output current (Iout), terminal 4
Up to 35mA

Leakage to earth
1.5mA max

Internal fuse, terminal 2
50mA

Maximum voltage drop, terminals 5 to 2
[(I_{out} x 33Ω) + 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 Vs <26V; Iout + 1.5mA max
At Vs >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
[(Iout x 350Ω) + 1.2]V (current not limited)

Output current (Iout), terminal 4
Up to 35mA

Leakage to earth
1.5mA max

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MTL7991
power feed module

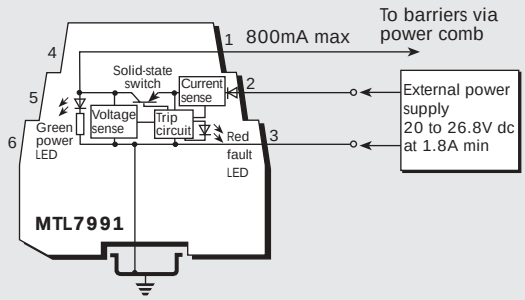
The MTL7991 power feed module incorporates both voltage and current sense mechanisms to protect barrier circuits by activating a solid-state trip mechanism when fault or overload conditions occur in the power source circuit. Resetting the module after tripping is done by interrupting the supply to the 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

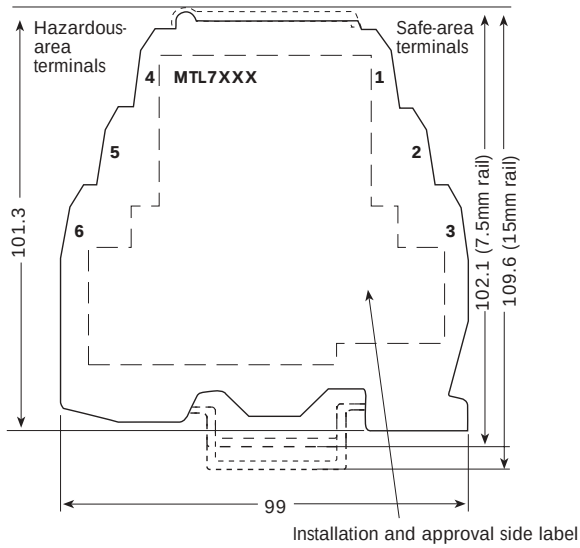
Ambient temperature limits
–20 to +60°C (FM/CSA) continuous working
–20 to +40°C (BASEEFA) continuous working
–40 to +80°C storage
Humidity limits
5 to 95% RH
Case flammability
UL94: V-2
Terminations
Terminals accommodate conductors up to 2.5mm^2
Hazardous-area terminals are identified as dark blue
Colour 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

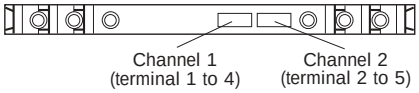
Weight
100g approximately
Mounting and earthing
Clamping onto standard 35mm 'top-hat' DIN-rail: 7.5mm (low profile) or 15mm (high profile)

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

DIMENSIONS (mm)



Fuse/link positions (MTL7100/7200)



Colour-coded top label



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MTL7000 SERIES BARRIER APPLICATIONS

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.

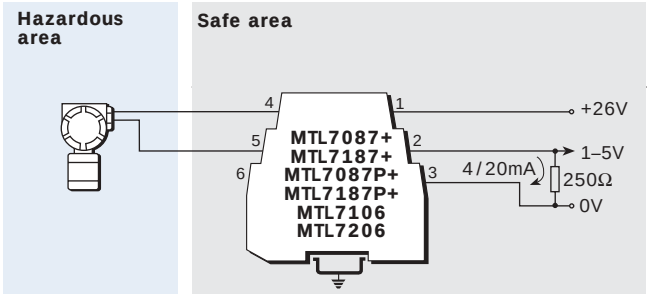
These are examples, and many other configurations will suggest themselves. For advice on a particular application, please contact MTL.

ANALOGUE INPUTS (HIGH-LEVEL)

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

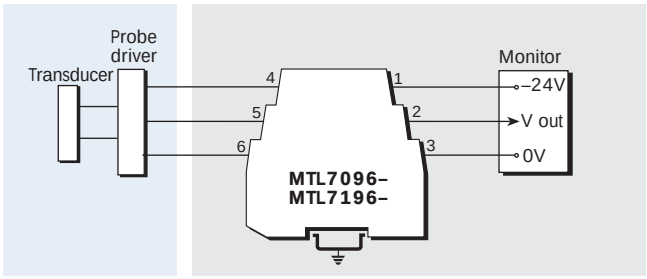
Recommended barriers for use with 'conventional' and 'smart' 4/20mA transmitters (fed by a regulated supply) are the MTL7087+/7187+ or MTL7087P+/7187P+. These provide up to 14.2V at V_{wkg} and 20mA for a transmitter and its lines as well as 5V for the typical 250Ω load. This application and these barriers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

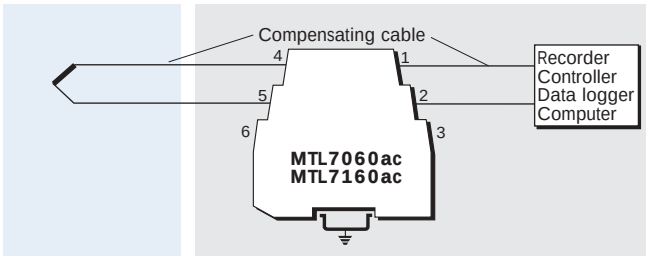
The 3-wire transmitters used with vibration monitoring equipment are invariably supplied by a –24V dc power supply – hence the recommended barrier choice is the negatively-polarised MTL7096–/7196–. The 'third terminal' makes this choice ideal for these 3-wire applications.



ANALOGUE INPUTS (LOW-LEVEL)

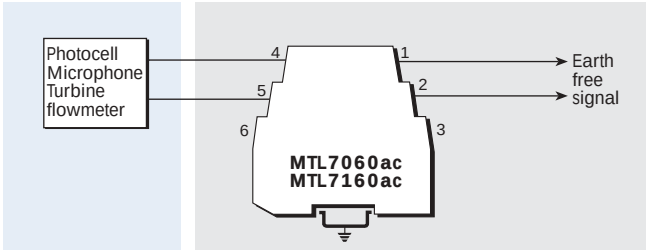
Thermocouples and mV sources

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.



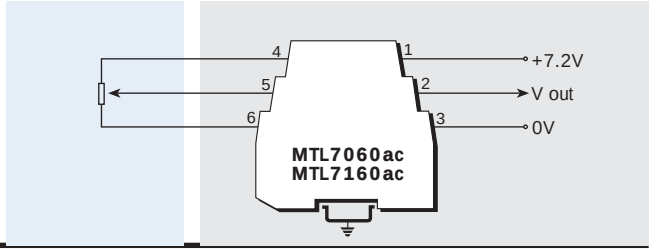
ac sensors, photocells, microphones and turbine flowmeters

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.



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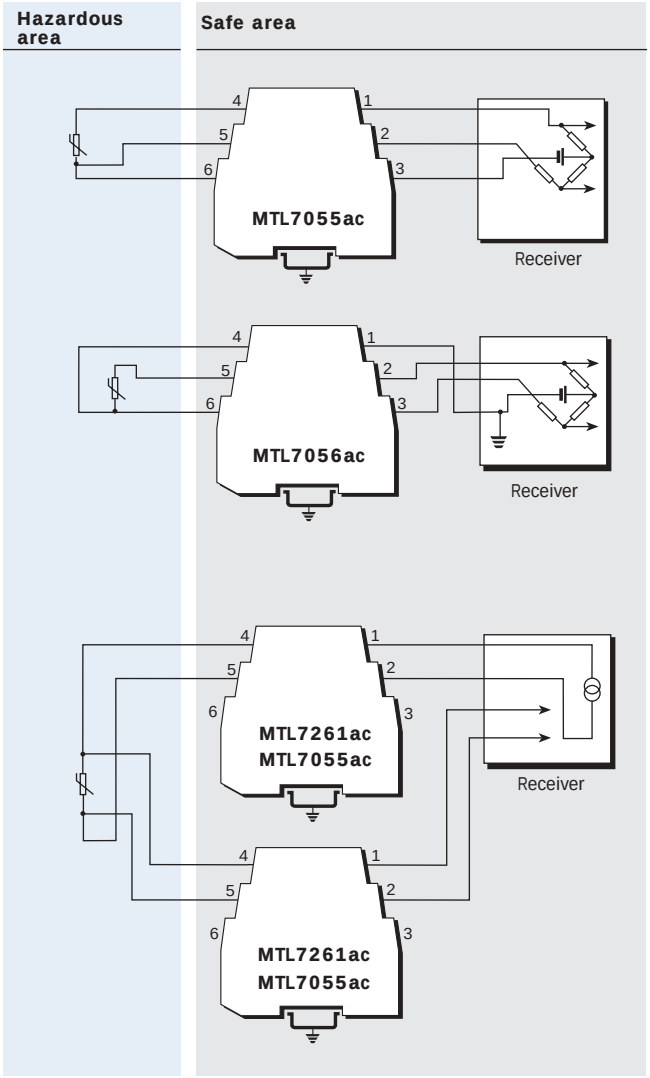
RTDs

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 by two MTL7261ac barriers. If the increase in loop resistance is too great, use two MTL7055ac barriers instead.



STRAIN-GAUGE BRIDGES

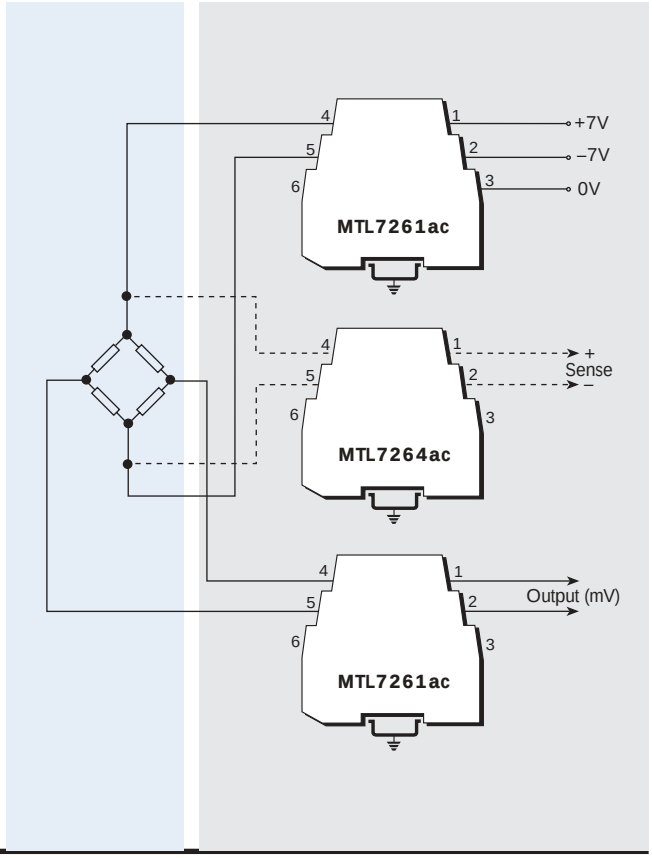
Single strain-gauge bridges

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.



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Double strain-gauge bridges

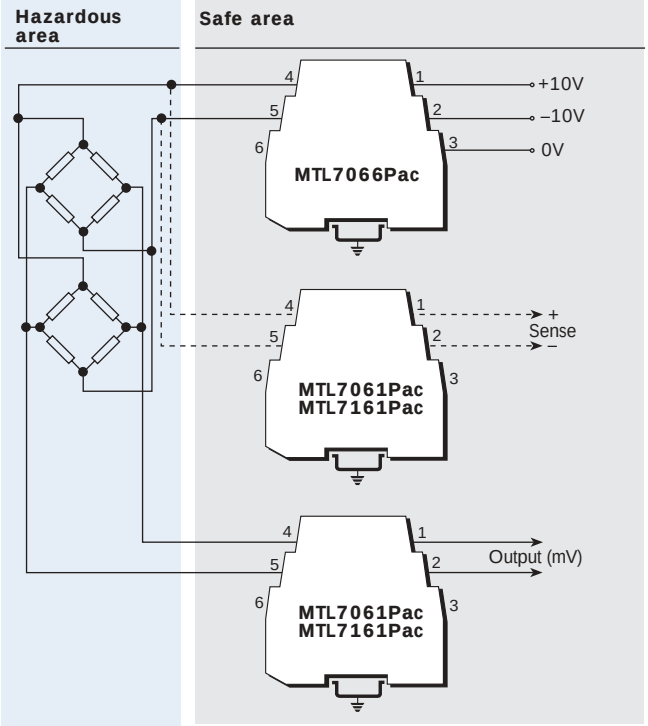
Quite frequently there is a demand to monitor two load cells, and a possible circuit, safe in IIC, is shown.

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



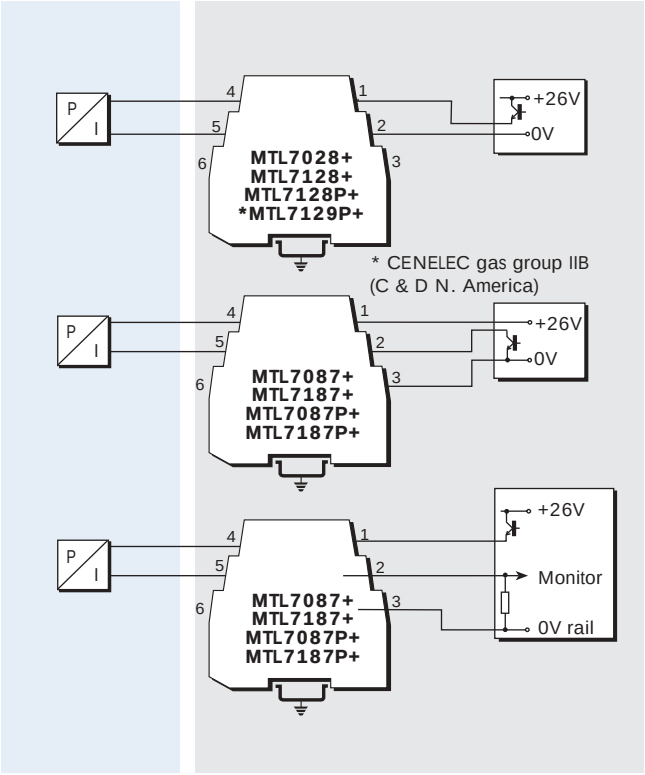
ANALOGUE OUTPUTS

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.



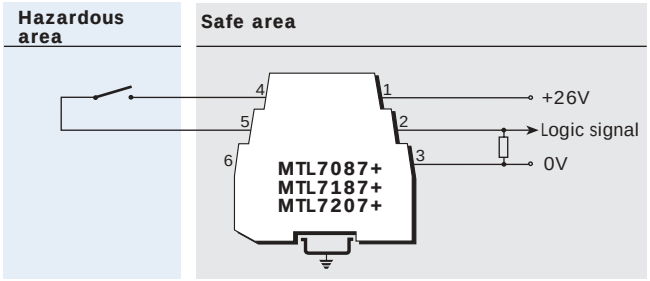
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DIGITAL (ON/OFF) INPUTS

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.

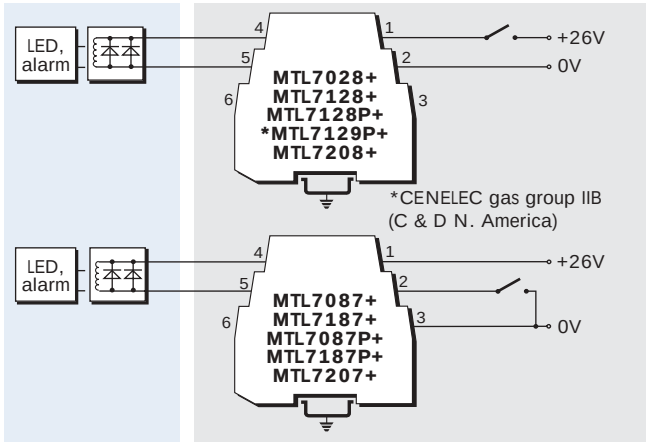


DIGITAL (ON/OFF) OUTPUTS

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+.

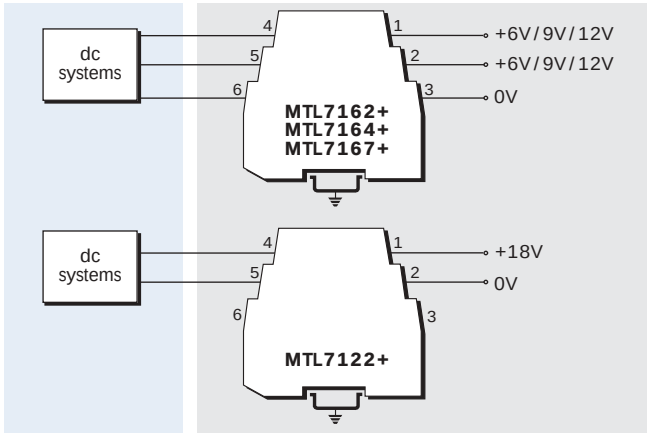


+VE DC SYSTEMS

Low-level to 12V dc systems
The two channels of the MTL7162+, MTL7164+ and MTL7167+ can be combined safely in IIC.

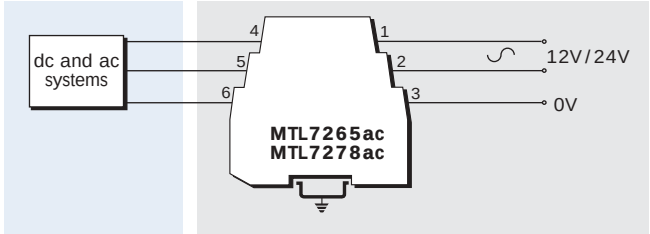
The MTL7164+ can be used for low-level logic return signals. The MTL7162+ and MTL7167+ are used for 6V dc and 12V dc systems respectively.

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



AC AND DC SYSTEMS

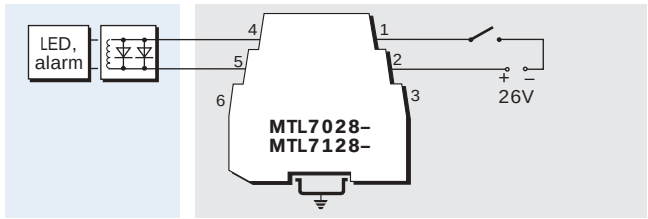
High-level ac and dc systems
The versatile star-connected MTL7265ac and MTL7278ac allow V_{wkg} to be developed from each channel to ground but only allow V_{wkg} to be developed between channels. This provides some common-mode voltage capability and can allow higher cable parameters to be used.



NEGATIVE AND FLOATING POWER SUPPLIES

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.



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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.

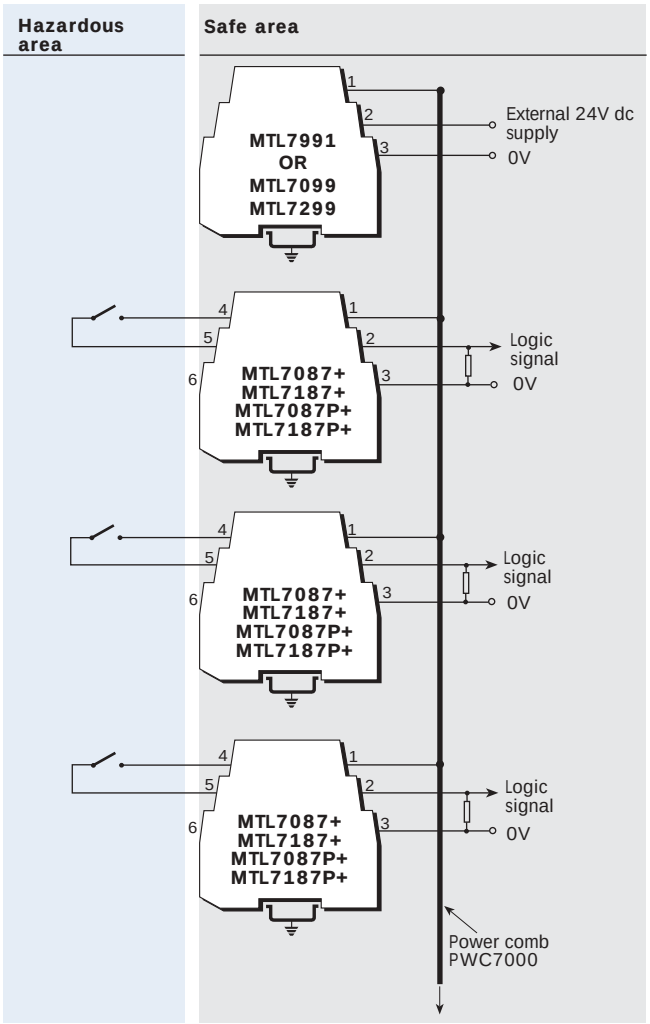
Typical applications include hazardous-area switches, 4/20mA transmitters and solenoids. The diagram illustrates the configuration for 3 barriers but up to 40 barriers can be served by this method.

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.

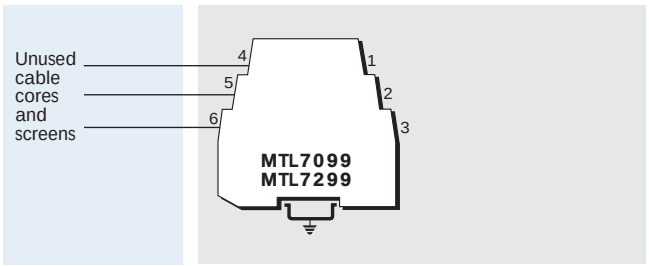
The MTL7299 dummy barrier has a removable link between terminals 1 and 2 for easy disconnection of the supply.

Other units which can use the power comb: MTL7106
MTL7206
MTL7207+
MTL7208+



SPARE CABLE CORES AND SCREENS

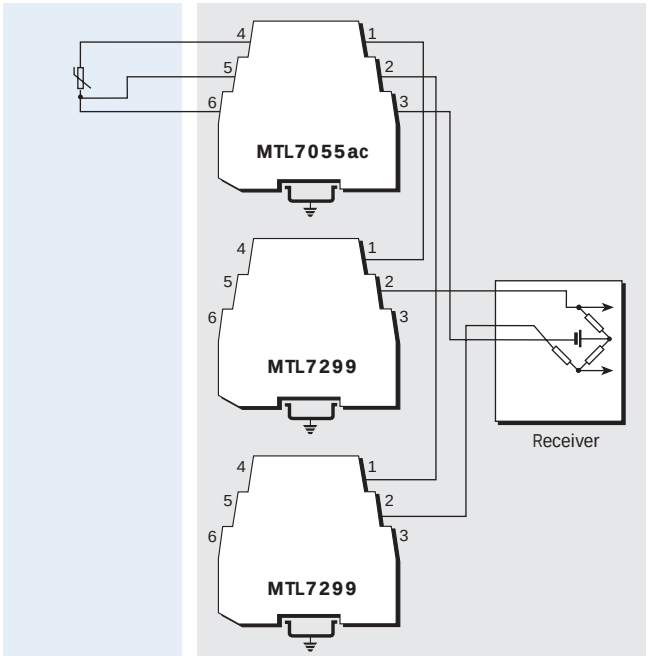
The MTL7099/7299 dummy barriers are used primarily for securing and earthing unused cables and screen connections. Hazardous area terminals 4, 5 and 6 (and safe area terminal 3) are internally connected to the DIN-rail mounting/earth connection.



WIRED IN APPLICATIONS

MTL7299s 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.



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MAXIMUM CABLE PARAMETERS

Model no.	Number of single channels inter-connected within hazardous area	Earth[1] return used?	Maximum permissible cable parameters[2]					Matched[3] power (W)	
			BASEEFA (group IIC (hydrogen))			FM (Groups A & B)			
			Capacitance (µF)	Inductance (mH)	L/R ratio (µH/Ω)	Capacitance (µF)	Inductance (mH)		
MTL7106/7206	**1**	**Yes**	**0.083**	**4.1**	**54**	**0.14**	**4.27**	**0.65**	
MTL7207+	**2**	**Yes**	**0.083**	**4.1**	**54**	**0.12**	**4.0**	**0.65**	
MTL7208+	**1**	**Yes**	**0.083**	**4.1**	**54**	**0.12**	**4.0**	**0.65**	
MTL7122+	1	Yes	0.165	1.66	44	0.2	1.4	0.81	
MTL7028+/7128+	**1**	**Yes**	**0.083**	**4.1**	**54**	**0.12**	**4.0**	**0.65**	
MTL7128P+	1	Yes	0.042	1.26	42	0.16	2.86	0.83	
MTL7028–/7128–	1	Yes	0.083	4.1	54	0.13	4.0	0.65	
MTL7129P+	1	Yes	–	–	–	0.49	6.25	1.19	IIB (C&D) only
MTL7055ac	**1**	**Yes**	**1000**	**0.4**	**158**	**1000**	**0.4**	**0.23**	
	2	**Yes**	**1000**	**0.1**	**79**	**150**	**0.1**	**0.45**	
	2	**No**	**40**	**0.4**	**79**	**150**	**0.1**	**0.45**	
	3	**No**	**40**	**0.22**	**59**	**–**	**–**	**0.68**	
	4	**Yes**	**40**	**0.035**	**31.25**	**–**	**–**	**0.92**	
MTL7056ac	1	Yes	1000	0.4	158	–	–	0.23	
	3	No	40	0.22	59	–	–	0.68	
MTL7060ac/7160ac	**1**	**Yes**	**4.9**	**2.47**	**131**	**4.50**	**2.50**	**0.27**	
	2	**Yes**	**4.9**	**0.61**	**65**	**–**	**–**	**0.54**	
MTL7061Pac/7161Pac	2	No	0.309	54.2	307	0.42	13.0	0.12	
MTL7261ac	1	Yes	4.9	3.55	158	3.1	3.5	0.23	
	2	Yes	4.9	0.88	79	0.4	1.0	0.45	
MTL7162+	1	Yes	3.0	0.89	71	3.0	1.0	0.50	
	2	Yes	3.0	0.22	35	–	–	1.0	
	2	No	1.97	2.93	117	–	–		
MTL7164+	1	Yes	1.41	246	987	1.5	200	0.04	
	2	Yes	1.41	61.7	493	1.0	60	0.08	
MTL7264ac	1	Yes	1.41	246	987	1.5	200	0.04	
	2	Yes	1.41	61.7	493	0.18	60	0.08	
		No	0.125	246	493	0.18	60	0.08	
MTL7265ac	1	Yes	0.58	1.58	63	0.7	1.3	0.56	
	2	Yes	0.58	0.4	31	0.7	1.4	1.13	
MTL7066Pac/7166Pac	2	Yes	1.41	0.36	37	1.80	1.27	0.96	
MTL7167+	1	Yes	0.58	1.58	63	0.7	1.7	0.56	
	2	Yes	0.58	0.4	31	0.5	0.4	1.13	
MTL7278ac	1	Yes	0.083	16.1	108	0.12	14	0.33	
	2	Yes	0.083	4.02	54	0.12	4.2	0.66	
MTL7087+/7187+	**2**	**Yes**	**0.083**	**4.1**	**54**	**0.13**	**4.2**	**0.65**	
MTL7087P+/7187P+	2	Yes	0.042	1.26	42	0.13	2.47	0.84	
MTL7096–/7196–	2	Yes	0.134	1.86	44	0.14	1.71	0.83	

Notes

Key barriers in bold

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

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

[3]The 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 50ž 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.

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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

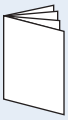
TAG57	Tagging strip, 1m length
TGL57	Tagging strip labels, set of 10 x 0.5m
BRI7000	Barrier identifier
BIL7000	Barrier identification labels, sheet of 120
BIL7000L	Barrier identification labels, A4 sheet of 126

Replaceable fuses/removable links

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

CORRELATION BETWEEN MTL7700 — MTL7000 — MTL700 BARRIERS (IIC)

Module No.	Bussed Power ?	MTL7000 Equivalent	MTL7000 Original Certificate Number(s)	MTL7000 ATEX Certificate Number(s)	MTL700 equivalent	MTL700 Original Certificate Number(s)	MTL700 ATEX Certificate Number(s)	Typical Application
MTL7710+/-	No	Half of MTL7162+/-	Ex95C2261	BAS99ATEX7285	MTL710+/-	Ex832452	BAS01ATEX7202	4/6V Systems
MTL7715+/-	No	N/A	N/A	N/A	MTL715+/-	Ex832452	BAS01ATEX7202	12V Systems
MTL7715P+/-	No	N/A	N/A	N/A	MTL715P+	Ex92C2373	BAS01ATEX7202	12V Systems
MTL7722+/-	No	MTL7122+/-	Ex95C2261	BAS99ATEX7285	MTL722+/-	Ex832452	BAS01ATEX7202	General Purpose
MTL7728+/-	No	MTL7028+/- MTL7128+/-	Ex95C2261	BAS99ATEX7285	MTL728+/-	Ex832452	BAS01ATEX7202	Analogue / Digital
MTL7728ac	No	N/A	N/A	N/A	MTL728ac	Ex832452	BAS01ATEX7202	General Purpose
MTL7728P+/-	No	MTL7128P+/-	Ex95C2261	BAS99ATEX7285	MTL728P+	Ex92C2373	BAS01ATEX7202	Analogue / Digital
MTL7755ac	No	MTL7055ac	Ex95C2261	BAS99ATEX7285	MTL755ac	Ex832452	BAS01ATEX7202	RTD, Grounded
MTL7756ac	No	MTL7056ac	Ex95C2261	BAS99ATEX7285	N/A	N/A	N/A	RTD, Grounded
MTL7760ac	No	N/A	N/A	N/A	MTL760ac	Ex832452	BAS01ATEX7202	Active sensors, Thermocouples
MTL7761ac	No	MTL7261ac	Ex95C2261	BAS99ATEX7285	MTL761ac	Ex832452	BAS01ATEX7202	Strain Gauges
MTL7761Pac	No	MTL7061Pac MTL7161Pac	Ex95C2261	BAS99ATEX7285	MTL761Pac	Ex92C2373	BAS01ATEX7202	Load cell
MTL7764+/-	No	MTL7164+/-	Ex95C2261	BAS99ATEX7285	MTL764+/-	Ex832452	BAS01ATEX7202	High resistance
MTL7764ac	No	MTL7264ac	Ex95C2261	BAS99ATEX7285	MTL764ac	Ex832452	BAS01ATEX7202	Strain / Level Gauges
MTL7765ac	No	N/A	N/A	N/A	MTL765ac	Ex832452	BAS01ATEX7202	General Purpose
MTL7766ac	No	N/A	N/A	N/A	MTL766ac	Ex832452	BAS01ATEX7202	Strain Gauges
MTL7766Pac	No	MTL7066Pac MTL7166Pac	Ex95C2261	BAS99ATEX7285	MTL766Pac	Ex92C2373	BAS01ATEX7202	Strain Gauges
MTL7767+/-	No	MTL7167+/-	Ex95C2261	BAS99ATEX7285	MTL767+/-	Ex832452	BAS01ATEX7202	Dual MTL715
MTL7779+/-	No	N/A	N/A	N/A	MTL779+/-	Ex832452	BAS01ATEX7202	Dual MTL728
MTL7787+/-	Yes	MTL7087+/- MTL7187+/-	Ex95C2261	BAS99ATEX7285	MTL787S+	Ex832452	BAS01ATEX7202	Analogue / Digital
MTL7787P+/-	Yes	MTL7087P+ MTL7187P+	Ex95C2261	BAS99ATEX7285	MTL787SP+	Ex92C2373	BAS01ATEX7202	Analogue / Digital
MTL7788+/-	Yes	N/A	N/A	N/A	MTL788+/-	Ex832452	BAS01ATEX7202	Transmitters
MTL7788R+/-	Yes	N/A	N/A	N/A	MTL788R+/-	Ex832452	BAS01ATEX7202	1—5V systems
MTL7796+/-	No	MTL7096+ MTL7196-	Ex95C2261	BAS99ATEX7285	MTL796+/-	Ex832452	BAS01ATEX7202	Gas Metering

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