

Multiplexer systems

MTL's multiplexers reduce the cost of installing hazardous-area cabling by transmitting and receiving input and output signals over single or dual-redundant wire-pairs.

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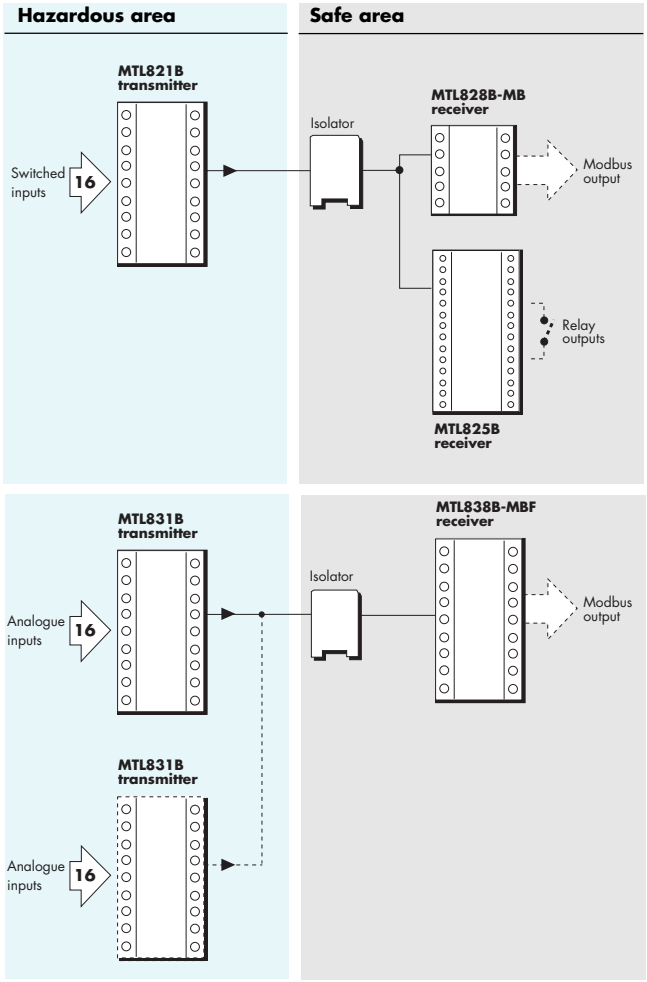
CHOOSING AN MTL MULTIPLEXER

MTL800 Series IS multiplexer systems transmit multiple signals from a hazardous to a safe area through only two wires.

Within the MTL800 Series are:

MTL820 range of discrete input multiplexer systems (transmitters and receivers), which monitor the status of switches or proximity detectors, and provide outputs via relay contacts or a serial digital output to a host computer using Modbus protocol.

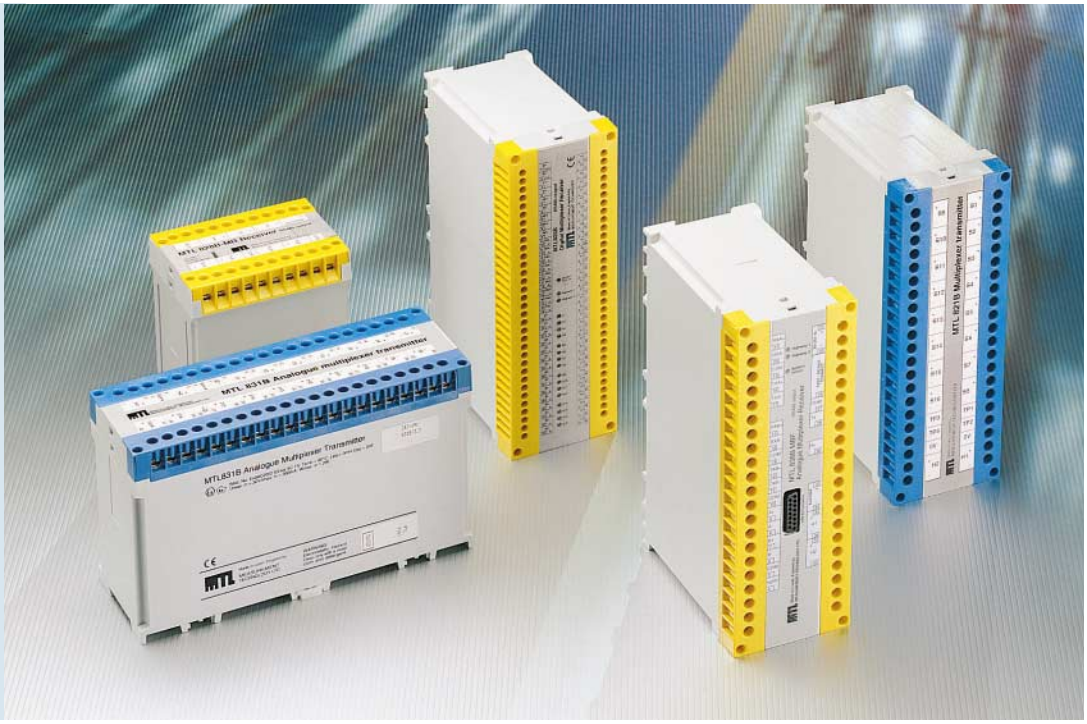
MTL830 analogue multiplexer systems (transmitters and receivers), which monitor thermocouple, RTD or mV inputs and provide a serial data output to a host computer using Modbus protocol.



MTL800 SERIES

IS multiplexer systems

Cuts installation and cable costs for all IS hazardous-area circuits



Ex STOCK
Intrinsically safe products – FAST

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

THE MTL WEB SITE http://www.mtl-inst.com

CE

- **Reduce the cost of installing hazardous-area cabling**
- **Save installation time, space and weight**
- **Highlight problems quickly with status reporting systems**
- **Protect the process with sensor-failure detection and safety drives**
- **Connect directly to host systems through serial-data outputs**
- **Discrete and analogue inputs to controllers with Modbus® communications**
- **Redundant data highways**

MTL820 and 830 Series multiplexers for relay or Modbus outputs provide a cost-effective alternative to single-loop isolation. The cost of installed wiring can be reduced by up to 50% by communicating the status of multiple hazardous-area sensors over dual-redundant data highways. Further savings can be achieved by reducing the number of inputs to the host and by reducing cabinet space and weight.

Two multiplexer transmitters, mounted in the hazardous area, cater for discrete (on/off) inputs (switch, contact, proximity detector) and mV analogue inputs respectively.

Three compatible safe-area receivers provide either relay outputs (which mimic corresponding discrete inputs) or serial Modbus outputs (which mirror corresponding discrete or analogue inputs) for feeding to host PLC, PC or DCS controllers.

Dual-redundant data highways between the hazardous-area transmitter and the safe-area receiver allow the system to continue working normally with only one highway connected. The highways carry both power and data, over distances up to 2km. The highway cable may consist of a simple twisted pair or a pair of wires within an IS multi-core cable. When the multiplexer transmitter is located in the hazardous area, each data highway must be protected by an MTL3052 digital isolator.

Discrete-input multiplexer systems can communicate the status of up to 16 inputs, reducing the number of hazardous-area wiring pairs from 16 to two. Analogue multiplexer systems can communicate the status of up to 32 inputs, reducing the number of hazardous-area wiring pairs from 32 to two.

Significant cost reductions are made by eliminating runs of expensive thermocouple compensation cable from the hazardous to the safe area. Similar savings are found when using 3- or 4-wire RTDs, as all wires of each RTD can be terminated at the transmitter or its enclosure.

System reliability is increased by providing for dual redundant highways. Failure detectors and safety drives protect against the consequences of sensor failure, while built-in systems report failures to the host controller.

Accessories and configuration tools are available for the complete MTL800 range. Accessories include steel and stainless-steel enclosures and earth-leakage detectors. Analogue units may be configured with a PC-based software package, and interrogated in the field with a hand-held device.

See also MTL Block I/O section 6 for discrete inputs.

Further application information is provided in AN9010, 'A user's guide to multiplexers'. Costing is considered in TP1098, 'Cut the cost of intrinsic safety – by multiplexing!'

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MTL821B AND MTL831B MULTIPLEXER TRANSMITTERS

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MTL821B and MTL831B multiplexer transmitters are normally sited in the hazardous area. They are connected to sensors or switches in the field and communicate the status of these inputs to the safe area via single-pair data highways. The data highways support communication between the safe and hazardous areas, using MTL's own protocol, and also provide power to the transmitters – no additional field power is required.

The MTL821B and MTL831B would typically be mounted close to the field instruments in an enclosure such as the ENC8 or ENC83.

MTL821B DISCRETE INPUT TRANSMITTER

Monitors any combination of up to 16 switches or proximity detectors within a hazardous area.

- Intrinsically safe; Zone 0 location
- Communication and power pass over twin data highways
- Powered by the data highway

MTL831B ANALOGUE INPUT TRANSMITTER

Monitors inputs from up to 16 THC or millivolt sources (max ±60mV) or up to 15 2-, 3- or 4-wire RTDs within a hazardous area.

- Intrinsically safe; Zone 0 location
- Communication and power pass over twin data highways
- Powered by the data highway
- Thermocouples and RTDs may be mixed on one transmitter

MULTI-DROPPING TWO MTL831BS

Two MTL831B multiplexer transmitters can share the same single-pair highway to a single safe-area isolator/receiver combination, providing up to 32 multiplexed inputs.

DATA HIGHWAY CABLING

There is no special requirement for the data highway cabling. Simple twisted-pair or multi-core cable is acceptable. The system can be used with only one data highway in place, but the provision of a second data highway provides redundancy in a key area of the system.

Data highway lengths of up to 2km in hazardous areas and 3km in safe areas have been achieved.

ENCLOSURES

A range of steel and stainless steel enclosures is available for mounting MTL821B and 831B units in the field. ENC8 and ENC8SS (stainless steel) enclosures provide protection for a single MTL821B or MTL831B. The enclosures are dust-tight and waterproof to IP67.

When using 4-wire RTDs, ENC83 and ENC83SS (stainless steel) enclosures provide additional terminals to accommodate the third and fourth RTD wires, which are not connected to the MTL831B itself.

MTL825B, MTL828B-MB AND MTL838B-MBF RECEIVERS

CE

MTL825B, MTL828B-MB and MTL838B-MBF receivers translate the information transmitted from the hazardous area via the data highway.

MTL825B provides a relay-contact output to mimic the input to the MTL821B;
MTL828B-MB provides a Modbus® serial-data output representation of the inputs to the MTL821B;
MTL838B-MBF provides a Modbus serial-data output representation of the inputs to the MTL831B.

MTL828B-MB MODBUS DI RECEIVER

Translates data received from the MTL821B in the hazardous area and makes it available as twin RS485 Modbus serial data outputs.

An MTL825B can be slaved from the MTL828B-MB to provide a local relay output for each of the switch inputs.

MTL825B RELAY OUTPUT DI RECEIVER

Translates the status of switched inputs to the MTL821B in the hazardous area and mimics the status via relay outputs.

- Up to 16 relay outputs
- Phase reversal of outputs by link
- LED indication of output and system/highway status
- May be used on its own or as slave to serial data receiver

MTL838B-MBF MODBUS ANALOGUE RECEIVER

Translates data received from the MTL831B in the hazardous area and makes it available as twin RS485 Modbus serial data outputs.

The MTL838B-MBF is configured by personal computer for thermocouple and RTD type, safety drive, high and low alarm and any other operational parameters.

The HAN83 hand-held unit can be used for minor configuration changes and interrogation.

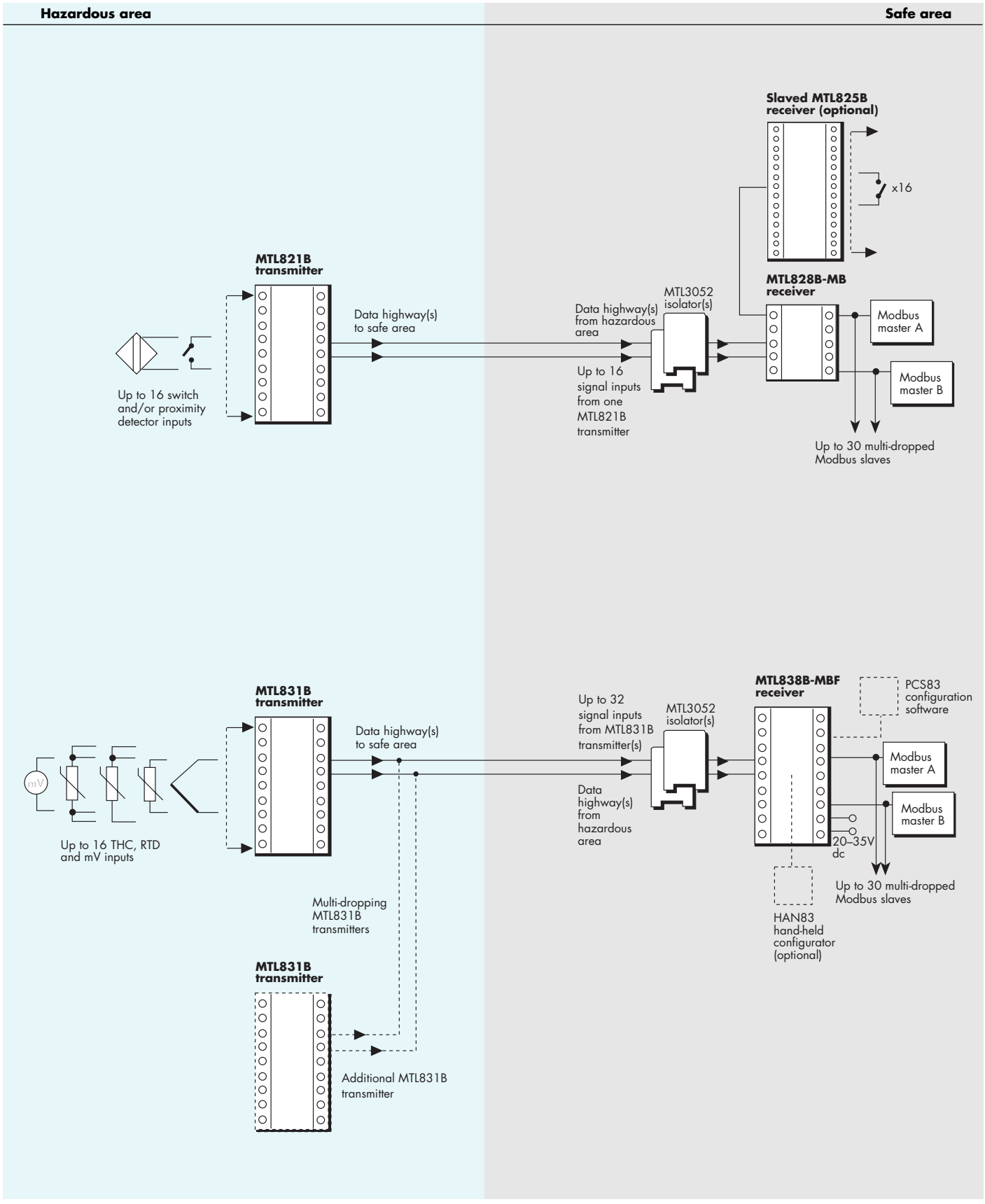
MTL3052 DATA HIGHWAY ISOLATOR

An MTL3052 isolator is required for each data highway, when the transmitter is located in a hazardous area. It is not required for safe-area applications.

MULTI-DROPPING MODBUS RECEIVERS

Up to 31 Modbus receivers can be multi-dropped on a single RS485 link to the host system. Modbus receivers can be controlled by any suitable Modbus master. The receivers may be used with other Modbus slaves on the same RS485 link.

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Hazardous area
Safe area
Slaved MTL825B receiver (optional)
x16
MTL821B transmitter
Data highway(s) to safe area
MTL3052 isolator(s)
Data highway(s) from hazardous area
MTL828B-MB receiver
Modbus master A
Modbus master B
Up to 16 switch and/or proximity detector inputs
Up to 16 signal inputs from one MTL821B transmitter
Up to 30 multi-dropped Modbus slaves
MTL831B transmitter
Data highway(s) to safe area
Up to 32 signal inputs from MTL831B transmitter(s)
MTL3052 isolator(s)
MTL838B-MBF receiver
PCS83 configuration software
Modbus master A
Modbus master B
Up to 16 THC, RTD and mV inputs
Data highway(s) from hazardous area
20–35V dc
Up to 30 multi-dropped Modbus slaves
Multi-dropping MTL831B transmitters
HAN83 hand-held configurator (optional)
MTL831B transmitter
Additional MTL831B transmitter

MTL821B AND MTL831B TRANSMITTERS

basic specifications

	MTL821B (switched input)	MTL831B (mV input)
Number of input channels	16	16 THC or mV sources, potentiometer inputs up to 1kΩ) 15 (RTD or mixed)
(IS segregated and fully floating when used with MTL3052)		
Location of input sources	Zone 0, IIC, T6 (switches) Zone 0, IIC, T4–6 (proximity detectors)	Zone 0, IIC, T4
Location of unit	Zone 0, IIC, T4	Zone 0, IIC, T4
Number of data highways	Dual redundant (either or both)	Dual redundant (either or both)
Power requirement	Loop-powered through data highway from receiver – no hazardous-area power supply required	Loop-powered through data highway from from receiver – no hazardous-area power supply required
Multi-transmitter facility	n/a	1 or 2
Ambient temperature limits	–20 to +60°C working –40 to +80°C storage	–20 to +50°C working –40 to +80°C storage
Weight	700g	1.3kg
Typical response time (input to receiver output)	60ms	1s for each transmitter
Electrical safety (each input circuit)	Umax:out = 10.5V Imax:out = 13mA Wmax:out = 34mW	Umax:out = 15V Imax:out = 16.3mA Wmax:out = 60mW } All channels
Input sensor cable parameters BASEEFA values (C,L or L/R)		
(IIC)	2.4µF,165mH or 640µH/Ω	0.8µF,120mH or 505µH/Ω
(IIB)	7.2µF, 495mH or 1920µH/Ω	2.4µF, 360mH or 1515µH/Ω
(IIA)	19.2µF,1320mH or 5120µH/Ω	6.4µF, 960mH or 4040µH/Ω
Electrical safety (data highway circuit[s]) – maximum input parameters	Umax:in = 30V Imax:in = 300mA Wmax:in = 1.2W C_{eq} = 0, L_{eq} = 0	Umax:in = 30V Imax:in = 300mA Wmax:in = 1.2W C_{eq} = 0, L_{eq} = 0
Cable parameters (data highway circuits, each highway) BASEEFA values (C,L or L/R)		
(IIC)	0.75µF, 5.2mH or 109µH/Ω	0.75µF, 5.2mH or 109µH/Ω
(IIB)	2.25µF,15.6mH or 327µH/Ω	2.25µF,15.6mH or 327µH/Ω
(IIA)	6.00µF, 41.6mH or 827µH/Ω	6.00µF, 41.6mH or 827µH/Ω

TRANSMITTERS – ADDITIONAL SPECIFICATIONS

MTL821B

Voltage applied to each input sensor
7.7 to 9.0V dc from 900Ω

Sampling time
Each sensor energised for 1.6ms every 32ms
Sensor output sampled after 1.2ms delay
Proximity detectors must respond adequately within 1.2ms, typical manufacturers' specification: >1kHz

Input characteristics
'Closed' if >2.1mA* (<2kΩ) in sensor circuit
'Open' if <1.2mA* (>10kΩ) in sensor circuit
**NAMUR and DIN 19234 standards for proximity detectors*

Compatibility
Connects to MTL825B and/or 828B-MB receivers

MTL831B

Each input terminal block is user-selectable by switch for mixed mV, THC, 2- or 4-wire RTD input or 3-wire RTD input.

Measuring ranges
±60mV or ±25mV or ±10mV, auto ranging

Common mode voltage
Maximum 5V common mode between input channels of one transmitter

mV signals

Accuracy at 20°C (including non-linearity and hysteresis)
<0.1% of measuring range

Temperature effects on accuracy
{(greater of 0.01% of range or 2µV) + 0.01% of reading} /°C

Thermocouple signals

Accuracy at 20°C (including non-linearity and hysteresis)
<0.1% of measuring range ±0.7°C
Upscale/downscale drive does not introduce any accuracy errors

Temperature effects on accuracy
{(greater of 0.01% of range or 2µV) + 0.01% of reading + 0.03°C}/°C

RTD signals

RTD range
–200 to +850°C (Pt100 type, DIN 43760, IEC751: 1983)

RTD excitation current
100µA

Accuracy at 20°C (including non-linearity and hysteresis)
<0.1% of measuring range

Temperature effects on accuracy
{(greater of 0.01% of range or 0.025°C) + 0.005% of reading}/°C

MTL825B, MTL828B-MB AND MTL838B-MBF RECEIVERS

basic specifications

	MTL825B (relay output)	MTL828B-MB (Modbus® output)	MTL838B-MBF (Modbus output)
Number of data highways	2, dual redundant (either or both may be used)	2, dual redundant (either or both may be used)	2, dual redundant (either or both may be used)
Location of unit	Safe area	Safe area	Safe area
Input noise rejection	Up to 0.5mA peak-to-peak at 100 to 1000Hz, or up to 1mA peak-to-peak at 50Hz	Up to 0.5mA peak-to-peak at 100 to 1000Hz, or up to 1mA peak-to-peak at 50Hz	Up to 0.5mA peak-to-peak at 100 to 1000Hz, or up to 1mA peak-to-peak at 50Hz
Number of output channels	16 relays	–	–
Type of output(s)	Relays, 1-pole changeover Contact rating: 240V,1A,120VA,ac 50V, 0.1A, 5W,dc *(Reactive loads must be suppressed)* Contact life: 1 x 10^5 operations at full rated load	Dual RS485 Modbus protocol	Dual RS485 Modbus protocol
System protocol	–	Modbus ASCII or RTU	Modbus ASCII or RTU
Serial communication parameters	–	Baud rate: 300 to 19200 Stop bits: 1 or 2 Data bits: 7 or 8 Parity bit: odd, even or none	Baud rate: 300 to 19200 Stop bits: 1 or 2 Data bits: 7 or 8 Parity bit: odd, even or none
Multi-receiver facility	–	Up to 31 MTL828B-MB/ MTL838B-MBF units can be connected to communicate with one Modbus master controller	Up to 31 MTL828B-MB/ MTL838B-MBF units can be connected to communicate with one Modbus master controller
Power requirement	350mA at 20–35V dc	250mA at 20–35V dc	500mA at 20–35V dc
Isolation		100V ac between data highways and dc supply circuit	
Ambient temperature limits	–20 to +50°C working –40 to +80°C storage	–20 to +50°C working –40 to +80°C storage	–20 to +50°C working –40 to +80°C storage
Weight	900g	460g	840g

RECEIVERS – ADDITIONAL SPECIFICATIONS

MTL825B

Output LED indicators (x16)

Associated red LED is ON when each output relay is energised

MTL828B-MB

Configuration

By DIP switches within the casing

MTL838B-MBF

Thermocouple range supported

Types E, J, K, N, R and T THCs to IEC 584. Other options are available, please contact MTL for details.

System configuration

Serial communications parameters and system parameters entered using PCS83 software program, by downloading from process controller, or entered directly with the HAN83 hand-held terminal

Linearisation

Multi breakpoint calculation by microprocessor (output is linearised and cold junction compensated)

Broken THC indication

Serial output drives upscale or downscale

Alarm facilities

High and low alarms are indicated in the serial data and can be set for each input

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APPROVALS

Country (Authority)	Australia (NSW M)	Australia (SA)	Canada (CSA)	CIS (VNIIVE)	Czech Republic (FTZU)	Hungary (BKI)	Slovak Republic (EVPU)	UK (BASEEFA)	UK (BASEEFA)	USA (FM)
Standard	CMRA 67/1982	AS 2380: Pts. 1 & 7	C22.2 No. 157	GOST22782.0 GOST22782.5	CSN33 0380	MSZ4814/7	STN EN50014 & 020	BS5501:Pts 1 & 7 EN 50 014 & 020	BS5001: Pt 9 EN50 039	3610 Entity
Approved for	Ex ia coal & shale mines	Ex ia IIC T4	Class 1, Div 1, Gps A-D	1 Ex ib IIC T4 "X"	Ex ia IIC T4	Ex ia IIC T4	EEx ia IIC T4	EEx ia IIC T4	EEx ia IIC T4 (systems)	Class 1, Div 1, Gps A-D
Model No. (MTL)	Certificate/File No.									
MTL821B		Ex 3495X	LR36637-28				P/02239/101/1/97	Ex862221	Ex862222	5BOA8.AX-1
MTL831B		*	LR36637-41	D.97C.197	*	*	P/02239/101/1/97	Ex89C2052	Ex892054 Ex892382 (non systems) Ex892433 (with MTL3052)	5BOA8.AX-1

APPROVALS

	Country (Authority)	Standard	Certificate/ File No.	Approved for
MTL825B (Receiver)	Canada (CSA)	C22.2. No.142	LR36637-36	Safe area (non-hazardous location)
MTL838B-MB (Receiver)	Canada (CSA)	C22.2. No.142	*	Safe area (non-hazardous location)
HAN83	Canada (CSA)	C22.2. No.142	LR36637-36	Safe area (non-hazardous location)

Note: approval is required in Canada only, to comply with local certification regulations
** Approvals pending*

SYSTEM SPECIFICATION

Maximum loop impedance (each data highway)
50Ω when using MTL3052 interface (terminals 7 & 8)
130Ω when using MTL3052 interface (terminals 5 & 6)
300Ω for non-IS applications

Transmission distance (transmitter to receiver)
0.5km typically (IS applications)
1.5km typically (non-IS applications)
For many applications it is possible to use longer distances up to 3km, for details consult MTL

Intrinsically safe interface (IS applications)
1 MTL3052 isolating interface unit for each data highway

Earth fault protection
An optional MTL2220 earth leakage detector will detect line-to-earth faults on either line of either highway, and on any MTL821B transmitter sensor input (except negative sides when sensor is open)

Data highway monitoring

Highway 1 LED, green (located on receiver)
ON when highway 1 connected and operating

Highway 2 LED, green (located on receiver)
ON when highway 2 connected and operating

Highway 1 & 2 status
MTL825B: relay (1-pole c/o) ENERGISED when both highways connected and operating
Serial output receivers: condition of highway(s) transmitted in unit status word to process controller

System failure monitoring

System failure LED, red (located on receiver)
ON when both highways disconnected or faulty or when there is an internal receiver fault

System failure signal
MTL825B: relay (1-pole c/o) DE-ENERGISED when both highways are disconnected or not operating, or with internal receiver fault
Serial output receivers: derived from status word

Power supply failure
All relays and LEDs de-energise

ADDITIONAL INFORMATION

Refer to section 3 in the catalogue for full details and specifications for the following items:
MTL3052 isolating interface unit
Isolating interface unit mounting accessories
MTL2220 earth leakage detector
MTL3991 power supply unit

ACCESSORIES (HAN83 AND PCS83) – SPECIFICATIONS

HAN83 HAND-HELD CONFIGURATOR (FOR MTL838B-MBF)

Display: 6 digit
Pushbuttons: three for setting all system parameters, calibration and fault finding
Setting functions: see 'Serial communication parameters' and 'Configurable parameters' in MTL838B-MBF specification
Ambient temperature limits: –20 to +50°C working
–40 to +60°C storage
Power requirement: powered by receiver
Weight: 230g

PCS83 SOFTWARE PACKAGE (FOR MTL838B-MBF)

Format: 3.5 inch diskette
Suitability: IBM® PC or compatible
Functions: Software configuration of multiplexer system using any IBM compatible PC with DOS 2.2 or higher and a serial link

MTL800 SERIES COMMON SPECIFICATION

The following specification applies to MTL800 Series multiplexers.

Humidity
5–95% RH (without condensation)

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

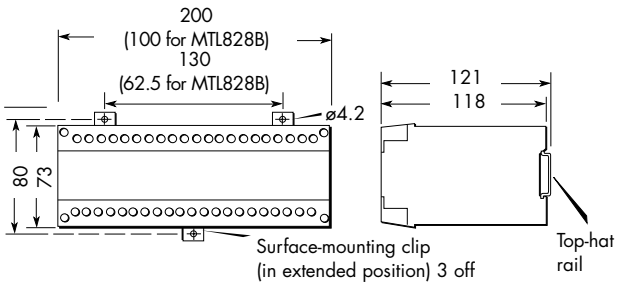
Terminals
Detachable, each accommodates two (one for MTL825B receivers) 2.5mm² conductors

Casings
Moulded polycarbonate

CONDITIONS OF USE

The conditions governing the use of MTL800 Series multiplexers are given in the relevant certificates and schedules, copies of which are available from MTL.

DIMENSIONS (mm)



ENC8/ENC8SS AND ENC83/ENC83SS ENCLOSURES

SPECIFICATIONS

Suitability

ENC8/ENC8SS: for
1 MTL821B/831B transmitter, or
1 MTL838B receiver, or
2 MTL828B receivers
1 MTL8841L DI block
1 MTL8842L DO block
1 MTL8851L AI/AO block

ENC83/ENC83SS: for
1 MTL831B transmitter
(for use with 4-wire RTDs)

Location
Zone 0, 1 or 2

Protection
Dust-tight and waterproof to IEC529:IP67

Construction (ENC8 and ENC83)
Sheet steel, zinc sprayed and painted RAL7015 grey

Construction (ENC8SS and ENC83SS)
Stainless steel

Lid
Detachable with lift-off hinges, secured by captive fixing screws with a padlock hasp

Earth terminals
Fitted on internal earth rails; accommodate conductors up to 4mm²

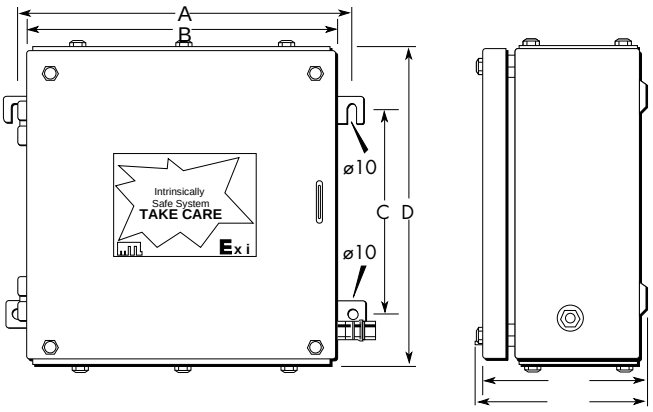
Number of earth terminals
ENC8/ENC8SS: 22
ENC83/ENC83SS: 18

4-wire RTD terminals (ENC83/ENC83SS only)
32 ready-mounted terminals to accommodate conductors up to 4mm²

Gland fixing
Top and bottom gland plates detachable for drilling by user

Mounting
By fixed mounting lugs

Weight (excl. transmitters/receivers)
ENC8: 7kg
ENC83: 9.8kg



	A	B	C	D
ENC8	331	306	203	306
ENC83	407	380	305	466

CONDITIONS OF USE

The conditions governing the use of MTL800 Series multiplexers are given in the relevant certificates and schedules, copies of which are available from MTL.

Other enclosures styles and configurations are available

Please contact MTL for details

TO ORDER, specify:

Transmitters

MTL821B	Discrete input transmitter
MTL831B	Analogue transmitter, mV input

Receivers

MTL825B	Discrete input receiver, relay output
MTL828B-MB	Discrete input receiver, RS485 and/or RS422 output, for Modbus®
MTL838B-MBF	Analogue receiver, RS485 and/or RS422 outputs for Modbus®

Analogue receiver accessories

HAN83	Hand-held plug-in configuration terminal
PCS83	PC software configuration package

Process controller interface software

Contact MTL for details of software for interfacing with proprietary process controllers

Isolating interface units and earth leakage detectors

MTL3052	Digital isolator interface unit
MTL2220	Earth leakage detector

Enclosures

ENC8	General-purpose enclosure
ENC8SS	General-purpose enclosure (stainless steel)
ENC83	Enclosure for MTL831B transmitter
ENC83SS	Enclosure for MTL831B transmitter (stainless steel)

Literature

INM828B-MB	System protocol manual: *MTL828B-MB Modbus receivers*
INM838B-MBF	System protocol manual: *MTL838B-MBF Modbus receivers*
AN9010	Application Note: *A user's guide to intrinsically safe input multiplexer systems*
INS821B	MTL821B Multiplexer transmitter
INS825B	MTL825B Multiplexer receiver - contact output
INS828B	MTL828B-MB Multiplexer receiver - Modbus output
INS831B	MTL831B mV multiplexer transmitter
INS838B	MTL838B-MBF Multiplexer receiver - Modbus output

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