

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

MTL800 SERIES

IS multiplexer systems



- ◆ **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 'Block I/O' 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!'

MTL821B AND MTL831B MULTIPLEXER TRANSMITTERS



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 (see 'MTL800 Series Enclosures').

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 $\pm 60\text{mV}$) 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

Cabling with low capacitance and resistance is recommended to achieve greater distances between transmitters and receivers. See cable parameters in 'Basic Specifications' for specific requirements, and contact MTL for latest cable recommendations. The system is designed to use both data highways, although it can be used with only one data highway in place. However, use of a single highway will increase response time.

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 (see 'MTL800 Series Enclosures'). ENC8 and ENC8SS (stainless steel) enclosures provide protection for a single MTL821B or MTL831B. The enclosures are dust-tight and water-proof 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



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 (see 'MTL800 Series Accessories').

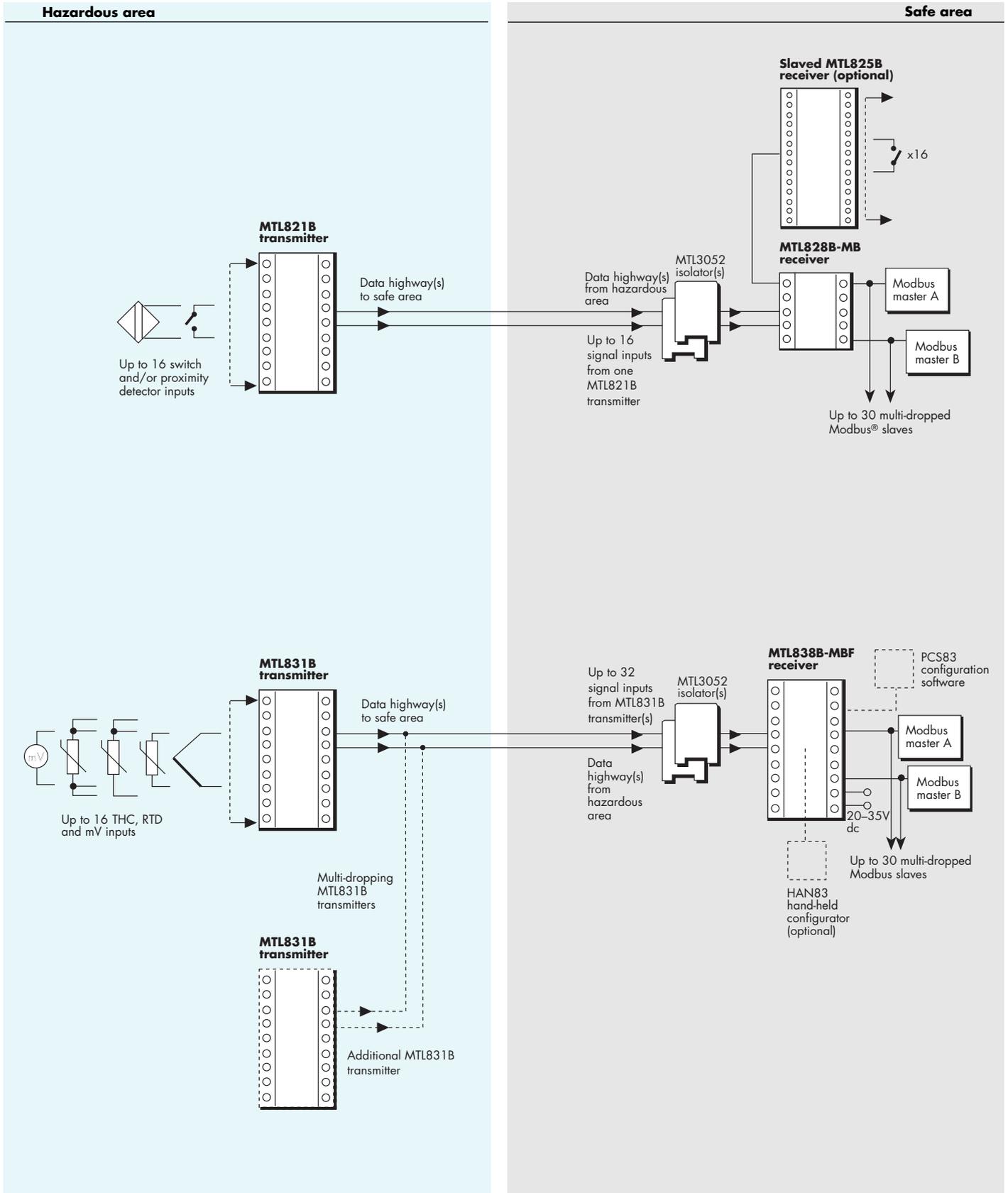
MTL3052 DATA HIGHWAY ISOLATOR

An MTL3052 isolator is required for each data highway, when the transmitter is located in a hazardous area (see 'MTL3000 Series'). 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.

MTL800 SERIES MULTIPLEXER SYSTEM DIAGRAMS



MTL821B AND MTL831B TRANSMITTERS

BASIC SPECIFICATIONS

(see also 'Common specification')

	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)
(15 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	Zone 0, IIC, T4
Location of unit	Dual redundant (either or both)	Dual redundant (either or both)
Number of data highways	Loop-powered through data highway from receiver – no hazardous-area power supply required	Loop-powered through data highway from receiver – no hazardous-area power supply required
Power requirement	n/a	1 or 2
Multi-transmitter facility	-20 to +60°C working	-20 to +60°C working
Ambient temperature limits	-40 to +80°C storage	-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)	U _{max:out} = 10.5V I _{max:out} = 13mA W _{max:out} = 34mW	U _{max:out} = 15V I _{max:out} = 16.3mA W _{max: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	U _{max:in} = 30V I _{max:in} = 300mA W _{max:in} = 1.2W C _{eq} = 0, L _{eq} = 0	U _{max:in} = 30V I _{max:in} = 300mA W _{max: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

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

(see also 'Common specification')

	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 1 mA peak-to-peak at 50Hz	Up to 0.5mA peak-to-peak at 100 to 1000Hz, or up to 1 mA peak-to-peak at 50Hz	Up to 0.5mA peak-to-peak at 100 to 1000Hz, or up to 1 mA 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 <i>(Reactive loads must be suppressed)</i> 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 Up to 31 MTL828B-MB/ MTL838B-MBF units can be connected to communicate with one Modbus master controller	Baud rate: 300 to 19200 Stop bits: 1 or 2 Data bits: 7 or 8 Parity bit: odd, even or none Up to 31 MTL828B-MB/ MTL838B-MBF units can be connected to communicate with one Modbus master controller
Multi-receiver facility	–	250mA at 20–35V dc 100V ac between data highways and dc supply circuit	500mA at 20–35V dc
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

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. Configuration parameters are retained by using battery-backed RAM.

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

APPROVALS

Country (Authority)	Australia (NSW M)	Australia (SA)	Canada (CSA)	CIS (ISC VE)	Czech Republic (FTZU)	Hungary (BKl)	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	CSN EN 50014 CSN EN 50020	MSZ4814/7	STN EN 50014 STN EN 50020	EN 50014 EN 50020	BS5001: Pt 9 EN50 039	3610 Entity
Approved for	Ex ia coal & shale mines	Ex ia IIC T4	Class 1, Div 1, Gps AD	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 AD
Model No. (MTL)	Certificate/File No.									
MTL821B	MDA Ex ia 14321	Ex 3495X	LR36637-28		FTZU99Ex0782X		P/02239/101/1/97	Ex86B2221	Ex862222	J.I.5B0A8.AX-1
MTL831B		*	LR36637-108	D.97C.197	FTZU98Ex0025	*	P/02239/101/1/97	Ex89C2052	Ex892054 Ex892382 (non systems) Ex892433 (with MTL3052)	J.I.5B0A8.AX-1

APPROVALS FOR USE IN SAFE AREA (NON-HAZARDOUS LOCATION)

	Country (Authority)	Standard	Certificate/ File No.
MTL825B (Receiver)	Canada (CSA)	C22.2. No. 142	LR36637-112
MTL838B-MB (Receiver)	Canada (CSA)	C22.2. No. 142	*
HAN83	Canada (CSA)	C22.2. No. 142	LR36637-36

Note: Safe-area approval is required in Canada only, to comply with local certification regulations

* Approvals pending

MTL800 SERIES COMMON SPECIFICATION

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

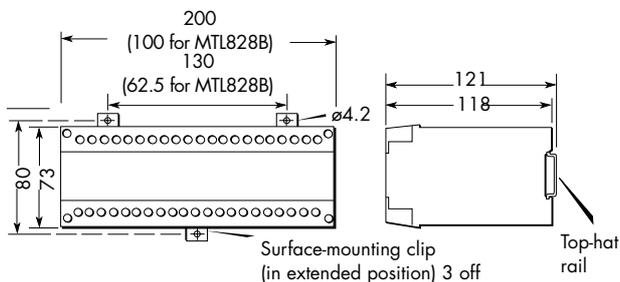
Casings

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)



MTL800 SERIES SYSTEM SPECIFICATION

Maximum loop impedance (each data highway)

50 Ω when using MTL3052 interface (terminals 7 & 8)
130 Ω when using MTL3052 interface (terminals 5 & 6)
300 Ω 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 (optional)

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

MTL800 SERIES ENCLOSURES

SPECIFICATIONS

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

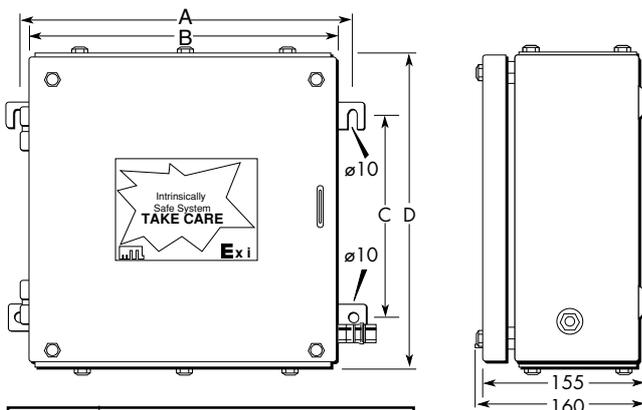
By fixed mounting lugs

Weight (excl. transmitters/receivers)

ENC8: 7kg

ENC83: 9.8kg

DIMENSIONS (mm)



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

MTL800 SERIES ACCESSORIES

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

ADDITIONAL INFORMATION

Refer to 'Isolators' for full details and specifications of the following items:

MTL3052 isolating interface unit

Isolating interface unit mounting accessories

MTL2220 optional earth leakage detector

Other enclosure styles and configurations are available

Please contact MTL for details

TO ORDER, specify:

Transmitters

- MTL821B Discrete input transmitter
- MTL831B Analogue transmitter

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