Overview
I/O Modules
Field Terminals
Carriers, Extenders, Cables
Power Supplies
Railbus Isolator
Bus Interface Modules
System Specification
**General**

MTL8000 is a completely modular I/O solution for both general purpose and hazardous area applications. Based upon a carrier system that supports a range of modules, it offers a wide variety of I/O functions, including AC mains and intrinsic safety signals - even within the same node. It has an “open” architecture that allows communication with a variety of different field-buses by selecting the appropriate type of Bus Interface Module (BIM).

### I/O Modules

I/O modules transfer signals to and from field instruments. Input modules receive signals from transmitters and sensors and convert them into a digital form for presentation to the BIM. Output modules receive commands from the BIM and transfer them to actuators. A wide range of modules is available, including types for low-level instrumentation, AC mains and intrinsically safe signals. I/O modules typically have 4, 8 or 16 field channels.

### Field terminals

Field terminals provide the interface between the I/O modules and the field wiring. They include fusing and loop disconnect as options. A mechanical keying system prevents an I/O module from being connected to the wrong type of field terminal.

Field terminals mount onto the module carrier, one to each I/O module. They are clamped firmly by the I/O module to form an electrical and mechanical assembly of high integrity. They may be replaced in service without removing carriers or disturbing the operation of other modules.

### Carriers

Carriers form MTL8000’s physical and electrical backbone by providing a mounting onto a flat panel or T- or G-section DIN rail. They support and interconnect the BIM, power supplies, I/O modules and field terminals, and carry the address, data and power lines of the internal Railbus. They provide a termination points for the LAN and field wiring cable screens and can also distribute bussed field power to the I/O modules.

I/O module carriers are available to support four or eight I/O modules.

### Power supplies

Good power management lies at the heart of a true distributed I/O system. MTL8000 power supplies accept locally available unregulated power and provide a regulated supply for the BIM and I/O modules. Supply redundancy is supported.

### Bus Interface Module (BIM)

The BIM provides a serial data connection to a host controller, which could be a distributed control system (DCS), a programmable logic controller (PLC), or a PC running a soft control package. A choice of BIMs allows you to accommodate the most popular fieldbus protocols. The BIM also uses a fast internal bus to pass data to, and obtain data from, the I/O modules. Only one BIM is required at each node to control up to 32 I/O modules.

‘HART-ability’

The use of ‘smart’ instruments on process plants is growing but this investment is not always fully exploited. Whether it is for a new installation, or the upgrade of an existing one, MTL has solutions that provide the connections between the HART field instruments, the control systems and the process automation maintenance software.

Specifically, the MTL8000 Process I/O system has been designed to be transparent to HART signals, thus allowing the host control software and any HART field instruments to communicate directly with each other.

In addition, MTL’s HART connection system provides on-line access from a PC to the HART field devices for monitoring device performance. HART devices may be selected for regular status monitoring and alerts can be issued if the status changes. The benefits from this approach are:

- Reduced commissioning time and cost
- Reduced process downtime through status monitoring
- Lower loop maintenance costs by using field device diagnostics

Consult an MTL representative for further details.

### System specification

See end of section.
MTL8000 in your system

Figure 1 shows two possible methods for linking the MTL8000 into a system. On the left is a host controller system that uses fieldbus as the main distribution medium. On the right is a section of a typical DCS/PLC information network, with an operator station that uses a separate interface to the process fieldbus.

The number of MTL8000 nodes that can be accommodated depends upon the addressing capability of the fieldbus in use. Each MTL8000 node can address 32 I/O modules which, depending upon the number of channels per module, can provide up to 512 I/O points at a single node! A node can consist of a mixture of analog and discrete modules and this gives maximum flexibility to the system designer. Where supported by the fieldbus, full HART pass-through is provided—the MTL8000 appears “transparent”, allowing the host controller to access the HART capabilities of field instruments.

Wide choice of fieldbus options

MTL8000 supports a number of popular fieldbus protocols: Modbus® (RTU mode), Profibus–DP, etc., and the range is growing. If your protocol is not mentioned then consult us. MTL is also interested in talking to OEM partners who want to develop their own fieldbus variations. A software core has been developed that simplifies the design of alternative control interfaces for the system.

Redundancy options

MTL8000 has been designed to increase availability and minimise downtime. Redundant LAN channels and power supplies can be specified as options to increase system availability. Possible downtime is further reduced by ensuring that the system components using active circuitry can be removed and replaced quickly and easily. Even the field terminals can be replaced without interrupting the operation of adjacent I/O modules. Carriers have no active circuitry and are unlikely to need replacement.

System power supplies

The system power supply at an MTL8000 node converts the local DC supply to power the node and can also provide field power for I/O modules with low-level field circuits. Where heavy-current or AC mains circuits are handled by the I/O modules, MTL’s innovative Bussed Field Power scheme for distributing field power avoids complex wiring at the field terminal and minimises the backplane/carrier wiring.

Hazardous area applications

The MTL8000 is a truly field mountable system even in areas where flammable gases are present. It is available in three versions to suit different area classification schemes:

a) Equipment and field wiring located in general purpose areas, Class 1, Division 2 hazardous locations or Zone 2 hazardous areas.

b) Equipment mounted in general purpose areas, Class 1, Division 2 hazardous locations or Zone 2 hazardous areas.

c) MTL8000-1/1 equipment mounted in Zone 1 hazardous areas, with field wiring located in Zone 0 hazardous areas, or Zone 1 hazardous areas.

Figure 2 illustrates the connection of field devices for these various options.
MTL8000 with general purpose field wiring

Many industry applications do not present an explosion risk from gas or dust hazards. In others, the environment may be classified as a Zone 2 or Division 2 hazardous area, where flammable material is expected to occur only in abnormal conditions. For both of these the 2/2 system provides effective distributed I/O for process control. MTL8000 supports a full range of I/O module types covering inputs and outputs for both analog and discrete circuits. The node can be mounted out on the plant in a suitable enclosure providing protection against the environment. Figure 3 shows a node containing all the key components: a Bus Interface Module, PSU modules (including a redundant one), I/O modules on carriers and a pair of carrier-extendsers linked with an extension cable.

MTL8000 with intrinsic safety field wiring

The MTL8000 Process I/O System is capable of supporting I/O modules with intrinsic safety (IS) field wiring, for connection to certified or ‘simple apparatus’ field devices in Division 1 or Zone 0 hazardous areas (see Figure 4). A range of I/O module types with IS field circuits for industry-standard DI, DO, AI and AO applications is supported.

I/O modules with built-in protection

All voltage and current-limiting components required for IS protection are incorporated within the I/O module housings, so no external, add-on zener barriers or galvanic isolators are necessary. IS field terminals are distinguished from other types by blue colouring of the terminal housing. A unique and sophisticated mechanical keying mechanism for modules with different protection techniques from being interchanged, so that potentially explosive or damaging conditions cannot occur.

Integrated power supplies

Power for IS I/O modules is derived from integrated, modular power supply units. Each power unit is capable of supplying between eight and twenty I/O modules, depending on the I/O type and mix. Optional power supply redundancy is supported by means of an additional, redundant supply unit connected in an ‘n+1’ arrangement. In applications with mixed IS and non-IS field wiring, the full facilities of the ‘Bussed Field Power’ regime are retained for the non-IS part of the system.

In nodes populated only with IS I/O modules, a separate system power supply module provides power for the Bus Interface Module and ‘node services’. Redundancy of this supply is also supported.
Mixed I/O types within a single node
IS and non-IS field wiring types can also be incorporated within one MTL8000 node (see Figure 5). In this arrangement, the two parts of the node are separated by a ‘Railbus Isolator’ module. The Railbus Isolator provides a section of internal communications bus (‘Railbus’) for the IS I/O modules which is protected from invasion by damaging fault voltages. Uniquely, a single MTL8000 node (under the command of one Bus Interface Module) can then support a mixture of certified IS field devices, certified Division 2 or Zone 2 field devices and general purpose I/O, including AC mains circuits. Only one Railbus Isolator is used per MTL8000 node.

Related MTL8000 Literature
AN8000
System Specifier’s Guide - Modular I/O
INM8000
Installation Guide

Figure 5  MTL8000 node with mixed IS and non IS field wiring
## I/O Module Types

### 2/2 modules

#### Analog input modules
- 8-channel, 4–20mA with HART®: 8101–HI–TX
- 8-channel, 4–20mA: 8103–AI–TX
- 8-channel, 1–5V: 8119–VI–05

#### THC and RTD modules
- 4-channel, THC and mV: 8105–TI–TC
- 4-channel, RTD and W: 8106–TI–RT

#### Analog output modules
- 8-channel, 4–20mA with HART®: 8102–HO–IP
- 8-channel, 4–20mA: 8104–AO–IP

#### Discrete input modules
- 8-channel, 24V dc, isolated, sinking: 8109–DI–DC
- 16-channel, 24V dc, isolated, sinking: 8122–DI–DC
- 8-channel, 24V dc, non-isolated, module powered: 8110–DI–DC
- 16-channel, 24V dc, non-isolated, module powered: 8121–DI–DC
- 32-channel, 24V dc, non-isolated, module powered: 8125–DI–DC
- 32-channel, 24V dc, non-isolated, module powered, Sequence of Events: 8127–DI–SE
- 8-channel, 115V ac, isolated, sinking: 8111–DI–AC
- 8-channel, 115V ac, non-isolated, module powered: 8112–DI–AC
- 8-channel, 230V ac, isolated, sinking: 8113–DI–AC
- 8-channel, 230V ac, non-isolated, module powered: 8114–DI–AC

#### Discrete output modules
- 8-channel, 2–60V dc, non-isolated, module powered: 8115–DO–DC
- 8-channel, 20–265V ac, non-isolated, module powered: 8116–DO–AC
- 8-channel, 2–60V dc, isolated, unpowered: 8117–DO–DC
- 8-channel, 20–265V ac, isolated, unpowered: 8118–DO–AC

#### Pulse input modules
- 2-channel, pulse/quadrature input: 8123–PI–QU

### 2/1 modules

#### Analog input modules
- 8-channel, 4–20mA with HART®: 8201–HI–IS
- 8-channel, 0–10V/potentiometer: 8230–AI–IS

#### THC and RTD modules
- 8-channel, THC and mV: 8205–TI–IS
- 8-channel, RTD and W: 8206–TI–IS

#### Analog output modules
- 8-channel, 4–20mA with HART®: 8202–HO–IS
- 8-channel, 4–20mA: 8204–AO–IS

#### Discrete input modules
- 16 (8)* -channel, switch/proximity detector: 8220–DI–IS

#### Discrete output modules
- 4-channel, solenoid driver, IIC gas groups: 8215–DO–IS

#### Pulse input modules
- 2-channel, pulse/quadrature input: 8223–PI–IS

---

*8-channel when used with 8624-FTIS field terminal

---

HART® is a registered trademark of the HART Communication Foundation.
I/O Modules - Overview

Addressing of I/O modules

Modules are addressed by the BIM in terms of their position, or slot, in the total chain of 32 modules not by individual module types. As a result, a module can be removed and replaced by another of its own type without the need to “tell” the BIM of the change. During configuration, the BIM is told the characteristics of each necessary module position whether or not the module is present at the time. Consequently, if a module is removed for service replacement, the properties of the ‘slot’ are still retained by the BIM.

Important modes

Output failsafe mode

Output modules have the ability to assume a failsafe state. This can happen for two reasons.
1) The BIM can force a module into a failsafe state by issuing a specific command to it.
2) Modules have a configurable “timeout” parameter. This defines the maximum time period of communication inactivity with the BIM. If this period is exceeded the module adopts a failsafe state.

The different module types have their own response to a failsafe command, and those responses are described in the individual sections that follow.

Input fail values

In the event of failure of an input module, the BIM forces the reported value to a predefined state – low, high or hold last value.

This ensures that the host adopts a state consistent with safe operation of the plant.

Power-up/initialisation state

When powering-up a node it is essential for plant safety that the state of each of the outputs is known. While the BIM is initialising, the I/O modules are held in the power-up state (see following pages). After BIM initialisation and before establishing communication with the host, the outputs are set to predefined “initialisation” states. This “safe-state” can be defined by the user for each output channel.

Non-volatile configuration memory

The configuration information for all I/O modules in a node is stored in the BIM in non-volatile memory (NVM). When a module is replaced, when the node is powered up or following a reset, the BIM will download the stored configuration information to the relevant I/O modules.

Visual indicators

LEDs are provided on each module to indicate Power, Fault and channel Status information. These are based on the NAMUR NE44 specification for LED indicators.

The Power and Fault indicators are common to all I/O modules and their states are shown in the following tables.

Module ‘Fault’ LED (red)

<table>
<thead>
<tr>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Normal</td>
</tr>
<tr>
<td>Flashing</td>
<td>Initialisation error</td>
</tr>
<tr>
<td>On</td>
<td>Failsafe</td>
</tr>
<tr>
<td></td>
<td>A/D error on AI</td>
</tr>
<tr>
<td></td>
<td>BFP failure on 2/2 AI</td>
</tr>
</tbody>
</table>

Module ‘Power’ LED (green)

<table>
<thead>
<tr>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Power failure</td>
</tr>
<tr>
<td>On</td>
<td>Power OK</td>
</tr>
</tbody>
</table>

Module ‘Status’ LED (yellow)

The channel “Status” indicators have different meanings according to the module type and are described in the individual module sections.

Field Terminals

An I/O module requires a field terminal to provide a connection to the field wiring. A field terminal should be chosen to suit the type of module and its field wiring, so the user is advised to consult the module data sheet, which has recommendations for the module and certain types of application. In addition to the screw-clamp field terminal type, there is also one that uses multi-pin IDC connectors. This type is referred to as a “mass termination assembly” and gives the user a wide choice of options when choosing a method for terminating their field wiring.

See the Field Terminal data sheets for further details.

Important note

If, when using the 8502 Profibus BIM, the node is configured via Profibus, a reduced set of configuration parameters is available. Alternatively, if the 8455 Configurator Software is used to configure a Profibus node, a fully detailed range of module configuration parameters is available.

In both cases, the module specifications should be read in conjunction with the Profibus BIM instruction manual INM8502 which explains all the configuration options.

GSD files are available for either of the above options.
**Analog Input Modules - 4-20mA**

**General**
The 4–20mA AI modules provide digitised data and status information from 4–20 mA current loop sensors.

**HART® capability**
AI modules “with HART” can obtain information from HART instruments of protocol revision 5.0 or later. Each channel can communicate with a single HART instrument. HART universal command 3 is used to gather up to 4 dynamic variables and status from each HART instrument. This provides more process information to the control system from each device. Greater accuracy can also be achieved by eliminating A/D and D/A errors.

In addition, HART pass-through may be used for device configuration, calibration and advanced diagnostics.

**Input sampling**
The AI modules have eight user-channels that are sampled every 27ms (2/2) or 33ms (2/1).

**Data format**
The input signal is stored as a 16-bit unsigned value. In this range 0 is equivalent to 0mA and 65,535 is equivalent to 25mA. Any digital HART data is stored in its original IEEE754 floating point format.

**Filtering**
The Analog Input modules use a first-order software filter that provides 12dB attenuation at the Nyquist frequency of the algorithm. The filter supports a set of options that can be matched with control algorithm execution rates.

**Input alarms**
Four configurable alarm levels are provided for each channel—two high and two low (see figure below). When an input value exceeds an alarm limit a flag is set and the BIM gets a new alarm status.

**Alarm deadband**
The Alarm Deadband prevents the alarm from tripping on and off because of system noise. It can be configured for each channel and is always set on the ‘inner’ side of the alarm limit to be, typically, greater than the system noise in the plant. If an alarm is activated, it will remain until the input moves the full extent of the deadband towards a “safer” value.

The Hi-Hi and Lo-Lo alarms support the NAMUR recommendations, i.e. if the alarm limit is set less than 3.0mA (Lo-Lo), or greater than 21.0mA (Hi-Hi), the alarms must be active for 4 seconds before the alarm is set. The Deadband does not apply to NAMUR alarms. If the alarm limits are set at values between the NAMUR limits, the alarms function normally.

**Dead zone**
Each channel has a definable “dead zone”. This is to reduce the need for the module to report an alarm for every minor change in input value. If the input value differs by the amount defined by the Dead Zone, or more, then the new value is reported, otherwise it is not. This reduces traffic on the internal bus which improves the system response time. If the Dead Zone value is set to zero (the default), then every input value read will set a ‘New Data’ flag, and be reported.

**Module operating states**

**Normal/Failsafe mode**
The AI module supports failsafe mode as defined in the earlier I/O module introductory section. When not in failsafe the module adopts Normal mode.

**Channel Active/Inactive**
A channel can be made active or inactive individually. When a channel is made inactive inputs will not be processed.

**Default/Power-up conditions**
These modules use the following values when they power up.

**Module mode**
Normal (not “failsafe”)

**Active/inactive**
All channels power up in the active state.

**Alarms**
All alarms are made inactive by having their values set to high or low extremes, as appropriate.

**Dead Zone**
0 (i.e. all changes of A/D data are reported for an active channel)

**Software Filtering**
Disabled.

**Passthrough**
Passthrough messages to HART instruments are always allowed.

**Visual indicators**

**Channel “Status” LED (yellow)**

**On**
Sensor loop OK

**Off**
Open circuit sensor and channel inactive

**Flashing**
Open circuit sensor and channel active OR Error condition

An error – i.e. a flashing LED – could be as a result of any of the following conditions:
a) a loss of HART signal,
b) an error in the A/D converter,
c) a NAMUR alarm or
d) a Hi (Hi) or Low (Low) alarm.

---

**HART®** is a registered trademark of the HART Communications Foundation.
Analog Input Modules - THC and RTD

General
These modules provide digitised data and status information of analog measurements from thermocouples, mV sources, RTDs and resistance sources.

Thermocouple modules provide four or eight channels for monitoring input signals from thermocouples or mV sources. The function of the module is set up during configuration. Cold junction compensation for thermocouple applications is provided by means of a sensor in the field terminal. Only the recommended field terminals can be used with these modules.

RTD modules provide four or eight channels for monitoring input signals from RTD or resistance sources. The function of the module is set up during configuration. The RTD can be 2-, 3- or 4-wire type. Only the recommended field terminals can be used with these modules.

Input sampling
Thermocouple modules sample at intervals of 60ms per channel. In addition, the module has cold junction temperature compensation that is refreshed every 1.8 seconds for 4-channel modules and every 2.4 seconds for 8-channel modules. The sampling technique for the RTD module is similar where samples of the voltage across, and the current through, the RTD are measured at intervals of 60ms per channel. Compensation methods reject the effect of resistance in the cable conductors for 3-wire and 4-wire RTD/Resistance.

Data format
The 8105/6 4-channel modules store data as 15-bit plus sign integers (–32768 to +32767). The 8205/6 8-channel modules store data as 16-bit unsigned integers (0 to 65535).

Filtering
An Infinite Impulse Response (IIR) filter is used on the input data before it reaches the A/D converter. Depending upon the coefficients selected, the output from the filter will be:
- the input value (filter OFF)
- an average of the last two readings (filter ON - setting 1)
- a running average of readings (filter ON - setting 2)

The coefficients can be selected individually for each channel.

Input alarms
The modules provide two configurable alarm levels for each channel—a high limit and a low one. See figure.

When an input value exceeds an alarm limit the appropriate alarm bit (high or low) is set in the channel status byte. In addition, the "new data" signal is set to allow the controller to collect the new alarm status information and the affected channel LED will flash.

Alarm deadband
The alarm deadband (not shown on the diagram) is fixed at 1%.

Dead zone
Each channel has a definable "dead zone". This is to reduce the need for the module to report to the BIM every minor change in input value. If the input value differs by the amount defined by the Dead Zone, or more, then the new value is reported, otherwise it is not. This reduces traffic on the internal bus which improves the system response time. If the Dead Zone value is set to zero (the default), then every input value read will set a 'New Data' flag, and be reported.

Open sensor detection
When configured to do so, the modules will detect an open circuit sensor and report it within 10 seconds. When this occurs a status bit is set in the module and the affected channel LED flashes. The detection options for the two module types are configurable as follows:

**THC and mV**
- Off, drive upscale or drive downscale

**RTD and resistance**
- Off or drive upscale

These choices can be made for each channel.

Module operating states

**Normal/Failsafe mode**
The THC and RTD modules support failsafe mode as defined in the earlier I/O module introductory section. When not in failsafe the module adopts Normal mode.

**Channel Active/Inactive**
A channel can be made active or inactive individually. When a channel is made inactive inputs will not be processed.

**Power-up conditions**
The module uses the following values when it powers up.

**Module mode**
- Normal (not "failsafe")

**Active/inactive**
- All channels power up in the active state.

**Alarms**
- All alarms are made inactive by having their values set to high or low extremes, as appropriate.

**Dead zone**
- 0 (i.e. all changes of A/D data are reported for an active channel)

**Software filtering**
- Disabled

**Channel type**
- Type K thermocouple or 3-wire RTD - Pt100

**O/C sensor**
- Off

**Visual indicators**

**Channel “status” LED (yellow)**

| On | Sensor loop OK |
| Off | Open circuit sensor and channel inactive |
| Flashing | Open circuit sensor and channel active OR Error condition |

Oct 2006
Analog Output Modules - 4-20mA

General
The 4–20 mA AO modules use a single D/A converter in a sample and hold configuration to drive each of the output channels. The processor sets the current value for each of the active channels once every 20ms. Any requested output values below 1mA are clamped to 1mA to ensure that the open-loop detection mechanism is always operable.

To verify that active output channels have current flowing to the field, the processor reads a hardware signal every time an output is written to the D/A converter. If the signal indicates “no current flowing”, i.e. < 1mA, for 50 consecutive scans (i.e. one second), an Open-Loop Detection failure is set for that channel.

HART® capability
AO modules “with HART” are compatible with all HART devices of protocol revision 5.0 or later. Each channel can communicate with a single HART instrument and supports HART communication with the wide range of HART valve positioners now available. HART universal command 3 can be used to gather up to 4 dynamic HART variables such as valve position, air pressure, etc., together with HART status variables. These are scanned by the BIM and may be communicated over the LAN for easy integration into the control system.

In addition, HART pass-through may be used for device configuration, calibration and advanced diagnostics.

Data format
The output data has a resolution of 12 bits but is stored as a 16-bit unsigned value. In this range 0 is equivalent to 0mA and 65,535 is equivalent to 25mA.

Module operating states
Failed safe mode
The module supports failsafe mode as defined in the earlier I/O module introductory section. When put in failsafe mode the output can be made to adopt one of the following options.

1) Use configured failsafe values
In this (default) mode, the module forces the output to a predefined percentage value. The default value is 0%.

2) Hold last value
In this mode the channel holds the last value it output.

When not in failsafe the module adopts Normal mode.

Channel Active/Inactive
Each channel can be made active or inactive individually. When a channel is made inactive the output is disabled, i.e. de-energised.

When a channel is made Active again the output is driven based upon the current configuration.

Default/Power-up conditions
The module uses predefined values when it powers up. The following parameters summarise the state of the module when it powers up.

Module mode:
Normal (not “failsafe”)

Active/inactive:
All channels power up in the Inactive state.

Visual indicator
Channel “Status” LED (yellow)
On the AO modules the yellow “Status” LED reacts in the following way to module conditions.

<table>
<thead>
<tr>
<th>On</th>
<th>Off</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field circuit OK</td>
<td>Open circuit field loop</td>
</tr>
<tr>
<td></td>
<td>and channel inactive</td>
</tr>
<tr>
<td>Flashing</td>
<td>Open circuit field loop</td>
</tr>
<tr>
<td></td>
<td>and channel active</td>
</tr>
<tr>
<td></td>
<td>OR Error condition</td>
</tr>
</tbody>
</table>

An error condition – i.e. a flashing LED – could be as the result of the loss of the HART communications signal.

HART® is a registered trademark of the HART Communications Foundation.
Discrete Input Modules

General
DI modules can accept up to 8, 16 or 32 discrete inputs, from dry contacts, NAMUR standard proximity detectors, or switched voltages, depending upon module type. The source voltage for field switching can be provided through the module or from an independent supply out in the field.

In operation, the input voltage is compared against a threshold voltage to create a ‘true’ or ‘false’ condition. If the inputs are from Zone 2/ Zone 1 or Zone 0 hazardous areas, the appropriate (2/1) module provides certified isolation for these signals. A pulse counter is also included which can count the number of input pulses for each of the channels.

Input filter
An input filter can be set individually for each channel to introduce a delay period that allows the input to settle to a stable value.

When switched off, the bandwidth of the DI input is 250Hz (100Hz for 2/1 modules). The timeout filter can introduce a timeout delay of between 2 and 512ms in 2ms steps for 2/2 modules and between 3 and 512ms in 3ms steps for 2/1 modules. Alternatively, preset values of “Fast” (22ms) or “Slow” (258ms) may be used.

Latch
Any channel input can be configured to be “real time” or latched. If the latch feature is enabled, the polarity can also be set so that an input signal that goes:
◆ high will be held high
◆ low will be held low
until the latch is released by a command from the controller. All channels are latched independently and can be cleared simultaneously, or independently, by a Write instruction to the module’s latch reset register. If controlled by a BIM this will occur automatically in 2 to 3 seconds.

Line fault detection (2/1 only)
When enabled, this will cause a flag to be set to indicate a short or open circuit fault.

Low-frequency pulse counter
The DI modules contain a continuously running 16-bit pulse counter that counts each low-frequency pulse received on the input. The maximum pulse rate, with the timeout filter switched off, depends upon the module selected; consult the individual data sheets for details. With the filter active, the maximum pulse rate will be determined by the timeout period used. In order to start a particular count the counter must be reset to zero by a host instruction. When the counter overflows (i.e. > 65,536 counts) it will restart from zero.

Module operating states
“Failsafe” mode
The module supports failsafe mode as defined in the earlier I/O module introductory section.

Channel Active/Inactive
Each channel can be made active or inactive individually. When a channel is made inactive:
◆ inputs are not processed—i.e. the last input value is held and not refreshed
◆ channel events are not generated
◆ the counter is not incremented

Power-up conditions
On power-up, or if a reset is executed, the configuration will automatically adopt predefined states:

Module mode:
Normal (not “failsafe”)

Channel types:
All latches and filters are off

Active/Inactive:
All channels power-up in the Active state

Visual indicators
Channel “Status” LED (yellow)
On the DI modules the yellow “Status” LED reacts in the following way to module conditions.

<table>
<thead>
<tr>
<th>Condition</th>
<th>LED State</th>
</tr>
</thead>
<tbody>
<tr>
<td>On</td>
<td>Channel input “high” or latched</td>
</tr>
<tr>
<td>Off</td>
<td>Channel input “low”</td>
</tr>
<tr>
<td>Flashing</td>
<td>Line fault detect (2/1 only)</td>
</tr>
</tbody>
</table>

Note: the LED may appear to flash when the input goes high and low repeatedly.
Discrete Output Modules

General
DO modules can provide up to 4 or 8 discrete outputs, depending upon module type. Continuous switched loads of up to 1A are directly achievable with these modules. Relays rated at 3, 6 and 10A are also available for switching larger load currents. Line fault detection is provided on the 2/1 modules for both open and short-circuit conditions.

Output Mode
The DO module outputs may be configured for one of three different types of output:

◆ Discrete
◆ Single pulse
◆ Continuous pulse

Discrete
The Bus Interface Module (BIM) signals an ON or OFF condition on demand.

Single Pulse
(See Notes 1 & 2)
This is an individual “single-shot” action, creating a single ON pulse of specified duration that occurs at a definable time. The pulse on-time can be varied between 2ms and 130s in increments of 2ms. If a new ON command (i.e. trigger) is given during the ON period the pulse will restart. If a new pulse width is supplied during the ON period, it will not take effect until the next ON period. A pulse can experience a small amount of time differ that depends upon the amount of Railbus activity. This can be ± 1% of the pulse width or ± 3.5ms, whichever is the longer.

Continuous Pulse
(see Notes 2, 3 & 4)
This type of output provides a continuous pulse train that is defined by the pulse on-time, and the pulse period (the time between the start of each ON time). The pulse period is configurable to any value between 4 ms and 130,000ms in 2ms steps. The pulse on-time is the same as for the momentary action described above. The on-time must not exceed the setting for the pulse period. (See also the above note regarding AC modules.) Pulses can experience a small amount of time differ that depends upon the amount of Railbus activity. This can be ± 1% of the pulse period, or ± 3.5ms, whichever is the longer. Continuous pulse operation has two distinct modes—static and dynamic. When in static mode, the pulse parameters are cleared from memory when the channel is made inactive; in dynamic mode the values are retained for use when the channel is made active once again.

Line Fault detection
(2/1 only)
When enabled, this will cause a flag to be set to indicate a short or open circuit fault even when channel output is in OFF state.

Module operating states
Failsafe mode
The module supports failsafe mode as defined in the earlier I/O module introductory section, with the following two additions:

1) Channel using “Configured failsafe values”
In this mode, the module will force the outputs to predefined levels—defined on a per channel basis.

On entering “failsafe”:

a) If channel is in Static mode of operation:
   Pulse mode is disabled and the channel is configured as a latched output and is driven to its failsafe value.

b) If channel is in Dynamic mode of operation:
   If in single pulse (momentary) mode, the output is driven to its failsafe value.

On leaving failsafe:

Channel will adopt the mode defined below for a channel going from inactive to active state

2) Channel using “Hold last value”
If the module goes into failsafe during a single pulse, it is allowed to complete the pulse before adopting the failsafe state. A latched [discrete] output will remain at its current value.

Channel Active/ Inactive
Each channel can be made active or inactive individually.

When a channel is made inactive the output is turned OFF (i.e. de-energised).

When a channel changes from inactive to active the following situations apply:

a) If channel is in Static mode of operation:
   It becomes a latched output and will remain so until reconfigured by the BIM.

b) If channel is in Dynamic mode of operation:
   The channel will resume operation with its previous configuration and output.

Power-up conditions
On power-up, or if a reset is executed, the configuration will automatically adopt predefined states:

Module mode:
Normal (not failsafe)

Channel types
All channels are configured as Discrete outputs

Active/Inactive
All channels power-up in the Inactive state

Line fault detection (2/1 only)
Disabled on all channels

Visual indicators
Channel “Status” LED (yellow)
On the DO modules the yellow “Status” LED reacts in the following way to module conditions.

ON   Field circuit OK
OFF  Open circuit field loop and channel inactive
Flashing  Open circuit field loop and channel active
OR Error condition

Note: the LED may appear to be flashing when input goes high and low repeatedly.

Notes:
1. This action is only available in Static mode.
2. AC modules will react differently to the on-time length and trigger time. The module can only be triggered ON during a zero crossing of the AC waveform; similarly, the module can only switch OFF at a zero crossing point. The minimum on-time is therefore restricted to half the total period of a regular waveform.
3. Continuous pulse operation is supported only by Version 2 models of BIMs 8502 and 8505.
4. On 2/2 modules, this action is only available in Static mode.
Pulse Input Modules - 2-channel pulse/quadrature

General
These modules are designed to meet the requirements of a very wide range of mechanical positioning and flow applications. When used separately, the two input channels will accept pulse inputs to measure:

- frequency
- acceleration / rate
- number of pulses (i.e. counter)

When combined, they provide:

- rotational position and direction data from quadrature encoding devices

In addition, the module has two digital outputs and one digital input to gate (start/stop) the channel 1 internal counter.

Pulse inputs
Pulse inputs can come from a range of sensors having different amplitudes, trigger levels and input impedance requirements. Inputs types accepted are:

- Proximity detectors (NAMUR/DIN19234)
- Current inputs
- Voltage inputs
- Switch / electro-mechanical inputs

Threshold levels for the current and voltage input can be set to suit the application.

Dynamic data
Several values are calculated, for each channel, from the signal pulses received.

Frequency
This is calculated by measuring the time interval between pulses. An average is calculated over a period (20ms to 200s) defined by the user. The time interval is measured from the edge of one pulse to the same edge of the next pulse. The polarity (rising or falling edge) can be configured. The default is the rising edge.

There are ten frequency measurement ranges. They start at 0 – 100Hz and rise in ratios of 3, 5 and 10. However, the maximum frequency of the module is 50kHz, so any values in the 100kHz range that exceed this should be considered as “out-of-range”.

Acceleration
This is calculated from the difference in frequency from the start to the end of the sample period. A positive value indicates an increase in the rate of frequency and a negative value is a decrease in the rate.

Counting
Each channel has a 32-bit counter that indicates the total number of input pulses since the counter was reset. The counter on Channel 1 can be started and stopped by the control gate input and both channel counters can be started, stopped and reset by BIM commands.

Counters can be configured to count up (the default) or down. If the quadrature calculation is enabled (see below) then the configured counter direction is ignored; instead counter direction is determined by the quadrature value (up for forward, down for reverse).

A counter preset value can be configured by a BIM command which also resets the counter. On reaching the preset count value an event is triggered which can also be passed to the channel’s digital output. This state is cleared by resetting the counter or assigning a new preset value.

Quadrature (rotation direction)

The second channel can be used to determine direction of rotation by comparing the phase of its input pulse with that of the first channel.

If the Ch 2 input is in a low state on the rising edge of the Ch 1 pulse then the rotation is forward (Fig 1a). If the Ch 2 input is high on the rising edge of the Ch 1 pulse then the rotation is backward (Fig 1b).

Filtering
The module has a hardware filter which can be used to minimise the effects of contact bounce. The available settings are 1, 5, 20 kHz and Off.

Alarms
High / Low alarms
High and low alarms can be configured for each channel. When the input value goes beyond an alarm limit, channel and module flags are set, the channel LED flashes and, if configured, the channel’s digital output state will change.

Acceleration alarms
An acceleration alarm limit can also be set. If the limit is exceeded the actions taken are identical to those for the high/low alarms.

Alarm deadband
A deadband can be specified for the high, low and acceleration alarms. This provides hysteresis to avoid repetitive alarms in noisy signal environments.

Missing pulse alarm
Both channels can be configured to detect a “missing pulse”. If no input pulse is detected for a defined time period an alarm is signalled in the same way as the high/low alarms.

The alarm is cleared on receipt of a pulse or on reconfiguration of the alarm. The time period is restarted after each sample period in which at least one pulse occurs.

Line Fault Detect
Each channel can be configured to sense an open or a short circuit condition on inputs. On detection, the actions are those for the high/low alarms.

On fault, the BIM can: report the frequency value as being at the top or the bottom of the range, freeze the counter, set the acceleration to zero; depending on how the BIM is configured.

Control data
The host can write data to control each channel counter. The available parameters are: start, stop, set, reset and preset value.

Digital outputs
Both digital output channels can reflect the status of the inputs by indicating:

- frequency or acceleration alarm
- counter preset value reached while the main channel can also output:
  - quadrature forward or reverse signal
  - scaled retransmission (a “divided by N” version of the input)
Sequence of Events Module

General
Sequence of Events (SOE) recording is used to capture each of the events that occur during a shut-down or trip sequence. Such information is invaluable in determining the cause of such an event.

In the course of such a sequence, events often take place very rapidly throughout the process area. The SOE module and its companion Event Logger software provide a means for recording these events and, because highly accurate time stamps are used, the precise order in which they occurred can be determined.

8127-DI-SE is a 32-channel SOE module designed to monitor the status of digital inputs and to record any state changes to an internal buffer. Each state change is time-stamped to the nearest ¼ millisecond. The contents of the buffer are periodically transferred to the controller. Each module has a buffer capacity of 512 events, which it can transfer to the controller in about 500ms, consequently, approximately 1000 events per second can be captured.

SOE Event Logger software
The Event Logger software is provided with all MOST Workbench products. This software collects time-stamped data from the controller and merges information from multiple controllers into a chronological journal before exporting the data to standard event viewers, such as Wonderware’s InTouch. Other data export options include OPC Event format or a basic text file.

The event logging software can also be used to record events other than SOE activity. For example, it can be used to record changes of state in the controller, such as when control is switched between master and slave controllers. It could be used to record when an analogue limit has been exceeded or when a digital module changes state. This powerful capability enables all critical events in the process to be recorded, providing a complete picture for further analysis.

Benefits
◆ More accurate event sequencing
All logged events are time stamped using 1/8ms resolution for 1/4ms accuracy. The controller uses Network Time Protocol (NTP) to assure time stamp accuracy between modules across the network. When using NTP, all controllers are synchronized across the network to ± 3ms, resulting in very accurate event sequencing.

◆ Identify problems quickly
Each SOE input has a unique line-fault detection feature to identify a short circuit or open circuit on each input. Problems are identified immediately for correction, saving considerable maintenance time.

◆ Simplifies field wiring
Field circuits are module-powered, eliminating the need to “daisy chain” power supply wiring at field terminals. Field circuits are powered with a minimum of wiring and termination effort.

◆ Locate SOE modules in the process
Like the rest of the control platform, SOE modules can be located in your process, next to your field devices in order to record events locally on a more reliable & timely basis.

◆ Easy integration with other applications
Events from multiple modules and controllers can be stored in a single SOE Event Logger providing an easy interface to other applications.

32 Discrete Channels
The 8127-DI-SE has 32 discrete input channels and each channel can be configured as either an SOE input or a standard discrete input. SOE input signals can also be used as standard discrete inputs as part of any control strategy. Each module can buffer up to 512 events.

Events are communicated to the controller, which uses Network Time Protocol (NTP) to accurately convert the module’s time stamp data to real time. The SOE Event Logger, which constantly polls the controller for new events (typically every 2 seconds), collects each time-stamped event. After recording the events, the Event Logger sends an acknowledgement to the controller, which then clears the event from its memory.

The controller retains all events until all active Event Loggers acknowledge them. Multiple Event Loggers can be used for redundant event recording and will always have consistent time stamps since all events are time stamped by the controller.

Events are displayed by the SOE Data Retrieval Client. Following data retrieval, the user can choose to email the SOE data, Print it or Save it to a CSV file. The user can create a custom report easily by selecting the columns to be viewed and printed.
8-channel Analog Input

**4–20mA with HART®**

- 8 single-ended 4–20mA input channels
- non-incendive field circuits
- HART pass-through
- HART variable and status reporting
- 2- or 4-wire transmitters
- open and short circuit detection
- 24V dc bussed field power required

**MODULE SPECIFICATION**

See also System Specification

**INPUTS**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of channels</td>
<td>8, single-ended</td>
</tr>
<tr>
<td>Nominal signal range (span)</td>
<td>4 to 20mA</td>
</tr>
<tr>
<td>Full signal range</td>
<td>1 to 23mA</td>
</tr>
<tr>
<td>Line fault detection</td>
<td></td>
</tr>
<tr>
<td>Short circuit current</td>
<td>&gt; 23.5mA</td>
</tr>
<tr>
<td>Open circuit current</td>
<td>&lt; 0.5mA</td>
</tr>
<tr>
<td>Output voltage (at 20mA)</td>
<td>13.5V (min.)</td>
</tr>
<tr>
<td>Output current</td>
<td>32mA (max.)</td>
</tr>
<tr>
<td>Accuracy (over temp range)</td>
<td>± 0.1% of span</td>
</tr>
<tr>
<td>Resolution</td>
<td>16 bits</td>
</tr>
<tr>
<td>Repeatability</td>
<td>0.05% of span</td>
</tr>
<tr>
<td>Isolation</td>
<td>none</td>
</tr>
</tbody>
</table>

**CONFIGURABLE PARAMETERS**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarms</td>
<td>high, high-high, low and low-low</td>
</tr>
<tr>
<td>Alarm deadband (hysteresis)</td>
<td>user defined value</td>
</tr>
<tr>
<td>Input filter time constant</td>
<td>user defined value</td>
</tr>
<tr>
<td>Input dead zone</td>
<td>user defined value</td>
</tr>
<tr>
<td>Drive on failsafe</td>
<td>disabled /upscale /downscale</td>
</tr>
<tr>
<td>Channel status</td>
<td>active /inactive</td>
</tr>
<tr>
<td>HART variable and status reporting</td>
<td>enable /disable</td>
</tr>
</tbody>
</table>

**RESPONSE TIME**

<table>
<thead>
<tr>
<th>Mode</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>4–20mA mode</td>
<td>27ms (max.)</td>
</tr>
<tr>
<td>HART mode</td>
<td>0.75s per channel</td>
</tr>
</tbody>
</table>

**SAFETY**

FM non-incendive field wiring parameters (each channel):

\[ V_{oc} = 28.7V; I_{lc} = 33mA; C_a = 0.17\mu F; L_a = 11.0\mu H \]

**POWER SUPPLIES**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Railbus (12V) current</td>
<td>100mA (typ.)</td>
</tr>
<tr>
<td></td>
<td>150mA (max.)</td>
</tr>
<tr>
<td>Bussed Field Power</td>
<td>2-wire 1x 300mA (max.)</td>
</tr>
<tr>
<td>(at 24V dc ±10%)</td>
<td>4-wire 1x 60mA (max.)</td>
</tr>
</tbody>
</table>

HART® is a registered trademark of the HART Communication Foundation.

**FIELD TERMINALS (2-WIRE TX)**

See also the 8618-HFMT field terminal for custom termination options.
8-channel Analog Input

4–20mA

- 8 single-ended 4–20mA input channels
- non-incendive field circuits
- 4–20mA
- 2- or 4-wire transmitters
- open and short circuit detection
- 24V dc bussed field power required

MODULE SPECIFICATION

See also System Specification

INPUTS

Number of channels........................................8, single-ended
Nominal signal range (span)..........................4 to 20mA
Full signal range........................................1 to 23mA
Out of range alarm
Lower threshold.............................................> 23.5mA
Upper threshold..........................................< 0.5mA
Output voltage (@ 20mA)..............................13.5V (min.)
Output current............................................32mA (max.)
Accuracy (over temp range)..........................± 0.1% of span
Resolution................................................16 bits
Repeatability.............................................0.05% of span
Isolation (any channel to Railbus).................100V ac
(between channels).....................................none

CONFIGURABLE PARAMETERS

Alarms.............................................high, high-high, low and low-low
Alarm deadband (hysteresis).........................user defined value
Input filter time constant..........................user defined value
Input dead zone....................................user defined value
Drive on failsafe.................................disabled /upscale /downscale
Channel status....................................active /inactive

RESPONSE TIME

Signal change to availability on Railbus ..........27ms (max.)

SAFETY

FM non-incendive field wiring parameters (each channel).

\[ V_{oc} = 28.7V; I_{oc} = 33mA; C_a = 0.17\mu F; L_a = 11.0mH \]

POWER SUPPLIES

Railbus (12V) current................................100mA (typ.)
..................................................150mA (max.)
Bussed Field Power 2-wire Tx....................300mA (max.)
(@ 24V dc ± 10%) 4-wire Tx.....................60mA (max.)

FIELD TERMINALS (2-WIRE TX)

Field wiring Recommended Compatible Field Terminal Field Terminal

General Purpose 8602-FTST Standard 8604-FTFU Fused

Class 1, Div 2 or Zone 2 hazardous area 8601-FIIN 8603-FIIN Non-incendive Non-incendive

See also the 8618-FTMT field terminal for custom termination options.
8-channel Analog Input

1–5V

- 8 single-ended input channels
- non-incendive field circuits
- 1–5V inputs
- open circuit and short circuit detection
- 24V dc bussed field power required

**MODULE SPECIFICATION**

**INPUTS**

- Number of channels: 8, single-ended
- Nominal signal range (span): 1 to 5V
- Full signal range: 0.19 to 5.64V
- Input impedance: 2MΩ
- Out of range alarm:
  - Lower threshold: < 0.19V
  - Upper threshold: > 5.64V
- Accuracy (over temp range): ± 0.1% of span
- Resolution: 16 bits
- Repeatability: 0.05% of span
- Isolation (any channel to Railbus): 100V ac (between channels): none

**CONFIGURABLE PARAMETERS**

- Alarms: high, high-high, low and low-low
- Alarm deadband (hysteresis): user defined value
- Input filter time constant: user defined value
- Input dead zone: user defined value
- Drive on fail safe: disabled / upscale / downscale
- Channel status: active / inactive

**RESPONSE TIME**

- Signal change to availability on Railbus: 27ms (max.)

**SAFETY**

- FM non-incendive field wiring parameters (each channel):
  - Voc = 28.7V; Ic = 33mA; C = 0.17µF; L = 11.0mH

**POWER SUPPLIES**

- Railbus (12V) current:
  - 100mA (typ.)
  - 150mA (max.)
- Bussed Field Power:
  - 60mA (max.) at 24V dc ± 10%

**MECHANICAL**

- Module Key Code: A1
- Module width: 42mm
- Weight: 200g

**FIELD TERMINALS**

<table>
<thead>
<tr>
<th>Field wiring</th>
<th>Recommended Field Terminal</th>
<th>Compatible Field Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Purpose</td>
<td>8615-FT-4W</td>
<td>–</td>
</tr>
<tr>
<td>Class 1, Div 2 or Zone 2 hazardous area</td>
<td>8615-FT-4W</td>
<td>–</td>
</tr>
</tbody>
</table>

See also the 8618-FTMT field terminal for custom termination options.
4-channel Analog Input

Thermocouple and mV

- four thermocouple or mV* input channels
- cold junction compensation

MODULE SPECIFICATION
See also System Specification

INPUTS

<table>
<thead>
<tr>
<th>Number of channels</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>THCs types</td>
<td>B,E,J,K,N,R,S, or T to EN 60584-2, IEC584-2, BS4937; W3 and W5.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input type</th>
<th>Range</th>
<th>Overall accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>mV</td>
<td>0 to +120mV ±0.1% of span (+10 to +40°C)</td>
<td>±0.2% of span (+40 to +70°C)</td>
</tr>
<tr>
<td>THC: B</td>
<td>0 to +1820°C</td>
<td>≤600°C: 1.5°C + BTA ≥600°C: 0.45°C + BTA</td>
</tr>
<tr>
<td>E</td>
<td>-270 to +1000°C</td>
<td>0.3°C + BTA</td>
</tr>
<tr>
<td>J</td>
<td>-210 to +1200°C</td>
<td>0.3°C + BTA</td>
</tr>
<tr>
<td>K</td>
<td>-270 to +1372°C</td>
<td>0.3°C + BTA</td>
</tr>
<tr>
<td>N</td>
<td>-270 to +1300°C</td>
<td>0.3°C + BTA</td>
</tr>
<tr>
<td>R</td>
<td>-50 to +1767°C</td>
<td>0.6°C + BTA</td>
</tr>
<tr>
<td>S</td>
<td>-50 to +1767°C</td>
<td>0.4°C + BTA</td>
</tr>
<tr>
<td>T</td>
<td>-270 to +400°C</td>
<td>0.3°C + BTA</td>
</tr>
<tr>
<td>W3</td>
<td>0 to +2320°C</td>
<td>0.6°C + BTA</td>
</tr>
<tr>
<td>W5</td>
<td>0 to +2320°C</td>
<td>0.4°C + BTA</td>
</tr>
</tbody>
</table>

Basic THC accuracy (BTA)..............25°C ±0.05% of THC span +10°C to +40°C ±0.1% of THC span -40°C to +70°C ±0.3% of THC span

Cold junction compensation error† ≤1°C (-40 to +70°C)

Resolution..............................15 bits plus sign bit

Common mode rejection...............> 80dB @ 50/60Hz

Series mode rejection...............> 40dB @ 50/60Hz

Maximum input voltage.................±4.0V

Common mode voltage between channels...........................................................................±4.5V (max.)

Isolation (any channel to Railbus).........250V ac rms

Open circuit bleed current...............±0.5µA (nom.)

CONFIGURABLE PARAMETERS

| Sensor type | user selectable |
| Input dead zone (hysteresis) | user defined value |
| Selectable input filtering | off /2 reading avg./running avg. |
| Drive on open circuit fault | disabled /upscale /downscale |
| Alarms | high and low |
| Channel status | active/ inactive |

RESPONSE TIMES

Signal change to availability on Railbus..................................................120ms (min.)

O/C sensor detection.................................................420ms (max.)

SAFETY

FM non-incendive field wiring parameters [each channel] .

Voc = 10.5V; Isc = 3.6mA; C_a = 14.9µF; L_a = 1000mH

POWER SUPPLIES

Railbus (12V) current.............................................150mA (typ.)

Bussed Field Power.................................not required

MECHANICAL

| Module Key Code | C1 |
| Module width | 42mm |
| Weight | 200g |

FIELD TERMINAL

<table>
<thead>
<tr>
<th>Field wiring</th>
<th>Recommended Field Terminal</th>
<th>Compatible Field Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>General purpose</td>
<td>8605-FT-TC THC</td>
<td>–</td>
</tr>
<tr>
<td>Class 1, Div 2</td>
<td>8605-FT-TC THC</td>
<td>–</td>
</tr>
</tbody>
</table>

* Consult MTL for availability
† C/J compensation located in recommended field terminal
4-channel Analog Input

RTD and Ω

- 4 RTD or resistance* source inputs
- function defined by configuration
- 2-, 3- or 4-wire RTD types accommodated

MODULE SPECIFICATION
See also System Specification

INPUTS
Number of channels ...........................................................4
RTD input (2, 3, or 4 wire) ..................................................Pi100 to BS1904/DIN43760/IEC 75
.................................................................................Ni120; Pi100 to JIS C1604: 1989
Input range

<table>
<thead>
<tr>
<th>Input type</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistance</td>
<td>Consult MTL for availability</td>
</tr>
<tr>
<td>RTDs: Pi100</td>
<td>– 200 to + 850 °C</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Ni120</td>
<td>– 80 to + 320 °C</td>
</tr>
</tbody>
</table>

Input resistance range (span) ........................................0 to 500Ω
Accuracy (% of span) ..................................................0.

Tamb (RTD & Ω inputs)

<table>
<thead>
<tr>
<th>Tamb</th>
<th>(RTD &amp; Ω inputs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25°C</td>
<td>± 0.05%</td>
</tr>
<tr>
<td>+10 to + 40°C</td>
<td>± 0.1%</td>
</tr>
<tr>
<td>– 40 to + 70°C</td>
<td>± 0.2%</td>
</tr>
</tbody>
</table>

RTD excitation current ............................................200µA (nom.)
Resolution ................................................................15 bits plus sign bit
Common mode rejection .............................................> 80dB @ 50/60 Hz
Series mode rejection ...............................................> 40dB @ 50/60 Hz
Isolation (any channel to Railbus)..............................250V ac rms
Open circuit bleed current .......................................0.5µA (nom.)

CONFIGURABLE PARAMETERS

Sensor type .................................................................user selection
Input deadzone ............................................................user defined value
Selectable input filtering ............................................off /2-reading avg./running avg.
Drive on open circuit fault ............................................disabled /upscale
Alarms ...............................................................high and low
Channel status ......................................................active/ inactive
Offset (2-wire RTD mode) ............................................user defined value

* Consult MTL for availability

RESPONSE TIMES
Signal change to availability on Railbus
..................................................................................180ms (min.)
.............................................................................840ms (max.)
O/C sensor detection ..................................................≤ 10s

SAFETY
FM non-incendive field wiring parameters (each channel) .
..............................................................................Voc = 10.5V; Isc = 3.6mA; Cφ = 14.9µF; Lφ = 1000mH

POWER SUPPLIES
Railbus (12V) current ..............................................150mA (typ.)
...........................................................................200mA (max.)
Bussed Field Power ..................................................not required

MECHANICAL
Module Key Code .........................................................C3
Module width .............................................................42mm
Weight .................................................................200g

FIELD TERMINAL

<table>
<thead>
<tr>
<th>Field wiring</th>
<th>Recommended Field Terminal</th>
<th>Compatible Field Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>General purpose</td>
<td>8606-FT-RT RTD</td>
<td>–</td>
</tr>
</tbody>
</table>

Class 1, Div 2 or Zone 2 hazardous areas

8606-FT-RT RTD
–
8-channel Analog Output

4–20mA with HART®

- 8 single-ended 4–20mA output channels
- non-incendive field circuits
- HART pass-through
- HART variable and status reporting
- valve positioners and remote indicators, etc.
- open circuit detection on each channel
- 24V dc bussed field power required

**MODULE SPECIFICATION**

*See also System Specification*

**INPUTS**
- Number of channels: 8, single-ended
- Nominal signal range (span): 4 to 20mA
- Full signal range: 1 to 23mA
- Open loop detection threshold: 0.7 ± 0.25mA
- Output compliance: 20mA at 21.6V dc supply ([into 700Ω load])
- Accuracy (over temp range): ± 0.25% of span
- Resolution: 12 bits
- Isolation (any channel to Railbus): 100V ac (between channels): none

**CONFIGURABLE PARAMETERS**
- Initialisation state: predefined value
- Drive on fail-safe: predefined value/last value
- Channel status: active /inactive
- HART variable and status reporting: enable /disable

**RESPONSE TIME**

Signal change to availability on Railbus
- 4–20mA mode: 25ms (max.)
- HART mode: 0.75s per channel

**SAFETY**

FM non-incendive field wiring parameters (each channel): 
- \( V_{oc} = 28.7V; I_{sc} = 33mA; C_a = 0.17\mu F; L_a = 11.0mH \)

**POWER SUPPLIES**

- Railbus (12V) current: 100mA (typ.)
- Bussed Field Power: 300mA (max.) at 24V dc ± 10%

**MECHANICAL**

- Module Key Code: A4
- Module width: 42mm
- Weight: 200g

**FIELD TERMINALS**

<table>
<thead>
<tr>
<th>Field wiring</th>
<th>Recommended Field Terminal</th>
<th>Compatible Field Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Purpose</td>
<td>8602-FTST</td>
<td>8604-FTFU</td>
</tr>
<tr>
<td>Class 1, Div 2 or Zone 2 hazardous area</td>
<td>8601-FTNI</td>
<td>8603-FTFU</td>
</tr>
</tbody>
</table>

©HART is a registered trademark of the HART Communication Foundation.

See also the 8618-FTMT field terminal for custom termination options.
8-channel Analog Output

4–20mA

- 8 single-ended outputs
- 4–20mA
- for I/P converters and remote indicators, etc
- open circuit detection is provided on each channel
- 24V dc bussed field power required

MODULE SPECIFICATION
See also System Specification

OUTPUTS
Number of channels .......................................8, single-ended
Nominal signal range (span) ...............................4 to 20mA
Full signal output range .......................................1 to 23mA
Open loop detection threshold .......................0.7 ± 0.25mA
Output compliance ...............................................20mA at 21.6V dc supply (into 700 Ω load)
Accuracy (over temp range) ..............................± 0.25% of span
Output ripple ..................................................< 0.02% of span
Resolution .........................................................12 bits
Isolation any channel to Railbus .........................100V ac

CONFIGURABLE PARAMETERS
Initialisation state .............................................predefined value
Drive on fail-safe .............................................predefined value / last value
Channel status ................................................active / inactive

RESPONSE TIME
Response time
From Railbus command to output change ..............25ms (max.)

SAFETY
FM non-incendive field wiring parameters (each channel) .
.........................................................V_{oc} = 28.7V; I_{sc} = 33mA; C_a = 0.17µF; L_a = 11.0mH

POWER SUPPLIES
Railbus (12V) current ........................................100mA (typ.)
.........................................................150mA (max.)
Bussed Field Power ........................................300mA (max.) @ 24V dc ±10%
Quiescent current ...........................................60mA

MECHANICAL
Module Key Code .............................................A4
Module width ..................................................42mm
Weight .........................................................200g

FIELD TERMINAL

<table>
<thead>
<tr>
<th>Field wiring</th>
<th>Recommended Field Terminal</th>
<th>Compatible Field Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>General purpose</td>
<td>8602-FT-ST</td>
<td>8604-FT-FU</td>
</tr>
<tr>
<td>Class 1, Div 2 or Zone 2 hazardous areas</td>
<td>8601-FT-NI</td>
<td>8603-FT-FU</td>
</tr>
</tbody>
</table>

See also the 8618-FTMT field terminal for custom termination options.
8-channel Discrete Input

24V dc, isolated, sinking

- 8 discrete isolated inputs
- 24V dc field voltage sources
- user definable input threshold
- pulse counting option

MODULE SPECIFICATION

See also System Specification

INPUTS

Number of channels ...........................................................8
OFF voltage ..........................................................................< 3.2V dc
ON voltage .........................................................................> 11V dc
Wetting current .................................................................6.3mA (nom.) @ 24V dc
Minimum pulse width detected .........................................3ms
Maximum switching frequency (no-filtering) .................200Hz
Maximum voltage
Input ..............................................................................30V dc
Reverse input .................................................................> 25V dc

CONFIGURABLE PARAMETERS

Selectable input filter ..................................................fast, slow or user defined
(User defined permits 0 to 512ms values in 2ms steps)
Latch inputs ........................................................................enable / disable
Latch polarity .................................................................latch on high / latch on low
Pulse counting .................................................................enable / disable

RESPONSE TIME

I/O response time
Field event to new data available on Railbus .................3ms (max.)

SAFETY

FM non-incendive field wiring parameters (each channel)
V_{max} = 30V; I_{max} = 100mA; C_i = 0\mu F; L_i = 0mH

POWER SUPPLIES

Railbus (12V) current .........................................................35mA (typ.)
 ......................................................................................55mA (max.)
Bussed Field Power ............................................................not required

MECHANICAL

Module Key Code ..............................................................B2
Module width ....................................................................42mm
Weight ...........................................................................170g

FIELD TERMINAL

<table>
<thead>
<tr>
<th>Field wiring</th>
<th>Recommended Field Terminal</th>
<th>Compatible Field Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>General purpose</td>
<td>8602-FT-ST Standard †</td>
<td>8604-FTFU Fused</td>
</tr>
<tr>
<td>Class 1, Div 2 or Zone 2 hazardous areas</td>
<td>8610-FT-NA Non-arcing †</td>
<td>8611-FTFU Non-arcing Fused</td>
</tr>
</tbody>
</table>

See also the 8618-FTMT field terminal for custom termination options.

† External fusing of the Field Power supply is recommended in order to protect the field wiring.
16-channel Discrete Input

24V dc, isolated, sinking

- 16 input channels
- 24V dc field voltage sources
- individually isolated channels
- user definable input threshold
- pulse counting option

MODULE SPECIFICATION
See also System Specification

INPUTS
Number of channels .........................................................16
OFF voltage .............................................................< 3.4V dc
ON voltage .............................................................> 11V dc
Wetting current .......................................................2.8mA (nom.) @ 24V dc
Minimum pulse width detected .....................................5ms
Max input freq in pulse counting mode (no-debounce) .........................................................100Hz

Maximum voltage
Input .................................................................30V dc
Reverse input ......................................................- 25V dc
Isolation (Any Channel to railbus) ..........................250V ac
Isolation (channel to channel) ................................150V peak

CONFIGURABLE PARAMETERS
Selectable input filter ........................................fast, slow or user defined
(User defined permits 0 to 512ms values in 2ms steps)
Latch inputs ..........................................................enable/disable
Latch polarity ......................................................latch on high / latch on low
Pulse counting ..........................................................enable/disable

RESPONSE TIME
I/O response time .....................................................5ms (max.)
(Field event to new data available on Railbus)

SAFETY
FM non-incendive field wiring parameters (each channel)
.................................................................V_max = 30V; I_max = 100mA; C_i = 0µF; L_i = 0mH

POWER SUPPLIES
Railbus (12V) current .................................................90mA (typ.)
Bussed Field Power ..................................................not required

MECHANICAL
Module Key Code ......................................................E2
Module width .............................................................42mm
Weight .................................................................210g

FIELD TERMINAL

<table>
<thead>
<tr>
<th>Field wiring</th>
<th>Recommended Field Terminal</th>
<th>Compatible Field Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>General purpose</td>
<td>8617-FT-NI † 16/30 channel DI</td>
<td>8619-FT-MT † 44-pin MTA</td>
</tr>
<tr>
<td>Class 1, Div 2 or Zone 2 hazardous areas</td>
<td>8617-FT-NI † 16/30 channel DI</td>
<td>8619-FT-MT † 44-pin MTA</td>
</tr>
</tbody>
</table>

† External fusing of the Field Power supply is recommended in order to protect the field wiring.
8-channel Discrete Input

24V dc, non-isolated, module powered

- 8 discrete inputs
- for dry contact switches
- pulse counting option
- 24V dc bussed field power required

MODULE SPECIFICATION
See also System Specification

INPUTS
Number of channels .................................................. 8
OFF current ......................................................... < 0.69mA
ON current ........................................................ > 2.24mA
Wetting current ..................................................... 5mA (typ.)
Minimum pulse width detected ............................ 3ms
Maximum switching frequency (no-filtering) ............ 200Hz
Isolation (any channel to Railbus) ......................... 250V ac

CONFIGURABLE PARAMETERS
Selectable input filter .......................... fast, slow or user defined
(User defined permits 0 to 512ms values in 2ms steps)
Latch inputs .................................................. enable / disable
Latch polarity ................................................ latch on high / latch on low
Pulse counting .................................................. enable / disable

RESPONSE TIME
I/O response time ........................................... 3ms (max.)
(Field event to new data available on Railbus)

FIELD TERMINAL
See also the 8618-FT-MT field terminal for custom termination options.

SAFETY
FM non-incendive field wiring parameters (each channel)
.................................................\(V_{oc} = 30V; I_{lc} = 15.2mA; C_a = 0.12\mu F; L_a = 151mH\)

POWER SUPPLIES
Railbus (12V) current ........................................... 35mA (typ.)
......................................................... 55mA (max.)
Bussed Field Power ...................................... 40mA, @ 18—30V dc

MECHANICAL
Module Key Code .............................................. B1
Module width .................................................. 42mm
Weight ......................................................... 170g

FIELD TERMINAL

<table>
<thead>
<tr>
<th>Field wiring</th>
<th>Recommended Field Terminal</th>
<th>Compatible Field Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>General purpose</td>
<td>8602-FT-ST</td>
<td>8604-FFFU</td>
</tr>
<tr>
<td></td>
<td>Standard †</td>
<td>Fused</td>
</tr>
<tr>
<td>Class 1, Div 2</td>
<td>8601-FT-NI</td>
<td>8603-FFFU</td>
</tr>
<tr>
<td>or Zone 2</td>
<td>Non-incendive †</td>
<td>Non-incendive, fused</td>
</tr>
<tr>
<td>hazardous areas</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

† External fusing of the field power supply is recommended in order to protect the field wiring.

†† External fusing of the field power supply is recommended in order to protect the field wiring.
16-channel Discrete Input

24V dc, non-isolated, module-powered

- 16 input channels
- for dry contact switches
- pulse counting option
- 24V dc bussed field power required

MODULE SPECIFICATION
See also System Specification

INPUTS
Number of channels .........................................................16
OFF current .................................................................< 0.3mA
ON current ...............................................................> 1.2mA
Wetting current .........................................................2.8mA (typ.)
Minimum pulse width detected ......................................5ms
Max input freq in pulse counting mode (no-debounce) ....100Hz
Isolation (any channel to Railbus) ...........................250V dc

CONFIGURABLE PARAMETERS
Selectable input filter ..............................................fast, slow or user defined
(Latch inputs) ..............................................................enable /disable
Latch polarity ..................................................latch on high / latch on low
Pulse counting ........................................................enable /disable

RESPONSE TIME
I/O response time .............................................................5ms (max.)
(Field event to new data available on Railbus)

SAFETY
FM non-incendive field wiring parameters (each channel) ..............................................V_{oc} = 30V; I_{sc} = 3.5mA; C_{a} = 0.12\mu F; L_{a} = 1000mH

POWER SUPPLIES
Railbus (12V) current ....................................................90mA (typ.)
.............................................................................135mA (max.)
Bussed Field Power ...........................................60mA, @ 18–30V dc

MECHANICAL
Module Key Code ..............................................................E1
Module width ...............................................................42mm
Weight .................................................................210g

FIELD TERMINAL

<table>
<thead>
<tr>
<th>Field wiring</th>
<th>Recommended Field Terminal</th>
<th>Compatible Field Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>General purpose</td>
<td>8617-FT-NI</td>
<td>8619-FT-MT</td>
</tr>
<tr>
<td>16/30 channel DI</td>
<td>44-pin MTA</td>
<td></td>
</tr>
<tr>
<td>Class 1, Div 2 or Zone 2 hazardous areas</td>
<td>8617-FT-NI</td>
<td>8619-FT-MT</td>
</tr>
<tr>
<td>16/30 channel DI</td>
<td>44-pin MTA</td>
<td></td>
</tr>
</tbody>
</table>
24V dc, non-isolated, module-powered

◆ up to 32 input channels
◆ for dry contact switches or proximity detectors
◆ pulse counting and latching option
◆ 24V dc bussed field power required
◆ line fault detection on all inputs

MODULE SPECIFICATION
See also System Specification

INPUT
Number of channels ......................................................... 32
OFF current ...................................................................... < 1.2mA
ON current ....................................................................... > 2.1mA
Short circuit current ...................................................... 8.6mA (typ.)
Output resistance ........................................................... 950Ω (typ.)
Open circuit output voltage ............................................. 8.2V dc (typ.)
Line fault detection
  Short Circuit .............................................................. < 100Ω
  Open Circuit .............................................................. < 50µA
Input voltage range without damage ..................... 0 to +12V dc
Isolation (channel to Railbus) ....................................... 250V ac
Input sampling rate (all 32) ......................................... 8kHz
Input pulse width ......................................................... 250µS (min.)
DI counting frequency without loss ....................... 500Hz (max.)
Applicable specification ............................................. NAMUR, DIN 19234

CONFIGURABLE PARAMETERS
Input filter ................................................................. 0 to 8.192secs in 250µs steps
Pulse counting ............................................................. on/off
Latching ......................................................................... on/off

RESPONSE TIME
Input module scan time .................................................. < 1ms
(Inputs sampled at 8kHz and processed every 1ms)

SAFE area or Zone 2/Div 2 hazardous area

SAFETY
FM non-incendive field wiring parameters (each channel)
........................................ V_{oc} = 8.64V; I_{sc} = 18.5mA; C_a = 28µF; L_a = 23.6mH

POWER SUPPLIES
Railbus (12V) current .................................................... < 50mA
Bussed field power ....................................................... 190mA (max.) at 24V dc

MECHANICAL
Module Key Code ....................................................... B3
Module width .............................................................. 42mm
Weight ................................................................. 185g

FIELD TERMINAL

<table>
<thead>
<tr>
<th>Field wiring</th>
<th>Recommended Field Terminal</th>
<th>Compatible Field Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>General purpose</td>
<td>8617-FT-NI 16/30 channel DI</td>
<td>8619-FT-MT 44-pin MTA</td>
</tr>
<tr>
<td>Class 1, Div 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>or Zone 2 hazardous areas</td>
<td>8617-FT-NI 16/30 channel DI</td>
<td>8619-FT-MT 44-pin MTA</td>
</tr>
</tbody>
</table>
32-channel Sequence of Events

24V dc, non-isolated, module-powered

- switch or proximity detector inputs
- captures events with ¼ ms resolution
- distributed architecture for accurate event recording
- line fault detection on all inputs
- power to all field inputs - simplifies field wiring
- high-res time stamp for accurate event sequencing
- log event data, e.g. controller status & module alarms
- export data to PC for reporting or analysis
- 24V dc bussed field power required

MODULE SPECIFICATION

See also System Specification

INPUT

Number of channels .................................................. 32
Off current ......................................................... < 1.2mA
On current ........................................................... > 2.1mA
Short circuit current .................................................. 8.6mA (typ)
Output resistance ..................................................... 950Ω (typ)
Open circuit output voltage ........................................ 8.2Vdc (typ)

Line fault detection

Input voltage range without damage ......0 to +12V dc
Isolation (channel to Railbus) ...........250V ac
Input sampling rate (all 32 inputs) ...........8kHz
Input pulse width .................................................. 250μS (min)
DI counting frequency without loss ......500Hz (max)
Applicable specification ..................NAMUR, DIN 19234

SOE SPECIFICATION

Module event buffer .........................480 events + 32 overflow
Event recording peak rate (module) .................64,000 events/sec
Duration of peak rate ......................................7.5 ms (max.)
(for 32 SOE channels enabled)

Event recording continuous rate

Module ..................................................220 events/sec (min.)
Each of 32 inputs ........................................6.8 events/sec (min.)
Excessive event threshold (for 32 inputs) .....150 events/sec/ch.
(for each channel)

SOE module time stamping resolution ..........125 μs
System time stamping resolution ..........250 μs
Simultaneous inputs, time stamping error

Within one module ......................................0.25 ms (max.)
Within one 8000 node....................................1.0 ms (max.)
Between 8000 nodes ..................................... 5.0 ms (typ.)
(Absolute accuracy will depend on network time reference in use)

CONFIGURABLE PARAMETERS

SOE Logging ........................................configurable per channel
Input filter ..............................................0 to 8.192secs in 250μs steps
Pulse counting ........................................on/off
Latching ...............................................on/off

RESPONSE TIME

Input module scan time .........................<1ms
(Inputs sampled at 8kHz and processed every 1ms)

SAFETY

FM non-incendive field wiring parameters (each channel)

\[ V_{oc} = 8.64V; \quad I_{sc} = 18.5mA; \quad C_a = 28μF; \quad L_a = 23.6mH \]

POWER SUPPLIES

Railbus (12V) current ..........< 50mA
Bussed field power .........................190mA (max) at 24V dc

MECHANICAL

Module Key Code .........................B4
Module width ...............................................42mm
Weight .......................................................185g

FIELD TERMINAL

<table>
<thead>
<tr>
<th>Field wiring</th>
<th>Recommended Field Terminal</th>
<th>Compatible Field Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>General purpose</td>
<td>8617-FTNI</td>
<td>8619-FTMT</td>
</tr>
<tr>
<td>16/30 channel DI</td>
<td>44-pin MTA</td>
<td></td>
</tr>
</tbody>
</table>

Class 1, Div 2 or Zone 2 hazardous areas

<table>
<thead>
<tr>
<th>Field wiring</th>
<th>Recommended Field Terminal</th>
<th>Compatible Field Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 1, Div 2 or Zone 2 hazardous areas</td>
<td>8617-FTNI</td>
<td>8619-FTMT</td>
</tr>
<tr>
<td>16/30 channel DI</td>
<td>44-pin MTA</td>
<td></td>
</tr>
</tbody>
</table>
8-channel Discrete Input

115V ac, isolated, sinking

- 8 discrete inputs
- 115V ac field voltage sources
- user definable input threshold
- pulse counting option

MODULE SPECIFICATION
See also System Specification

INPUTS
Number of channels .................................................. 8
Off voltage .............................................................. < 34V ac
On voltage .............................................................. > 84V ac
Wetting current ...................................................... 2mA (nom.) @ 115V ac
Max. input voltage ..................................................... 130V ac
Frequency .............................................................. 50 / 60Hz

CONFIGURABLE PARAMETERS
Selectable input filter ........................................... fast, slow or user defined
(Last defined permits 0 to 512ms values in 2ms steps)
Latch inputs ............................................................ enable / disable
Latch polarity ....................................................... latch on high / latch on low
Pulse counting ....................................................... enable / disable

RESPONSE TIME
I/O response time .................................................. 33ms (max.)
(Field event to new data available on Railbus)

POWER SUPPLIES
Railbus (12V) current ............................................. 40mA (typ.)
.............................................................. 60mA (max.)
Bussed Field Power ............................................. not required

MECHANICAL
Module Key Code .................................................. E4
Module width .......................................................... 42mm
Weight ................................................................. 170g

FIELD TERMINAL

<table>
<thead>
<tr>
<th>Field wiring</th>
<th>Recommended Field Terminal</th>
<th>Compatible Field Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>General purpose</td>
<td>8602-FT-ST</td>
<td>8604-FTFU</td>
</tr>
<tr>
<td>Standard † Fused</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class 1, Div 2</td>
<td>8610-FTNA</td>
<td>8611-FTFU</td>
</tr>
<tr>
<td>or Zone 2</td>
<td>Non-arching †</td>
<td>Non-arching, fused</td>
</tr>
<tr>
<td>hazardous areas</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

† External fusing of the Field Power supply is recommended in order to protect the field wiring.
## 8-channel Discrete Input

### 115V ac, non-isolated, module powered

- 8 discrete inputs
- for dry contact switches.
- 115V ac provided on input high side
- returns commoned internally
- pulse counting option
- 115V ac Bussed Field Power required

### MODULE SPECIFICATION

See also System Specification

### INPUTS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of channels</td>
<td>8</td>
</tr>
<tr>
<td>OFF current</td>
<td>&lt; 0.56mA</td>
</tr>
<tr>
<td>ON current</td>
<td>&gt; 1.4mA</td>
</tr>
<tr>
<td>Wetting current</td>
<td>2mA (nom.) @ 115V ac</td>
</tr>
</tbody>
</table>

### CONFIGURABLE PARAMETERS

- Selectable input filter:
  - fast, slow or user defined
  (User defined permits 0 to 512ms values in 2ms steps)
- Latch inputs:
  - enable /disable
- Latch polarity:
  - latch on high / latch on low
- Pulse counting:
  - enable /disable

### RESPONSE TIME

- I/O response time: 33ms (max.)
  (Field event to new data available on Railbus)

### POWER SUPPLIES

- Railbus (12V) current: 40mA (typ.)
- Bussed Field Power: 115V ac ±10%
- Frequency: 50 / 60Hz

### MECHANICAL

- Module Key Code: E1
- Module width: 42mm
- Weight: 170g

### FIELD TERMINAL

<table>
<thead>
<tr>
<th>Field wiring</th>
<th>Compatible Field Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>General purpose</td>
<td>8604-FT-FU Fused</td>
</tr>
<tr>
<td></td>
<td>8602-FT-ST Standard †</td>
</tr>
</tbody>
</table>

| Class 1, Div 2  | Fused         | 8611-FT-FU Non-arcing, Fused |
| or Zone 2       |               | 8610-FTNA Non-arcing †       |
| hazardous areas |               |                             |

† Alternative fusing in the field wiring is recommended if it is not provided in the field terminal.
8-channel Discrete Input

230V ac, isolated, sinking

◆ 8 discrete isolated inputs
◆ 230V ac field voltage sources
◆ user definable input threshold
◆ pulse counting option

MODULE SPECIFICATION
See also System Specification

INPUTS
Number of channels ......................................................... 8
OFF voltage ................................................................. < 68V ac
ON voltage ................................................................. > 168V ac
Wetting current ....................................................... 1mA (nom.) @ 230V ac
Max. input voltage ................................................... 265V ac
Frequency ................................................................. 50 / 60Hz

CONFIGURABLE PARAMETERS
Selectable input filter ..................................... fast, slow or user defined
(Last defined permits 0 to 512ms values in 2ms steps)
Latch inputs .......................................................... enable / disable
Latch polarity ........................................................ latch on high / latch on low
Pulse counting ...................................................... enable / disable

RESPONSE TIME
I/O response time ..................................................... 33ms (max.)
(Field event to new data available on Railbus)

POWER SUPPLIES
Railbus (12V) current ........................................ 40mA (typ.)
............................................................................. 60mA (max.)
Bussed Field Power ................................................ not required

MECHANICAL
Module Key Code ......................................................... E5
Module width .............................................................. 42mm
Weight ................................................................. 170g

FIELD TERMINAL

<table>
<thead>
<tr>
<th>Field wiring</th>
<th>Recommended Field Terminal</th>
<th>Compatible Field Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>General purpose</td>
<td>8602-FT-ST</td>
<td>8604-FT-FU</td>
</tr>
<tr>
<td>Class 1, Div 2 or Zone 2 hazardous areas</td>
<td>8610-FT-NA</td>
<td>8611-FT-FU</td>
</tr>
</tbody>
</table>

† External fusing of the Field Power supply is recommended in order to protect the field wiring.
8-channel Discrete Input

230V ac, non-isolated, module powered

- 8 discrete inputs
- for dry contact switches.
- 230V ac provided on input high side
- returns commoned internally
- pulse counting option
- 230V ac Bussed Field Power required

MODULE SPECIFICATION
See also System Specification

INPUTS
Number of channels ................................................. 8
OFF current ......................................................... < 0.28mA
ON current ......................................................... > 0.71mA
Wetting current .................................................... 1mA (nom.) @ 230V ac

CONFIGURABLE PARAMETERS
Selectable input filter ........................................... fast, slow or user defined
Latch inputs ......................................................... enable /disable
Latch polarity ................................................... latch on high / latch on low
Pulse counting ....................................................... enable /disable

RESPONSE TIME
I/O response time .................................................. 33ms (max.)
(Field event to new data available on Railbus)

POWER SUPPLIES
Railbus (12V) current ........................................... 40mA (typ.)
Bussed Field Power ................................................. 207 to 265V ac
Frequency .......................................................... 50 / 60Hz

MECHANICAL
Module Key Code ................................................... E2
Module width ......................................................... 42mm
Weight .............................................................. 170g

FIELD TERMINAL

<table>
<thead>
<tr>
<th>Field wiring</th>
<th>Recommended Field Terminal</th>
<th>Compatible Field Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>General purpose</td>
<td>8604-FT-FU Fused</td>
<td>8602-FT-ST Standard †</td>
</tr>
<tr>
<td>Class 1, Div 2 or Zone 2</td>
<td>8611-FT-FU Non-arcing</td>
<td>8610FT-NA Non-arcing †</td>
</tr>
<tr>
<td>hazardous areas</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

† Alternative fusing in the field wiring is recommended if it is not provided in the field terminal.
8-channel Discrete Output

2–60V dc, non-isolated, module powered

- 8 powered outputs
- controls solenoids and relays
- common load supply of up to 60V dc
- discrete or pulsed outputs
- 1A per channel switched current
- 2–60V dc bussed field power required

MODULE SPECIFICATION
See also System Specification

OUTPUTS

- Number of channels .......................................................... 8
- Output voltage range ...................................................... 2–60V dc
- ON voltage drop .............................................................. 0.25V (max.)
- OFF leakage current ....................................................... 1.0mA (max.)
- Switched current per channel †
  - Continuous* .......................................................................... 1A
  - For < 100 ms ............................................................... 4A
  - For < 20 ms ............................................................... 6A

CONFIGURABLE PARAMETERS

- Output initialisation state ....................................... predefined value
- Fail-safe ............................................................. predefined value/last value
- Output .......................................................... discrete, momentary or continuous pulse ‡
- Pulse width .......................................................... 2ms to 130s

† The total instantaneous switched current for the module should not exceed the following:
  - 10A for < 100ms
  - 18A for < 20ms

‡ For a way to increase these limits using high-current relays see Technical Support Note TSN110 on the MTL web site.

* Limited to 6A per module unless using high current relay option

‡ Consult MTL for availability

RESPONSE TIME

Response time ............................................................ 1ms (max.)
(From Railbus command to output change)

POWER SUPPLIES

- Railbus (12V) current ........................................... 45mA [typ.]
  ............................................................................. 70mA (max.)
- Bussed Field Power .................................................. 2 to 60V dc

MECHANICAL

- Module Key Code .................................................... B6
- Module width .......................................................... 42mm
- Weight ................................................................. 200g

FIELD TERMINAL

<table>
<thead>
<tr>
<th>Field wiring</th>
<th>Recommended Field Terminal</th>
<th>Compatible Field Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>General purpose</td>
<td>8604-FT-FU</td>
<td>8602-FTST</td>
</tr>
<tr>
<td></td>
<td>Fused</td>
<td>Standard †</td>
</tr>
<tr>
<td>Class 1, Div 2</td>
<td>8611-FT-FU</td>
<td>8610FTNA</td>
</tr>
<tr>
<td>or Zone 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>hazardous areas</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Non-arcing,</td>
<td>Non-arcing †</td>
</tr>
</tbody>
</table>

‡ Alternative fusing in the field wiring is recommended if it is not provided in the field terminal.

See also the 8618-FTMT field terminal for custom termination options.
8-channel Discrete Output

20–265V ac, non-isolated, module powered

- 8 powered outputs
- controls solenoids and relays
- common load supply of up to 265V ac
- discrete or pulsed outputs
- 1A per channel maximum
- 20–265V ac bussed field power required

MODULE SPECIFICATION
See also System Specification

OUTPUTS

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of channels</td>
<td>8</td>
</tr>
<tr>
<td>Output voltage range</td>
<td>20–265V ac</td>
</tr>
<tr>
<td>Frequency</td>
<td>50 / 60Hz</td>
</tr>
<tr>
<td>ON voltage drop</td>
<td>&lt; 1.2V</td>
</tr>
<tr>
<td>OFF leakage current</td>
<td>&lt; 4mA</td>
</tr>
<tr>
<td>Switched current per channel†</td>
<td></td>
</tr>
<tr>
<td>Continuous</td>
<td>1A*</td>
</tr>
<tr>
<td>For &lt; 100ms</td>
<td>5A</td>
</tr>
<tr>
<td>For &lt; 20ms</td>
<td>20A</td>
</tr>
<tr>
<td>Minimum load current, per channel</td>
<td></td>
</tr>
<tr>
<td>@ 115V ac</td>
<td>11mA</td>
</tr>
<tr>
<td>@ 230V ac</td>
<td>5mA</td>
</tr>
</tbody>
</table>

† Stated figures are for operation with unfused field terminal.
When operating with 2A fused field terminal (part no. 8604-FTFU) maximum switched current is 5A inrush for < 10ms pulse width at 0.1% duty cycle and < 10⁶ operations.

* Limited to 3A per module.
† Consult MTL for availability

CONFIGURABLE PARAMETERS

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output initialisation state</td>
<td>predefined value</td>
</tr>
<tr>
<td>Fail-safe</td>
<td>predefined value/last value</td>
</tr>
<tr>
<td>Output</td>
<td>discrete, momentary or continuous pulse‡</td>
</tr>
<tr>
<td>Pulse width</td>
<td>2 ms to 130s</td>
</tr>
</tbody>
</table>

RESPONSE TIME

Response time (max.) 2 ms + ½ cycle of mains frequency
(From Railbus command to output change)

POWER SUPPLIES

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Railbus (12V) current</td>
<td>75mA (typ.)</td>
</tr>
<tr>
<td></td>
<td>125mA (max.)</td>
</tr>
<tr>
<td>Bussed Field Power (voltage)</td>
<td>20 to 265V ac</td>
</tr>
</tbody>
</table>

MECHANICAL

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module Key Code</td>
<td>F1</td>
</tr>
<tr>
<td>Module width</td>
<td>42mm</td>
</tr>
<tr>
<td>Weight</td>
<td>220g</td>
</tr>
</tbody>
</table>

FIELD TERMINAL

<table>
<thead>
<tr>
<th>Field wiring</th>
<th>Recommended Field Terminal</th>
<th>Compatible Field Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>General purpose</td>
<td>8604-FT-FU Fused</td>
<td>8602-FT-ST Standard †</td>
</tr>
<tr>
<td>Class 1, Div 2 or Zone 2</td>
<td>8611-FT-FU Non-arcing,</td>
<td>8610FTNA Non-arcing †</td>
</tr>
<tr>
<td>hazardous areas</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fused</td>
<td></td>
</tr>
</tbody>
</table>

† Alternative fusing in the field wiring is recommended if it is not provided in the field terminal.
8-channel Discrete Output

2–60V dc, isolated, unpowered

- 8 fully isolated semiconductor switched outputs
- controls solenoids and relays
- for load supplies of up to 60V dc
- discrete or pulsed outputs
- 1A per channel switched

MODULE SPECIFICATION
See also System Specification

OUTPUTS
Number of channels ........................................................... 8
Output voltage range ................................................. 2–60V dc
ON voltage drop .............................................................. 0.25V (max.)
OFF leakage current ...................................................... 1.0mA (max.)
Switched current per channel
Continuous ............................................................................ 1A
For < 100ms ................................................................. 4A
For < 20ms ................................................................. 6A

CONFIGURABLE PARAMETERS
Output initialisation state ........................................ predefine value
Fail-safe ............................................................... predefine value/last value
Output ............................................................... discrete, momentary or continuous pulse‡
Pulse width .............................................................. 2ms to 130s

RESPONSE TIME
Response time ............................................................. 3ms (max.)
(From Railbus command to output change)

† Consult MTL for availability

POWER SUPPLIES
Railbus (12V) current ....................................................... 45mA (typ.)
............................................................................. 70mA (max.)
Bussed Field Power .................................................... not required

MECHANICAL
Module Key Code .............................................................. B5
Module width ............................................................... 42mm
Weight ................................................................. 200g

FIELD TERMINAL

<table>
<thead>
<tr>
<th>Field wiring</th>
<th>Recommended Field Terminal</th>
<th>Compatible Field Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>General purpose</td>
<td>8604-FT-FU Fused</td>
<td>8602-FT-ST Standard</td>
</tr>
<tr>
<td>Class 1, Div 2 or Zone 2 hazardous areas</td>
<td>8611-FT-FU Non-arcing, Fused</td>
<td>8610-FT-NA Non-arcing</td>
</tr>
</tbody>
</table>

Note: External fusing to protect field wiring is recommended.

See also the 8618-FT-MT field terminal for custom termination options.
8-channel Discrete Output

20–265V ac, isolated, unpowered

- 8 fully isolated semiconductor switched outputs
- controls solenoids and relays
- for load supplies of up to 250V ac
- discrete or pulsed outputs
- 1A per channel maximum

**MODULE SPECIFICATION**

*See also System Specification*

**OUTPUTS**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of channels</td>
<td>8</td>
</tr>
<tr>
<td>Output voltage range</td>
<td>20–265V ac</td>
</tr>
<tr>
<td>Frequency</td>
<td>50 / 60Hz</td>
</tr>
<tr>
<td>ON voltage drop</td>
<td>&lt; 1.2V</td>
</tr>
<tr>
<td>OFF leakage current</td>
<td>&lt; 4mA</td>
</tr>
<tr>
<td>Switched current per channel †</td>
<td></td>
</tr>
<tr>
<td>Continuous</td>
<td>1A*</td>
</tr>
<tr>
<td>For &lt; 100ms</td>
<td>5A</td>
</tr>
<tr>
<td>For &lt; 20ms</td>
<td>20A</td>
</tr>
<tr>
<td>Minimum load current, per channel ‡</td>
<td></td>
</tr>
<tr>
<td>@ 115V ac</td>
<td>11mA</td>
</tr>
<tr>
<td>@ 230V ac</td>
<td>5mA</td>
</tr>
</tbody>
</table>

† Stated figures are for operation with unfused field terminal. When operating with 2A fused field terminal part no. 8604-FT-FU, maximum switched current is 5A inrush for < 10ms pulse width at 0.1% duty cycle and < 10⁶ operations.

‡ Consult MTL for availability.

- **Field wiring**
  - **Recommended Field Terminal**: 8604-FT-FU, 8602-FT-ST
  - **Compatible Field Terminal**: 8611-FT-FU, 8610-FT-NA

- **MECHANICAL**
  - Module Key Code: F4
  - Module width: 42mm
  - Weight: 220g

- **RESPONSE TIME**
  - Response time (max.): 2ms + ½ cycle of mains frequency (from Railbus command to output change)

- **POWER SUPPLIES**
  - Railbus (12V) current: 75mA (typ.), 125mA (max.)
  - Bussed Field Power: not required

- **FIELD TERMINAL**

<table>
<thead>
<tr>
<th>Field Wiring</th>
<th>Recommended Field Terminal</th>
<th>Compatible Field Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>General purpose</td>
<td>8604-FT-FU, 8602-FT-ST</td>
<td>8611-FT-FU, 8610-FT-NA</td>
</tr>
<tr>
<td>Class 1, Div 2 or Zone 2 hazardous areas</td>
<td>8611-FT-FU, Non-arcing</td>
<td>8610-FT-NA, Non-arcing</td>
</tr>
</tbody>
</table>

Note: External fusing to protect field wiring is recommended.
**Pulse Input Module**

**2-channel pulse/quadrature input**

**INPUT CHARACTERISTICS**

**NAMUR 1**
- Switching thresholds: 1.2mA / 2.1mA
- Input impedance: 1kΩ
- Supply voltage: 8.1V (nom.) at 8mA

**CURRENT**
- Input signal: 20mA (max.)
- Threshold: configurable in 8 levels
- Input impedance: 25Ω
- Open circuit current: < 0.5mA
- Short circuit current: > 21.5mA

**VOLTAGE**
- Input signal: 0 - 24V dc (50V max.)
- Threshold: configurable in 8 levels
- Input impedance: > 10kΩ
- Switching hysteresis: 100mV

**INPUTS**

**PULSE/FREQUENCY**
- Number of channels: 2
- Maximum frequency: 50kHz (in quadrature mode): 12.5kHz
- Accuracy (25°C): ± 0.05% of span
- Temperature Stability: ± 0.005% / °C

**CONTROL GATE (for gating Channel 1 only)**
- Switching thresholds: 1.2mA / 2.1mA
- Input impedance: 1kΩ
- Supply voltage: 8.1V (nom.) at 8mA

**OUTPUTS (TX SUPPLY)**

The outputs are open-collector type for separately powered devices such as LED clusters, annunciators or solenoids.

**Number of channels**: 2
- OFF state voltage: 30V (max)
- OFF state leakage current: 10µA (max)
- ON state voltage drop: < 1.0V @ 50mA
- ON state current: 100mA
- Retransmission bandwidth: 1 – 2000Hz

**MODULE SPECIFICATION**

*See also System and Common Module Spec.*

**INPUTS**

**PULSE/FREQUENCY**
- Number of channels: 2
- Maximum frequency: 50kHz (in quadrature mode): 12.5kHz
- Accuracy (25°C): ± 0.05% of span
- Temperature Stability: ± 0.005% / °C
2-channel pulse/quadrature input

CONFIGURABLE PARAMETERS

INPUTS
- Channel enable / disable
- Sensor type NAMUR prox. type (select low / high speed)
- Quadrature enable / disable
- Threshold level user defined values
- Triggering rising edge / falling edge
- Filtering off, 1, 5, 20, 100kHz
- Alarms frequency / acceleration
- Alarm deadband (hysteresis) user defined value
- Line fault detect open/short circuit
- Channel status active / inactive
- Counter enable / disable
- Counting direction count up / count down

* While measurements can be made in the upper half of this range, the stated accuracy applies only to frequencies up to 50kHz.
  In quadrature mode, the upper limit is 12.5kHz.

DISCRETE OUTPUT
- Function selection disabled
- high / low alarm
- acceleration alarm
- counter preset value reached
- quadrature output (channel 1 only)
- scaled retransmission (channel 1 only)
- Retransmission scaling (K factor – channel 1 only) 1 – 256

AUXILIARY DISCRETE INPUT
- Counter (channel 1) start (count)/pause

DYNAMIC DATA (READ ONLY)

PROCESS VALUES
- Frequency 16 bit unsigned
- Count 32 bit signed
- Acceleration 16 bit signed

STATUS VALUES
- Frequency / acceleration alarms high / low
- Line fault detect missing pulse detect
- Quadrature direction 1 =clockwise, 2 =anti-clockwise
- Counter alarms preset value reached

CONTROL DATA (WRITE ONLY)
- Counter preset value 32 bit signed
- Load preset value = 0 to disable
- Counter commands start / stop / reset

Note: Channel 1 counter can also be controlled by control gate input: 1= start (count), 0 = pause

ISOLATION
- Any channel to Railbus 100V ac
- Between input channels none (common 0V connection)
- Between output channels 30V ac

RESPONSE TIME
- Response time 25ms (max.)
  (Signal change to availability on Railbus)

POWER SUPPLIES
- Railbus current (both channels @22mA) 300mA (max.)
- Bussed field power 20mA @ 24 ± 10% V dc
- Power dissipation (both channels @22mA) 2.8W (max.)
  (no load)
- 2.0W (max.)

MECHANICAL
- Module Key Code F2
- Module width 42mm
- Weight 260g

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Current input</td>
</tr>
<tr>
<td>2</td>
<td>Voltage input</td>
</tr>
<tr>
<td>3</td>
<td>NAMUR input Channel #1</td>
</tr>
<tr>
<td>4</td>
<td>Common</td>
</tr>
<tr>
<td>5</td>
<td>Power supply +ve</td>
</tr>
<tr>
<td>6</td>
<td>Power supply +ve</td>
</tr>
<tr>
<td>7</td>
<td>Current input</td>
</tr>
<tr>
<td>8</td>
<td>Voltage input Channel #2</td>
</tr>
<tr>
<td>9</td>
<td>NAMUR input</td>
</tr>
<tr>
<td>10</td>
<td>Common</td>
</tr>
<tr>
<td>11</td>
<td>NAMUR gate/control input</td>
</tr>
<tr>
<td>12</td>
<td>Common</td>
</tr>
<tr>
<td>13</td>
<td>Output +ve Channel #1</td>
</tr>
<tr>
<td>14</td>
<td>Output –ve</td>
</tr>
<tr>
<td>15</td>
<td>Output +ve Channel #2</td>
</tr>
<tr>
<td>16</td>
<td>Output –ve</td>
</tr>
</tbody>
</table>

FIELD TERMINAL

<table>
<thead>
<tr>
<th>Field wiring</th>
<th>Recommended Field Terminal</th>
<th>Compatible Field Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>General purpose</td>
<td>8602-FTST Standard</td>
<td>8618-FTMT 16-pin MTA</td>
</tr>
<tr>
<td>Class 1, Div 2 or Zone 2 hazardous areas</td>
<td>8601-FTNI Non-incendive</td>
<td>8618-FTMT 16-pin MTA</td>
</tr>
</tbody>
</table>

EUROPE (EMEA) Tel: +44 (0)1582 733633 Fax: +44 (0)1582 422283
AMERICAS Tel: +1 603 926 0090 Fax: +1 603 926 1899
EUROPE (EMEA) Fax: +44 (0)1582 422283
Tel: +44 (0)1582 733633
ASIA PACIFIC E-mail: enquiry@mtl-inst.com Web site: www.mtl-inst.com
Tel: +65 487 7887 Fax: +65 487 7997
AMERICAS Tel: +1 603 926 0090 Fax: +1 603 926 1899
EUROPE (EMEA) Fax: +44 (0)1582 422283
Tel: +44 (0)1582 733633
ASIA PACIFIC E-mail: enquiry@mtl-inst.com Web site: www.mtl-inst.com
Tel: +65 487 7887 Fax: +65 487 7997
AMERICAS Tel: +1 603 926 0090 Fax: +1 603 926 1899

Oct 2006
Pulse Input Module

2-channel pulse/quadrature input

TERMINAL ASSIGNMENTS

SAFETY
Field wiring protection ............................................................ non-incendive
FM and ATEX Cat 3 NON-INCENDIVE FIELD WIRING

PARAMETERS
The following figures are for Gas Groups A/B (IIC) unless otherwise stated.

Current inputs (Ch1 & Ch2)
..........................................................\( U_o \leq 0.6V, I_o \leq 0.5mA, P_o \leq 75\mu W \)
..........................................................\( Ca = 1000\mu F, La = 1000mH \)

3-wire current inputs (Ch1 & Ch2)
..........................................................\( U_o \leq 30V, I_o \leq 102.5mA, P_o \leq 765.7mW \)
..........................................................\( Ca = 0.165\mu F, La = 6mH, La/Ra = 82\mu H/\Omega \)

Voltage inputs (Ch1 & Ch2)
..........................................................\( U_o \leq 5.5V, I_o \leq 0.58mA, P_o \leq 0.8mW \)
..........................................................\( Ca = 535\mu F, La = 1000mH \)

3-wire voltage inputs (Ch1 & Ch2)
..........................................................\( U_o \leq 30V, I_o \leq 102.6mA, P_o \leq 765.8mW \)
..........................................................\( Ca = 0.165\mu F, La = 6mH, La/Ra = 82.1\mu H/\Omega \)

NAMUR inputs (Ch1 & Ch2)
..........................................................\( U_o \leq 9.1V, I_o \leq 10.6mA, P_o \leq 24mW \)
..........................................................\( Ca = 20\mu F, La = 490mH \)

NAMUR gate input (Ch1)
..........................................................\( U_o \leq 9.1V, I_o \leq 10.6mA, P_o \leq 24mW \)
..........................................................\( Ca = 20\mu F, La = 490mH \)

Discrete outputs (Ch1 & Ch2)
Each pair of field terminals may be considered as non-incendive when connected into a field circuit with the following parameters
..........................................................\( V_{max}=30V \text{ dc}, I_{max}=100mA, C_i=0\mu F, L_i=0mH \)

LED INDICATORS

POWER – Green LED

<table>
<thead>
<tr>
<th>OFF</th>
<th>ON</th>
<th>FLASHING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power failure</td>
<td>Power OK</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

FAULT – Red LED

<table>
<thead>
<tr>
<th>OFF</th>
<th>ON</th>
<th>FLASHING</th>
</tr>
</thead>
<tbody>
<tr>
<td>In running state</td>
<td>Fault</td>
<td>Awaiting module training</td>
</tr>
</tbody>
</table>

PULSE INPUT CHANNEL – Yellow LED

<table>
<thead>
<tr>
<th>OFF</th>
<th>ON</th>
<th>FLASHING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel inactive</td>
<td>Channel active and operating normally</td>
<td>Channel active but in alarm condition</td>
</tr>
</tbody>
</table>

DIGITAL OUTPUT CHANNEL – Yellow LED

<table>
<thead>
<tr>
<th>OFF</th>
<th>ON</th>
<th>FLASHING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel inactive</td>
<td>Channel active and operating normally</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>
8-channel Analog Input

4–20mA with HART®

- 8 single-ended input channels
- intrinsically safe field circuits
- conventional 4–20mA
- HART pass-through
- HART variable and status reporting
- for 2-wire transmitters
- in-built power supply

MODULE SPECIFICATION
See also System Specification

INPUTS
Number of channels ........................................................... 8
Nominal signal range (span) ................................................. 4 to 20mA
Full signal range .................................................................. 0.5 to 22mA
Line fault detection
Short circuit current .............................................................. > 21.5mA
Open circuit current .............................................................. < 0.5mA
Voltage to transmitter @ 20mA ............................................. 15V (min.)
Accuracy (@25°C) ................................................................. ± 2µA
Accuracy temperature Stability
(-40°C to +70°C) ................................................................. ± 0.006% of span per °C
Isolation
(any channel to Railbus) ...................................................... 60V ac
(between channels in same module) ....................................... none

CONFIGURABLE PARAMETERS
Alarms ................................................................................. high, high-high, low, low-low
Alarm deadband (hysteresis) ............................................. user defined value
Input filter time constant ..................................................... user defined value
Input dead zone ................................................................. user defined value
Drive on failsafe ................................................................. user defined value
Channel status ................................................................. active /inactive
HART comms ..................................................................... enable /disable

RESPONSE TIME
Analog signal change to availability on Railbus
4–20mA mode .................................................................. 33ms (max.)
HART mode ....................................................................... 0.75s per channel

SAFETY
Field wiring protection .................................................... [Ex ia] IIIC
Safety description (each channel)
.......................................................... Uo = 28V, Io = 93mA, Po = 0.65W
FM entity parameters ..................................................... VCI ≤ 28V dc, ICI ≤ 93mA
.......................................................... Ci ≤ 0.14µF, ICI ≤ 4.38mH

POWER SUPPLIES
IS Railbus (12V) current (all channels @ 22mA)
.......................................................... 600mA (typ.)
Power dissipation within module .................................... 4.2W (max.)

MECHANICAL
Module Key Code ................................................................. A1
Module width ................................................................. 42mm
Weight ........................................................................... 260g

FIELD TERMINAL

<table>
<thead>
<tr>
<th>Field wiring type</th>
<th>Recommended Field Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intrinsically safe standard</td>
<td>8621-FT-IS</td>
</tr>
<tr>
<td>Intrinsically safe loop disconnect</td>
<td>8622-FT-IS</td>
</tr>
</tbody>
</table>

®HART is a registered trademark of the HART Communication Foundation.
8-channel Analog Input

0-10V/potentiometer input

- 8 single-ended input channels
- intrinsically safe field circuits
- 0–10V/100Ω–10kΩ potentiometer
- 0/4 - 20mA current input with additional burden resistor
- true zero on voltage input
- open circuit field wiring detection

MODULE SPECIFICATION
See also System Specification

INPUTS
Number of channels ...............................................8, single-ended
0-10V input characteristics
Nominal signal range (span) .................................0 to 10V
Full signal range ...................................................0 to +11V
Resolution .................................................................16 bits
Input impedance .........................................................> 100kΩ
Under-range indication ..............................................–100mV
Potentiometer input characteristics
Nominal signal range (span) .................................0 to 100 % of travel
Potentiometer resistance ..............................................100Ω to 10kΩ
Excitation voltage (nom.) .........................................10V (from 2.2kΩ source)
Resolution (≥1kΩ potentiometer ) .................................14 bits
Resolution (100Ω potentiometer ) ...............................11 bits
Accuracy (at 25°C) ...............................................± 0.1 % of span
Isolation (any channel to Railbus) ..............................100V ac
(between channels) .....................................................none

CONFIGURABLE PARAMETERS
Input type (per channel) ............................................voltage/potentiometer
Alarms .......................................................................high and low
Alarm deadband (hysteresis) .................................user defined value
Input filter time constant ........................................user defined value
Input dead zone .......................................................user defined value
Drive on open circuit ............................................disabled / upscale / downscale
Channel status .........................................................active/inactive
Lead compensation ................................................user defined value

RESPONSE TIME
Signal change to availability on Railbus ..................33ms (max.)
Open circuit line fault detection time ......................≤ 5s

SAFETY
Field wiring protection ..............................................[EExia] IIC
Safety description (each channel - non linear output) .........................................................
Uo ≤ 15.75V, Io ≤ 20mA, Po ≤ 0.315W
FM entity parameters ..............................................Voc = 15.75V, Isc = 20mA
..............................................................Ca = 0.22µF, La = 5mH

POWER SUPPLIES
IS Railbus (12V) current
Typical .................................................................200mA
Max with voltage/current inputs ................................250mA
Max. with 100Ω potentiometer inputs ......................350mA
Power dissipation within module
Max with voltage/current inputs ................................3W
Max. with 100Ω potentiometer inputs ......................4.2W

MECHANICAL
Module Key Code .....................................................C4
Module width ..........................................................42mm
Weight .................................................................200g

FIELD TERMINAL
Field wiring type ......................................................Intrinsically safe, standard
Recommended Field Terminal .....................................8623-FT-IS
8-channel Analog Input

Thermocouple and mV

- 8 input channels
- intrinsically safe field circuits
- thermocouple and mV
- cold junction compensation (internal or remote)
- built-in thermocouple linearisation
- channels independently configurable
- open-circuit field wiring detection

MODULE SPECIFICATION
See also System Specification

INPUTS

<table>
<thead>
<tr>
<th>Input type</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermocouples</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>0 to +1820°C</td>
</tr>
<tr>
<td>E</td>
<td>–270 to +1000°C</td>
</tr>
<tr>
<td>J</td>
<td>–210 to +1200°C</td>
</tr>
<tr>
<td>K</td>
<td>–270 to +1372°C</td>
</tr>
<tr>
<td>N</td>
<td>–270 to +1300°C</td>
</tr>
<tr>
<td>R &amp; S</td>
<td>–50 to +1768.1°C</td>
</tr>
<tr>
<td>T</td>
<td>–270 to +400°C</td>
</tr>
<tr>
<td>W3 &amp; W5</td>
<td>0 to +2315°C</td>
</tr>
<tr>
<td>Russian K</td>
<td>–200 to +1300°C</td>
</tr>
<tr>
<td>Russian L</td>
<td>–200 to +800°C</td>
</tr>
<tr>
<td>mV</td>
<td></td>
</tr>
<tr>
<td>–8 to +24 mV</td>
<td></td>
</tr>
<tr>
<td>–20 to +60 mV</td>
<td></td>
</tr>
<tr>
<td>–33.333 to +100 mV</td>
<td></td>
</tr>
<tr>
<td>–100 to +100 mV</td>
<td></td>
</tr>
</tbody>
</table>

In addition, see error table in System specification section

Accuracy (% of span)

<table>
<thead>
<tr>
<th>Temperature</th>
<th>mV inputs</th>
<th>THC inputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tamb 25°C</td>
<td>± 0.05%</td>
<td>± 0.05%</td>
</tr>
<tr>
<td>+10 to 40°C</td>
<td>± 0.08%</td>
<td>± 0.1%</td>
</tr>
<tr>
<td>–40 to 70°C</td>
<td>± 0.18%</td>
<td>± 0.3%</td>
</tr>
</tbody>
</table>

RESPONSE TIME

Response time........................................600ms (max)
(Analog signal change to availability on Railbus)

SAFETY

Field wiring protection..................................[EEx ia] IIC
Safety Description (each channel)
Channels 1, 2, 3, 4, 7 and 8, wired as separate IS circuits
.............................................Uo = 16.4V, Io = 79mA, Po = 0.33W
Channels 5 and 6, wired as separate IS circuits
.............................................Uo = 1V, Io = 1.1mA, Po = 0.3mW
(Input terminals are equivalent to non-energy storing apparatus)
FM entity parameters
.............................................Uo = 1V, Io = 1mA, Po = 0.25mW

POWER SUPPLIES

IS Railbus (12V) current................................120mA (max.)
Power dissipation within module..........................1.5W (max.)

MECHANICAL

Module Key Code....................................C1
Module width......................................42mm
Weight.............................................245g

Note 1: Consult MTL for support in BIM/configurator.

CONFIGURABLE PARAMETERS

Sensor type..............................................user selectable
Alarms.................................................high and low
Input dead zone.....................................user defined value
Selectable input filtering..............off / 2 reading avg./running avg.
Drive on open circuit fault............disabled/upscale/downscale
Channel status.....................................active/inactive
Cold junction compensation...............enable/disable/channel no.

FIELDD TERMINAL

Field wiring type

<table>
<thead>
<tr>
<th>Field wiring type</th>
<th>Recommended Field Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intrinsically safe THC</td>
<td>8625-TI-IS</td>
</tr>
</tbody>
</table>
8-channel Analog Input

RTD and Ω

- 8 input channels
- intrinsically safe field circuits
- RTD and Ω
- 2-, 3- and 4-wire RTD format
- channels independently configurable
- channels are o/c failure independent

MODULE SPECIFICATION
See also System Specification

INPUTS
Number of channels ................................................. 8
RTD inputs ......................................................... (2-, 3- or 4-wire)
.................................................. Pt100, Pt500 to BS EN60751: 1996
.................................................. Ni120 to DIN 43 760: 1985
.................................................. jPt100 to JIS C1604: 1981
........................................ user definable linearisation table, note 1

Resistance input

<table>
<thead>
<tr>
<th>Excitation current</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>211 µA</td>
<td>0 to 110 Ω</td>
</tr>
<tr>
<td>211 µA</td>
<td>0 to 280 Ω</td>
</tr>
<tr>
<td>211 µA</td>
<td>0 to 470 Ω</td>
</tr>
<tr>
<td>48 µA</td>
<td>0 to 2000 Ω</td>
</tr>
</tbody>
</table>

Accuracy (% of span), see note 2

<table>
<thead>
<tr>
<th>Tamb (RTD &amp; Ω inputs)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>25°C</td>
<td>± 0.05%</td>
</tr>
<tr>
<td>10°C to + 40°C</td>
<td>± 0.1%</td>
</tr>
<tr>
<td>- 40°C to + 70°C</td>
<td>± 0.2%</td>
</tr>
</tbody>
</table>

Cable resistance per loop .................................. 50Ω (max)
RTD excitation current ....................................... 211µA (nom.)
Compliance voltage of current source ..................... 6.8V
Resolution ...................................................... 16 bits
Series mode rejection ....................................... > 50dB @ 50/60Hz
Isolation (any channel to Railbus) ......................... 60V peak

Note 1: Consult MTL for support in BIM/configurator.
Note 2: For Pt500 and 0 to 2000Ω ranges a deviation of 0 to + 0.1% of reading is to be added for channel 1 or any channel preceded by a lower resistance range.

CONFIGURABLE PARAMETERS

Sensor type ............................................. user selectable
Alarms ....................................................... high and low
Input dead zone ........................................ user defined value
Selectable input filtering ...... off / 2 reading avg. / running avg.
Drive on open circuit fault ...... disabled / upscale / downscale
Channel status ...................................... active/ inactive
Offset (2-wire RTD mode) ......................... user defined value

RESPONSE TIME

Response time ........................................... 600ms (max.)
(Analog signal change to availability on Railbus)

SAFETY

Field wiring protection ................................... [EEx ia] IIC
Safety Description (all channels combined) ............ Uo = 16.4V, Io = 217mA, Po = 0.9W
FM entity parameters ................................... Voc = 16.4 V dc , Isc = 350mA, Po = 718mW

POWER SUPPLIES

IS Railbus (12V) current ................................ 120mA (max.)
Power dissipation within module ...................... 1.5W (max.)

MECHANICAL

Module Key Code ........................................ C3
Module width ............................................. 42mm
Weight ..................................................... 245g

FIELD TERMINAL

Field wiring type ....................................... Recommended Field Terminal
Intrinsically safe RTD ...................................... 8626-FT-I5
8-channel Analog Output

4–20mA with HART®

- 8 single ended output channels
- intrinsically safe field circuits
- 4–20mA for I/P converters
- open-circuit field wiring detection
- HART pass-through
- HART variable and status reporting

MODULE SPECIFICATION
See also System Specification

OUTputs
Number of channels ........................................................... 8
Nominal signal range (span) ........................................... 4 to 20mA
Full signal range ............................................................ 1 to 22mA
Voltage to load ............................................................. 13V min. @ 20mA
Load resistance .............................................................. 0 to 650Ω max.
Accuracy (@ 25°C) ........................................................ ± 20µA
Temperature stability
(-40°C to + 70°C) ...................................................... ± 0.006% of span per °C
Resolution ...................................................................... 12 bits
Open circuit detection threshold ................................... > 685Ω (typ.)
(iso detects loads greater than driveable range)
Isolation
(any channel to Railbus) ..................................................... 60V ac
(between channels) ........................................................ none

CONFIGURABLE PARAMETERS
Output initialisation state ............................................. predefined value
Drive on “fail-safe” ................................................ upscale /downscale /last value
Channel status ........................................................ active / inactive
HART variable and status reporting ......... enable/disable

RESPONSE TIME
Railbus command to output change
4-20mA mode ............................................................. 20ms (typ.)
............................................................. 80ms* (max.)
HART mode .............................................................. 1s per channel

*Time to reach 90% level for 4–20mA step into 650Ω load

SAFETY
Location of module
Field wiring protection ............................................. [EEx ia] IIC
Safety description
(each channel) ......................................................... $V_o = 24.6V, I_o = 93mA, P_o = 0.57W$
FM entity parameters ................................................. $V_{oc} \leq 24.6V$, $I_{oc} \leq 93mA$
................................................................. $C_o \leq 0.42µF$, $L_o \leq 4.2mH$

POWER SUPPLIES
IS Railbus (12V) current
(all channels @ 22mA into 650Ω load) ......................... 630mA
Power dissipation within module ............................. 4.1W (max.)

MECHANICAL
Module Key Code .......................................................... A4
Module width ............................................................... 42mm
Weight ....................................................................... 265g

FIELD TERMINAL
Field wiring type
Recommended Field Terminal
Intrinsically safe standard ........................................ 8621-FT-IS
Intrinsically safe loop disconnect ....................... 8622-FT-IS

Oct 2006
## 8-channel Analog Output

### 4–20mA

- 8 single ended output channels
- intrinsically safe
- conventional 4–20mA
- for I/P converters
- open-circuit field wiring detection

### MODULE SPECIFICATION

**See also System Specification**

### OUTPUTS

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of channels</td>
<td>8</td>
</tr>
<tr>
<td>Nominal signal range (span)</td>
<td>4 to 20mA</td>
</tr>
<tr>
<td>Full signal range</td>
<td>1 to 22mA</td>
</tr>
<tr>
<td>Voltage to load</td>
<td>13V min. @ 20mA</td>
</tr>
<tr>
<td>Load resistance</td>
<td>450Ω max.</td>
</tr>
<tr>
<td>Accuracy (@ 25°C)</td>
<td>± 20µA</td>
</tr>
<tr>
<td>Temperature stability (-40°C to +70°C)</td>
<td>± 0.006% of span per °C</td>
</tr>
<tr>
<td>Resolution</td>
<td>12 bits</td>
</tr>
<tr>
<td>Open circuit detection threshold</td>
<td>0.7 ± 0.2mA</td>
</tr>
<tr>
<td>Isolation (any channel to Railbus)</td>
<td>60V ac</td>
</tr>
<tr>
<td>(between channels)</td>
<td>none</td>
</tr>
</tbody>
</table>

### CONFIGURABLE PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output initialisation state</td>
<td>predefined value</td>
</tr>
<tr>
<td>Drive on “fail-safe”</td>
<td>upscale / downscale / last value</td>
</tr>
<tr>
<td>Channel status</td>
<td>active / inactive</td>
</tr>
</tbody>
</table>

### RESPONSE TIME

<table>
<thead>
<tr>
<th>Time</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Railbus command to output change</td>
<td>25ms (typ.) / 80ms (max.)</td>
</tr>
</tbody>
</table>

### SAFETY

Field wiring protection: [EEx ia] IIC

Safety description (each channel): \(V_o = 24.6V, I_o = 93mA, P_o = 0.57W\)

### POWER SUPPLIES

IS Railbus (12V) current (all channels @ 22mA): 530mA

Power dissipation within module: 3.8W (max.)

### MECHANICAL

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module Key Code</td>
<td>A4</td>
</tr>
<tr>
<td>Module width</td>
<td>42mm</td>
</tr>
<tr>
<td>Weight</td>
<td>245g</td>
</tr>
</tbody>
</table>

### FIELD TERMINAL

<table>
<thead>
<tr>
<th>Field wiring type</th>
<th>Recommended Field Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intrinsically safe, standard</td>
<td>8621-FT-IS</td>
</tr>
<tr>
<td>Intrinsically safe, loop disconnect</td>
<td>8622-FT-IS</td>
</tr>
</tbody>
</table>

---

### Footnotes

1. **8204-AO-IS**
2. **Field wiring type**
3. **Recommended Field Terminal**
16-channel Discrete Input

Switch/proximity detector

- 16 single-ended input channels
- intrinsically safe field circuits
- simple apparatus, dry contacts or IS proximity detectors
- open and short-circuit field wiring detection

MODULE SPECIFICATION
See also System Specification

INPUTS
Number of channels ..............................................16
OFF current ......................................................< 1.2mA
ON current ......................................................> 2.1mA
Switching hysteresis ...........................................200µA (nom.)
Applicable specifications .....................................NAMUR, DIN19234
Voltage applied to sensor .................................7.0 to 9.0V from 1kΩ ±10%
Output (wetting) current @ 100Ω line impedance ..............> 6mA
Line fault detection
Short circuit ....................................................< 100Ω
Open circuit ....................................................> 90kΩ
Maximum input frequency in pulse counting mode .................20Hz
Minimum pulse width detected ..................................45ms

CONFIGURABLE PARAMETERS
Selectable input filter ...........................................fast, slow or user defined
(Latch inputs)..................................................enable /disable
(Latch polarity)............................................latch on high / latch on low
Pulse counting ..................................................enable /disable
Line fault detection .............................................enable /disable

RESPONSE TIME
Response time ...................................................6ms (max.)
(Field event to availability on Railbus)

SAFETY
Field wiring protection ..............................................[Ex ia] IIC
Safety Description (each channel)
(U)oc = 10.5V, Io = 14mA, Po = 0.04W
FM Entity parameters ...........................................Voc ≤ 10.5 V dc, Ioc ≤ 14mA
Isolation .........................................................60V ac
(any channel to Railbus) (channels arranged in two groups of eight, with returns commoned within each group)

POWER SUPPLIES
IS Railbus (12V) current
(16-channel mode) ...............................................350mA (max.)
(8-channel mode) ...............................................285mA (max.)

MECHANICAL
Module Key Code ..............................................B1
Module width ....................................................42mm
Weight ...........................................................170g

FIELD TERMINAL
Field wiring type Recommended
Intrinsically safe, 16-channel 8623-FT-IS
Intrinsically safe, 8-channel loop disconnect 8624-FT-IS
### 4-channel Discrete Output

**Solenoid driver, IIC gas groups**

- 4 single-ended output channels
- intrinsically safe field circuits
- solenoid valves and alarms or LED indicators
- line-fault detection

**MODULE SPECIFICATION**  
*See also System Specification*

**OUTPUTS**

- **Number of channels**: 4
- **Minimum output voltage**
  - Open circuit: 22V
  - 45mA load: 11V
- **Maximum output voltage**: 25V
- **Current limit per channel**: 45mA (min.)
- **Output supply ripple**: <0.5% of output (pk. to pk.)
- **Line fault detection**
  - Short circuit: < 15Ω
  - Open circuit: > 13kΩ
- **Isolation**
  - (any channel to Railbus): 60V ac
  - (between channels): none

**CONFIGURABLE PARAMETERS**

- **Output initialisation state**: high / low
- **Output state on “fail-safe”**: high / low / last value
- **Channel status**: active / inactive
- **Operation mode**: static / dynamic
- **Output**: discrete / momentary pulse / continuous pulse
- **Pulse width**: 2ms to 130s
- **Duty cycle**: 2 ms to 130 s (0.01% to 99.99%)
- **Line fault detection**: enable / disable

**RESPONSE TIME**

- **Response time**: 10ms (typ.)
  - (Railbus command to output changes)

**SAFETY**

- **Field wiring protection**: [EEx ia] IIC
- **Safety description**
  - (each channel): \( V_o = 25V, I_o = 110mA, P_o = 0.69W \)
  - FM Entity parameters: \( V_{CC} \leq 25V \text{dc}, I_C \leq 110mA \)
  - \( C_o \leq 0.19\mu\text{F}, L_o \leq 3.15\text{mH} \)

**POWER SUPPLIES**

- **IS Railbus (12V) current**: 560mA (max.)
- **Power dissipation within module**: 3.7W (max.)

**MECHANICAL**

- **Module Key Code**: B5
- **Module width**: 42mm
- **Weight**: 220g

**FIELD TERMINAL**

<table>
<thead>
<tr>
<th>Field wiring type</th>
<th>Recommended Field Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intrinsically safe, standard</td>
<td>8621-FT-IS</td>
</tr>
<tr>
<td>Intrinsically safe, loop disconnect</td>
<td>8622-FT-IS</td>
</tr>
</tbody>
</table>
## Pulse Input Module

### 2-channel pulse input

#### MODULE SPECIFICATION

- **2** input channels with power supplies or single quadrature input
- **1** Hz to **50kHz** signal capability
- **Frequency** & acceleration measurement
- **2** alarm/repeater retransmitted output channels
- **2-** and **3-wire** pulse transmitter format
- **Pulse** counting (with gate control)
- **Channels** independently configurable
- **Open** circuit, **short** circuit and **missing** pulse detection

**SENSOR INPUT CHARACTERISTICS**

**NAMUR 1**

<table>
<thead>
<tr>
<th>Switching thresholds</th>
<th>1.2mA / 2.1mA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input impedance</strong></td>
<td>0kΩ</td>
</tr>
<tr>
<td><strong>Supply voltage</strong></td>
<td>8.1V (nom.) at 8mA</td>
</tr>
</tbody>
</table>

**CURRENT**

<table>
<thead>
<tr>
<th>Input signal</th>
<th>20mA (max.)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Threshold</strong></td>
<td>configurable in <strong>8</strong> levels</td>
</tr>
<tr>
<td><strong>Input impedance</strong></td>
<td>25Ω</td>
</tr>
<tr>
<td><strong>Open circuit current</strong></td>
<td>&lt; 0.5mA</td>
</tr>
<tr>
<td><strong>Short circuit current</strong></td>
<td>&gt; 21.5mA</td>
</tr>
</tbody>
</table>

**VOLTAGE**

<table>
<thead>
<tr>
<th>Input signal</th>
<th>0 - 24V dc (50V max.)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Threshold</strong></td>
<td>configurable in <strong>8</strong> levels</td>
</tr>
<tr>
<td><strong>Input impedance</strong></td>
<td>&gt; 10kΩ</td>
</tr>
<tr>
<td><strong>Switching hysteresis</strong></td>
<td>100mV</td>
</tr>
</tbody>
</table>

**Output voltage range**

| 0 – 10V dc |

### OUTPUTS

The outputs are open-collector type for separately powered IS devices such as LED clusters, annunciators or solenoids

<table>
<thead>
<tr>
<th>Number of channels</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OFF state voltage</strong></td>
<td>30V (max)</td>
</tr>
<tr>
<td><strong>OFF state leakage current</strong></td>
<td>10µA (max)</td>
</tr>
<tr>
<td><strong>ON state voltage drop</strong></td>
<td>&lt; 1.0V @ 50mA</td>
</tr>
<tr>
<td><strong>ON state current</strong></td>
<td>100mA</td>
</tr>
<tr>
<td><strong>Retransmission bandwidth</strong></td>
<td>1 – 2000Hz</td>
</tr>
</tbody>
</table>

---

**EUROPE (EMEA)**  
Tel: +44 (0)1582 723633  
Fax: +44 (0)1582 422283

**ASIA PACIFIC**  
Tel: +65 487 7887  
Fax: +65 487 7997

**AMERICAS**  
Tel: +1 603 926 0090  
Fax: +1 603 926 1899

E-mail: enquiry@mtl-inst.com  
Web site: www.mtl-inst.com

Oct 2006
2-channel pulse input

CONFIGURABLE PARAMETERS

INPUTS
Channel ..................................................enable / disable
Sensor type ..............................................NAMUR prox. type (select low / high speed)
..........................................................current pulse input
..........................................................voltage pulse input
..........................................................switch input
Frequency ranges ........................................0.1, 0.3, 0.5, 1, 3, 5, 10, 30, 50, 100kHz
Sample period ............................................50ms to 200s
Quadrature ..................................................enable / disable
Threshold level ...........................................user defined values
Triggering ...................................................rising edge / falling edge
Filtering ...................................................off, 1, 5, 20, 100kHz
Alarms .....................................................frequency / acceleration
Alarm limits ..................................................high / low
Alarm deadband (hysteresis) .........................user defined value
Line fault detect ..........................................enable / disable
Channel status ..........................................active / inactive
Counter ....................................................enable / disable
Counting direction ......................................count up / count down
* While measurements can be made in the upper half of this range, the stated accuracy applies only to frequencies up to 50kHz.
  In quadrature mode, the upper limit is 12.5kHz.

DISCRETE OUTPUT
Function selection ...........................................disabled
..........................................................high / low alarm
..........................................................acceleration alarm
..........................................................counter preset value reached
..........................................................quadrature output (channel 1 only)
..........................................................scaled retransmission (channel 1 only)
Retransmission scaling (K factor – channel 1 only) ………1 – 256

CONTROL GATE INPUT
Counter (channel 1) ...........................................start (count)/pause

DYNAMIC DATA (READ ONLY)

PROCESS VALUES
Frequency .................................................16 bit unsigned
Count .......................................................32 bit signed
Acceleration ...........................................16 bit signed

STATUS VALUES
Frequency / acceleration alarms .....................High / low
..........................................................missing pulse detect
Line fault detect ............................................open/short circuit
Quadrature direction .........................1 = clockwise, 2 = anti-clockwise
Counter alarms .............................................preset value reached

CONTROL DATA (WRITE ONLY)
Counter preset value ....................................32 bit signed
..........................................................load preset value = 0 to disable
Counter commands ....................................start / stop / reset
Note: Channel 1 counter can also be controlled by control gate input: 1 = start, 0 = pause

ISOLATION
Any channel to Railbus ........................................60V ac
Between input channels ..........................none (common 0V connection)
Between output channels .........................30V ac

RESPONSE TIME
Response time ...........................................25ms (max.)
(Signal change to availability on Railbus)

POWER SUPPLIES
Railbus current (both channels @22mA) ...............300mA (max.)
Power dissipation (both channels @22mA) ...........2.8W (max.)
(no load) ...................................................2.0W (max.)

MECHANICAL
Module Key Code ........................................F2
Module width ......................................42mm
Weight ...........................................260g

TERMINAL ASSIGNMENTS

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Current input</td>
</tr>
<tr>
<td>2</td>
<td>Voltage input</td>
</tr>
<tr>
<td>3</td>
<td>NAMUR input</td>
</tr>
<tr>
<td>4</td>
<td>Common</td>
</tr>
<tr>
<td>5</td>
<td>Power supply +ve</td>
</tr>
<tr>
<td>6</td>
<td>Power supply +ve</td>
</tr>
<tr>
<td>7</td>
<td>Current input</td>
</tr>
<tr>
<td>8</td>
<td>Voltage input</td>
</tr>
<tr>
<td>9</td>
<td>NAMUR input</td>
</tr>
<tr>
<td>10</td>
<td>Common</td>
</tr>
<tr>
<td>11</td>
<td>NAMUR gate/control input</td>
</tr>
<tr>
<td>12</td>
<td>Common</td>
</tr>
<tr>
<td>13</td>
<td>Output +ve</td>
</tr>
<tr>
<td>14</td>
<td>Output –ve</td>
</tr>
<tr>
<td>15</td>
<td>Output +ve</td>
</tr>
<tr>
<td>16</td>
<td>Output –ve</td>
</tr>
</tbody>
</table>

FIELD TERMINAL

<table>
<thead>
<tr>
<th>Field wiring type</th>
<th>Recommended Field Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intrinsically safe, standard</td>
<td>8621-FT-IS</td>
</tr>
</tbody>
</table>

EUROPE (EMEA) Tel: +44 (0)1582 723633 Fax: +44 (0)1582 422283
ASIA PACIFIC Tel: +65 487 7887 Fax: +65 487 7997
E-mail: enquiry@mtl-inst.com Web site: www.mtl-inst.com
SAFETY
Field wiring protection .................................... [Ex ia IIC]
The following figures are for Gas Groups A/B (IIC) unless otherwise stated.
24V TX supplies (Ch1 & Ch2)
...........................................................................Uo = 27.4V, Io = 93.2mA, Po = 639mW
...........................................................................Ca = 0.08µF, La = 4.1mH
Current inputs (Ch1 & Ch2)
...........................................................................Uo = ±1.1V, Io = 53mA, Po = 15mW
...........................................................................Ui = 1.1V, li = 50mA
...........................................................................C0 = 1000µF, Lo = 13.1mH
Voltage inputs (Ch1 & Ch2)
NAMUR inputs (Ch1 & Ch2)
NAMUR gate input (Ch1)
...........................................................................Uo = 9.6V, Io = 25mA, Po = 57mW
...........................................................................Ui = 18.2V, Pi = 333mW
...........................................................................Co = 3.6µF, Lo = 56.6mH
Discrete outputs (Ch1 & Ch2)
...........................................................................Ui = 30V, Pi = 333mW
All circuits combined within one channel
...........................................................................Uo = 28.5V, Io = 93.2mA (or 169mA at 13.4V), Po = 639mW
...........................................................................C0 = 0.078µF, Lo = 1.28mH

FM ENTITY PARAMETERS
24V TX supplies (Ch1 & Ch2)
...........................................................................Uo = 27.4V, Io = 93.2mA, Po = 639mW
...........................................................................Ca = 0.08µF, La = 4.1mH
24V TX supplies (Ch1 & Ch2 connected together)
Gas Groups C,E (IIB)
...........................................................................Uo = 27.4V, Io = 186.4mA, Po = 1.28W
...........................................................................Ca = 0.67µF, La = 4.3mH
Current inputs (Ch1 & Ch2)
...........................................................................Uo = 1.2V, Io = 57.4mA, Po = 17.2mW
...........................................................................Ca = 1000µF, La = 10.6mH
3-wire current inputs (Ch1 & Ch2)
Gas Groups C,E (IIB)
...........................................................................Uo = 27.4V, Io = 150.6mA, Po = 656mW
...........................................................................Ca = 0.67µF, La = 6.4mH
Voltage inputs (Ch1 & Ch2)
...........................................................................Uo = 9.56V, Io = 1.0mA, Po = 2.39mW
...........................................................................Ca = 3.7µF, La = 1000mH
3-wire voltage inputs (Ch1 & Ch2)
...........................................................................Uo = 27.4V, Io = 93.2mA, Po = 642mW
...........................................................................Ca = 0.08µF, La = 4.0mH

NAMUR inputs (Ch1 & Ch2)
NAMUR gate input (Ch1)
...........................................................................Uo = 9.56V, Io = 11.1mA, Po = 26.4mW
...........................................................................Ca = 3.7µF, La = 263mH
Discrete outputs (Ch1 & Ch2)
...........................................................................Ui = 30V, li = 100mA
...........................................................................Ci = 0µF, Li = 0mH

LED INDICATORS
POWER – Green LED
<table>
<thead>
<tr>
<th>OFF</th>
<th>ON</th>
<th>FLASHING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power failure</td>
<td>Power OK</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

FAULT – Red LED

<table>
<thead>
<tr>
<th>OFF</th>
<th>ON</th>
<th>FLASHING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In running state</td>
<td>Fault</td>
<td>Awaiting module training</td>
</tr>
</tbody>
</table>

PULSE INPUT CHANNEL – Yellow LED

<table>
<thead>
<tr>
<th>OFF</th>
<th>ON</th>
<th>FLASHING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Channel inactive</td>
<td>Channel active and operating normally</td>
<td>Channel active but in alarm condition</td>
</tr>
</tbody>
</table>

DIGITAL OUTPUT CHANNEL – Yellow LED

<table>
<thead>
<tr>
<th>OFF</th>
<th>ON</th>
<th>FLASHING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Channel inactive</td>
<td>Channel active and operating normally</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>
Field terminals - Screw clamp

Fusing & loop-disconnect
Field terminals are available that contain a replaceable fuse or a “loop-disconnect” link for each channel. Fuses have a 2A rating and, like the links, have a mechanical feature that allows them to be partially withdrawn. This provides a break in the field wiring loop which assists servicing and fault finding in the field.

Thermocouple modules
Thermocouple modules require specific field terminals. The thermocouple modules – 8105-TI-TC (4-channel) and 8205-TI-IS (8-channel IS) – each have their own specific field terminal containing a cold junction compensation sensor. The 8205-TI-IS can also accommodate a remote cold junction – if used, it occupies one of the eight available channels.

RTD modules
The RTD modules, 8106-TI-TRT (4-channel) and 8206-TI-TS (8-channel IS) use field terminals that are specifically designed to accommodate 2, 3 and 4-wire connections. The field terminals incorporate diodes that become forward biased if a channel becomes open circuited - ensuring that other channels are not affected by this situation. Similarly, an RTD can be removed from, or not fitted to, a channel without affecting the operation. The points where the energisation current enters and leaves the terminal (with the exception of the mass terminals) are coloured blue to mark this difference.

IS field terminals
Particular field terminals are required for modules with built-in IS interfaces, and field terminals are coloured blue to mark this difference.

Tagging strip
A tagging strip is supplied with each terminal (with the exception of the mass termination assemblies). A card is provided for the user to mark the channel assignments for the field wiring and this is protected by a clear plastic panel.

Mechanical key coding
Field terminals are an important link in the field connection process and a mechanical keying technique is used to prevent incompatible modules from being connected accidentally to a field circuit. This avoids inadvertent damage to I/O modules and field wiring, and maintains safety in hazardous area applications. It is implemented in two complementary ways.

Rotatable keys
A pair of mechanically rotatable keys form part of the field terminal (see diagram below) and these are set by the user during installation to match the fixed key-code (e.g. A 1) of the I/O module that will be fitted onto it. A module with a different key-code cannot then accidentally be fitted on that field terminal.

Keyways
The four types of field terminal: general purpose, non-incendive, non-arcing and intrinsically safe, have a further pattern of keys that make each type unique; modules of a corresponding type have a matching keyway. It is therefore impossible to implement a potentially hazardous combination of module and field terminal. The four types of field terminal can be identified from the diagram below.

General
A field terminal is a replaceable unit for terminating the wiring from the field devices. Each I/O module requires its own field terminal and the correct type is recommended on the individual I/O module data sheet.

The field wiring is terminated on screw terminals that can take up to 2.5mm² wire. By wiring virtually directly to the I/O module there is no need for additional patching or terminations.

The field terminal attaches to the module carrier first; the I/O module is then mounted on it. A pair of multipin connectors link the field terminal to the I/O module.

General Purpose

Non-Incendive (2/2)

Non-Arching (2/2)

Intrinsically Safe (2/1)

Keys to match keyways on modules
Field terminals - Mass Termination Assemblies

Mass Termination Assembly
Mass Termination Assemblies (MTAs) offer the user a number of different ways to terminate field wiring. Two versions are available, 16-pin (8618-FT-MT) and 44-pin (8619-FT-MT), both of which provide IDC multi-pin connectors instead of screw terminals.

Some standard 1, 2 and 3 metre cables, are available from MTL to assist the user; others can be made to order; or users can put together their own custom cables to suit their specific wiring termination requirements.

The Mass Termination Assemblies are particularly useful when legacy systems are being replaced and connections must be made to existing field wiring, junction boxes and marshalling cabinets.

Mass Termination Assemblies can also be used to interface to signal conditioning units. For example, with devices that require a drive current above the 1A capability of the 8115-DO-DC discrete output module, the 8618-FT-MT can be used to connect to high-current relays*

Switch/Proximity Detector Wiring Panel
The 8650-FT-PX provides a simple method to terminate up to 32 two-wire field devices. It is DIN-rail mountable and links to the 8619-FT-MT field terminal using a pair of ready terminated, IDC connector cables. For maximum convenience, there is also provision for cable screens to be terminated and grounded.

Mechanical key coding
This feature is available on these terminals. See the previous page for details.

*See Technical Support Note TSN112: “Using the 8115-DO-DC with high-current loads”.
Available from: www.mtl-inst.com
**Field terminals**

- range of field terminals
- standard, fused, loop-disconnect & MTAs
- blue moulding for IS field wiring
- THC and RTD versions available
- tag strip on all screw-clamp field terminals

**SPECIFICATION**

*See also System Specification*

**HAZARDOUS AREA APPROVALS**

Location of field terminal... Zone 2, IIC, T4 hazardous area or Class 1, Div 2, Groups A-D, T4 hazardous location

Location of I/O field wiring
For 860x-FT-xx and 861x-FT-xx... Zone 2, IIC, T4 hazardous area or Class 1, Div 2, Groups A-D, T4 hazardous location
For 862x-FT-IS... Zone 0, IIC hazardous area or Div 1, Groups A-D hazardous location

**ELECTRICAL**

Rated voltage ..................................................250V ac
Maximum current per I/O channel..............................3A
Fuse rating (where fitted) ........................................2A
Conductor size ..................................................0.14–2.5mm²

**MECHANICAL**

Material ..........................................................Modified Poly-Phenylene Oxide
Dimensions - approx (including tagging strip)
8617-FT-NI and 8623-FT-IS..................42 (w) x 88 (d) x 61 (h) mm
Others..........................................................42(w) x 88 (d) x 39.5 (h) mm
Weights (typical - including tagging strip)
Unfused type (except THC & RTD)..............................78g
Fused type (including fuses) ....................................86g
THC type..........................................................70g
RTD type..........................................................106g
8617-FT-NI and 8623-FT-IS (16-channel) .....................106g

See also datasheets for 8618-FT-MT and 8619-FT-MT

**PART NUMBERS**

**GENERAL PURPOSE FIELD WIRING**

<table>
<thead>
<tr>
<th>Field terminal description</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>8602-FTST</td>
</tr>
<tr>
<td>Fused</td>
<td>8604-FTFU</td>
</tr>
<tr>
<td>THC</td>
<td>8605-FTTC</td>
</tr>
<tr>
<td>RTD</td>
<td>8606-FTRT</td>
</tr>
<tr>
<td>4-wire transmitter</td>
<td>8615-FT4W</td>
</tr>
<tr>
<td>16/30-channel DI</td>
<td>8617-FTNI</td>
</tr>
<tr>
<td>16-pin Mass Termination Assembly</td>
<td>8618-FTMT</td>
</tr>
<tr>
<td>44-pin Mass Termination Assembly</td>
<td>8619-FTMT</td>
</tr>
</tbody>
</table>

**ZONE 2/DIV2 FIELD WIRING APPLICATIONS**

<table>
<thead>
<tr>
<th>Field terminal description</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>THC</td>
<td>8605-FTTC</td>
</tr>
<tr>
<td>RTD</td>
<td>8606-FTRT</td>
</tr>
<tr>
<td>Non-incendive*</td>
<td>8601-FTNI</td>
</tr>
<tr>
<td>Non-incendive, fused*</td>
<td>8603-FTFU</td>
</tr>
<tr>
<td>Non-arcing, standard*</td>
<td>8610-FTNA</td>
</tr>
<tr>
<td>Non-arcing, fused*</td>
<td>8611-FTFU</td>
</tr>
<tr>
<td>4-wire transmitter</td>
<td>8615-FT4W</td>
</tr>
<tr>
<td>16-channel DI</td>
<td>8617-FTNI</td>
</tr>
<tr>
<td>16-pin Mass Termination Assembly</td>
<td>8618-FTMT</td>
</tr>
<tr>
<td>44-pin Mass Termination Assembly</td>
<td>8619-FTMT</td>
</tr>
</tbody>
</table>

**ZONE 1, 0/DIV 1 (IS) FIELD WIRING APPLICATIONS**

<table>
<thead>
<tr>
<th>Field terminal description</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>IS, standard</td>
<td>8621-FTIS</td>
</tr>
<tr>
<td>IS, loop-disconnect</td>
<td>8622-FTIS</td>
</tr>
<tr>
<td>IS, 16-channel DI</td>
<td>8623-FTIS</td>
</tr>
<tr>
<td>IS, 8-channel DI, loop-disconnect</td>
<td>8624-FTIS</td>
</tr>
<tr>
<td>IS, THC</td>
<td>8625-FTIS</td>
</tr>
<tr>
<td>IS, RTD</td>
<td>8626-FTIS</td>
</tr>
</tbody>
</table>

**ADDITIONAL COMPONENTS**

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch/Prox detector wiring panel</td>
<td>8650-FTPX</td>
</tr>
<tr>
<td>2A Fuse pack (10 in pack)</td>
<td>8401-FU-2A</td>
</tr>
<tr>
<td>Loop-disconnect links (10 in pack)</td>
<td>8405-JK-ZE</td>
</tr>
</tbody>
</table>

*Refer to 2/2 I/O module data sheets for recommended non-incendive or non-arcing field terminal type in Zone 2 and Division 2 applications.*
### Field terminals

#### Connection diagrams

Identify terminal type in the table below, then see named diagram for connections.

<table>
<thead>
<tr>
<th>Terminal type</th>
<th>Diagram No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>8601-FTNI</td>
<td>1</td>
</tr>
<tr>
<td>8602-FTST</td>
<td>1</td>
</tr>
<tr>
<td>8603-FTFU</td>
<td>1</td>
</tr>
<tr>
<td>8604-FTFU</td>
<td>1</td>
</tr>
<tr>
<td>8605-FTTC</td>
<td>2</td>
</tr>
<tr>
<td>8606-FTRT (2-wire)</td>
<td>3</td>
</tr>
<tr>
<td>8606-FTRT (3-wire)</td>
<td>4</td>
</tr>
<tr>
<td>8606-FTRT (4-wire)</td>
<td>5</td>
</tr>
<tr>
<td>8610-FTNA</td>
<td>1</td>
</tr>
<tr>
<td>8611-FTFU</td>
<td>1</td>
</tr>
<tr>
<td>8615-FT4W</td>
<td>1</td>
</tr>
<tr>
<td>8617-FTNI</td>
<td>6 or 6a†</td>
</tr>
<tr>
<td>8618-FTMT</td>
<td>see datasheet</td>
</tr>
<tr>
<td>8619-FTMT</td>
<td>see datasheet</td>
</tr>
<tr>
<td>8621-FTIS</td>
<td>1 or 7*</td>
</tr>
<tr>
<td>8622-FTIS</td>
<td>1 or 7*</td>
</tr>
<tr>
<td>8623-FTIS</td>
<td>6</td>
</tr>
<tr>
<td>8624-FTIS</td>
<td>1</td>
</tr>
<tr>
<td>8625-FTIS</td>
<td>8</td>
</tr>
<tr>
<td>8626-FTIS [2 wire]</td>
<td>9</td>
</tr>
<tr>
<td>8626-FTIS [3 wire]</td>
<td>10</td>
</tr>
<tr>
<td>8626-FTIS [4 wire]</td>
<td>11</td>
</tr>
<tr>
<td>8650-FTPX</td>
<td>see datasheet</td>
</tr>
</tbody>
</table>

† Wire as per diagram 6a only when used with 8125-DI-DC or 8127-DI-SE modules.

* Wire as per diagram 7 only when used with 8215-DO-IS module.

### Diagrams

**Diagram 1**

![Diagram 1](image1)

**Diagram 2**

![Diagram 2](image2)

**Diagram 3**

![Diagram 3](image3)

**Diagram 4**

![Diagram 4](image4)

**Diagram 5**

![Diagram 5](image5)
Field terminals - Standard

Connection diagrams

Diagram 6

Diagram 6a

Diagram 7

Diagram 8

Diagram 9

Diagram 10

Diagram 11
Field terminals

16-pin mass termination assembly

- 16-pin IDC connector termination
- IDC alternative for most screw terminal types
- use with 8115-DO-DC for high-current relay adapters
- provides a choice of field wiring terminations
- clip-on protective cover

SPECIFICATION
See also System Specification

HAZARDOUS AREA APPROVALS
Field terminal location ..... Zone 2, IIC, T4 hazardous area or Class 1, Div 2, Groups A–D, T4 hazardous location
I/O field wiring location ..... Zone 2, IIC, T4 hazardous area or Class 1, Div 2, Groups A–D, T4 hazardous location

ELECTRICAL
Rated voltage ...........................................................50V AC
Maximum current per I/O channel ..................0.75A

MECHANICAL
Material ..................................................Modified Poly-Phenylene Oxide
Dimensions - approx ..................42(w) x 95(d) x 42*(h) mm
Weight .................................................................44g
* with protective cover fitted

CABLE OPTIONS
16-way cables, terminated with 16-pin IDC connectors at each end, are available for the 8618-FT-MT.

Description Part number
1 metre cable ..........................................................8081-FC-10
2 metre cable ..........................................................8082-FC-20
3 metre cable ..........................................................8083-FC-30

See also Technical Support Note TSN112 for details of using this product with high-current relays.

Notes
1. This field terminal cannot be used with the following I/O module types:
   8105-TI-TC, 8106-TI-RT Special functionality required e.g. CJC
   8121-DI-DC, 8122-DI-DC
   8125-DI-DC, 8127-DI-SE Insufficient terminals - use 8619-FTMT
2. AC modules cannot be used with this field terminal because of the 50V AC voltage rating.

IDC CONNECTOR PINOUTS

When used with the following I/O module types:
8101-HI-TX 8102-HO-IP 8103-AI-TX 8104-AO-IP
8109-DI-DC 8110-DI-DC 8115-DO-DC 8117-DO-DC
8119-VI-05 use this pinout:

| Pin | Function
|-----|-----------
| 1   | Voltage i/p - Ch 1
| 2   | Current i/p - Ch 1
| 3   | Common - Ch 1
| 5   | Power supply +ve - Ch 2
| 6   | Power supply +ve - Ch 1
| 7   | Voltage i/p - Ch 2
| 8   | Current i/p - Ch 2
| 9   | Common - Ch 2
| 10  | NAMUR i/p - Ch 2
| 11  | Common - Ch 1
| 12  | NAMUR gate control - Ch 1
| 13  | o/p –ve - Ch 1
| 14  | o/p +ve - Ch 1
| 15  | o/p –ve - Ch 2
| 16  | o/p +ve - Ch 2

When used with I/O module type: 8123-PI-QU

| Pin | Function
|-----|-----------
| 1   | Voltage i/p - Ch 1
| 2   | Current i/p - Ch 1
| 3   | Common - Ch 1
| 4   | NAMUR i/p - Ch 1
| 5   | Power supply +ve - Ch 2
| 6   | Power supply +ve - Ch 1
| 7   | Voltage i/p - Ch 2
| 8   | Current i/p - Ch 2
| 9   | Common - Ch 2
| 10  | NAMUR i/p - Ch 2
| 11  | Common - Ch 1
| 12  | NAMUR gate control - Ch 1
| 13  | o/p –ve - Ch 1
| 14  | o/p +ve - Ch 1
| 15  | o/p –ve - Ch 2
| 16  | o/p +ve - Ch 2

EUROPE (EMEA) Tel: +44 (0)1582 723633 Fax: +44 (0)1582 422283
AMERICAS Tel: +1 603 926 0090 Fax: +1 603 926 1899
ASIA PACIFIC Tel: +65 487 7997 E-mail: enquiry@mtl-inst.com Web site: www.mtl-inst.com

Nov 2006
USAGE OPTIONS

PIN OUT

+ CABLE

+ 16-TO 14-WAY CABLE
+ HIGH-CURRENT RELAYS

For further details on choosing and using output relays see MTL Technical Support Note TSN112 “Using the 8115-DO-DC with high-current loads”
Field terminals

44-pin mass termination assembly

- 32 channel connection
- use with 8121/8122 and 8125/8127
- use with 8650-FT-PX field terminal
- provides a choice of field wiring terminations
- clip-on protective cover

SPECIFICATION
See also System Specification

HAZARDOUS AREA APPROVALS
Field terminal location ... Zone 2, IIC, T4 hazardous area or
Class 1, Div 2, Groups A–D, T4 hazardous location
I/O field wiring location ... Zone 2, IIC, T4 hazardous area or
Class 1, Div 2, Groups A–D, T4 hazardous location

ELECTRICAL
Rated voltage ........................................................... 50V AC
Maximum current per I/O channel ....................... 0.75A

MECHANICAL
Material .................................... Modified Poly-Phenylene Oxide
Dimensions - approx ................. 42(w) x 95(d) x 42*(h) mm
Weight ............................................................. 48g
* with protective cover fitted

CABLE OPTIONS
20-+24-way cable sets, terminated with IDC connectors at each end, are available for the 8619-FT-MT. These could be used, for example, to connect the 8619-FT-MT to the 8650-FT-PX wiring panel.

<table>
<thead>
<tr>
<th>Description</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 metre length set</td>
<td>8085-FC-10</td>
</tr>
<tr>
<td>2 metre length set</td>
<td>8086-FC-20</td>
</tr>
<tr>
<td>3 metre length set</td>
<td>8087-FC-30</td>
</tr>
</tbody>
</table>

IDC CONNECTOR PINOUTS

J1

<table>
<thead>
<tr>
<th>Pin</th>
<th>8125</th>
<th>8127</th>
<th>8125</th>
<th>8127</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ch 1</td>
<td>Ch 2</td>
<td>Ch 8</td>
<td>Ch 1</td>
</tr>
<tr>
<td>2</td>
<td>0V</td>
<td>Ch 1</td>
<td>Ch 9</td>
<td>Ch 2</td>
</tr>
<tr>
<td>3</td>
<td>Ch 3</td>
<td>Ch 4</td>
<td>Ch 10</td>
<td>Ch 3</td>
</tr>
<tr>
<td>4</td>
<td>Ch 2</td>
<td>Ch 3</td>
<td>Ch 11</td>
<td>Ch 4</td>
</tr>
<tr>
<td>5</td>
<td>Ch 5</td>
<td>Ch 6</td>
<td>Ch 12</td>
<td>Ch 5</td>
</tr>
<tr>
<td>6</td>
<td>Ch 4</td>
<td>Ch 5</td>
<td>Ch 13</td>
<td>Ch 6</td>
</tr>
<tr>
<td>7</td>
<td>Ch 7</td>
<td>Ch 8</td>
<td>Ch 14</td>
<td>Ch 7</td>
</tr>
<tr>
<td>8</td>
<td>Ch 6</td>
<td>Ch 7</td>
<td>Ch 15</td>
<td>Ch 8</td>
</tr>
<tr>
<td>9</td>
<td>Ch 17</td>
<td>Ch 10</td>
<td>Ch 16</td>
<td>Ch 9</td>
</tr>
<tr>
<td>10</td>
<td>Ch 16</td>
<td>Ch 9</td>
<td>Ch 26</td>
<td>Ch 9</td>
</tr>
<tr>
<td>11</td>
<td>Ch 19</td>
<td>Ch 12</td>
<td>Ch 24</td>
<td>Ch 10</td>
</tr>
<tr>
<td>12</td>
<td>Ch 18</td>
<td>Ch 11</td>
<td>Ch 25</td>
<td>Ch 11</td>
</tr>
<tr>
<td>13</td>
<td>Ch 21</td>
<td>Ch 14</td>
<td>Ch 27</td>
<td>Ch 12</td>
</tr>
<tr>
<td>14</td>
<td>Ch 20</td>
<td>Ch 13</td>
<td>Ch 28</td>
<td>Ch 13</td>
</tr>
<tr>
<td>15</td>
<td>Ch 23</td>
<td>Ch 16</td>
<td>Ch 29</td>
<td>Ch 14</td>
</tr>
<tr>
<td>16</td>
<td>Ch 22</td>
<td>Ch 15</td>
<td>Ch 30</td>
<td>Ch 15</td>
</tr>
<tr>
<td>17</td>
<td>0V</td>
<td>n/c</td>
<td>Ch 31</td>
<td>n/c</td>
</tr>
<tr>
<td>18</td>
<td>Ch 27</td>
<td>n/c</td>
<td>Ch 32</td>
<td>n/c</td>
</tr>
<tr>
<td>19</td>
<td>Ch 28</td>
<td>n/c</td>
<td>0V</td>
<td>n/c</td>
</tr>
<tr>
<td>20</td>
<td>Ch 32</td>
<td>n/c</td>
<td>0V</td>
<td>n/c</td>
</tr>
</tbody>
</table>

Notes:
1. 0V pins are all linked only when the module is fitted.
2. Channels 27, 28 and 32 are common to both J1 and J2

n/c = no connection
Field terminals

44-pin mass termination assembly

USAGE OPTIONS

PIN OUT

+ CABLE

+ CABLE + 8650 Wiring Panel
Field terminals

Switch/proximity detector wiring panel 8650-FT-PX

- simplified 32-channel field wiring connection
- multipin connectors to 8619-FT-MT field terminal
- screw terminals for field wiring
- DIN-rail mounting

SPECIFICATION
See also System Specification

HAZARDOUS AREA APPROVALS
Location Zone 2, IIC, T4 hazardous area or Class 1, Div 2, Groups A–D, T4 hazardous location

ELECTRICAL
System connectors 20-pin & 24-pin
Field terminals rising cage-clamp screw terminals
Conductor size 0.14–2.5 mm²
Rated voltage 50V AC
Maximum current per I/O channel 0.75A
Ground terminals 2 x M4

MECHANICAL
DIN rail mounting 'T' section to EN 50022
'G' section to EN 50035

CABLE OPTIONS
20- + 24-way cable sets to connect with the 8619-FT-MT
1 metre length set 8085-FC-10
2 metre length set 8086-FC-20
3 metre length set 8087-FC-30

DIMENSIONS
in mm

TERMINAL ASSIGNMENTS
Module carriers - Overview

General
Carriers are the building blocks on which the MTL8000 system is assembled. They distribute the basic power supply services to the modules, and provide the communications route between the Bus Interface Module (BIM) or Controller and the I/O modules. Most carriers can be mounted on DIN rail or directly to a flat surface and may be joined end-to-end to extend the size of an installation. Multipin connectors at the end of each carrier carry the system power supply and internal “Railbus” communications across to the next carrier.

All I/O module carriers have their own independent earthing/grounding strip, with screw terminals, to terminate the screens/shields of field-wiring cables. At each end of the strip there is a separate terminal to enable it to be linked to other carriers, or to the system ground, as required.

Node services carrier-NSM
This node services carrier will accommodate one BIM and a node services module. It is the recommended BIM carrier for all AC powered nodes because it supports “power health” management. This carrier will support Modbus or Profinbus-DP BIMs. It is also recommended for DC powered nodes that are exclusively 2/1, i.e. where no 2/2 I/O modules are required. For these applications, it is commonly used with the power supply carrier (see this page).

BIM-only carrier
This carrier provides an alternative to a node services carrier - NSM when a node services module is not required. This carrier will support Modbus or Profinbus-DP BIMs. It is commonly used with the power supply carrier (see this page).

Node services carrier-BIM
These two node services carriers will accommodate one BIM, a node services module, two system DC power supplies and four 2/2 I/O modules. One carrier (8711) supports the Modbus BIM and the other (8712) supports the Profinbus-DP BIM. These carriers are recommended for DC powered nodes that use 2/2, or a mixture of 2/2 and 2/1 I/O modules.

Controller carrier
The controller carrier provides a mounting platform for up to two controllers or EBIMs (8521-XX-XX). It can also accommodate a Power Supply Monitor module (8410-NS-PS), to monitor up to seven system power supplies in the node and alert the controller to failures.

I/O Module carriers
I/O Module carriers are available in general purpose (2/2) and 2/1 format. As a safeguard, these two types cannot be connected to each other because of the different multipin connectors used. The only way to connect the two types is by placing a Railbus Isolator (on its carrier) between them. Within these basic formats, 4 and 8 module carriers are available and they may be joined in any combination to suit node requirements.

64 module addressing
The 8521 controller/EBIM is capable of addressing up to 64 modules, unlike the BIM models 8502 and 8505, which will address a maximum of 32.

Two carriers, models 8709-CA-08 (2/2) and 8729-CA-08 (2/1), are available with additional addressing lines to build a node with up to 64 modules. If 64-slot addressing is required for a node, these carrier types must be used exclusively, i.e. they cannot be mixed with 32-slot address carriers. Note: The 8521 controller/eBIM can also be configured to a 32 module limit and may then use 32-slot address carriers.

Power supply carrier
This carrier is used to mount the 8910-PS-DC system power supply module which provides system power for DC power nodes. It is often used to support the node services carrier-NSM or the BIM-only carrier.

IS power supply module carrier
The 8920-PS-DC field power supply module provides power for 2/1 I/O modules and requires its own carrier to mount it. The carrier mounts in-line with 8- and 4-module 2/1 carriers, maintaining the Railbus connections through its edge connectors. This carrier may be used in 32-slot or 64-slot address nodes.

Railbus isolator carrier
When a node has IS field wiring terminating on it, an 8922-RB-IS Railbus isolator must be used between 2/2 and 2/1 carrier types. This is to prevent possible mains-voltage fault conditions from being propagated, via the Railbus, to the IS field wiring. The Railbus isolator has its own carrier – 8723-CARB. This carrier may be used in 32-slot or 64-slot address nodes.

Carrier extenders
If the chosen field enclosure will not accommodate a single, end to end line of carriers, extenders can be fitted to enable the carriers to be continued on another line. The extenders are left and right handed and connect to the ends of the I/O module carriers using the multipin connectors. A multicore cable is used to link the data and address bus between the carriers.

General purpose (2/2) and 2/1 extenders have different connectors to prevent accidental cross connection of the two types. Carrier extenders may be used in 32-slot or 64-slot address nodes.

jun 2004
### Module carriers - Listing

#### 2/2 carriers

<table>
<thead>
<tr>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-module carrier (32-slot addressing)</td>
<td>8707-CA-08</td>
</tr>
<tr>
<td>8-module carrier (64-slot addressing)</td>
<td>8709-CA-08</td>
</tr>
<tr>
<td>4-module carrier (32-slot addressing)</td>
<td>8710-CA-04</td>
</tr>
<tr>
<td>Node services carrier (Modbus)</td>
<td>8711-CA-NS</td>
</tr>
<tr>
<td>Node services carrier (Profibus)</td>
<td>8712-CA-NS</td>
</tr>
<tr>
<td>BIM carrier</td>
<td>8715-CA-BI</td>
</tr>
<tr>
<td>Power supply (8910-PS-DC) carrier</td>
<td>8717-CA-PS</td>
</tr>
<tr>
<td>Node services carrier (NSM)</td>
<td>8718-CA-NS</td>
</tr>
<tr>
<td>Controller/EBIM carrier</td>
<td>8750-CA-NS</td>
</tr>
</tbody>
</table>

| Carrier extender (right hand)                    | 8020-CE-RH |
| Carrier extender (left hand)                     | 8021-CE-LH |

| Carrier extender cable                            |         |
| 0.35m                                             | 8001-CC-35 |
| 0.85m                                             | 8002-CC-85 |
| 1.2m                                              | 8003-CC-12 |

#### 2/1 carriers

<table>
<thead>
<tr>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>IS 8-module carrier (32-slot addressing)</td>
<td>8727-CA-08</td>
</tr>
<tr>
<td>IS 8-module carrier (64-slot addressing)</td>
<td>8729-CA-08</td>
</tr>
<tr>
<td>IS 4-module carrier (32-slot addressing)</td>
<td>8720-CA-04</td>
</tr>
<tr>
<td>Railbus isolator carrier</td>
<td>8723-CA-RB</td>
</tr>
<tr>
<td>IS module power supply carrier</td>
<td>8724-CA-PS</td>
</tr>
</tbody>
</table>

| Carrier extender (right hand)                    | 8030-CE-RH |
| Carrier extender (left hand)                     | 8031-CE-LH |

| Carrier extender cable                            |         |
| 0.35m                                             | 8011-CC-35 |
| 0.85m                                             | 8012-CC-85 |
| 1.2m                                              | 8013-CC-12 |

| IS power extension cable                          |         |
| 0.35m                                             | 8016-CC-35 |
| 0.85m                                             | 8017-CC-85 |
| 1.2m                                              | 8018-CC-12 |

| IS carrier extension cable set                    |         |
| 0.35m                                             | 8032-CC-35 |
| 0.85m                                             | 8033-CC-85 |
| 1.2m                                              | 8034-CC-12 |
Module carriers

8-module carrier

- 32-slot address bus*
- accepts up to eight I/O modules and field terminals
- printed wiring board
- rugged polycarbonate moulding
- DIN rail or panel mounting
- carries control signals and data on Railbus
- distributes DC power to modules
- distributes Bussed Field Power to modules
- isolated earthing bar for cable screens/shields

CARRIER SPECIFICATION
See also System Specification

HAZARDOUS AREA APPROVALS
Location of node
.........Class 1, Div 2, Groups A, B, C, D T4 hazardous location or
......Zone 2, IIC T4 hazardous location
Location of field wiring .........................As node
Field terminals accepted ...................General purpose, 2/2
I/O modules accepted .......................General purpose, 2/2

ELECTRICAL
Railbus connectors ..............................female in, male out
Module address range ........................1–32
Bussed field power supply (optional)
Two 8-pin connectors are provided at the top rear of the carrier to connect power supplies for ‘field power’. Such supplies are routed through certain I/O module to provide power to field circuits.

MATERIALS
Carrier moulding ............................Modified poly-phenylene oxide
Printed wiring board .......................Epoxy resin woven glass laminate

ENVIRONMENTAL
Ambient temp
Operating, .....................................................– 40°C to + 70°C
Storage ...........................................................– 40°C to + 85°C
Relative Humidity ....................5 to 95% RH (non-condensing)
Vibration and Shock ....................See System specification sheet

MECHANICAL
Dimensions .................................342 (w) x 170 (d) x 22 (h) mm
Weight .....................................................680 g
Mounting methods .........................Flat panel or DIN rail
DIN-rail types
..........‘Top hat’ 35 x 7.5 mm rail or 35 x 15 mm rail to EN 50022
..........G-section rail to EN 50035

Note: A second connector uses the same pin assignments for modules 5 & 6 and 7 & 8.

* Must not be mixed with 64-slot address carriers

BUSSED FIELD POWER CONNECTIONS

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Bussed Field Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I/O Modules 1 &amp; 2</td>
</tr>
<tr>
<td>2</td>
<td>–ve (or Neutral)</td>
</tr>
<tr>
<td>3</td>
<td>I/O Modules 1 &amp; 2</td>
</tr>
<tr>
<td>4</td>
<td>+ve (or Live)</td>
</tr>
<tr>
<td>5</td>
<td>I/O Modules 3 &amp; 4</td>
</tr>
<tr>
<td>6</td>
<td>+ve (or Live)</td>
</tr>
<tr>
<td>7</td>
<td>I/O Modules 3 &amp; 4</td>
</tr>
<tr>
<td>8</td>
<td>–ve (or Neutral)</td>
</tr>
</tbody>
</table>

<image of module carrier>
**Module carriers**

### 8-module carrier - extended addressing

- 64-slot address bus*
- accepts up to eight I/O modules and field terminals
- printed wiring board
- rugged polycarbonate moulding
- DIN rail or panel mounting
- carries control signals and data on Railbus
- distributes DC power to modules
- distributes Bussed Field Power to modules
- isolated earthing bar for cable screens/shields

#### CARRIER SPECIFICATION

See also System Specification

### HAZARDOUS AREA APPROVALS

**Location of carrier**

- Class 1, Div 2, Groups A, B, C, D T6 hazardous location or Zone 2, IIIC T6 hazardous location

**Location of field wiring**

- As carrier

**Field terminals accepted**

- General purpose, 2/2

**I/O modules accepted**

- General purpose, 2/2

**Applicable standards:**

- Factory Mutual Research Co., Class No. 3611 for Class I, Division 2, Groups A, B, C, D hazardous locations
- CSA Std C22.2 No. 213 for Class I, Division 2, Groups A, B, C, D hazardous locations
- ATEX Category 3 (for Zone 2 installation) to EN50021:1999 protection type ‘n’

### ELECTRICAL

**Railbus connectors**

- Female in, male out

**Module address range**

- 1–64

**Bussed field power supply (optional)**

- Two 8-pin connectors are provided at the top rear of the carrier to connect power supplies for ‘field power’. These supplies are routed through I/O modules that require power for their field circuits.

### MATERIALS

**Carrier moulding**

- Modified poly-phenylene oxide

**Printed wiring board**

- Epoxy resin woven glass laminate

### ENVIRONMENTAL

**Ambient temp**

- Operating: –40°C to + 70°C
- Storage: –40°C to + 85°C

**Relative Humidity**

- 5 to 95% RH (non-condensing)

**Vibration and Shock**

- See System specification

### MECHANICAL

**Dimensions**

- 342 (w) x 170 (d) x 22 (h) mm

**Weight**

- 680 g

**Mounting methods**

- Flat panel or DIN rail

**DIN-rail types**

- ‘Top hat’ 35 x 7.5 mm rail or 35 x 15 mm rail to EN 50022
- G-section rail to EN 50035

### BUSSED FIELD POWER CONNECTIONS

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I/O modules 1 &amp; 2</td>
</tr>
<tr>
<td></td>
<td>–ve (or Neutral)</td>
</tr>
<tr>
<td>3</td>
<td>I/O modules 1 &amp; 2</td>
</tr>
<tr>
<td>4</td>
<td>+ve (or Live)</td>
</tr>
<tr>
<td>5</td>
<td>I/O modules 3 &amp; 4</td>
</tr>
<tr>
<td>6</td>
<td>+ve (or Live)</td>
</tr>
<tr>
<td>7</td>
<td>I/O modules 3 &amp; 4</td>
</tr>
<tr>
<td>8</td>
<td>–ve (or Neutral)</td>
</tr>
</tbody>
</table>

Note: A second connector uses the same pin assignments for modules 5 & 6 and 7 & 8.

* For use only with 8521-XX-XX controller/EBIM, and cannot be mixed with 32-slot address carriers
Module carriers

4-module carrier

- 32-slot address bus*
- accepts up to four I/O modules and field terminals
- printed wiring board
- rugged polycarbonate moulding
- DIN rail or panel mounting
- carries control signals and data on Railbus
- distributes DC power to modules
- distributes Bussed Field Power to modules
- isolated earthing bar for cable screens/shields

CARRIER SPECIFICATION
See also System Specification

HAZARDOUS AREA APPROVALS
Location of node
...........Class 1, Div 2, Groups A, B, C, D T4 hazardous location or
...........Zone 2, IIC T4 hazardous location
Location of field wiring ...........................................As node
Field terminals accepted .................................General purpose, 2/2
I/O modules accepted ...................................General purpose, 2/2

ELECTRICAL
Railbus connectors ............................................female in, male out
Module address range ..................................1–32
Bussed field power supply (optional)
An 8-pin connector is provided at the top rear of the carrier to connect power supplies for ‘field power’. Such supplies are routed through certain I/O module to provide power to field circuits.

MATERIALS
Carrier moulding.................................Modified poly-phenylene oxide
Printed wiring board.........................Epoxy resin woven glass laminate

ENVIRONMENTAL
Ambient temp
Operating ............................................– 40°C to + 70°C
Storage.....................................................– 40°C to + 85°C
Relative Humidity ..............................5 to 95% RH (non-condensing)
Vibration and Shock ............................See System specification sheet

MECHANICAL
Dimensions ......................................178 (w) x 170 (d) x 22 (h) mm
Weight ........................................350 g
Mounting methods ............................Flat panel or DIN rail
DIN-rail types
...........‘Top hat’ 35 x 7.5 mm rail or 35 x 15 mm rail to EN 50022
...........G-section rail to EN 50035

* Must not be mixed with 64-slot address bus carriers
**Node services carrier**

- Modbus BIM
- accommodates one BIM, two PSUs and four I/O modules
- screw terminals for LAN
- DIN rail or panel mounting
- printed wiring board
- rugged polycarbonate moulding
- routes Bussed Field Power to I/O modules
- isolated earthing bar for cable screen/shield

**CARRIER SPECIFICATION**

*See also System Specification*

**CARRIER MOUNTING MODULES**

PSU Modules (main and redundant) ..........8910-PS-DC
Bus Interface Module ..................(Modbus) 8505-BIMB
Node Services Module ..................8510-NS-MO
I/O modules ...................general purpose (2/2) various

**HAZARDOUS AREA APPROVALS**

Location of node
.........Class 1, Div 2, Groups A, B, C, D T4 hazardous location or .....Zone 2, IIC T4 hazardous area

Location of field wiring...............As per node
Field terminals accepted ........General purpose or Zone 2/Div 2
I/O modules accepted ........General purpose or Zone 2/Div 2

**ELECTRICAL**

Railbus connector........................male out
External dc power supply (optional)
A 6-pin connector is provided at the top/rear of the carrier to connect a 12.0 V dc (±5%) power supply. This is an alternative to the carrier mounted PSU modules.

**BUSSED FIELD POWER SUPPLY (OPTIONAL)**

An 8-pin connector is provided at the top rear of the carrier to connect power supplies for ‘field power’. Such supplies are routed through certain I/O module to provide power to field circuits.

**LAN CONNECTORS**

- LAN A ...................6-way, screw-terminal (x2)
- LAN B ...................6-way, screw-terminal (x2)

**MATERIALS**

Carrier moulding...........Modified poly-phenylene oxide
Printed wiring board.....Epoxy resin woven glass laminate

**ENVIRONMENTAL**

Ambient temp
Operating ..............................................– 40°C to + 70°C
Storage..................................................– 40°C to + 85°C
Relative Humidity ..............5 to 95% RH (non-condensing)
Vibration and Shock ............See System specification sheet

**MECHANICAL**

Dimensions.................342 (w) x 170 (d) x 22 (h) mm
Weight (approx.).................680 g
Mounting methods .............Flat panel (4 fixings) or DIN rail
DIN-rail types
...................'Top hat', 7.5 x 35 mm or 15 x 35 mm to EN 50022
........................................G-section, to EN 50035
**LAN INTERFACE**

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rx +</td>
</tr>
<tr>
<td>2</td>
<td>Tx +</td>
</tr>
<tr>
<td>3</td>
<td>Rx –</td>
</tr>
<tr>
<td>4</td>
<td>Tx –</td>
</tr>
<tr>
<td>5</td>
<td>Gnd</td>
</tr>
<tr>
<td>6</td>
<td>Gnd</td>
</tr>
</tbody>
</table>

Each LAN has duplicate connections wired in parallel - pin 1 to pin 1, pin 2 to pin 2, etc.

**LAN DIL SWITCHES**

One switch block per LAN. Operating mode set with switches.

<table>
<thead>
<tr>
<th>Mode</th>
<th>Switch positions</th>
<th>Termination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode 1: RS422</td>
<td>OK ON ON</td>
<td>–</td>
</tr>
<tr>
<td>Mode 2: RS485</td>
<td>OK ON OFF</td>
<td>–</td>
</tr>
<tr>
<td>Mode 3: RS485</td>
<td>OK ON OFF</td>
<td>—</td>
</tr>
<tr>
<td>Mode 4: RS485</td>
<td>OFF OFF OFF</td>
<td>—</td>
</tr>
</tbody>
</table>

**POWER SUPPLY CONNECTIONS**

<table>
<thead>
<tr>
<th>Terminal</th>
<th>External Power</th>
<th>Bussed Field Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Test Point 1</td>
<td>I/O Modules 1 &amp; 2</td>
</tr>
<tr>
<td>2</td>
<td>0 V</td>
<td>–ve (or Neutral)</td>
</tr>
<tr>
<td>3</td>
<td>+12 V</td>
<td>I/O Modules 1 &amp; 2</td>
</tr>
<tr>
<td>4</td>
<td>+12 V</td>
<td>+ve (or Live)</td>
</tr>
<tr>
<td>5</td>
<td>0 V</td>
<td>I/O Modules 3 &amp; 4</td>
</tr>
<tr>
<td>6</td>
<td>Test Point 2</td>
<td>+ve (or Live)</td>
</tr>
<tr>
<td>7</td>
<td>Not applicable</td>
<td>I/O Modules 3 &amp; 4</td>
</tr>
<tr>
<td>8</td>
<td>Not applicable</td>
<td>–ve (or Neutral)</td>
</tr>
</tbody>
</table>

Pins for power supplies are provided in pairs. This enables one pin to be used for the supply input and the second to loop to another connector, when required.
Module carriers

Node services carrier

- Profibus BIM
- accommodates one BIM, two PSUs and four I/O modules
- sub-miniature, 9-pin, D connectors for LAN
- DIN rail or panel mounting
- printed wiring board
- rugged polycarbonate moulding
- routes Bussed Field Power to I/O modules
- isolated earthing bar for cable screen/shield

CARRIER SPECIFICATION
See also System Specification

CARRIER MOUNTING MODULES
PSU Modules (main and redundant) ..............8910-PS-DC
Bus Interface Module ..........................Profibus-DP 8502-BI-DP
Node Services Module ..............8510-NS-MO
I/O modules ......................general purpose (2/2) various

HAZARDOUS AREA APPROVALS
Location of node
..............Class 1, Div 2, Groups A, B, C, D T4 hazardous location or
..............Zone 2, IIC T4 hazardous area
Location of field wiring ..........................As per node
Field terminals accepted ....General purpose or Zone 2/Div 2
I/O modules accepted ........General purpose or Zone 2/Div 2

ELECTRICAL
Railbus connector ..............................................male out
External dc power supply (optional)
A 6-pin connector is provided at the top/rear of the carrier to
connect a 12.0 V dc (±5%) power supply. This is an alternative to the
carrier mounted PSU modules.
Bussed field power supply (optional)
An 8-pin connector is provided at the top rear of the carrier to
connect power supplies for ‘field power’. Such supplies are routed
through certain I/O module to provide power to field circuits.

LAN CONNECTORS
LAN A .........................................9-way ‘D’ sub-miniature, female (x2)
**LAN INTERFACE**

**POWER SUPPLY CONNECTIONS**

<table>
<thead>
<tr>
<th>Terminal</th>
<th>External Power</th>
<th>Bussed Field Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Test Point 1</td>
<td>I/O Modules 1 &amp; 2</td>
</tr>
<tr>
<td>2</td>
<td>0 V</td>
<td>–ve [or Neutral]</td>
</tr>
<tr>
<td>3</td>
<td>+12 V</td>
<td>I/O Modules 1 &amp; 2</td>
</tr>
<tr>
<td>4</td>
<td>+12 V</td>
<td>+ve [or Live]</td>
</tr>
<tr>
<td>5</td>
<td>0 V</td>
<td>I/O Modules 3 &amp; 4</td>
</tr>
<tr>
<td>6</td>
<td>Test Point 2</td>
<td>+ve [or Live]</td>
</tr>
<tr>
<td>7</td>
<td>Not applicable</td>
<td>I/O Modules 3 &amp; 4</td>
</tr>
<tr>
<td>8</td>
<td>Not applicable</td>
<td>–ve [or Neutral]</td>
</tr>
</tbody>
</table>

The LAN has duplicate connections wired in parallel: pin 1 to pin 1, pin 2 to pin 2, etc.

Pins for power supplies are provided in pairs. This enables one pin to be used for the supply input and the second to loop to another connector, when required.
Module carriers

**BIM carrier**

- accommodates Bus Interface Module
- Modbus or Profibus-DP
- dual LAN connections (A & B)
- switchable RS485/RS422 termination options
- DIN rail or panel mounting

**CARRIER SPECIFICATION**

*See also System Specification*

**LAN CONNECTORS**

- **LAN A**.................................9-pin, D, sub-miniature, female
- **LAN B**.................................9-pin, D, sub-miniature, female

Switchable terminations for Modbus RS485, Modbus RS422 or Profibus-DP

**CARRIER MOUNTING MODULES**

- Bus Interface Modules ..................(Profibus-DP)  8502-BI-DP
  ..................................................(Modbus)  8505-BI-MB

**HAZARDOUS AREA APPROVALS**

- **Location of node**............... Zone 2, IIC T4 hazardous area
  .......or Class 1, Div 2, Groups A, B, C, D T4 hazardous location

**ENVIRONMENTAL**

- **Ambient temp**
  - Operating......................................– 40°C to + 70°C
  - Storage......................................– 40°C to + 85°C
- **Relative Humidity**..................5 to 95% RH (non-condensing)
- **Vibration and Shock**............See System specification sheet

**MATERIALS**

- **Carrier moulding**.................Modified Poly-Phenylene Oxide
- **Printed wiring board**..............Epoxy Resin Woven Glass Laminate

**DC POWER**

- **External power supply**...............12.0 V dc ± 5%
  (via 6-pin external power connector at top/rear)

**MECHANICAL**

- **Dimensions (overall)**................93 (w) x 170 (d) x 35 (h) mm
- **Weight (approx.)**......................680 g
- **Mounting methods**.................Flat panel (2 fixings) or DIN rail
- **DIN-rail types**....................Top hat’, 7.5 x 35 mm to EN 50022
  .............................................or 15 x 35 mm to EN 50022
  .............................................or G-section, to EN 50035
Module carriers

LAN INTERFACE

LAN A

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Modbus RS422</th>
<th>Modbus RS485</th>
<th>Profibus-DP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 1</td>
<td>FGND/Socket shroud</td>
<td>FGND/Socket shroud</td>
<td>FGND/Socket shroud</td>
</tr>
<tr>
<td>Pin 2</td>
<td>RxD+</td>
<td>RxD/TxD+</td>
<td>NC</td>
</tr>
<tr>
<td>Pin 3</td>
<td>TxD+</td>
<td>RxD/TxD+</td>
<td>RxD/TxD+</td>
</tr>
<tr>
<td>Pin 4</td>
<td>RxD–</td>
<td>RxD/TxD–</td>
<td>RTS+</td>
</tr>
<tr>
<td>Pin 5</td>
<td>GND</td>
<td>GND</td>
<td>GND</td>
</tr>
<tr>
<td>Pin 6</td>
<td>VT</td>
<td>VT</td>
<td>VP</td>
</tr>
<tr>
<td>Pin 7</td>
<td>RxD–</td>
<td>RxD/TxD–</td>
<td>RTS+</td>
</tr>
<tr>
<td>Pin 8</td>
<td>TxD–</td>
<td>RxD/TxD–</td>
<td>RxD/TxD–</td>
</tr>
<tr>
<td>Pin 9</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
</tr>
</tbody>
</table>

LAN B

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Modbus RS422</th>
<th>Modbus RS485</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 1</td>
<td>Socket shroud</td>
<td>Socket shroud</td>
</tr>
<tr>
<td>Pin 2</td>
<td>RxD+</td>
<td>RxD/TxD+</td>
</tr>
<tr>
<td>Pin 3</td>
<td>TxD+</td>
<td>RxD/TxD+</td>
</tr>
<tr>
<td>Pin 4</td>
<td>RxD–</td>
<td>RxD/TxD–</td>
</tr>
<tr>
<td>Pin 5</td>
<td>GND</td>
<td>GND</td>
</tr>
<tr>
<td>Pin 6</td>
<td>VT</td>
<td>VT</td>
</tr>
<tr>
<td>Pin 7</td>
<td>RxD–</td>
<td>RxD/TxD–</td>
</tr>
<tr>
<td>Pin 8</td>
<td>TxD–</td>
<td>RxD/TxD–</td>
</tr>
<tr>
<td>Pin 9</td>
<td>NC</td>
<td>NC</td>
</tr>
</tbody>
</table>

Modbus applications

<table>
<thead>
<tr>
<th>Mode</th>
<th>Switch positions</th>
<th>Termination</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS422 not terminated</td>
<td>OFF OFF OFF</td>
<td>None</td>
</tr>
<tr>
<td>RS422 terminated receiver</td>
<td>OFF ON OFF</td>
<td>+220Ω</td>
</tr>
<tr>
<td>RS422 terminated &amp; biased receiver</td>
<td>OFF ON OFF</td>
<td>+220Ω</td>
</tr>
<tr>
<td>RS485 not terminated</td>
<td>OFF OFF OFF</td>
<td>None</td>
</tr>
<tr>
<td>RS485 terminated</td>
<td>OFF OFF OFF</td>
<td>+220Ω</td>
</tr>
<tr>
<td>RS485 terminated &amp; biased</td>
<td>OFF OFF OFF</td>
<td>+220Ω</td>
</tr>
</tbody>
</table>

Note: Switch model may vary but switching directions remain the same.

POWER SUPPLY CONNECTIONS

External power

<table>
<thead>
<tr>
<th>Terminal</th>
<th>External power</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No connection</td>
</tr>
<tr>
<td>2</td>
<td>0 V</td>
</tr>
<tr>
<td>3</td>
<td>+12 V</td>
</tr>
<tr>
<td>4</td>
<td>+12 V</td>
</tr>
<tr>
<td>5</td>
<td>0 V</td>
</tr>
<tr>
<td>6</td>
<td>No connection</td>
</tr>
</tbody>
</table>

Power supply pins are provided in pairs. This enables one pin to be used for the supply input and the second to loop to another connector, when required.

Note: Pins with assignments shown in italics are normally not connected; they occur because of the ‘universal’ nature of the interface.

LAN DIL SWITCHES

One switch block per LAN to determine termination and/or bias ON = switch to right; OFF = switch to left (with normal orientation) Set operating mode with switches as follows:

Profibus-DP applications

<table>
<thead>
<tr>
<th>Mode</th>
<th>Switch positions</th>
<th>Termination</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS485 not terminated</td>
<td>OFF OFF OFF</td>
<td>None</td>
</tr>
</tbody>
</table>

Note: Any required termination should be implemented in the Profibus D-type plug.
Module carriers

Power supply carrier

- accommodates one 8910-PS-DC power supply
- DIN rail or panel mounting
- use for 2/1 only nodes with DC power feed
- use with 8718-CA-NS or 8715-CA-BI with DC power feed

CARRIER SPECIFICATION
See also System Specification

HAZARDOUS AREA APPROVALS
Location of node
.........Class 1, Div 2, Groups A, B, C, D T4 hazardous location or
......Zone 2, IIC T4 hazardous location

ELECTRICAL
12V dc output connector ...............................6-way screw terminal

MATERIALS
Carrier moulding..................................Modified poly-phenylene oxide
Printed wiring board.............Epoxy resin woven glass laminate

ENVIROMENTAL
Ambient temp
Operating ..............................................−40°C to +70°C
Storage ..................................................−40°C to +85°C
Relative Humidity .......................5 to 95% RH (non-condensing)
Vibration and Shock ..............See System specification sheet

MECHANICAL
Dimensions ..........................85.5 (w) x 167 (d) x 27.4 (h) mm
Weight ..............................................200 g
Mounting methods .....................Flat panel or DIN rail
DIN-rail types ......................‘Top hat’ 35 x 7.5 mm rail or 35 x 15 mm rail to EN 50022

DC OUTPUT POWER CONNECTIONS

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0 V dc</td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>+12V dc</td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>
Module carriers

Node services carrier

◆ accommodates Bus Interface Module
◆ accommodates Node Services Module
◆ Modbus or Profbus-DP
◆ dual LAN connections (A & B)
◆ switchable RS485/RS422 termination options
◆ eight power fail inputs
◆ DIN rail or panel mounting

CARRIER SPECIFICATION
See also System Specification

CARRIER MOUNTING MODULES
.........................................................[Modbus] 8505-BI-MB
Node Services Module .................................8510-MO-NS

HAZARDOUS AREA APPROVALS
Location of Node .............................. Zone 2, IIC T4 hazardous area
.................or Class 1, Div 2, Groups A, B, C, D T4 hazardous location

ELECTRICAL
Railbus connector ..........................................................male out
Power fail connector ..................................................8 pairs (screw terminal)
Carrier ground terminal .................................M2 screw terminal

DC POWER
External power ......................................................12.0 V dc (±5%)
A 6-pin connector is provided at the top/rear of the carrier for the connection of the power supply.

LAN CONNECTORS
LAN A ......................................................9-pin, D, sub-miniature, female
LAN B ......................................................9-pin, D, sub-miniature, female
Switchable terminations for Modbus RS485, Modbus RS422 or Profbus-DP

Note: The screw terminal beside each LAN connector is a termination for the cable screen and should not be used as system ground.

ENVIRONMENTAL
Ambient temp
Operating ......................................................−40°C to + 70°C
Storage ......................................................−40°C to + 85°C
Relative Humidity ........................................5 to 95% RH (non-condensing)
Vibration and Shock ................................ See System specification sheet

MATERIALS
Carrier moulding .................................Modified Poly-Phenylene Oxide
Printed wiring board .............Epoxy Resin Woven Glass Laminate

MECHANICAL
Dimensions (overall) ......................178 (w) x 170 (d) x 68 (h) mm
Weight (approx.) .................................450 g
Mounting methods .........................Flat panel (2 fixings) or DIN rail
DIN-rail types .................................‘Top hat’, 7.5 x 35 mm to EN 50022
...................................................or 15 x 35 mm to EN 50022
...................................................or G-section, to EN 50035

POWER SUPPLY CONNECTIONS

<table>
<thead>
<tr>
<th>Terminal</th>
<th>External power</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No connection</td>
</tr>
<tr>
<td>2</td>
<td>0 V</td>
</tr>
<tr>
<td>3</td>
<td>+12 V</td>
</tr>
<tr>
<td>4</td>
<td>+12 V</td>
</tr>
<tr>
<td>5</td>
<td>0 V</td>
</tr>
<tr>
<td>6</td>
<td>No connection</td>
</tr>
</tbody>
</table>

Power supply pins are provided in pairs. This enables one pin to be used for the supply input and the second to loop to another connector, when required.
**Module carriers**

### LAN INTERFACE

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Modbus RS422</th>
<th>Modbus RS485</th>
<th>Modbus RS485 only</th>
<th>Profibus-DP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 1</td>
<td>Socket</td>
<td>Socket</td>
<td>Socket shroud</td>
<td>shroud</td>
</tr>
<tr>
<td>Pin 2</td>
<td>RxD+</td>
<td>RxD/TxD+</td>
<td>NC</td>
<td></td>
</tr>
<tr>
<td>Pin 3</td>
<td>TxD+</td>
<td>RxD/TxD+</td>
<td>RxD/TxD+</td>
<td></td>
</tr>
<tr>
<td>Pin 4</td>
<td>RxD–</td>
<td>RxD/TxD–</td>
<td>RTS+</td>
<td></td>
</tr>
<tr>
<td>Pin 5</td>
<td>GND</td>
<td>GND</td>
<td>GND</td>
<td></td>
</tr>
<tr>
<td>Pin 6</td>
<td>VT</td>
<td>VT</td>
<td>VP</td>
<td></td>
</tr>
<tr>
<td>Pin 7</td>
<td>RxD–</td>
<td>RxD/TxD–</td>
<td>RTS+</td>
<td></td>
</tr>
<tr>
<td>Pin 8</td>
<td>TxD–</td>
<td>RxD/TxD–</td>
<td>RxD/TxD–</td>
<td></td>
</tr>
<tr>
<td>Pin 9</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
<td></td>
</tr>
</tbody>
</table>

Note: Pins with assignments shown in italics are normally not connected; they occur because of the ‘universal’ nature of the interface.

### PSU POWER FAIL CONNECTOR

**Connection pairs**

<table>
<thead>
<tr>
<th>AUX --ve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1</td>
</tr>
<tr>
<td>Pair 2</td>
</tr>
<tr>
<td>Pair 3</td>
</tr>
<tr>
<td>Pair 4</td>
</tr>
<tr>
<td>Pair 5</td>
</tr>
<tr>
<td>Pair 6</td>
</tr>
<tr>
<td>Pair 7</td>
</tr>
<tr>
<td>Pair 8</td>
</tr>
</tbody>
</table>

Eight pairs of terminals are provided for the PSU health signals. If an 8510-MO-NS module is fitted and power fail signalling is being used:

a) connect the power supply AUX and --ve terminals to a pair as shown in the table (right)
b) put individual wire links across each unused terminal pairs to prevent a continual alarm condition being signalled to the BIM.

**Notes:** Terminals 15 and 18 are not used.

### LAN DIL SWITCHES

One per LAN to determine termination and/or bias

<table>
<thead>
<tr>
<th>Mode</th>
<th>Switch positions</th>
<th>Termination</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS422 not terminated</td>
<td>OFF OFF OFF</td>
<td>None</td>
</tr>
<tr>
<td>RS422 terminated receiver</td>
<td>ON OFF OFF</td>
<td>220Ω</td>
</tr>
<tr>
<td>RS422 terminated &amp; biased receiver</td>
<td>ON OFF OFF</td>
<td>220Ω</td>
</tr>
<tr>
<td>RS485 not terminated</td>
<td>OFF OFF OFF</td>
<td>None</td>
</tr>
<tr>
<td>RS485 terminated</td>
<td>ON OFF OFF</td>
<td>220Ω</td>
</tr>
<tr>
<td>RS485 terminated &amp; biased</td>
<td>ON ON ON</td>
<td>390Ω</td>
</tr>
</tbody>
</table>

Note: Switch model may vary.

### Modbus applications

<table>
<thead>
<tr>
<th>Mode</th>
<th>Switch positions</th>
<th>Termination</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS422 not terminated</td>
<td>OFF OFF OFF</td>
<td>None</td>
</tr>
<tr>
<td>RS422 terminated receiver</td>
<td>ON OFF OFF</td>
<td>220Ω</td>
</tr>
<tr>
<td>RS422 terminated &amp; biased receiver</td>
<td>ON OFF OFF</td>
<td>220Ω</td>
</tr>
</tbody>
</table>

Note: Any required termination should be implemented in the Profibus D-type plug.

### Profibus-DP applications

<table>
<thead>
<tr>
<th>Mode</th>
<th>Switch positions</th>
<th>Termination</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS485 not terminated</td>
<td>OFF OFF OFF</td>
<td>None</td>
</tr>
</tbody>
</table>

Note: Any required termination should be implemented in the Profibus D-type plug.
Controller carrier

- accommodates two controllers/EBIMs
- accommodates Power Supply Monitor module
- serial port connections for controllers
- manual “change state” buttons
- seven* power fail inputs
- panel mounting

The controller carrier provides a mounting platform for up to two controllers or EBIMs (8521-XX-XX). It can also accommodate a Power Supply Monitor module (8410-NS-PS) which can monitor up to seven system power supplies in the node and alert the controller to failures. The “powerfail” signals are brought to the module via a screw terminal block at the rear of the carrier. For each controller /EBIM there is a serial port connection on the carrier and a manually operated “change state” (failover) button.

CARRIER SPECIFICATION
See also System Specification

CARRIER MOUNTING MODULES
Controller/EBIM (x2) ........................................8521-XX-XX
Power Supply Monitor module ..........................8410-NS-PS

HAZARDOUS AREA APPROVALS
Location of carrier .................. Zone 2, IIC T6 hazardous area
........................................or Class 1, Div 2, Groups A, B, C, D T6 hazardous location
Applicable standards:
- Factory Mutual Research Co., Class No. 3611 for Class I, Division 2, Groups A, B, C, D hazardous locations
- CSA Std C22.2 No. 213 for Class I, Division 2, Groups A, B, C, D hazardous locations
- ATEX Category 3 (for Zone 2 installation) to EN50021:1999 protection type ‘n’

ELECTRICAL
Railbus connector .............................................male out
Serial port connectors ..........................9-pin, D-type (female) (x2)
Power “health” connections ................screw terminals (x7 pairs)
Ground terminals ..............................................M4 screw terminal (x2)

DC POWER
External power ........................................12.0 V dc (±5%)
A 6-pin connector (see next page) is provided at the top of the carrier. This connection powers the Power Supply Monitor module and other modules on carriers connected to this one.

Note: This connection does not provide power to the controller/EBIM module(s).

ENVIRONMENTAL
Ambient temp
Operating ..................................................– 40°C to + 70°C
Storage .....................................................– 40°C to + 85°C
Relative Humidity ..................5 to 95% RH (non-condensing)
Vibration and Shock .................See System Specification

MATERIALS
Carrier body ......................Painted 1.6mm ZINTEC to BS EN 10152
Printed wiring board ..............Epoxy Resin Woven Glass Laminate

MECHANICAL
Dimensions (footprint) ...........200 (w) x 253 (d) mm
Height (top of circuit board) ..........28 mm (overall) ...............55 mm
Weight (approx.) .........................1.43 kg
Mounting methods .................flat panel (4 fixings)

USER CONTROLS
Two “change state” buttons, one for each controller/EBIM, are provided on the carrier to enable the user to change the state of a controller from master to standby, standby to offline or offline to standby. The controller/EBIM affected by each “change state” button is indicated on the circuit board. The state change depends upon the controller state before the button is pressed. See table below for effects.

<table>
<thead>
<tr>
<th>State</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master</td>
<td>Change to standby if current standby is healthy</td>
</tr>
<tr>
<td>Standby</td>
<td>Change to offline state</td>
</tr>
<tr>
<td>Backup</td>
<td>Re-synchronize and return to standby</td>
</tr>
</tbody>
</table>

* up to six 2/2 power supplies plus one 2/1 power supply.
**RAILBUS POWER SUPPLY CONNECTIONS**

**External power**

<table>
<thead>
<tr>
<th>Terminal</th>
<th>External power</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No connection</td>
</tr>
<tr>
<td>2</td>
<td>0 V</td>
</tr>
<tr>
<td>3</td>
<td>+12 V</td>
</tr>
<tr>
<td>4</td>
<td>+12 V</td>
</tr>
<tr>
<td>5</td>
<td>0 V</td>
</tr>
<tr>
<td>6</td>
<td>No connection</td>
</tr>
</tbody>
</table>

Power supply pins are provided in pairs. This enables one pin to be used for the supply input and the second to loop to another connector, when required.

Note: The controllers/EBIMs do not draw main power from this supply. See previous page.

**PSU POWER “HEALTH” CONNECTOR**

This power “health” facility is operational only when a Power Supply Monitor module (8410-NS-PS) is fitted on the carrier.

**Terminal pairs 1 – 6**

These terminal pairs (+ and –) are provided for external 2/2 power supplies, e.g. 8913-PS-AC or 8914-PS-AC. For each pair:

- Power health signal from PSU
- negative (–ve) connection from PSU

Note: On the 8913-PS-AC, it is the 12V output that provides the power health signal, therefore connect the –ve terminal from the 12V output to the –ve terminal on the power health connector.

Each unused terminal pair must be fitted with a shorting link to prevent an alarm condition being signalled to the controller.

**Terminal pairs 7 & 8**

These terminal pairs are disconnected and should not be used.

**Terminal pair 9**

If a Railbus Isolator (8922-RB-IS) is not used in the node, this terminal pair must be fitted with a shorting link to prevent an alarm condition being signalled to the controller/EBIM.
Carrier extender

Left-hand/right-hand

◆ General purpose and non-IS field wiring installations
◆ ensures Railbus and power supply continuity
◆ pairs (LH & RH) link separate carrier runs
◆ sub-D connectors linked via multiway cable
◆ screw terminals link power supply connections
◆ rugged polycarbonate base with DIN rail fixings
◆ multipin connector to carrier
◆ maximum of 3 extender pairs per node
◆ 32- and 64-slot address capable

SPECIFICATION

See also System Specification

HAZARDOUS AREA APPROVALS

Location of node

.........Class 1, Div 2, Groups A, B, C, D T4 hazardous location or
......Zone 2, IIC T4 hazardous location

ELECTRICAL

Railbus carrier connector

8020-CE-RH....................................................female in
8021-CE-LH....................................................male out
Usable with 32-slot or 64-slot address nodes
Extender cable connector...............Sub-D, 37-pin female
DC power cable connector...............Screw terminal
DC power cable conductor size............2.5 mm² (max.)

MATERIALS

Carrier moulding.........................Modified poly-phenylene oxide
Printed wiring board..............Epoxy resin woven glass laminate

ENVIRONMENTAL

Ambient temp
Operating, ...........................................– 40°C to + 70°C
Storage..............................................– 40°C to + 85°C
Relative Humidity ...............5 to 95% RH (non-condensing)
Vibration and Shock.................See System specification sheet

MECHANICAL

Dimensions (overall) .......................42 (w) x 168 (d) x 37 (h) mm
Weight ............................................135 g
Mounting method .......................Integral DIN-rail fixings
DIN rail types
..............................................‘Top hat’, 35 x 7.5 mm or 35 x 15 mm to EN 50022
..............................................G-section, to EN 50035

PART NUMBERS

<table>
<thead>
<tr>
<th>Carrier Extender, Right-hand</th>
<th>8020-CE-RH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrier Extender, Left-hand</td>
<td>8021-CE-LH</td>
</tr>
</tbody>
</table>
Carrier extender cables

0.35m, 0.85m and 1.2m

- Railbus data extender cables
- general purpose and non-IS field wiring installations
- three lengths - 0.35, 0.85 and 1.2 m
- sub-D cable connectors
- 32- and 64-slot address capable

SPECIFICATION
See also System Specification

HAZARDOUS AREA APPROVALS
Location of node
..........Class 1, Div 2, Groups A, B, C, D T4 hazardous location or
......Zone 2, IIIC T4 hazardous location

ELECTRICAL
Extender cable connectors ..................... Sub-D, 37-pin male

ENVIRONMENTAL
Ambient temp
Operating ........................................... – 40°C to + 70°C
Storage............................................. – 40°C to + 85°C
Relative Humidity ......................... 5 to 95% RH (non-condensing)
Vibration and Shock ..................... See System specification sheet

PART NUMBERS

| Carrier Extension Cable, 0.35m | 8001-CC-35 |
| Carrier Extension Cable, 0.85m | 8002-CC-85 |
| Carrier Extension Cable, 1.2m | 8003-CC-12 |
Module carriers

IS 8-module carrier

◆ 32-slot address bus*
◆ accepts up to eight 2/1 I/O modules and field terminals
◆ printed wiring board
◆ rugged polycarbonate moulding
◆ DIN rail or panel mounting
◆ carries control signals and data on Railbus
◆ distributes DC power to modules
◆ isolated earthing bar for cable screens/shields

CARRIER SPECIFICATION
See also System Specification

HAZARDOUS AREA APPROVALS

Location of node
.........Class 1, Div 2, Groups A, B, C, D T4 hazardous location or
......Zone 2, IIC T4 hazardous location

Location of field wiring
.........Class 1, Div 1, Groups A, B, C, D T4 hazardous location or
......Zone 1 /Zone 0, IIC T4 hazardous location

Field terminals accepted ............................................IS only
I/O modules accepted ........................................... 2/1 only

ELECTRICAL

Railbus connectors ....................................male in, female out
Module address range .................................................1–32

Earth leakage detection
4-pin connectors are provided at the top/rear of the carrier for wiring the individual modules to earth leakage detectors, e.g. MTL2220. (Refer to MTL for earth leakage detection support within I/O modules)

MATERIALS

Carrier moulding .........................Modified poly-phenylene oxide
Printed wiring board ...............Epoxy resin woven glass laminate

ENVIRONMENTAL

Ambient temp
Operating, .............................................................− 40°C to + 70°C
Storage .............................................................− 40°C to + 85°C

Relative Humidity ........................................5 to 95% RH (non-condensing)
Vibration and Shock ......................See System specification sheet

MECHANICAL

Dimensions .....................342 (w) x 170 (d) x 22 (h) mm
Weight .................................................680 g

Mounting methods ..................Flat panel or DIN rail
DIN-rail types
.......‘Top hat’ 35 x 7.5 mm rail or 35 x 15 mm rail to EN 50022
...............G-section rail to EN 50035

* Must not be mixed with 64-slot address bus carriers
Module carriers

**IS 8-module carrier - extended addressing**

- 64-slot address bus*
- accepts up to eight 2/1 I/O modules and field terminals
- printed wiring board
- rugged polycarbonate moulding
- DIN rail or panel mounting
- carries control signals and data on Railbus
- distributes DC power to modules
- isolated earthing bar for cable screens/shields

**CARRIER SPECIFICATION**

*See also System Specification*

**HAZARDOUS AREA APPROVALS**

Location of carrier

- Class 1, Div 2, Groups A, B, C, D T6 hazardous location or
- Zone 2, IIC T6 hazardous location

Field terminals accepted

- IS only

I/O modules accepted

- 2/1 only

**Applicable standards:**

- Factory Mutual Research Co., Class No. 3611 for Class I, Division 2, Groups A, B, C, D hazardous locations
- CSA Std C22.2 No. 213 for Class I, Division 2, Groups A, B, C, D hazardous locations
- ATEX Category 3 (for Zone 2 installation) to EN50021:1999 protection type 'n'

**ELECTRICAL**

Railbus connectors

- Male in, female out

Module address range

- 1–64

Earth leakage detection

4-pin connectors (see right) are provided at the top/rear of the carrier for wiring the individual modules to earth leakage detectors, e.g. MTL2220*

*Refer to MTL for earth leakage detection support within I/O modules

**MATERIALS**

- Carrier moulding: Modified poly-phenylene oxide
- Printed wiring board: Epoxy resin woven glass laminate

**ENVIRONMENTAL**

Ambient temp

- Operating: – 40°C to + 70°C
- Storage: – 40°C to + 85°C

Relative Humidity

- 5 to 95% RH (non-condensing)

Vibration and Shock

- See System specification

**MECHANICAL**

Dimensions

- 342 (w) x 170 (d) x 22 (h) mm

Weight

- 680 g

Mounting methods

- Flat panel or DIN rail

DIN-rail types

- 'Top hat' 35 x 7.5 mm rail or 35 x 15 mm rail to EN 50022
- G-section rail to EN 50035

* For use only with 8521-XX-XX controller/EBIM, and cannot be mixed with 32-slot address carriers

**MODULE NUMBER**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
</tbody>
</table>

Connector is repeated for modules 5 to 8

Jul 2005
Module carriers

IS 4-module carrier

◆ 32-slot address bus*
◆ accepts up to four 2/1 I/O modules and field terminals
◆ printed wiring board
◆ rugged polycarbonate moulding
◆ DIN rail or panel mounting
◆ carries control signals and data on Railbus
◆ distributes DC power to modules
◆ isolated earthing bar for cable screens/shields

CARRIER SPECIFICATION
See also System Specification

HAZARDOUS AREA APPROVALS
Location of node
.........Class 1, Div 2, Groups A, B, C, D T4 hazardous location or
......Zone 2, IIC T4 hazardous location
Location of field wiring
.........Class 1, Div 1, Groups A, B, C, D T4 hazardous location or
......Zone 1 /Zone 0, IIC T4 hazardous location
Field terminals accepted ............................................IS only
I/O modules accepted ........................................... 2/1 only

ELECTRICAL
Railbus connectors ....................................male in, female out
Module address range .................................................1–32
Earth leakage detection
A 4-pin connector is provided at the top/rear of the carrier for wiring the individual modules to earth leakage detectors, e.g. MTL2220. (Refer to MTL for earth leakage detection support within I/O modules.)

MATERIALS
Carrier moulding .........................Modified poly-phenylene oxide
Printed wiring board.............Epoxy resin woven glass laminate

ENVIRONMENTAL
Ambient temp
Operating ......................................................– 40°C to + 70°C
Storage ..........................................................– 40°C to + 85°C
Relative Humidity .................5 to 95% RH (non-condensing)
Vibration and Shock .................See System specification sheet

MECHANICAL
Dimensions .................178 (w) x 170 (d) x 22 (h) mm
Weight ....................................................350 g
Mounting methods .................Flat panel or DIN rail
DIN-rail types
......‘Top hat’ 35 x 7.5 mm rail or 35 x 15 mm rail to EN 50022
.........................................................G-section rail to EN 50035

* Must not be mixed with 64-slot address bus carriers
Module carriers

Railbus isolator carrier

- accommodates one Railbus Isolator
- DIN rail or panel mounting
- printed wiring board
- rugged polycarbonate moulding
- 32- and 64-slot address capable

CARRIER SPECIFICATION
See also System Specification

CARRIER MOUNTING MODULE
Railbus Isolator .....................................................8922-RB-IS

HAZARDOUS AREA APPROVALS
Location of node ..................................................
.........Class 1, Div 2, Groups A, B, C, D T4 hazardous location or
.........Zone 2, IIC T4 hazardous area

ELECTRICAL
Railbus connectors ...........................................male in, female out
Usable with 32-slot or 64-slot address nodes
DC power
DC power for the Railbus Isolator is obtained from the system through
the multipin Railbus connectors.

MATERIALS
Carrier moulding............................Modified poly-phenylene oxide
Printed wiring board ............Epoxy resin woven glass laminate

ENVIRONMENTAL
Ambient temp
Operating .....................................................– 40°C to + 70°C
Storage .........................................................– 40°C to + 85°C
Relative Humidity .................5 to 95% RH (non-condensing)
Vibration and Shock ...............See System specification sheet

MECHANICAL
Dimensions (overall) ..............93 (w) x 168 (d) x 35 (h) mm
Weight (approx.) .....................195 g
Mounting methods ....................Flat panel (3 fixings) or DIN-rail
DIN-rail types ......................’Top hat’, 7.5 x 35 mm or 15 x 35 mm to EN 50022
......................................G-section, to EN 50035
Module carriers

IS module power supply carrier

- accommodates one 8920 PSU module
- DIN rail or panel mounting
- printed wiring board
- rugged polycarbonate moulding
- 32- and 64-slot address capable

CARRIER SPECIFICATION
See also System Specification

CARRIER MOUNTING MODULE
System Power Supply module ...................... 8920-PS-DC

HAZARDOUS AREA APPROVALS
Location of node ..............................................
.......... Class 1, Div 2, Groups A, B, C, D T4 hazardous location or
.......... Zone 2, IIC T4 hazardous area

ELECTRICAL
Railbus connectors ........................................ male in, female out
(Usable with 32-slot or 64-slot address nodes)

MATERIALS
Carrier moulding................................. Modified poly-phenylene oxide
Printed wiring board .............. Epoxy resin woven glass laminate

ENVIRONMENTAL
Ambient temp
Operating .............................................. – 40°C to + 70°C
Storage ..................................................... – 40°C to + 85°C
Relative Humidity ............................ 5 to 95% RH (non-condensing)
Vibration and Shock ........................ See System specification sheet

MECHANICAL
Dimensions (overall) ...................... 93 (w) x 168 (d) x 35 (h) mm
Weight (approx.) ........................................ 195 g
Mounting methods ....................... Flat panel (4 fixings) or DIN-rail
DIN-rail types .............................. ‘Top hat’, 7.5 x 35 mm or 15 x 35 mm to EN 50022
............................................................... G-section, to EN 50035
Carrier extender

Left-hand/right-hand

- for IS field wiring installations
- ensures Railbus and power supply continuity
- pairs (LH & RH) link separate carrier runs
- sub-D connectors linked via multiway cable
- screw terminals link power supply connections
- rugged polycarbonate base with DIN rail fixings
- multipin connector to carrier
- maximum of 3 extender pairs per node
- 32- and 64-slot address capable

SPECIFICATION
See also System Specification

HAZARDOUS AREA APPROVALS
Location of node

...Class 1, Div 2, Groups A, B, C, D T4 hazardous location or
...Zone 2, IIIC T4 hazardous location

ELECTRICAL
Railbus carrier connector
8030-CERH.................................male in
8031-CE-LH.................................female out
Usable with 32-slot or 64-slot address nodes
Extender cable connector..............................Sub-D, 50-pin female
DC power cable connector.................................6-pin

MATERIALS
Carrier moulding............................Modified poly-phenylene oxide
Printed wiring board......................Epoxy resin woven glass laminate

ENVIRONMENTAL
Ambient temp
Operating...........................................– 40°C to + 70°C
Storage..............................................– 40°C to + 85°C
Relative Humidity..............................5 to 95% RH (non-condensing)
Vibration and Shock.........................See System specification sheet

MECHANICAL
Dimensions (overall).........................48 (w) x 168 (d) x 42 (h) mm
Weight.........................................................140 g
Mounting method.............................Integral DIN-rail fixings
DIN rail types
.........................................................‘Top hat’, 35 x 7.5 mm or 35 x 15 mm to EN 50022
.........................................................G-section, to EN 50035

PART NUMBERS
Carrier Extender, Right-hand 8030-CERH
Carrier Extender, Left-hand 8031-CE-LH
Carrier extender cables

**IS carrier extender cables**

- Railbus data & power extender cables
- for IS field wiring installations
- three lengths - 0.35, 0.85 and 1.2 m
- sub-D cable connectors
- 32- and 64-slot address capable

**SPECIFICATION**

*See also System Specification*

**HAZARDOUS AREA APPROVALS**

| Location of node | Class 1, Div 2, Groups A, B, C, D T4 hazardous location or Zone 2, IIC T4 hazardous location |

**ELECTRICAL**

- Data extender cable connectors: Sub-D, 50 pin male
- Power extender cable connectors: 6-pin

**ENVIRONMENTAL**

- Ambient temp
  - Operating: -40°C to +70°C
  - Storage: -40°C to +85°C
- Relative Humidity: 5 to 95% RH (non-condensing)
- Vibration and Shock: See System specification sheet

**PART NUMBERS - DATA CABLES**

| IS Carrier Extension Cable, 0.35m | 8011-CC-35 |
| IS Carrier Extension Cable, 0.85m | 8012-CC-85 |
| IS Carrier Extension Cable, 1.2m | 8013-CC-12 |

**PART NUMBERS - POWER CABLES**

| IS Power Extension Cable, 0.35m | 8016-CC-35 |
| IS Power Extension Cable, 0.85m | 8017-CC-85 |
| IS Power Extension Cable, 1.2m | 8018-CC-12 |

**PART NUMBERS - CABLE SETS**

| IS Carrier Extension Cable set, 0.35m | 8032-CC-35 |
| IS Carrier Extension Cable set, 0.85m | 8033-CC-85 |
| IS Carrier Extension Cable set, 1.2m | 8034-CC-12 |
Power supplies

General
Good power supply management is at the heart of the MTL8000 system.

AC and DC power supply units are available to suit the available resources.

All units are designed to endure the harsh environmental conditions that are frequently found in process plants and, naturally, they meet rigorous EMC and electrical safety standards. Power supply connections are minimised and simplified to ensure that power provision requires the minimum of wiring effort.

8000 series power supplies are designed to support redundancy when required. Most have “health” signal outputs for early warning of problems.

DC system power supply
The 8910P-DC DC input power supply provides a regulated 12 V @ 4.9 A output from a DC input voltage range of 18.5 up to 36V. This input voltage range accommodates the typical 24 V DC supplies available on process plants worldwide.

This power supply is designed to mount directly on 8711-CA-NS or 8712-CA-NS node services carriers or on a 8717-CA-PS power supply carrier. On the node services carriers mentioned here, two positions are provided. This enables a second power supply to be mounted, under conditions where the user wants to provide additional power, or where a redundant power supply is required to provide maximum system availability.

DC IS module supply
Power Supply module 8920-PS-DC mounts on its own carrier (8724-CA-PS) and accepts a locally available 24V dc [nominal] supply and converts it to 12V dc for powering MTL8000 I/O modules that have intrinsically safe field wiring.

Its 5A output is capable of powering between six and twenty I/O modules, depending on the module types and their mix.

A number of 8920-PS-DC modules may be used together, within an MTL8000 node, in a load-sharing arrangement. Where power supply redundancy is required an additional supply module may be added in an “n+1” arrangement. Failure of any power supply is signalled to the Bus Interface Module.

AC power supplies
The 8913-PS-AC and 8914-PS-AC supplies produce DC output power from a wide range of AC inputs. Both can be mounted in a Zone 2 or Division2 hazardous area which means that they can be used for a broad range of applications including supplying power to 8000 series modules.

System power
The 8913-PS-AC is a dual output supply capable of producing 12 V and 24 V DC outputs of approximately 5 A.

For 8000 series products, the 12 V output can be used to supply system power to the node and also provide 24 V to power field devices via the field power bussing facilities on the 8000 series carriers.

Field power
The 8914-PS-AC has a single 24 V DC output with a 10 A capacity. This is ideal for powering a wide range of field devices. With 8000 series products, it is normally distributed via the field power bus (see below).

Load sharing
A load sharing diode is built in to the 12V output of the 8913-PS-AC power supply and the 24V output of the 8914-PS-AC. This enables one or more of the same power supply type to be connected in parallel to share the load requirements.

Power health signalling
The 8913-PS-AC and the 8914-PS-AC supplies provide power health signals that can be routed to the BIM to warn of possible imminent power failure.

The 8913 provides the power health signal from its 12 V DC output.

Bussed field power
(2/2 modules/carriers only)
In addition to the system power supply, an MTL8000 node may need to be supplied with additional field power.

Conventional systems require field power supplies to be wired in at the field terminals or via additional patching connectors. This adds complication to the field wiring and can be a source of confusion during maintenance work.

The MTL8000 system overcomes this complication with a system for bussing power on the carriers. Each carrier can bus an external power supply to modules so that they can energise the field wiring.

In the case of the 4-20mA Analog Input and Output modules, the bussed field power is also used to energise the field interface circuits.

The connection for the bussed field power is located at the top of the carrier and uses a two-part removable connector. Individual bussed field power supplies connect to two modules. If an adjacent pair of modules require the same power supply voltage the connector can be wire-linked to provide it, otherwise a different supply voltage (AC or DC) can be connected.
Power supplies

System power supply

- power for 2/2 (general purpose) node
- 12 V DC output
- 18.5 - 36V DC input
- 4.9 A capacity
- supports redundancy with second supply

MODULE SPECIFICATION

HAZARDOUS AREA APPROVALS

Location of node ........................................Safe area or ..........Class 1, Div 2, Groups A, B, C, D T4 hazardous location or ........................................Zone 2 , IIC T4 hazardous area

Applicable standards:
- Factory Mutual Research Co., Class No. 3611 for Class I, Division 2, Groups A, B, C, D hazardous locations

ELECTRICAL

EMC compliance .................. To EN 50081-2 and EN 50082-2 .................. generic emission/immunity standards

Electrical safety . EN 61010-1:1993 and Amendment A2:1995

OUTPUT

Output voltage ............................................ 12 V dc ± 5%
Output current ............................................. 4.9 A
Input-output isolation ..................... 50 V ac rms, 720 V dc (Continuous working to EN 61010-1, Pollution Degree 2, ....Installation Category 2)

Hold-up (on i/p supply failure) ......................... 7 ms (– 40°C, full load and 22V input)
Thermal protection ....................... Protected against output s/c
Supply health indicator ............ LED (fed from final output)

Power-fail signal to BIM (i/p threshold) .......... ≤ 8.5 ± 2 V

INPUT

Input voltage ............................................. 18.5-36 V dc
Efficiency (at full load) 20 V input at 3.6 A ......................... 82.5%
24 V input at 3.1 A ......................... 80.0%
36 V input at 2.1 A ......................... 80.0%

Input connection .......... Two-part, screw terminal ...... each connection duplicated, 2.5 mm2 max. cable cross-section

Input protection .................... Fuse + supply reversal diode
Power-fail signal to BIM (i/p threshold) .......... ≤19.9 ± 0.5 V

ENVIRONMENTAL

Operating temperature (no forced ventilation)
(60% of full load) ........................................... – 40°C to + 70°C
Optimum orientation (full load) ......................... – 40°C to + 55°C
Worst case orientation (full load) ......................... – 40°C to + 50°C
Storage .................................................. – 40°C to + 85°C

Relative Humidity ...................5 to 95% RH (non-condensing)

Vibration .................... 2 g @ 10-100 Hz to BS EN 60068-2-6 and BS 2011- part 2.1
Shock .................. 10 g, 11 ms pulse width, to BS EN 60068-2-27

MTBF @ 50°C external ambient ....................... 80,000 hrs

Ingress Protection .................. IP20 to IEC 529/BS EN 60529

Corrosive atmospheres
To withstand gaseous corrosion level G3 as defined by ISA Standard SP71.04:1995, when protected by a suitable field enclosure.

MECHANICAL

Dimensions (approx.) .............. 42 (w) x 110 (h) x 160 (d) mm
Carrier mounting .................. types 8711-CA-NS or 8712-CA-NS
Weight ............................................. 775 g
IS module power supply

- power for 2/1 (IS) modules
- 12 V DC output
- 24 V DC (nominal) input
- 5 A capacity
- supports load sharing for redundancy

MODULE SPECIFICATION

HAZARDOUS AREA APPROVALS

Location of power supply
- Safe area or
- Class 1, Div 2, Group A, B, C, D hazardous location
- Zone 2, IIC T4 hazardous area

Output
- Galvanically isolated
- Voltage clamped; Un = 18 V

Applicable standards:
- Factory Mutual Research Co., Class No. 3611 for Class I, Division 2, Groups A, B, C, D hazardous locations
- Factory Mutual Research Co., Class No. 3610 for Class I, II, III, Division 1, Groups A - G hazardous locations (IS circuits)
- EN 50020:1994 Electrical apparatus for potentially explosive atmospheres, intrinsic safety “i”
- EC Directive 94/9/EC (ATEX)

ELECTRICAL

EMC compliance
- To EN 50081-2 and EN 50082-2
- Generic emission/immunity standards
- EN 61000-3-2:1995, EN 61000-3-3:1995

Electrical safety
- EN 61010-1:1993 and Amendment A2:1995
- EN 61131-2:1994

OUTPUT

Output voltage
- 12 V dc ± 5%

Output current
- 5 A

Input/Output isolation
- 250 V ac rms (tested at 1500 V ac rms)

INPUT

Input voltage
- 18.5–36 V dc

Efficiency (at full load)
- 18.5 V input at 4.1 A: 76%
- 24 V input at 3.3 A: 78%
- 36 V input at 2.1 A: 76.5%

Input connection
- 2-part screw terminal, each duplicated

Cable size
- 2.5 mm² (max.)

ENVIRONMENTAL

Operating temperature
- (60% of full load)
- 40°C to + 70°C
- Optimum orientation (full load)
- 40°C to + 55°C
- Worst case orientation
- 40°C to + 50°C
- Storage
- 40°C to + 85°C

Relative Humidity
- 5 to 95% RH (non-condensing)

Vibration
- 2 g @ 10-100 Hz to BS EN 60068-2-6
- and BS 2011- part 2.1

Shock
- 10 g, 11 ms pulse width, to BS EN60068-2-27

MTBF
- @ 50°C external ambient
- 80,000 hrs

Ingress Protection
- IP20 to IEC 529/BS EN 60529
- (tested on power supply carrier with all supply connectors in place)

Corrosive atmospheres:
- To withstand gaseous corrosion level G3 as defined by ISA Standard SP71.04:1995, when protected by a suitable field enclosure.

MECHANICAL

Dimensions (approx.)
- 84 (w) x 110 (h) x 160 (d) mm

Carrier mounting
- Type 8724-CA-PS

Weight
- 1290 g
Power supplies

System Power - dual voltage

- system & field power for MTL8000 Process I/O
- 12 V dc @ 5 A for system power
- 24 V dc @ 5 A for auxiliary power
- input voltage 85–264 V ac or 90–264 V dc
- Zone 2 / Div 2 mounting
- supports parallel connection for redundancy†

MODULE SPECIFICATION
See also System Specification

Location of power supply ................. safe area or
.................................................... Zone 2, IIC T4 hazardous area or
.............................................. Class 1, Div 2, Groups A, B, C, D T4 hazardous location

ELECTRICAL

EMC compliance ......................... To EN 61000-2,3,4,5,6,11
.............................................. EN 55011/22, EN 55014
Electrical safety......................... To EN 60950

INPUT

Input voltage (AC) ......................... 85–264 V ac
Input frequency (AC) .................... 47–65 Hz
Input voltage (DC) ....................... 90–264 V dc
Efficiency ................................ up to 87 %
Connections (Fig. 2) .................... 2-part pluggable connector
Input protection ......................... slow-blow fuse and VDR*

OUTPUTS

Output 1 ................................ 24.7 V dc ± 10%
Output 2 ................................ 11.95 V dc ± 5%
Output 1 current (see Fig. 1) .......... 5 A (nom.)
Output 2 current ......................... 5 A
Connections (Fig. 3) .................... 2-part pluggable connector
Input-output isolation .................. 2800 V dc
Hold-up time (at full rated load) ......... 15 ms (typ.)
Thermal protection ...................... reduced output power
Supply health indicator ................ LED

POWER-FAIL SIGNALLING - Output 2 only

Threshold to trigger "power-fail" signal .... 11.33 V (max.)
.............................................. 10.30 (min.)

Power-fail signal output (open collector)

Power supply "OK" ......................... Low impedance to –ve of o/p 2
Power supply "failure" ..................... High impedance to –ve of o/p 2
(Upto 8 power fail signals can be monitored by the 8510-NS-MO module when it is fitted on the 8718-CA-NS carrier.)

† internal load-sharing diode on 12V output only
* voltage dependent resistor

ENVIRONMENTAL

Operating ambient temperature .......... –40° to +70°C
Maximum operating case temperature ......... +80°C
Storage temperature ...................... –40° to +100°C
Relative humidity ...................... 93 %, 40°C for 56 days

MECHANICAL

Dimensions (see Fig 4) .................. 103 (w) x 138 (h) x 113.6 (d) mm
Mounting methods ....................... 35 mm x 7.5 mm T-section DIN rail
(see also Accessories overleaf)
Weight ..................................... 750 g

Figure 1 - Output current de-rating (24 V output only)
## Power supplies

### System Power - dual voltage

#### TERMINAL ASSIGNMENTS

**Input connector screw terminals**

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Des.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>Protective earth</td>
</tr>
<tr>
<td>2</td>
<td>N</td>
<td>Input neutral</td>
</tr>
<tr>
<td>3</td>
<td>L</td>
<td>Input live</td>
</tr>
</tbody>
</table>

**Output connector screw terminals**

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Protective earth</td>
</tr>
<tr>
<td>2</td>
<td>Output 1 + ve</td>
</tr>
<tr>
<td>3</td>
<td>Output 1 + ve</td>
</tr>
<tr>
<td>4</td>
<td>Output 1 – ve</td>
</tr>
<tr>
<td>5</td>
<td>Output 1 – ve</td>
</tr>
<tr>
<td>6</td>
<td>Output 2 + ve</td>
</tr>
<tr>
<td>7</td>
<td>Output 2 + ve</td>
</tr>
<tr>
<td>8</td>
<td>Output 2 – ve</td>
</tr>
<tr>
<td>9</td>
<td>Output 2 – ve</td>
</tr>
<tr>
<td>10</td>
<td>Aux. Power fail signal</td>
</tr>
<tr>
<td>11</td>
<td>Protective earth</td>
</tr>
</tbody>
</table>

#### ACCESSORIES

- Heavy duty DIN rail mounting kit† ...................... 8413-FK-DN
- Surface panel mounting kit ............................... 8414-FK-SU

† For larger amplitude vibration environments

#### APPROVALS

<table>
<thead>
<tr>
<th>Authority</th>
<th>Standards</th>
<th>Certificate No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>FM</td>
<td>No. 3600/3611</td>
<td>3011821</td>
</tr>
<tr>
<td>TÜV</td>
<td>EN50021</td>
<td>TÜV01ATEX1774X</td>
</tr>
<tr>
<td>CSA</td>
<td>2258 02</td>
<td>1368864</td>
</tr>
</tbody>
</table>

**Applicable standards:**

- Factory Mutual Research Class No. 3600/3611 for Class I, Division 2, Groups A, B, C, D hazardous locations
- ATEX Directive 94/9/EC Category 3 - \(\text{II 3 G}\)
- CENELEC standard EN50021:1999 \(\text{Ex n A II T4}\)
- CSA International - Class 2258 02

---

**Figure 2 - AC input power**

**Figure 3 - DC output power**

**Figure 4 - Outline and fixing dimensions**
Field power

- Power for wide range of Zone 2/Div 2 mounted equipment
- Field power for MTL8000 Process I/O
- 24 V dc @ 10 A for field power
- Input voltage 85–264 V ac or 90–264 V dc
- Zone 2 / Div 2 mounting
- Supports parallel connection for redundancy

MODULE SPECIFICATION
See also System Specification

HAZARDOUS AREA APPROVALS
Location of power supply: safe area or Zone 2, IIC T4 hazardous area or Class 1, Div 2, Groups A, B, C, D T4 hazardous location

Applicable standards:
- Factory Mutual Research Co., Class No. 3611 for Class I, Division 2, Groups A, B, C, D hazardous locations
- ATEX Category 3 for Zone 2

ELECTRICAL

EMC compliance: To EN 61000-2, 3, 4, 5, 6, 11
EN 55011/22, EN 55014
Electrical safety: To EN 60950

INPUT

Input voltage (AC): 85–264 V ac
Input frequency (AC): 47–65 Hz
Input voltage (DC): 90–264 V dc
Efficiency: Up to 87%
Connections (Fig. 2): 2-part pluggable connector
Input protection: Slow-blow fuse and VDR*

OUTPUT

Output: 24 V dc ± 10%
Output current (see also Fig. 1): 10 A (nom.)
Connections (Fig. 3): 2-part pluggable connector
Input-output isolation: 2800 V DC
Hold-up time (at full rated load): 15 ms (typ.)
Thermal protection: Reduced output power
Supply health indicator: LED

POWER-FAIL SIGNALING

Threshold to trigger "power-fail" signal: 23.3 V (max.)
22.0 V (min.)

Power-fail signal output (open collector)
Power supply "OK"—Low impedance to ground
Power supply "failure"—High impedance to ground
(Up to 8 power fail signals can be monitored by the 8510-NS-MO module when it is fitted on the 8718-CA-NS carrier.)

*Voltage dependent resistor

ENVIRONMENTAL

Operating ambient temperature: –40° to +70°C
Maximum operating case temperature: +80°C
Storage temperature: –40° to +100°C
Relative humidity: 93%, 40°C for 56 days

MECHANICAL

Dimensions (see Fig 4): 103 (W) x 138 (H) x 113.6 (D) mm
Mounting methods: 35 mm x 7.5 mm T-section DIN rail
(see also Accessories overleaf)

Weight: 750 g

Figure 1 - Output current de-rating

*Voltage dependent resistor
**TERMINAL ASSIGNMENTS**

Input connector screw terminals

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Des.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>Protective earth</td>
</tr>
<tr>
<td>2</td>
<td>N</td>
<td>Input neutral</td>
</tr>
<tr>
<td>3</td>
<td>L</td>
<td>Input live</td>
</tr>
</tbody>
</table>

Output connector screw terminals

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Des.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>Protective earth</td>
</tr>
<tr>
<td>2</td>
<td>+</td>
<td>Output + ve</td>
</tr>
<tr>
<td>3</td>
<td>+</td>
<td>Output + ve</td>
</tr>
<tr>
<td>4</td>
<td>–</td>
<td>Output – ve</td>
</tr>
<tr>
<td>5</td>
<td>–</td>
<td>Output – ve</td>
</tr>
<tr>
<td>6</td>
<td>+</td>
<td>Output + ve</td>
</tr>
<tr>
<td>7</td>
<td>+</td>
<td>Output + ve</td>
</tr>
<tr>
<td>8</td>
<td>–</td>
<td>Output – ve</td>
</tr>
<tr>
<td>9</td>
<td>–</td>
<td>Output – ve</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>Aux. Power fail signal</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td>Protective earth</td>
</tr>
</tbody>
</table>

**ACCESSORIES**

Heavy duty DIN rail mounting kit† ...........................8413-FK-DN
Surface panel mounting kit .......................................8414-FK-SU
† For larger amplitude vibration environments

**APPROVALS**

<table>
<thead>
<tr>
<th>Authority</th>
<th>Standards</th>
<th>Certificate No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>FM</td>
<td>No. 3600/3611</td>
<td>3011821</td>
</tr>
<tr>
<td>TÜV</td>
<td>EN50021</td>
<td>TÜV01ATEX1774X</td>
</tr>
<tr>
<td>CSA</td>
<td>2258 02</td>
<td>1368864</td>
</tr>
</tbody>
</table>

**Applicable standards:**
- Factory Mutual Research Class No. 3600/3611 for Class I, Division 2, Groups A, B, C, D hazardous locations
- ATEX Directive 94/9/EC Category 3 - II 3 G
- CENELEC standard EN50021:1999  EEx n A II T4
- CSA International - Class 2258 02
Railbus isolator

The Railbus Isolator module provides galvanic isolation between the 2/2 and 2/1 sections of the Railbus, thus preventing fault voltages on the general purpose (2/2) section of the Railbus from invading the parts that have IS field wiring. A Railbus Isolator is only required in a node that contains IS field wiring.

The Railbus Isolator mounts on its own carrier and is placed in the line of carriers immediately before the first (2/1) carrier that will carry IS field wiring. It is usually followed by an 8920-PS-DC IS module power supply (on its own carrier) which provides power for the 2/1 I/O modules.
Railbus isolator

- provides galvanic isolation between Railbus sections
- prevents fault-voltage invasions
- protects IS field wiring modules

MODULE SPECIFICATION
See also System Specification

MECHANICAL
Dimensions (approx.) ...............110 (w) x 160 (h) x 42 (d) mm
Weight .................................................................345 g (typ.)

HAZARDOUS AREA APPROVALS
Location of module ..............................................................
......Class 1, Div 2, Group A, B, C, D hazardous location or
..................................................Zone 2, IIC T4 hazardous area

'Safe area' Railbus ..................\( U_N = 250 \text{ V} \)
Isolated Railbus .................\( U_N = 18 \text{ V} \)

POWER SUPPLIES
'Safe area' Railbus supply current* .50 mA (max.) @ 12 V
IS Railbus supply current* ..........60 mA (max.) @ 12 V
Power dissipation within module........1.2 W (max.)

* Note: DC power for the Railbus Isolator is required from both sides of the galvanic interface.
LAN connection
An MTL8000 node uses a Bus Interface Module (BIM) to communicate with the host controller via a local area network (LAN). Different BIMs can be chosen to operate with a range of popular fieldbus protocols. The BIM mounts on a carrier and receives all of its communication and power links from it.

The BIM uses the RS485 communications standard. Other alternatives are RS422, by changing switches (where available) on the carrier, or RS232 by fitting an in-line converter. Switch options sometimes offer alternative methods for terminating the LAN.

Some BIMs also have a second LAN connection to maintain communications in the event of damage occurring to the main communications link. This technique is illustrated (right) for a Modbus host where a second master is shown.

HART management interface
An interface module is available, to link HART devices with the instrument management software. One 8512-IF-HA module is required per BIM. One port connects to the BIM and the other connects, via a daisy-chained RS485 link, to the PC running the software.

Internal ‘Railbus’ connection
The BIM communicates with the individual I/O modules via ‘Railbus’ - a proprietary, MTL serial bus. I/O information from the modules is gathered and stored in the BIM for reporting to the host. Similarly, all host commands are interpreted by the BIM and the relevant messages relayed to the I/O modules. In addition to the I/O data, status and diagnostic data is relayed over the same route, to monitor and maintain the health of the I/O system.

Failsafe mode
Under certain abnormal or fault conditions, the BIM will adopt a state known as “failsafe” which, in turn, forces the I/O modules into a similar failsafe state. (See I/O module section). This condition ensures that outputs are put into known states that have been predefined by the user.

Failsafe mode can be induced by a direct instruction from the host or if the BIM receives no communication from the host for a pre-defined length of time.

Failsafe recovery
The BIM is forced out of failsafe mode by the Master but, before exiting the failsafe state, the BIM will wait until all the I/O modules have been polled, to enable output values to be preconditioned by the Master before the BIM leaves the failsafe state.

Heartbeat
The BIM is capable of detecting a failed application on the host by using a “heartbeat” status signal. The application is expected to supply a signal which toggles between 0 and 1. The Master includes this value with every message to indicate that the application is still in control. This value is echoed by the BIM back to the Master, which must then send a new, opposite, value from the application within a defined period, otherwise the BIM adopts a failsafe state.

Configuration
When power is first applied to a BIM, it has no information about the system to which it is connected and must therefore be configured. This is achieved using dedicated software (Part No. 8455-SW-CF) that operates on a PC running Windows 95, 98 or NT.

After configuration, the user can store the information in the BIM’s non-volatile memory (NVM). At future start-ups, the BIM will recall the configuration data from the NVM.

The configuring PC can be linked to the BIM by one of three methods:

a) via an RS232 link to the sub-D connector on the BIM or
b) via the secondary LAN - if available
c) via “pass-through” messaging over the primary LAN, if available
The 8502-BI-DP Bus Interface Module (BIM) provides the communications link between the 8000 series I/O modules and a Profibus-DP host. Its high speed acquisition of data from the modules and LAN operation speeds of up to 6 Mbaud allows the host to respond rapidly to conditions in the control process.

The BIM gathers the data from the I/O modules and makes it available to the host upon request. It is a slave to the Profibus master. As well as cyclic data exchange, which is required for reading input and writing output data, the BIM supports Profibus Extended Diagnostics for status information. It also supports a number of special features which have been implemented to allow high integrity system operation and in-situ maintenance.

PARAMETERISATION

The 8502 supports parameterisation from the Profibus master. This configures on a “per module” basis, i.e. all the channels on a single module carry the same configuration. The configuration is created in a Profibus configurator using details provided in a GSD file. This method is fast and enables a configuration to be built based upon “logical” modules which represent the physical modules. Modules are added one at a time to the configuration and parameters are chosen to apply to all the channels of the module. Logical modules can be selected to provide HART status and process variables in the Profibus-DP cyclic input telegram. In addition, for applications where access to many HART variables is required, the HART “mailbox” can be used. This technique collects HART variable as they are required; saving space in telegrams that are sometimes overworked with data. This method is available only when using parameterisation.

The configuration is passed down from the Profibus master to the BIM at the start of the session. If the system is stopped and re-started, the configuration file is re-transmitted to the BIM.

CONFIGURATION

The alternative to parameterisation is the use of the B455-SW-CF configuration software. This enables the user to configure individual channels and alarms and store the configuration in the BIM. The configuration can also be saved to the 8510-MO-NS Node Services Module for instant recovery if a BIM has to be replaced. Configuration by this method uses a different GSD file to the one used for parameterisation and the data frame is based on “data blocks” rather than on a “by module” approach. The B455 software automatically provides a map of the data created in the telegram to enable host programmers to identify the data passed. HART status and process variables can be communicated to the Profibus-DP host in the cyclic input telegram.

I/O & HART data requires space in the DP data frame as shown in the table below.

<table>
<thead>
<tr>
<th>Data type</th>
<th>Input words</th>
<th>Output Words</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog data</td>
<td>1 per input channel</td>
<td>1 per output channel</td>
</tr>
<tr>
<td>Digital data</td>
<td>1 per input module</td>
<td>1 per output module</td>
</tr>
<tr>
<td>HART variable</td>
<td>2 per variable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>HART status</td>
<td>1 per channel</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

The Profibus BIM supports both Standard and Extended Diagnostics. While the Standard Diagnostics provide standard PROFIBUS status information, the Extended Diagnostics provide detailed information relating to the status of the BIM, the health of the modules and the status of I/O channels. Depending on the I/O module type, events such as high and low alarm, open circuit and line fault are detected. Extended Diagnostic messages are generated on detection of an anomaly and also when it is cleared. Use of the diagnostic capability requires suitable support in the host application.

For hosts unable to use diagnostic data in the control algorithm, it is possible to map the diagnostic data into the input dataframe.

HART DEVICE MAINTENANCE

Pass through messaging to HART devices is available via the local configuration port and the 8512 HART Comms interface. This allows multi-dropping of a number of BIMs on an RS485 link to a PC running a wide range of instrument management software.
Profibus protocol

MODULE SPECIFICATION
See also System Specification

LAN INTERFACE
LAN protocol ........................................PROFIBUS-DP (to EN50170)
Transmission rates ...........9.6, 19.2, 93.75, 187.5, 500 kbaud
.........................................................and 1.5 and 6 Mbaud
Maximum bus segment length (metres) depends upon speed...........

<table>
<thead>
<tr>
<th>Speed (kbaud)</th>
<th>Max length</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.6</td>
<td>1200</td>
</tr>
<tr>
<td>19.2</td>
<td>1200</td>
</tr>
<tr>
<td>93.75</td>
<td>1200</td>
</tr>
<tr>
<td>187.5</td>
<td>1000</td>
</tr>
<tr>
<td>500</td>
<td>400</td>
</tr>
<tr>
<td>1500</td>
<td>200</td>
</tr>
<tr>
<td>6000</td>
<td>100</td>
</tr>
</tbody>
</table>

(Not: Table applies to cables with an impedance of 135 -165 Ω and a capacitance per unit length that does not exceed 30 pF/m.)

Transmission standard ........................................RS 485
Isolation (LAN to Railbus to Power Supply) ......................500 V
Action on software malfunction ..................................modules go to failsafe

I/O & DIAGNOSTIC DATA
DP Data frame ................. Size configurable up to 244 bytes
Input data, including Status word (2 bytes) .......................244 bytes max
Output data, including Control word (2 bytes) ...................244 bytes max
Total Input plus Output data .....................................296 bytes max
Diagnostic telegram .............................................78 bytes

CONFIGURATION
The BIM can be configured using MTL’s 8455-SW-CF software running on a PC, by parameterisation from a Profibus configurator or by transfer of a configuration from the 8510-NS-MO Node Services Module. The 8510 also has an autoconfiguration option.
Address setting .............................................Software settable in BIM,
.........................................................by Profibus “Set Slave Address” command
.........................................................or by switch setting on 8510-NS-MO module

POWER SUPPLIES
Railbus (12V) current ........................................420 mA (typ.)
..........................................................520 mA (max.@ -40 °C)

MECHANICAL
Module width ..............................................63 mm
Weight (approx.) ..........................................350 g

LED INDICATORS

<table>
<thead>
<tr>
<th>Power (green)</th>
<th>OFF</th>
<th>ON</th>
<th>Flashing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power fail</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power OK</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fault (red)</th>
<th>OFF</th>
<th>ON</th>
<th>Flashing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fail or fault</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Comm (yellow)</th>
<th>OFF</th>
<th>ON</th>
<th>Flashing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comms. Failure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comms. OK</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On power up</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LAN A (yellow)</th>
<th>OFF</th>
<th>ON</th>
<th>Flashing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power OFF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LAN activity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slow flash = no LAN active</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Config. (yellow)</th>
<th>OFF</th>
<th>ON</th>
<th>Flashing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not defined</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Configurator connected</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Configurator not connected</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Railbus (yellow)</th>
<th>OFF</th>
<th>ON</th>
<th>Flashing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Railbus Fault</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Railbus OK</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Bus interface modules

Modbus protocol

- links MTL8000 node to Modbus host LAN
- LAN speeds of up to 115.2 kbaud
- supports up to 32 I/O modules
- HART process and status variables via Modbus
- module status & channel status flags
- automatic scan optimisation
- configuration data held in non-volatile memory
- software configurable via local port or LAN B
- HART™ maintenance via comms adaptor

MODBUS SOFTWARE

The implementation of the Modbus protocol in the MTL8000 Series is according to Revision G of the Modicon Specification. Only RTU mode is supported.

Communication speeds of up to 115k baud are possible with single LAN systems, 57k baud with twin connections. The LAN node address is set by configuration.

The BIM supports the Modbus function codes that are required to read and write input, output and status data, and also supports a number of special features which have been implemented to allow high integrity system operation and in-situ maintenance.

DUAL LAN OPERATION

While LAN-A is the primary port for host communications, a second host may be connected to LAN-B as either an active or a passive standby in a redundant configuration. This is intended to provide fault tolerance against failure of either the primary host or its associated LAN connection.

Active Standby mode is intended for use with a simple pair of duplicated hosts.* Passive Standby mode is for a “redundant host pair” where Host B is capable of detecting the failure of Host A or LAN-A and taking action to assume active control.

A further mode of operation “Dual Comms” allows two hosts simultaneous read/write privileges. This is appropriate for manual control via duplicate HMI/SCADA workstations.

LAN-B may also be used for remote configuration and maintenance of both an MTL8000 sub-system and intelligent (HART) field devices connected to the I/O modules.

DIAGNOSTIC AND STATUS INFORMATION

The BIM provides detailed information relating to the status of the BIM, the health of I/O modules and the status of I/O channels. Depending on the I/O module type, information such as high and low alarm, open circuit and line fault is reported.

AUTOMATIC SCAN OPTIMISATION

The gathering of input data from the I/O modules and the issuing of output data to them is not determined by a fixed scan rate. A scan optimisation algorithm is used to gather and distribute data virtually as soon as it becomes available. A maximum scan period can be set for each module to ensure that the data is collected within this defined time period.

*In this mode of operation, writes to outputs are inhibited on the secondary LAN during normal operation but enabled if the BIM detects failure of the primary LAN.

PACKED DATA MAPPING

The dynamic data that is exchanged with the host application is mapped to consecutive memory locations. This eliminates the need for piecemeal read and write commands to separate data locations. A single Modbus read instruction will gather all of the current data from the BIM, resulting in a rapid interchange of information between the node and the host. Writes to the BIM’s database can similarly be made with a single command.

HART DEVICE MAINTENANCE

Pass through messaging to HART devices is available via the local configuration port and the 8512 HART Comms interface. This allows multi-dropping of a number of BIMs on an R5485 link to a PC running AMS, Cornerstone™ and other instrument management software.

BUILT-IN NON VOLATILE MEMORY

The BIM contains a section of non volatile memory (NVM) in which the configuration is stored. At switch on, the configuration is copied from NVM into working memory and the BIM can then initialise itself together with the I/O modules.

NODE SERVICES MODULE OPTION

The BIM also supports the use of the 8510-MO-NS - Node Services Module - which can store a BIM’s configuration. This enables the BIM to be swapped with another and, at switch on, the configuration from the NSM will be uploaded to the BIM and will overwrite its previous contents.

In addition, the NSM will monitor the dc supplies that power the node. If any power supply fail signal becomes active, the BIM receives a fault signal; a particularly important feature for systems having redundant power supplies. The failed PSU can then be identified quickly and replaced, restoring fault tolerant operation.

AUTOCONFIGURATION

The BIM has an autoconfiguration mode that can be triggered by a software command or by switches on the Node Services Module. This causes the BIM to delete its current configuration and reset the modules to their default values. The BIM then scans the Railbus and creates a new configuration file based upon the module types fitted and using their default values, which is then saved to NVM.

HART® is a registered trademark of the HART Communications Foundation. Cornerstone™ is a trademark of Applied System Technologies.
**Module Specifications**

**LAN Interface**
- Transmission protocol: Modbus (RTU mode)
- Transmission rates: 1.2 - 115.2 kbits/s
- By mode:
  - Single LAN mode: 115.2 kbit/s (max.)
  - Passive standby mode: 115.2 kbit/s (max.)
  - Active standby mode: 19.2 kbit/s (max.)
  - Dual comm. mode: 19.2 kbit/s (max.)
  - Remote config mode: 19.2 kbit/s (max.)
- Transmission standard: RS485 or RS422
- Bus Insulation: 500 V
- Action on software malfunction: Halt CPU / Reset CPU

**Configuration**
The BIM can be configured either by using MTL's 8455-SW-CF software running on a PC or by transfer of a configuration from the 8510-NS-MO Node Services Module. An autoconfiguration option is also provided.

**Address setting**: software settable in BIM or switch settable using 8510-NS--MO Node Services Module.

**Response Times**
- Modbus message response time: < 4 ms

**LED Indicators**

<table>
<thead>
<tr>
<th></th>
<th>OFF</th>
<th>ON</th>
<th>Flashing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power (green)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Off</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fault (red)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>OFF</th>
<th>ON</th>
<th>Flashing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LAN A &amp; LAN B (yellow)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LAN disconnected</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comms. OK</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>OFF</th>
<th>ON</th>
<th>Flashing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Config. (yellow)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Configurator not connected</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>to local port</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>via LAN</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>OFF</th>
<th>ON</th>
<th>Flashing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Railbus (yellow)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Railbus fault</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Module Specifications**

**Power Supplies**
- Railbus (12V) current: 260 mA (typ.)
- Railbus (12V) current: 300 mA (max.)

**Mechanical**
- Module width: 63 mm
- Weight (approx.): 320 g

See System Specification for other parameters.

**Modbus Functions Supported**

**Read Coil Status (Function 01)**
Reads a range of single-bit flags that show the status of Discrete Output channels. This allows the host to confirm the states to which the BIM has set the Discrete Outputs.

**Read Input Status (Function 02)**
Reads a range of single-bit flags that show the status of Discrete Input channels. This allows the host to monitor the latest reported state of the Discrete Inputs.

**Read Holding Registers (Function 03)**
Reads a range of 16-bit registers that contain the status of Analog Outputs. This allows the host to confirm the states to which the BIM has set the Analog Outputs.

**Read Input Registers (Function 04)**
Reads a range of 16-bit registers that contain the status of Analog Input channels. This allows the host to monitor the latest reported state of the Analog Inputs.

**Force Single Coil (Function 05)**
Requests the BIM to force a specified coil to a ‘1’ or a ‘0’. This could be used, for example, to switch a DO channel or make it pulse.

**Preset Single Register (Function 06)**
Writes a 16-bit value to a specified BIM register - either to set an Analog Output or to preset a DI counter.

**Return Diagnostic Register (Function 08)**
Requests that the slave reads the contents of its diagnostic register and returns the binary data values to the master, according to the specified sub-function code; i.e. Return Query Data (00) or Return Diagnostic Register (02)

**Force Multiple Coils (Function 15)**
Requests the BIM to force a specified range of coils to a ‘1’ or a ‘0’. This could be used, for example, to switch DO channels or make them pulse.

**Preset Multiple Registers (Function 16)**
Writes a 16-bit value to a specified range of BIM registers - for example to set Analog Outputs.

**Report Slave ID (Function 17)**
The Report Slave ID function permits the user to obtain information on the slave type and ‘RUN’ status.
**Bus Interface Modules**

**Configuration Software**

- Windows™ Explorer - style interface
- used to configure Bus Interface Modules
- local or remote configuration via LAN
- dynamic viewing of real-time data
- single project file for multiple nodes

The 8455 software is one of the methods for configuring Bus Interface Modules (BIMs) in an MTL Process I/O™ node. It runs on a PC, under the familiar Windows™ operating system. The PC can be linked to the BIM using either a local cable link or via a secondary LAN connection, where available.

The BIM is the interface between the I/O modules and the host controller, and must be configured to permit correct operation. The BIM needs to be told the identity of each I/O module fitted and values of relevant parameters. Parameters must also be defined for LAN communication with the host controller.

**PROJECT FILE**

The configuration information is contained in a project file. A project file can be created for a single BIM or for multiple BIMs, e.g. on a network, each of which can accommodate up to 32 I/O modules. The configuration information may then be downloaded to the individual BIMs on the network.

**USER INTERFACE**

The main screen of the Configurator has a conventional Windows Menu and Toolbar display at the top. The main body of the screen is then split to show a “navigation tree” for the network on the left-hand side and the BIM/module parameters on the right.

**MODULE ATTRIBUTES & PARAMETERS**

The software can display the hardware and software revision levels of both the BIM and the I/O modules. Each module has its own set of parameters and these appear with default values when the module is first added to the system. These can then be edited individually to specify the required system.

**DYNAMIC DATA**

Real-time data is available on-screen if the configuration link (serial or LAN) is in place. The viewable data includes primary variables as well as status parameters. This can be refreshed continually or when the operator requires a screen refresh. When in continuous refresh mode, the time between module data reads can also be viewed. Alternatively, the Configurator can be operated “offline” for simple project file creation.

**UPLOAD BIM DATA**

Configuration data already contained in a BIM can be uploaded to the Configurator. This can be saved as a PC file and copied to other BIMs. PC files that were created for earlier revisions of the BIM firmware can also be opened and edited for use with the latest versions of the BIM.

**OPEN DATABASE STRUCTURE**

The Configurator contains a Microsoft® Access open structure database in which the configuration data is held.

**SIMPLE TABBED PAGES**

The right hand side of the screen contains information on any item that is highlighted in the navigation tree to the left. With the network icon selected, three tabbed pages of information are available (see Fig 1).

**Fig 1 - Configuration file details**

These pages define and describe the network protocol, the BIMs that are attached to the network and the details of the project contained in the overall configuration file.
Selection of the BIM icon in the navigation area reveals five pages of information and settings (see Fig 2) for the BIM. These pages provide information that relate to the selected BIM and its specific network settings and the I/O modules attached to it.

Finally, clicking on an I/O module provides a further set of five pages of module information and settings (Fig 3). These pages contain details of the software and hardware revision levels of the chosen module, the condition of its various status flags, the user definable variables and, if connected “live”, the current value of each variable.

PC SYSTEM REQUIREMENTS
Intel “Pentium®” processor (recommended)
Microsoft® Windows™ 95, 98, 2000 or NT4 operating system
RAM capacity – as appropriate for operating system
At least one available serial port (COM1, 2, 3 or 4)
1 Mb hard disk space + space for user created configuration files

BIM COMMUNICATION PORT SETTINGS
Speeds ....................................................1,200 – 38,400 baud
Parity ......................................................Odd, Even or None
Data bits ......................................................8
Stop bits .....................................................1
Protocol .....................................................SLIP

ASSOCIATED LITERATURE
INM8455 .............Instruction manual, BIM Configuration Software

TO ORDER
Configurator with RS232 cable .........................8455-SW-CF
Configurator without RS232 cable .....................8456-SW-CF
RS232 cable .............................................8460-CA-CF
(The software and any release notes are supplied on a CD ROM.)

IMPORTANT NOTE:
This software is designed for use with the latest 8505-BIMB BIM that has version 2.x firmware. It is NOT compatible with version 1 BIMs. However, .csv or .ssf files created for use in version 1 BIMs can be imported to create configuration files for version 2 BIMs.

Windows™ is a trademark of Microsoft® Corporation
Intel and ‘Pentium®’ are trademarks of Intel Corporation

E-mail: enquiry@mtl-inst.com    Web site: www.mtl-inst.com
Bus Interface Modules

Node Services Module

- stores node configuration
- retains configuration on BIM swap
- used to define LAN address of node
- used to transfer configurations between nodes
- manages redundant PSU failure

MODULE SPECIFICATION

See also System Specification

INPUTS

8910 PSU signal inputs.........................2
8913/4 PSU external power fail signal inputs ..........8
Incoming power fail signal levels
PSU OK..............................................< 0.5 V @ 10 mA
PSU failed........................................< 100 µA @ 12 V DC
Input voltage........................................± 15 V DC (max.)

CONFIGURATION MEMORY

Memory type................................serial EEPROM, non-volatile
Data retention period.........................> 40 years
Write cycles.................................> 100,000
Configuration read or write time........7.5 s (typ.)
.....................................................15 s (max.)

CONFIGURATION SWITCHES (See Fig. A and Table 1)

Write protect (Sw 1) .....................DIL, on/off
Auto configure (Sw 2 & 3) ...........DIL (x2), on/off
2/2 only system (Sw 4) .................DIL, on/off

ADDRESS SWITCHES (Fig. B)

LAN A address ......................rotary (x3), 0–9
LAN B offset ..........................rotary (x1), 0–9

Table 1

<table>
<thead>
<tr>
<th>Auto config. setting</th>
<th>THC mode</th>
<th>RTD mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch 2</td>
<td>Type K</td>
<td>3-wire Pt100</td>
</tr>
<tr>
<td>Switch 3</td>
<td>Type J</td>
<td>4-wire Pt100</td>
</tr>
<tr>
<td>Switch 2 &amp; 3</td>
<td>mV</td>
<td>3-wire resistance</td>
</tr>
</tbody>
</table>

LED INDICATORS

Power, Fault, Comms, 2/2 fail, 2/1 fail

POWER SUPPLIES

Railbus (12V) current......................30 mA (max.)

MECHANICAL

Weight.................................100 g (nom.)
Mounting..............compatible with 8711, 8712 & 8718 carriers

DIMENSIONS (mm)

Figure A
Configuration switches

Figure B
Address switches

Safe area or Zone 2/Div 2 hazardous area
**Bus Interface Modules**

**HART® interface module**

- supports up to 256 HART devices per node
- supports AMS software
- simplifies maintenance of HART field devices
- mountable in Zone 2 or Div 2 hazardous areas
- only one required per MTL8000 node

**MODULE SPECIFICATION**

See also System Specification

**HOST INTERFACE**

Electrical specification ................................................. RS485
Physical medium.......................................................... 2-wire multidrop
Number of nodes per workstation ................................. 31 (max.)
Unit addresses (software configurable) ........................... 1 – 31
Baud rate (s/ware configurable) ..1.2, 9.6, 19.2 and 38.4 baud
Instrument management software supported
  ◆ AMS (contact MTL for further options)

**MTL8000 INTERFACE**

Connection to BIM ..................................................... via Configurator port
HART devices per mode .............................................. 256 (max.)

**HAZARDOUS AREA APPROVALS**

Location of 8512-IF-HA .............................................. Safe area or
.............................. Class I, Div 2, Groups A, B, C, D T4 Hazardous location or
............................................. Zone 2, IIC T4 Hazardous location

**ISOLATION**

Port to port and psu ........................................................ 250 V ac rms (to EN 61010-1)
.............................. [tested at 2.3 kV ac rms for 1 min.]

**LED INDICATORS**

LEDs for status indication of HOST and MTL8000 port

**ELECTRICAL**

Power supply voltage (Vs) ........................................... 20 – 35 V dc
Current required
  at 20 V .................................................................. 135 mA (max.)
  at 24 V .................................................................. 115 mA (max.)
  at 35 V .................................................................. 75 mA (max.)
Connections ................................................................. screw terminals
Conductor cross-section .............................................. 2.5 mm² (max.)

**MECHANICAL**

Mounting ..................................................... directly on to T- or G-section DIN rail
Casing ................................................................. polyamide
Module width .......................................................... 40 mm
Weight (approx.) .................................................. 100 g

---

**Circuit and wiring diagram**

**Dimensions and mounting (mm)**
MTL8000 2/x System specification

**System specification**

**MECHANICAL**
Mounting method .............................................. Flat panel or DIN-rail
DIN-rail types ............................................. 'Top hat', 35 x 7.5 mm to EN 50022
.................................................................................or 35 x 15 mm to EN 50022
.................................................................................or G-section, to EN 50035

**RAILBUS (Backplane)**
Maximum physical length* of node .................. 6.8 m
Maximum number of extender cables ............... 3
* overall, including backplanes and extender cables

**NODE SIZE**
BIM/Controller type  ................................................ Module limit
8502-BI-DP ...................................................... 32 max.
8505-BI-MB ...................................................... 32 max.
8521-xx-MT ...................................................... 64 max.

Note: I/O module carriers used with these must conform to the same module address limits. See I/O module carrier datasheets for details.

**ELECTRICAL**
EMC compliance .................................................. To BS EN 61326:1998
Electrical safety ................................................... EN 61010-1

**ISOLATION**
I/O Modules - 2/2
Between isolated channels .................. 250 V ac rms (to EN 61010-1)
.................................................................(Tested at 2.3 kV ac rms)
Channel (any) to Railbus .................. 250 V ac rms
(Except where stated on individual module specifications)

I/O Modules - 2/1
Between hazardous area terminals and Railbus ........ 60 V ac rms
Between IS field circuits of separate I/O modules† ........ 500 V ac rms
Between any IS field circuit & non-IS field circuit ........ 250 V ac rms
Between individual channels of an I/O module ....................
..............................................................................refer to individual module specifications
† 60 second test

**ENVIRONMENTAL**
Ambient temp
Operating, optimum orientation * ................. – 40°C to + 70°C
(except where stated in individual module specifications)
Operating, non-optimum orientation * .......... – 40°C to + 50°C
(except where stated in individual module specifications)
Storage ................................................................. – 40°C to + 85°C
* Optimum orientation is when the carrier is mounted in a vertical plane with field terminals located below the modules.

Relative Humidity .............................................. 5 to 95% RH (non-condensing)
Ingress Protection ............................................ IP20 to BS EN60529:1992
(Additional protection by means of enclosure)

**Corrosive atmospheres:** Designed to meet ten year service in Class G3 corrosive environment, as defined by ISA Standard SP71.04.

<table>
<thead>
<tr>
<th>Vibration - Storage &amp; Transport</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN 60068-2-6 (Sinusoidal Vibration)</td>
</tr>
<tr>
<td>5 g for surface mounting, 1 g for DIN-rail mounting</td>
</tr>
<tr>
<td>BS2011: Part 2.1 (Random Vibration)</td>
</tr>
<tr>
<td>5 g for surface mounting, 1 g for DIN-rail mounting</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Shock - Storage &amp; Transport</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN 60068-2-32</td>
</tr>
</tbody>
</table>

**Shake - Operating**

| EN 60068-2-27 | 30 g peak acceleration with 11 ms pulse width |

**IMPORTANT**
Users are strongly recommended to refer to the System Specifier’s Guide (SSG8002) when designing a new system.
System specification

HAZARDOUS AREA APPROVALS - 2/2 NODE
8000 node equipment location* ........................................ Safe area or
............................................................................... Zone 2, IIC T4 hazardous area or
............................................................................... Class 1, Div 2, Groups A-D, T4 hazardous location
*except for 8101-HI-TX, 8103-AI-TX and 8119-V1-05
............................................................................... Safe area or
Zone 2, IIC T4 (Tamb = 60°C), T3 (Tamb = 70°C), hazardous area or
............................................................................... Class 1, Div 2, Groups A-D, T4 (Tamb = 60°C),
............................................................................... T3 (Tamb = 70°C) hazardous location

Field equipment and wiring location
............................................................................... Safe area or
............................................................................... Zone 2, IIC hazardous area or
............................................................................... Class 1, Div 2, Groups A-D hazardous location
(Temperature classification will be determined by the field apparatus)

HAZARDOUS AREA APPROVALS - 2/1 NODE
8000 node equipment location ........................................ Safe area or
............................................................................... Zone 2, IIC T4 hazardous area or
............................................................................... Class 1, Div 2, Groups A-D, T4 hazardous location

Field equipment and wiring location
............................................................................... Zone 0, IIC hazardous area or
............................................................................... Class 1, Div 1, Groups A-D hazardous location
(Temperature classification will be determined by the field apparatus)

Applicable standards:
◆ Factory Mutual Research Co., Class No. 3611 for Class I,
Division 2, Groups A, B, C, D hazardous locations
◆ Factory Mutual Research Co., Class No. 3610 for Class I, II, III,
Division 1, 2 Groups A-G hazardous locations
◆ EN 50014: 1992 Electrical apparatus for potentially explosive
atmospheres, general requirements
◆ EN 50020: 1995 Electrical apparatus for potentially explosive
atmospheres, intrinsically safe “i”
◆ EN 50021: 1999 Electrical apparatus for potentially explosive
atmospheres, type of protection “n”
◆ EC Directive 94/9/EC (ATEX 100A)

LOCAL AREA NETWORK
Fieldbus protocols supported ................. Modbus (RTU mode)
............................................................................... Profibus - DP

Note
1. Protocols are selected by choice of Bus Interface Module
2. For other protocols consult MTL

Configuration
1) via host LAN (if supported by LAN)
2) via PC connected locally at configuration port

Node address setting .......... Software settable in the BIM

LAN physical medium (configurable on carrier)..............
LAN A ......................... RS485 or RS422, 5- wire
LAN B (where available) ......................... RS485 or RS422, 5- wire

LAN isolation
LAN A to LAN B (if applicable) ......................... 250 V ac
LAN A or B to system ground ......................... 250 V ac (to EN 61010)

POWER SUPPLIES
System Supply
Local supply input ................................. 18.5 - 36 V dc input
Supply redundancy ................................ supported
Railbus supply voltage ......................... 12 V dc ± 5%

IMPORTANT
Users are strongly recommended to refer to the System Specifier’s Guide (SSG8002) when designing a new system
### MTL8000 2/x System specification

#### 2/2 module cable parameters for non-incendive field wiring

**Note**

For module types 8109-DI-DC and 8122-DI-DC, each pair of field terminals may be considered as non-incendive when connected into a field circuit with the following parameters:

\[
V_{\text{max}} = 30 \text{ V dc} \quad I_{\text{max}} = 100 \text{ mA}.
\]

The values of capacitance and inductance seen at the module’s input terminals are:

\[
C_i = 0 \mu F \quad L_i = 0 \text{ mH}.
\]

<table>
<thead>
<tr>
<th>Module (each channel)</th>
<th>FM</th>
<th>Gas Group</th>
<th>C&lt;sub&gt;i&lt;/sub&gt; (µF)</th>
<th>L&lt;sub&gt;i&lt;/sub&gt; (mH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8101-HI-TX</td>
<td></td>
<td>A+B</td>
<td>0.17</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C</td>
<td>0.51</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D</td>
<td>1.36</td>
<td>88</td>
</tr>
<tr>
<td>8102-HO-IP</td>
<td></td>
<td>A+B</td>
<td>0.17</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C</td>
<td>0.51</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D</td>
<td>1.36</td>
<td>88</td>
</tr>
<tr>
<td>8103-AI-TX</td>
<td></td>
<td>A+B</td>
<td>0.17</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C</td>
<td>0.51</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D</td>
<td>1.36</td>
<td>88</td>
</tr>
<tr>
<td>8104-AO-IP</td>
<td></td>
<td>A+B</td>
<td>0.17</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C</td>
<td>0.51</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D</td>
<td>1.36</td>
<td>88</td>
</tr>
<tr>
<td>8105-TI-TC</td>
<td></td>
<td>A+B</td>
<td>14.9</td>
<td>1000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C</td>
<td>44.8</td>
<td>1000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D</td>
<td>119.6</td>
<td>1000</td>
</tr>
<tr>
<td>8106-TI-RT</td>
<td></td>
<td>A+B</td>
<td>14.9</td>
<td>1000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C</td>
<td>44.8</td>
<td>1000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D</td>
<td>119.6</td>
<td>1000</td>
</tr>
<tr>
<td>8110-DI-DC</td>
<td></td>
<td>A+B</td>
<td>0.12</td>
<td>151</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C</td>
<td>0.36</td>
<td>544</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D</td>
<td>0.97</td>
<td>1000</td>
</tr>
<tr>
<td>8119-VI-05</td>
<td></td>
<td>A+B</td>
<td>0.17</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C</td>
<td>0.51</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D</td>
<td>1.36</td>
<td>88</td>
</tr>
<tr>
<td>8121-DI-DC</td>
<td></td>
<td>A+B</td>
<td>0.12</td>
<td>1000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C</td>
<td>0.36</td>
<td>1000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D</td>
<td>0.97</td>
<td>1000</td>
</tr>
<tr>
<td>8123-PI-QU</td>
<td></td>
<td>A+B</td>
<td>1000</td>
<td>1000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C</td>
<td>1000</td>
<td>1000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D</td>
<td>1000</td>
<td>1000</td>
</tr>
</tbody>
</table>

For the latest certification information visit: [http://www.mtl-inst.com/certs_1.nsf](http://www.mtl-inst.com/certs_1.nsf)
## MTL8000 2/x System specification

### 2/1 module cable parameters for IS field wiring

<table>
<thead>
<tr>
<th>Module (each channel)</th>
<th>BASEEFA</th>
<th>FM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gas Group</td>
<td>μF</td>
</tr>
<tr>
<td><strong>8201-HI-IS</strong></td>
<td>IIC</td>
<td>0.083</td>
</tr>
<tr>
<td></td>
<td>IIB</td>
<td>0.65</td>
</tr>
<tr>
<td></td>
<td>IIA</td>
<td>2.15</td>
</tr>
<tr>
<td><strong>8202-HO-IS</strong></td>
<td>IIC</td>
<td>0.116</td>
</tr>
<tr>
<td></td>
<td>IIB</td>
<td>0.87</td>
</tr>
<tr>
<td></td>
<td>IIA</td>
<td>3.12</td>
</tr>
<tr>
<td><strong>8204-AO-IS</strong></td>
<td>IIC</td>
<td>0.136</td>
</tr>
<tr>
<td></td>
<td>IIB</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td>IIA</td>
<td>3.60</td>
</tr>
<tr>
<td><strong>8205-TI-IS</strong></td>
<td>Channels 1, 2, 3, 4, 7 and 8 wired as separate IS circuit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IIC</td>
<td>0.41</td>
</tr>
<tr>
<td></td>
<td>IIB</td>
<td>2.49</td>
</tr>
<tr>
<td></td>
<td>IIA</td>
<td>9.98</td>
</tr>
<tr>
<td></td>
<td>Channels 5 and 6 wired as separate IS circuit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IIC</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>IIB</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>IIA</td>
<td>100</td>
</tr>
<tr>
<td><strong>8206-TI-IS</strong></td>
<td>IIC</td>
<td>0.389</td>
</tr>
<tr>
<td></td>
<td>IIB</td>
<td>2.47</td>
</tr>
<tr>
<td></td>
<td>IIA</td>
<td>9.96</td>
</tr>
<tr>
<td><strong>8215-DO-IS</strong></td>
<td>IIC</td>
<td>0.11</td>
</tr>
<tr>
<td></td>
<td>IIB</td>
<td>0.84</td>
</tr>
<tr>
<td></td>
<td>IIA</td>
<td>2.97</td>
</tr>
<tr>
<td><strong>8220-DI-IS</strong></td>
<td>IIC</td>
<td>2.41</td>
</tr>
<tr>
<td></td>
<td>IIB</td>
<td>16.80</td>
</tr>
<tr>
<td></td>
<td>IIA</td>
<td>75.00</td>
</tr>
<tr>
<td><strong>8223-PI-IS</strong></td>
<td>IIC</td>
<td>0.078</td>
</tr>
<tr>
<td></td>
<td>IIB</td>
<td>0.627</td>
</tr>
<tr>
<td></td>
<td>IIA</td>
<td>2.05</td>
</tr>
<tr>
<td><strong>8230-AI-IS</strong></td>
<td>IIC</td>
<td>0.47</td>
</tr>
<tr>
<td></td>
<td>IIB</td>
<td>2.88</td>
</tr>
<tr>
<td></td>
<td>IIA</td>
<td>11.6</td>
</tr>
</tbody>
</table>

For the latest certification information visit: [http://www.mtl-inst.com/certs_1.nsf]
# MTL8000 2/x System specification

## Characterisation errors for module 8205-TI-IS

<table>
<thead>
<tr>
<th>Thermocouple type</th>
<th>Characterisation error</th>
<th>Temperature range</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>+ 0 to – 42 °C</td>
<td>0 to + 42 °C</td>
</tr>
<tr>
<td></td>
<td>+ 0.3 to – 0.6 °C</td>
<td>+ 42 to + 109 °C</td>
</tr>
<tr>
<td></td>
<td>+ 0.1 to – 0.11 °C</td>
<td>+ 109 to + 200 °C</td>
</tr>
<tr>
<td></td>
<td>± 0.06 °C</td>
<td>+ 200 to + 1000 °C</td>
</tr>
<tr>
<td></td>
<td>± 0.11 °C</td>
<td>+ 1000 to + 1820 °C</td>
</tr>
<tr>
<td>E</td>
<td>+ 0.45 to – 0.1 °C</td>
<td>– 270 to – 264 °C</td>
</tr>
<tr>
<td></td>
<td>+ 0.05 to – 0.07 °C</td>
<td>– 264 to – 237 °C</td>
</tr>
<tr>
<td></td>
<td>± 0.04 °C</td>
<td>– 237 to + 1000 °C</td>
</tr>
<tr>
<td>J</td>
<td>± 0.04 °C</td>
<td>– 210 to + 1200 °C</td>
</tr>
<tr>
<td>K</td>
<td>+ 0 to – 2.0 °C</td>
<td>– 270 to – 265 °C</td>
</tr>
<tr>
<td></td>
<td>± 0.15 °C</td>
<td>– 265 to – 200 °C</td>
</tr>
<tr>
<td></td>
<td>± 0.06 °C</td>
<td>– 200 to – 100 °C</td>
</tr>
<tr>
<td></td>
<td>± 0.04 °C</td>
<td>– 100 to + 1372 °C</td>
</tr>
<tr>
<td>N</td>
<td>+ 0 to – 2.3 °C</td>
<td>– 270 to – 265 °C</td>
</tr>
<tr>
<td></td>
<td>± 0.15 °C</td>
<td>– 265 to – 200 °C</td>
</tr>
<tr>
<td></td>
<td>± 0.06 °C</td>
<td>– 200 to – 100 °C</td>
</tr>
<tr>
<td></td>
<td>± 0.04 °C</td>
<td>– 100 to + 1372 °C</td>
</tr>
<tr>
<td>R</td>
<td>+ 0.72 to – 0 °C</td>
<td>– 50 to – 49 °C</td>
</tr>
<tr>
<td></td>
<td>± 0.06 °C</td>
<td>– 49 to + 1 °C</td>
</tr>
<tr>
<td></td>
<td>± 0.04 °C</td>
<td>+ 1 to +1768.1 °C</td>
</tr>
<tr>
<td>S</td>
<td>+ 0.92 to – 0 °C</td>
<td>– 50 to – 49 °C</td>
</tr>
<tr>
<td></td>
<td>± 0.04 °C</td>
<td>– 49 to + 1768.1 °C</td>
</tr>
<tr>
<td>T</td>
<td>+ 0 to – 2.0 °C</td>
<td>– 270 to – 265 °C</td>
</tr>
<tr>
<td></td>
<td>± 0.04 °C</td>
<td>– 265 to + 400 °C</td>
</tr>
<tr>
<td>W3</td>
<td>± 0.06 °C</td>
<td>0 to + 2315 °C</td>
</tr>
<tr>
<td>W5</td>
<td>± 0.055 °C</td>
<td>0 to + 2315 °C</td>
</tr>
<tr>
<td>Russian K</td>
<td>+ 0.25 to – 0 °C</td>
<td>– 200 to – 199 °C</td>
</tr>
<tr>
<td>Russian L</td>
<td>± 0.04 °C</td>
<td>– 199 to +1300 °C</td>
</tr>
<tr>
<td></td>
<td>± 0.032 °C</td>
<td>– 200 to + 800 °C</td>
</tr>
</tbody>
</table>
### I/O modules

<table>
<thead>
<tr>
<th>Part numbers &amp; descriptions</th>
<th>Standard Approved for</th>
<th>EUROPE</th>
<th>USA (FM)</th>
<th>CANADA (CSA)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Zone 2 installation and field wiring</td>
<td>Zone 2 installation and field wiring</td>
<td>Div 2 installation non-incendive apparatus suitable for installation in Class 1, Div 2, Grps A/D</td>
<td>Div 2 installation non-incendive apparatus suitable for installation in Class 1, Zone 2/Div 2, Grp IIC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>8101-HI-TX</td>
<td>B-channel AI, 4-20mA with HART</td>
<td>Non-incendive</td>
<td>EEx n L IIC T3</td>
</tr>
<tr>
<td>8102-HO-IP</td>
<td>B-channel AO, 4-20mA with HART</td>
<td>Non-incendive</td>
<td>EEx n L IIC T4</td>
</tr>
<tr>
<td>8103-AM-TX</td>
<td>B-channel AI, 4-20mA</td>
<td>Non-incendive</td>
<td>EEx n L IIC T3</td>
</tr>
<tr>
<td>8104-AO-IP</td>
<td>B-channel AO, 4-20mA</td>
<td>Non-incendive</td>
<td>EEx n L IIC T4</td>
</tr>
<tr>
<td>8105-Th-TC</td>
<td>4-channel</td>
<td>Non-incendive</td>
<td>EEx n L IIC T4</td>
</tr>
<tr>
<td>8106-Th-RT</td>
<td>4-channel</td>
<td>Non-incendive</td>
<td>EEx n L IIC T4</td>
</tr>
<tr>
<td>8109-DI-DC</td>
<td>B-channel DI, 24V dc isolated, sinking</td>
<td>Non-incendive</td>
<td>EEx n L IIC T4</td>
</tr>
<tr>
<td>8110-DI-DC</td>
<td>B-channel DI, 24V dc non-isolated, module-powered</td>
<td>Non-incendive</td>
<td>EEx n L IIC T4</td>
</tr>
<tr>
<td>8111-DI-AC</td>
<td>B-channel DI, 115V ac isolated, sinking</td>
<td>Non-arcing</td>
<td>EEx n VL IIC T4</td>
</tr>
<tr>
<td>8112-DI-AC</td>
<td>B-channel DI, 115V ac non-isolated, module-powered</td>
<td>Non-arcing</td>
<td>EEx n VL IIC T4</td>
</tr>
<tr>
<td>8113-DI-AC</td>
<td>B-channel DI, 230V ac isolated, sinking</td>
<td>Non-arcing</td>
<td>EEx n VL IIC T4</td>
</tr>
<tr>
<td>8114-DI-AC</td>
<td>B-channel DI, 230V ac non-isolated, module-powered</td>
<td>Non-arcing</td>
<td>EEx n VL IIC T4</td>
</tr>
<tr>
<td>8115-DO-DC</td>
<td>B-channel DO, 2-60V dc non-isolated, module-powered</td>
<td>Non-arcing</td>
<td>EEx n VL IIC T4</td>
</tr>
<tr>
<td>8116-DO-AC</td>
<td>B-channel DO, 20-250V ac non-isolated, module-powered</td>
<td>Non-arcing</td>
<td>EEx n VL IIC T4</td>
</tr>
<tr>
<td>8117-DO-DC</td>
<td>B-channel DO, 2-60V dc isolated, unpowere</td>
<td>Non-arcing</td>
<td>EEx n VL IIC T4</td>
</tr>
<tr>
<td>8118-DO-AC</td>
<td>B-channel DO, 20-250V ac isolated, unpowere</td>
<td>Non-arcing</td>
<td>EEx n VL IIC T4</td>
</tr>
<tr>
<td>8119-VI-05</td>
<td>B-channel AI, 5-5V</td>
<td>Non-incendive</td>
<td>EEx n L IIC T3</td>
</tr>
<tr>
<td>8121-DI-DC</td>
<td>16-channel DI, 24V dc non-isolated, module-powered</td>
<td>Non-incendive</td>
<td>EEx n L IIC T4</td>
</tr>
<tr>
<td>8122-DI-DC</td>
<td>16-channel DI, 24V dc isolated, sinking</td>
<td>Non-incendive</td>
<td>EEx n L IIC T4</td>
</tr>
<tr>
<td>8123-MQ-QU</td>
<td>2-channel, pulse/quadrature input</td>
<td>Non-incendive</td>
<td>EEx n L IIC T4</td>
</tr>
</tbody>
</table>

Note 1: EN50021 was available only in draft form (pr) when this apparatus was certified. When EN50021 was finally published, the designation EEx nV had been changed to EEx nA for non-arcing apparatus. EEx nV is equivalent to EEx nA.

Note 2: In Europe, the preferred term is “Energy Limited”. See EN50021.

Note 3: For +60°C the T class may be reduced to T4. T3 only applies for an ambient temperature of +70°C.

Note 4: These products are listed in the document MTL8000-1 “ATEX Documentation for ancillary components used with the MTL8000 Zone 2 System”.

For the latest certification information visit: [http://www.mtl-inst.com/certs_1.nsf](http://www.mtl-inst.com/certs_1.nsf)
### Field Terminals

<table>
<thead>
<tr>
<th>Part numbers &amp; descriptions</th>
<th>Standard Approved for</th>
<th>EUROPE</th>
<th>USA (FM)</th>
<th>CANADA (CSA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8601-FF-NI</td>
<td>field terminal, non-incendive - unfused</td>
<td>pEN50021 &amp; EN50021¹</td>
<td>Class No. 3611</td>
<td>C22 2 No. 213</td>
</tr>
<tr>
<td>8602-FF-ST</td>
<td>field terminal, standard - unfused</td>
<td>Zone 2 installations and field wiring ATEX Category II 3 G</td>
<td>Div 2 installation non-incendive apparatus suitable for installation in Class 1, Zone 2, Grp IIC</td>
<td>Div 2 installation non-incendive apparatus suitable for installation in Class 1, Zone 2/Div 2, Grp IIC</td>
</tr>
<tr>
<td>8603-FF-FU</td>
<td>field terminal, non-incendive - fused</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8604-FF-FU</td>
<td>field terminal, standard - fused</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8605-FF-TC</td>
<td>field terminal RTD</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8606-FF-RT</td>
<td>field terminal thermocouple</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8610-FT-NA</td>
<td>field terminal, non-arcing - unfused</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8611-FT-FU</td>
<td>field terminal, non-arcing - fused</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8615-FT-4W</td>
<td>field terminal, 4-wire transmitter</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8617-FT-NI</td>
<td>field terminal, 16-channel</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

### BIMs

<table>
<thead>
<tr>
<th>Part numbers &amp; descriptions</th>
<th>Standard Approved for</th>
<th>EUROPE</th>
<th>USA (FM)</th>
<th>CANADA (CSA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8410-NS-PS</td>
<td>power supply monitor module</td>
<td>EEx nL IIC T4</td>
<td>MTL02ATEX8410X01</td>
<td>1B3A9.AX</td>
</tr>
<tr>
<td>8502-BI-DP</td>
<td>Profibus-DP BIM</td>
<td>EEx nVL IIC T4¹</td>
<td>MTL99ATEX8502</td>
<td>1B3A9.AX</td>
</tr>
<tr>
<td>8505-BI-MB</td>
<td>Modbus BIM</td>
<td>EEx nVL IIC T4¹</td>
<td>MTL98ATEX8505</td>
<td>1B3A9.AX</td>
</tr>
<tr>
<td>8512-IF-HA</td>
<td>HART interface module</td>
<td>EEx nA IIC T4</td>
<td>MTL00ATEX8512</td>
<td>1B3A9.AX</td>
</tr>
<tr>
<td>8510-MO-NS</td>
<td>Node services module</td>
<td>EEx nL IIC T4</td>
<td>MTL01ATEX8510X</td>
<td>1B3A9.AX</td>
</tr>
<tr>
<td>8521-xx-xx</td>
<td>Process Controller/EBIM - see Note 5</td>
<td>EEx nL IIC T5</td>
<td>MTL02ATEX8521X</td>
<td>1B3A9.AX</td>
</tr>
</tbody>
</table>

### Power Supply

<table>
<thead>
<tr>
<th>Part numbers &amp; descriptions</th>
<th>Standard Approved for</th>
<th>EUROPE</th>
<th>USA (FM)</th>
<th>CANADA (CSA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8910-PS-DC</td>
<td>power supply, 18-36 V dc input</td>
<td>EEx nVL IIC T4¹</td>
<td>MTL98ATEX8910</td>
<td>1B3A9.AX</td>
</tr>
<tr>
<td>8913-PS-AC</td>
<td>power supply, 85-264 V ac input, 12/24 V dc output</td>
<td>I13G EEx n A II T4</td>
<td>TUV01ATEX1774X</td>
<td>3011821</td>
</tr>
<tr>
<td>8914-PS-AC</td>
<td>power supply, 84-264 V ac input, 24 V dc output</td>
<td>I13G EEx n A II T4</td>
<td>TUV01ATEX1774X</td>
<td>3011821</td>
</tr>
</tbody>
</table>

**Note 1** EN50021 was available only in draft form [pr] when this apparatus was certified. When EN50021 was finally published, the designation EEx nV had been changed to EEx nA for non-arcing apparatus. EEx nV is equivalent to EEx nA.

**Note 2** In Europe, the preferred term is “Energy Limited”. See EN50021.

**Note 3** For +60°C the T class may be reduced to T4. T3 only applies for an ambient temperature of +70°C.

**Note 4** These products are listed in the document MTL8000-1 “ATEX Documentation for ancillary components used with the MTL8000 Zone 2 System”.

**Note 5** The -xx-xx indicates a range of modules with the same initial digits in the part number.

For the latest certification information visit: [http://www.mtl-inst.com/certs_1.nsf](http://www.mtl-inst.com/certs_1.nsf)
MTL8000 2/x System specification

2/2 system approvals for mounting and field wiring

<table>
<thead>
<tr>
<th>Carriers</th>
<th>Standard</th>
<th>EUROPE</th>
<th>USA (FM)</th>
<th>CANADA (CSA)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Zone 2 installations and field wiring ATEX Category II 3 G</td>
<td>Div 2 installation non-incendive apparatus suitable for installation in Class 1, Zone 2, Grp IIC</td>
<td>Div 2 installation non-incendive apparatus suitable for installation in Class 1, Zone 2/Div 2, Grp IIC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>8707-CA-08 8-module carrier</td>
<td>-</td>
<td></td>
<td>See note 4 1B3A9.AX</td>
<td>152423-2500007251</td>
<td></td>
</tr>
<tr>
<td>8709-CA-08 8-module carrier</td>
<td>-</td>
<td></td>
<td>See note 4 1B3A9.AX</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8710-CA-04 4-module carrier</td>
<td>-</td>
<td></td>
<td>See note 4 1B3A9.AX</td>
<td>152423-2500007251</td>
<td></td>
</tr>
<tr>
<td>8711-CA-NS node services carrier, screw terminal LAN</td>
<td>-</td>
<td></td>
<td>See note 4 1B3A9.AX</td>
<td>152423-2500007251</td>
<td></td>
</tr>
<tr>
<td>8712-CA-NS node services carrier, sub-D terminal LAN</td>
<td>-</td>
<td></td>
<td>See note 4 1B3A9.AX</td>
<td>152423-2500007251</td>
<td></td>
</tr>
<tr>
<td>8715-CA-BI universal BIM carrier</td>
<td>-</td>
<td></td>
<td>See note 4 1B3A9.AX</td>
<td>152423-2500007251</td>
<td></td>
</tr>
<tr>
<td>8717-CA-PS 8910-PS-DC power supply carrier</td>
<td>-</td>
<td></td>
<td>See note 4 1B3A9.AX</td>
<td>152423-2500007251</td>
<td></td>
</tr>
<tr>
<td>8718-CA-NS BIM + node services module carrier</td>
<td>-</td>
<td></td>
<td>See note 4 1B3A9.AX</td>
<td>152423-2500007251</td>
<td></td>
</tr>
<tr>
<td>8750-CA-NS redundant controller and power fail module carrier</td>
<td>-</td>
<td></td>
<td>See note 4 1B3A9.AX</td>
<td>152423-2500007251</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Carrier Extenders</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>8020-CE-RH carrier extender, right-hand</td>
<td>-</td>
</tr>
<tr>
<td>8021-CE-LH carrier extender, left-hand</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Extender Cables</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>8001-CC-35 signal extension cable, 0.35m</td>
<td>-</td>
</tr>
<tr>
<td>8002-CC-85 signal extension cable, 0.85m</td>
<td>-</td>
</tr>
<tr>
<td>8003-CC-12 signal extension cable, 1.2m</td>
<td>-</td>
</tr>
</tbody>
</table>

Note 1 EN50021 was available only in draft form (pr) when this apparatus was certified. When EN50021 was finally published, the designation EEx nV had been changed to EEx nA for non-arcing apparatus. EEx nV is equivalent to EEx nA.

Note 2 In Europe, the preferred term is “Energy Limited”. See EN50021.

Note 3 For +60°C the T class may be reduced to T4. T3 only applies for an ambient temperature of +70°C.

Note 4 These products are listed in the document MTL8000-1 "ATEX Documentation for ancillary components used with the MTL8000 Zone 2 System".

For the latest certification information visit: http://www.mtl-inst.com/certs_1.nsf
## MTL8000 2/x System specification

### 2/1 system approvals for mounting and field wiring

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standard</strong></td>
<td></td>
<td><strong>EUROPE</strong></td>
<td></td>
<td><strong>USA (FM)</strong></td>
<td><strong>CANADA (CSA)</strong></td>
</tr>
<tr>
<td>Zone 2</td>
<td></td>
<td>Class No.</td>
<td>Class No. 3510</td>
<td>Div 2 installation</td>
<td>Div 2 installation</td>
</tr>
<tr>
<td>IS field</td>
<td></td>
<td></td>
<td></td>
<td>IS field</td>
<td>IS field</td>
</tr>
<tr>
<td>3 G</td>
<td></td>
<td></td>
<td></td>
<td>wiring</td>
<td>wiring</td>
</tr>
<tr>
<td>ATEX Category</td>
<td></td>
<td></td>
<td></td>
<td>ATEX Category</td>
<td>Class 1, Zone 2, Div 2, Grps A</td>
</tr>
<tr>
<td>II</td>
<td></td>
<td></td>
<td></td>
<td>II [1] G</td>
<td></td>
</tr>
<tr>
<td><strong>Approved for</strong></td>
<td></td>
<td><strong>Part numbers &amp; descriptions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### I/O modules

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>8201-HI-IS</strong></td>
<td>8-channel, AI, 420 mA with HART</td>
<td>EE Ex n IIC T4</td>
<td>MT199ATEX8201</td>
<td>[EEx ia] IIC</td>
<td>BAS 98 ATEX 7207U</td>
</tr>
<tr>
<td><strong>8202-HO-IS</strong></td>
<td>8-channel, AO, 420 mA with HART</td>
<td>EE Ex n IIC T4</td>
<td>MT101ATEX8202X</td>
<td>[EEx ia] IIC</td>
<td>BAS 01 ATEX 7185U</td>
</tr>
<tr>
<td><strong>8204-AO-IS</strong></td>
<td>8-channel, AO, 420 mA</td>
<td>EE Ex n IIC T4</td>
<td>MT199ATEX8204</td>
<td>[EEx ia] IIC</td>
<td>BAS 98 ATEX 7205U</td>
</tr>
<tr>
<td><strong>8205-TI-IS</strong></td>
<td>8-channel, THIC/mV input</td>
<td>EE Ex n IIC T4</td>
<td>MT100ATEX8205X</td>
<td>[EEx ia] IIC</td>
<td>BAS 99 ATEX 7316U</td>
</tr>
<tr>
<td><strong>8206-TI-IS</strong></td>
<td>8-channel, RTD input</td>
<td>EE Ex n IIC T4</td>
<td>MT100ATEX8206</td>
<td>[EEx ia] IIC</td>
<td>BAS 99 ATEX 7316U</td>
</tr>
</tbody>
</table>

**Note 1** Applies to railbus interface

**Note 2** The railbus interface and I/O field wiring are covered by a single certificate. The railbus interface code is ExnA.

**Note 3** The railbus interface and I/O field wiring are covered by a single certificate and no distinction is made between non-incendive and non-arcing railbus interface connections.

**Note 4** EEx nV had been changed to EEx nA for non-arcing apparatus. EEx nV is equivalent to EEx nA.

**Note 5** BASEEFA node certificate no BAS98ATEX 7202. BASEEFA system certificate no. Ex98E2203.

**Note 6** These products are listed in the document MTL8000-1 ‘ATEX Documentation for ancillary components used with the MTL8000 Zone 2 System’.

### Field Terminals

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>8621-FT-IS</strong></td>
<td>IS standard</td>
<td>See note 6</td>
<td>[EEx ia]</td>
<td>BAS 98 ATEX 7211U</td>
<td>3001345</td>
</tr>
<tr>
<td><strong>8622-FT-IS</strong></td>
<td>IS loop disconnect</td>
<td>See note 6</td>
<td>[EEx ia]</td>
<td>BAS 98 ATEX 7211U</td>
<td>3001345</td>
</tr>
<tr>
<td><strong>8623-FT-IS</strong></td>
<td>IS 16-channel</td>
<td>See note 6</td>
<td>[EEx ia]</td>
<td>BAS 98 ATEX 7211U</td>
<td>3001345</td>
</tr>
<tr>
<td><strong>8624-FT-IS</strong></td>
<td>IS 16-channel, DI, loop disconnect</td>
<td>See note 6</td>
<td>[EEx ia]</td>
<td>BAS 98 ATEX 7211U</td>
<td>3001345</td>
</tr>
<tr>
<td><strong>8625-FT-IS</strong></td>
<td>IS THC</td>
<td>See note 6</td>
<td>[EEx ia]</td>
<td>BAS 98 ATEX 7211U</td>
<td>3001345</td>
</tr>
<tr>
<td><strong>8626-FT-IS</strong></td>
<td>IS RTD</td>
<td>See note 6</td>
<td>[EEx ia]</td>
<td>BAS 98 ATEX 7211U</td>
<td>3001345</td>
</tr>
</tbody>
</table>

### Railbus isolator

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>8922-RB-IS</strong></td>
<td>Railbus isolator module</td>
<td>EE Ex n IIC T4</td>
<td>MT199ATEX8922</td>
<td>[EEx ia]</td>
<td>BAS 98 ATEX 7208U</td>
</tr>
</tbody>
</table>

### Power supply

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>8920-PS-DC</strong></td>
<td>IS Power supply, 18.36 V dc input</td>
<td>EE Ex n IIC T4</td>
<td>MT199ATEX8920D</td>
<td>[EEx ia]</td>
<td>BAS 98 ATEX 7209U</td>
</tr>
</tbody>
</table>

For the latest certification information visit: [http://www.mtl-inst.com/certs_1.nsf](http://www.mtl-inst.com/certs_1.nsf)
## MTL8000 2/x System specification

### 2/1 system approvals for mounting and field wiring

<table>
<thead>
<tr>
<th>Part numbers &amp; descriptions</th>
<th>Carriers</th>
<th>Extender extenders</th>
<th>Extender cables</th>
</tr>
</thead>
<tbody>
<tr>
<td>8727-CA-08 IS carrier, 8 module</td>
<td>3001345 2000 152423-1000846X</td>
<td>8030-CE-RH IS carrier extender, righthand</td>
<td>See note 6 [EEx ia] BAS98ATEX7210U</td>
</tr>
<tr>
<td>8720-CA-04 IS carrier, 4 module</td>
<td>3001345 2000 152423-1000846X</td>
<td>8031-CE-LH IS carrier extender, lefthand</td>
<td>See note 6 [EEx ia] BAS98ATEX7210U</td>
</tr>
<tr>
<td>8723-CA-RB IS carrier, Railbus isolator</td>
<td>3001345 2000 152423-1000846X</td>
<td>8032-CC-35 IS carrier extension cable 0.35m</td>
<td>See note 6 [EEx ia] BAS98ATEX7210U</td>
</tr>
<tr>
<td>8724-CA-PS IS carrier, IS module power supply</td>
<td>3001345 2000 152423-1000846X</td>
<td>8033-CC-85 IS carrier extension cable 0.85m</td>
<td>See note 6 [EEx ia] BAS98ATEX7210U</td>
</tr>
<tr>
<td>8729-CA-08 IS carrier, 8 module 64-address system</td>
<td>3001345 2000 152423-1000846X</td>
<td>8034-CC-12 IS carrier extension cable 1.2m</td>
<td>See note 6 [EEx ia] BAS98ATEX7210U</td>
</tr>
<tr>
<td>8011-CC-35 IS carrier extension cable 0.35m</td>
<td>See note 6 [EEx ia] BAS98ATEX7210U</td>
<td>8017-CC-85 IS carrier extension cable 0.85m</td>
<td>See note 6 [EEx ia] BAS98ATEX7210U</td>
</tr>
<tr>
<td>8012-CC-85 IS carrier extension cable 0.85m</td>
<td>See note 6 [EEx ia] BAS98ATEX7210U</td>
<td>8018-CC-12 IS carrier extension cable 1.2m</td>
<td>See note 6 [EEx ia] BAS98ATEX7210U</td>
</tr>
<tr>
<td>8013-CC-12 IS carrier extension cable 1.2m</td>
<td>See note 6 [EEx ia] BAS98ATEX7210U</td>
<td>8032-CC-35 IS carrier extension cable set 0.35m</td>
<td>See note 6 [EEx ia] BAS98ATEX7210U</td>
</tr>
<tr>
<td>8016-CC-35 IS power extension cable 0.35m</td>
<td>See note 6 [EEx ia] BAS98ATEX7210U</td>
<td>8033-CC-85 IS carrier extension cable set 0.85m</td>
<td>See note 6 [EEx ia] BAS98ATEX7210U</td>
</tr>
<tr>
<td>8017-CC-85 IS power extension cable 0.85m</td>
<td>See note 6 [EEx ia] BAS98ATEX7210U</td>
<td>8034-CC-12 IS carrier extension cable set 1.2m</td>
<td>See note 6 [EEx ia] BAS98ATEX7210U</td>
</tr>
</tbody>
</table>

**Note 1** Applies to railbus interface

**Note 2** The railbus interface and I/O field wiring are covered by a single certificate. The railbus interface code is ExnA.

**Note 3** The railbus interface and I/O field wiring are covered by a single certificate and no distinction is made between non-incendive and non-arcing railbus interface connections.

**Note 4** EN50021 was available only in draft form when this apparatus was certified. When EN50021 was finally published, the designation ExnV had been changed to ExnA for non-arcing apparatus. ExnV is equivalent to ExnA.

**Note 5** BASEEFA node certificate no BAS98ATEX 7202. BASEEFA system certificate no. Ex98E2203.

**Note 6** These products are listed in the document MTL8000-1 ‘ATEX Documentation for ancillary components used with the MTL8000 Zone 2 System’.

For the latest certification information visit: [http://www.mtl-inst.com/certs_1.nsf](http://www.mtl-inst.com/certs_1.nsf)