

MTL HART® SOLUTIONS

In Control Of HART
MTL4840 Series
Cornerstone
AMS

IN CONTROL OF HART® CONNECTIONS

If you've been future proofing your process infrastructure by specifying 'smart' field devices for instrument replacements and plant extensions, then you probably already have HART® instruments installed in the plant. But are you exploiting this considerable investment?

HART® provides simultaneous analogue and digital operation so that the 4/20mA analogue signal can be connected to conventional I/O cards for control while the digital signal can be used for:

- ◆ up to four process variables from each HART® device
- ◆ device status
- ◆ instrument diagnostics
- ◆ configuration changes

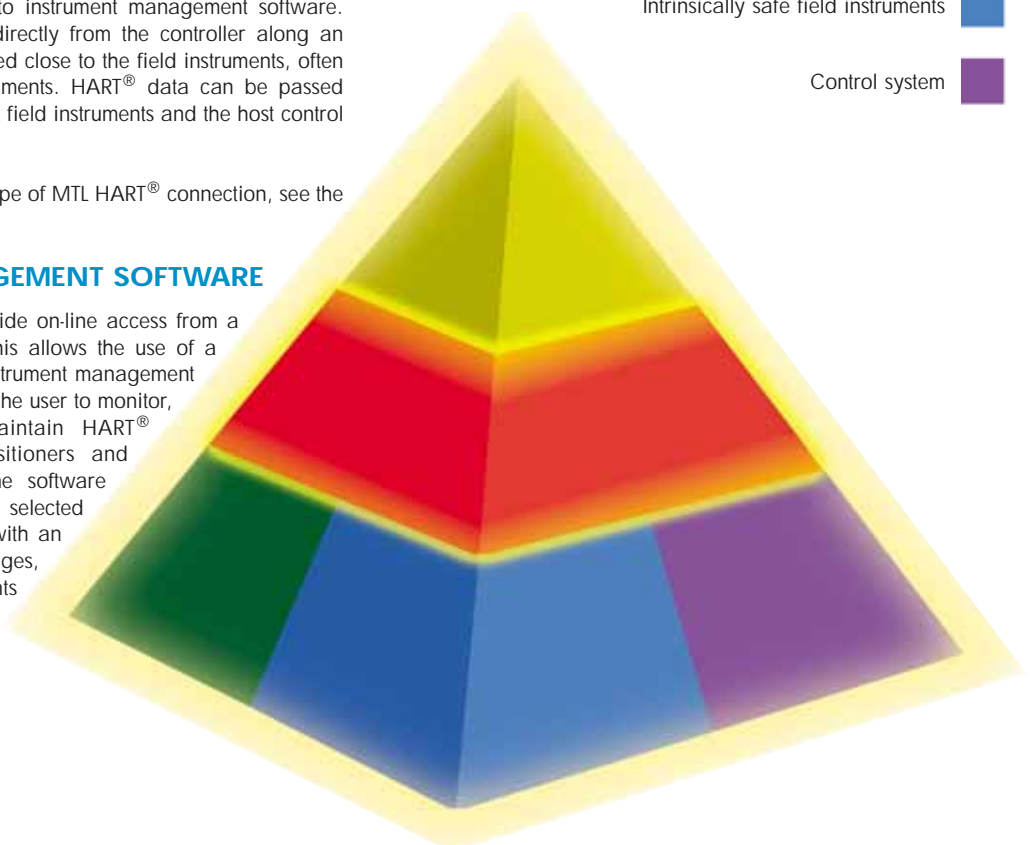
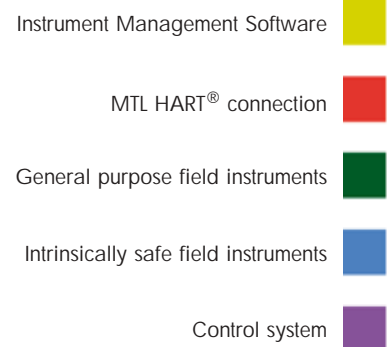
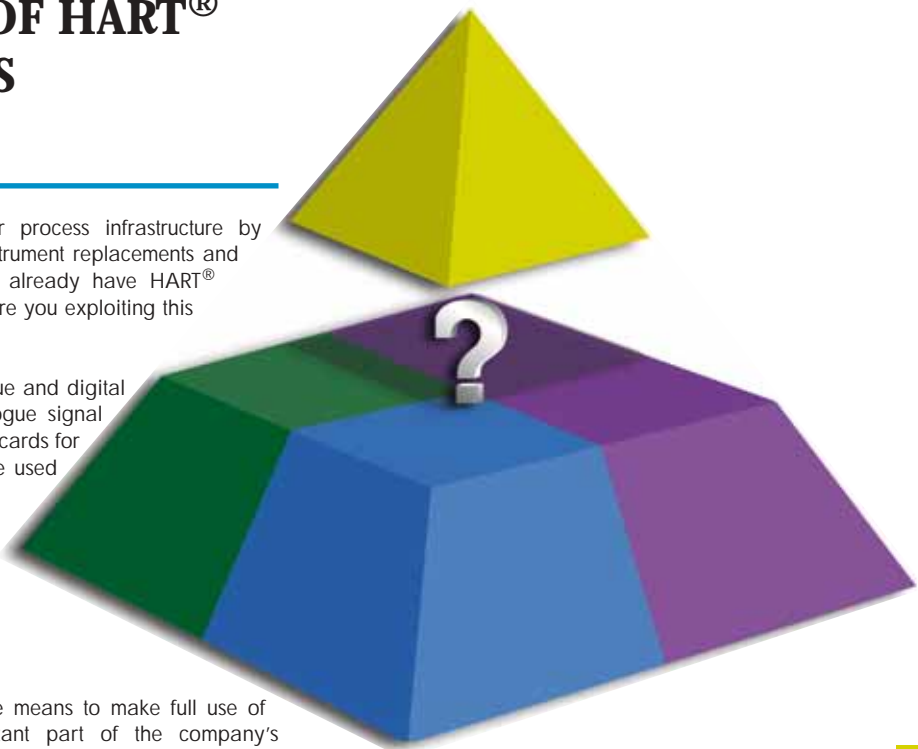
MTL's HART® connections provide the means to make full use of these features, and are an important part of the company's commitment to open systems. By connecting field instruments, control systems and instrument management software, MTL's HART® connections allow better use of maintenance resources, reduced commissioning and process down-time, and consequent lower costs for commissioning and loop maintenance.

The MTL4840 Series HART® connection is the solution for process control systems using traditional I/O and is described in the following pages. In addition, MTL's 8000 Process I/O™ system has a dedicated HART® connection to instrument management software. Process I/O™ communicates directly from the controller along an open bus to an I/O node located close to the field instruments, often in harsh or hazardous environments. HART® data can be passed transparently between the smart field instruments and the host control system, via the I/O modules.

For further information on this type of MTL HART® connection, see the Process I/O™ section.

INSTRUMENT MANAGEMENT SOFTWARE

MTL's HART® connections provide on-line access from a PC to HART® field devices. This allows the use of a growing variety of powerful instrument management software which, in turn, allows the user to monitor, configure, calibrate and maintain HART® devices, including valve positioners and transmitters. Depending on the software used, HART® devices may be selected for regular status monitoring, with an alert issued if the status changes, and other fieldbus instruments may be integrated into the same system database.



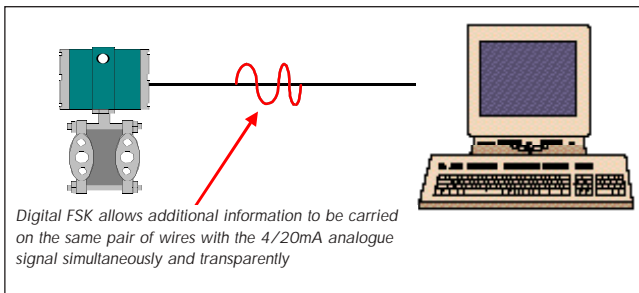
WHAT IS HART®?

HART® stands for:

HIGHWAY ADDRESSABLE REMOTE TRANSDUCER

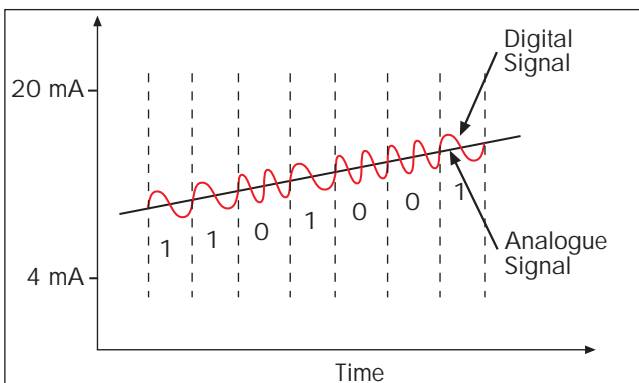
HART® is an open protocol that was originally developed in the late 1980's by Fisher Rosemount to communicate with their range of Smart field devices. Over the years it has become a de facto standard for communicating with SMART devices in the Process industry. Over 100 manufacturers utilise the HART® protocol in over 560 different products, from simple temperature transmitters to gas detectors.

The HART® protocol is a powerful communication technology used to realise the full potential of digital field devices whilst preserving the traditional 4-20mA signal. The HART® protocol extends the system capabilities for two way digital communication with smart instruments.



HART® offers the best solution for smart field device communications and has the widest base of support of any field device protocol worldwide. More instruments are available with the HART® protocol than any other digital communications technology. Almost any process application can be addressed by one of the products offered by HART® instrument suppliers. Unlike other digital communication methods the HART protocol gives a unique communication solution that it is backward compatible with currently installed instrumentation. This ensures that investments in existing cabling and current control strategies remain secure into the future.

The HART® digital signal is superimposed onto the standard 4-20mA signal. It uses Bell 202 standard Frequency Shift Keying (FSK) signal to communicate at 1200 baud. The digital signal is made up of two frequencies, 1200Hz and 2200Hz, representing bits 1 and 0 respectively. Sine waves of these two frequencies are superimposed onto the analogue signal cables to give simultaneous analogue and digital communications. As the average value of the FSK signal is always zero there is no effect on the 4-20mA analogue signal. A minimum loop impedance of 230ohms is required for communication.



HART® is a master-slave protocol - this means that a field device only replies when it is spoken to. Up to two masters can connect to each HART® loop. The primary master is usually the DCS (Distributed Control System), the PLC (Programmable Logic Controller) or a PC. The secondary master can be a hand held configurator or another PC running an instrument maintenance software package. Slave devices include transmitters, actuators and controllers that respond to commands from the primary or secondary master.

The digital communication signal has a response time of approx. 2-3 updates per second without interrupting the analogue signal.

HART® Commands

The HART® protocol provides uniform and consistent communication for all field devices via the HART® command set. This includes three types of Command:

Universal

All devices using the HART® protocol must recognise and support these commands. They provide access to information useful in normal operations.

Common Practice

These provide functions implemented by many but not all HART® communication devices.

Device specific

These represent functions that are unique to each field device. They access set up and calibration information as well as information on the construction of the device.

The HART® Communication Protocol is an open standard owned by more than 100 member companies in the HART® Communication Foundation HCF. The HCF is an independent, non-profit organisation, which provides worldwide support for application of the technology and ensures that the technology is openly available for the benefit of the industry.



MTL has been a full member of the HART® Communication Foundation since its formation in 1993.

HART® COMMUNICATION FOUNDATION

The HCF is an independent, not-for-profit organization funded by HCF membership & training/support fees. In addition the HCF:

- ◆ **owns and manages all elements of HART® technology**
- ◆ **enhances the technology as necessary to support industry needs for smart instrumentation.**
- ◆ **provides training workshops, newsletters, web site & other services to Educate Industry on the use of HART® communication.**
- ◆ **manages the library of Registered Device Descriptions**
- ◆ **represents HART® Technology at industry forums and technical symposiums.**

All major instrumentation suppliers support the HART® Protocol and available products cover the full range of process measurement. The following article by the HCF summarises the power of HART®.

If you thought you knew HART® before... LOOK AGAIN!

HART-capable instrumentation products are available around the globe for all process applications. Well known for their ease of remote configuration and device set-up, HART® smart devices also provide valuable information to improve process operations - every second of every day. Now, HART-capable control systems and cost-effective I/O solutions make it easier than ever to integrate HART® with plant systems and support real-time use of the valuable data in HART® devices from the plant floor to the highest levels of the enterprise.

The ability to do more than you think

HART® is the leading communication technology for accessing the intelligent data in "smart" field instrumentation.

HART® is:

- ◆ Field proven with millions of devices installed and working worldwide in process applications such as yours.
- ◆ A globally accepted standard supported by all major process control suppliers.
- ◆ Your most cost-effective process communication solution for improving plant operations and asset management.

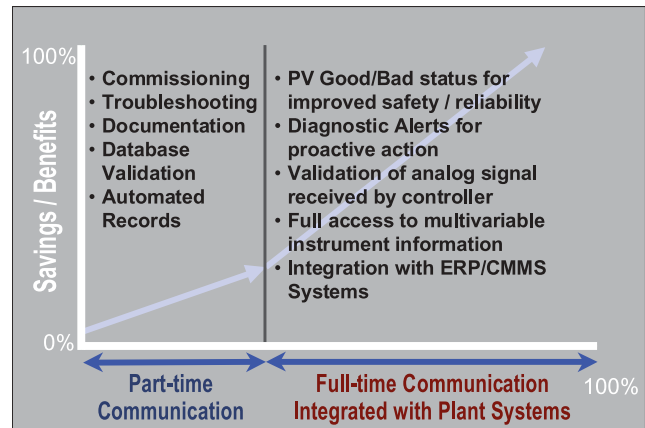
Things you probably know about HART

- ◆ Most smart instruments use HART® Communication.
- ◆ HART® smart field devices are used interchangeably with traditional analogue only units.
- ◆ Hand-held communicators are often used for device set-up, calibration, commissioning and periodic maintenance functions.
- ◆ PC-based instrument management tools can remotely communicate with HART devices to access device data and manage calibrations.
- ◆ HART® = cost savings for installation & management.

Things you may NOT know about HART®

- ◆ All HART® smart devices provide valuable data for process operations 24/7 - every second of every day.
- ◆ Information on status (health) of the field devices and quality of the 4-20mA signals is in every communication.
- ◆ The Primary Variable is transmitted as a 4-20mA signal and also as a digital value.
- ◆ Many devices communicate Secondary Process Variables (measured or calculated) in addition to the Primary Variable.

USING HART® DATA = MORE VALUE!



Unleash the power of HART® communication

- ◆ In most installations, communication with HART® devices is occasional or infrequent at best.
- ◆ "Part-time" communication using hand-held communicators for commissioning and periodic maintenance is beneficial, but provides only a small portion of the value.
- ◆ "Full-time" communication is important to get the full value from your HART® assets.

Continuously communicate to UNLEASH THE POWER

VALUABLE DATA to improve process operations, every second of every day

What you should know about HART® Device Data

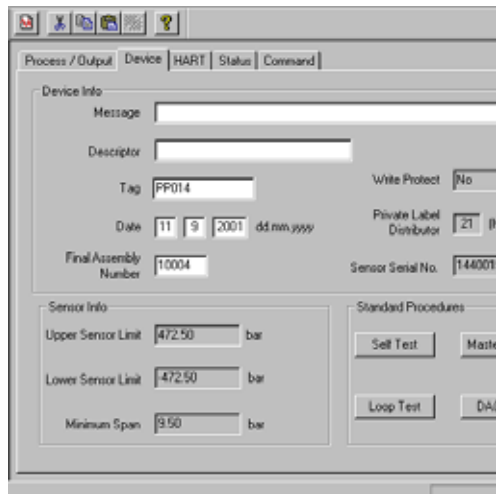
- ◆ **35-40 data items** are standard in every HART® device.
- ◆ Device Status, Diagnostic Alerts, Process Variables, Engineering Units, Loop Current, % Range, etc.
- ◆ Upper & Lower Range Values, Force Loop Current to specific value.
- ◆ Manufacturer Information, Device Tag.
- ◆ A device description (DD) is not necessary to access or interact with these standard data items.
- ◆ Standard commands provide easy data access.

HART® data is valuable to more than just the instrument dept. Available data includes:

- ◆ Process Variables.
- ◆ Device Status Alerts.
- ◆ Device Information.
- ◆ Basic Calibration Information.
- ◆ All data is easily available to your plant systems!

HART[®] provides access to ALL process variables in the device

- ◆ Many HART[®] Devices provide more than one process measurement or calculated value.
- ◆ Many Pressure & Temperature devices.
- ◆ Most Flow, Level & Analytical devices.
- ◆ All Valve Positioners/Controllers.
- ◆ Process Variable data is transmitted digitally in IEEE Floating Point format with Engineering Units.
- ◆ The Primary Variable can be read as a digital value and is typically transmitted on the continuous 4-20mA signal.



HART[®] Communication includes status & diagnostics

- ◆ HART[®] devices continuously self-access and monitor their performance.
- ◆ Status information returned with every communication.
- ◆ Early warning of device problems.
- ◆ Analogue signal and data quality.

COST-EFFECTIVE COMMUNICATION solution to better manage plant assets

HART[®] delivers high value at minimal costs

- ◆ Saves Time and Money.
- ◆ HART[®] capability provided at low or no additional cost in most devices.
- ◆ Easy installation and commissioning.
- ◆ Enhanced communication and diagnostics reduce maintenance and downtime.
- ◆ Protects Your Investments.
- ◆ Compatible with existing instrumentation, systems and people
- ◆ Allows incremental benefits to be achieved - one device at a time
- ◆ Get the benefits of enhanced field communications with minimal investment - no need to replace entire system.

Enables better management of plant assets

- ◆ HART[®] Information Improves Plant Operation and Product Quality.
- ◆ Additional process variables and performance indicators.
- ◆ Continuous device status for early warning of problems.
- ◆ Digital capability ensures easy integration with plant networks
- ◆ Cost-effective Solutions for Plant Integration.
- ◆ Control system interfaces and HART[®] I/O for connection to one or a thousand devices.
- ◆ OPC Servers provide plant networks with easy access to HART[®] device data.
- ◆ Low cost interfaces and gateways for non-HART[®] capable systems.

IMPROVED SYSTEM INTEGRITY - Increased reliability of control system information

Continuous HART[®] communication improves system integrity

- ◆ HART[®] smart devices continually self-access and monitor their performance.
- ◆ Information on device status, quality of 4-20mA signal and process variable good/bad status reported in every communication.
- ◆ Using this data in control and safety systems provides early warning of abnormalities before they become problems.
- ◆ Full-time communication with HART[®] devices increases the reliability of control and safety systems.

The Power of HART[®] Communication in Control Systems

- ◆ Continuous monitoring of device status and diagnostic alerts
- ◆ Validate accuracy of data exchange between field devices and DCS/PLC.
- ◆ Access secondary variables in multi-variable devices for operator displays, trending, or control functions.
- ◆ Unlock the value of additional process measurements, calculated/totalizer values, valve positions, etc.

POWERFUL TOOLS for easy plant integration

Powerful tools for easy plant integration

- ◆ Full cadre of software and hardware available to support all process applications
- ◆ Control systems, I/O, multiplexers, etc.
- ◆ Field devices 2 and 4 wire, analyzers, positioners, etc.
- ◆ Configuration, control, asset management and other software.
- ◆ Integration devices for delivering HART[®] data to analogue systems.
- ◆ Converters, signal conditioners and interfaces.
- ◆ Engineering, training, installation, configuration and commissioning are all facilitated by easy-to-use tools - no special training needed.

Getting HART[®] on plant networks

- ◆ Digital HART[®] information ensures easy integration with plant systems.
- ◆ OPC Servers provide easy access to HART[®] device data on plant networks.
- ◆ Multiple applications can simultaneously access HART[®] data including popular HMI and Historical Trending packages.
- ◆ HART[®] capable I/O Systems and Interfaces support connection to one or thousands of devices.

COMPLETE RANGE OF PRODUCTS

Largest range of products and worldwide manufacturer support. Broad range of HART[®] capable products & technical support

- ◆ Complete Range of HART[®] capable products available.
- ◆ Over 560 products from 111 different companies.
- ◆ All process measurement and control applications.
- ◆ Full compliment of software/hardware for plant integration.
- ◆ Technology supported by the 130+ Members of the HART[®] Communication Foundation representing the global leaders in process control.
- ◆ Membership spans the globe 46% North America, 44% Europe, 10% Asia & Australia.

Unleash the Power

- ◆ HART[®] is your cost-effective, easy-to-use, high value and low risk process communication solution.
- ◆ If you have not looked at HART[®] recently, look again!
- ◆ HART[®] may be all the fieldbus you really need!

Using the POWER of HART[®], you may have more communication capability than you think!





Communicate with, configure and monitor HART® smart devices in safe and hazardous areas

MTL4840 SERIES



- ◆ SIL3 rating
- ◆ Connect up to 7936 loops to a single PC
- ◆ LED indication of loop being scanned
- ◆ Easily scalable modular system

- ◆ Compact, ideal for new projects and upgrades
- ◆ Channel to channel isolation option
- ◆ HART signal conditioning

The **MTL4840 HART® connection** system provides a simple interface between smart devices in the field and HART® instrument management software run on a PC.

The system is based on 16-channel modularity to provide a compact, easily configurable and expandable system. Using a standard RS485 serial link, up to 7936 individual HART® devices can be connected to a single workstation.

For the optimum solution, choose from a range of general purpose and IS termination boards. For maximum flexibility the BPHM64 HART® backplane locates an MTL4841 communications module and up to four MTL4842 interface modules. General purpose HART® connection units and IS backplanes are also available, each fitted with an interface cable for connection to the BPHM64 HART® backplane. MTL4841 and MTL4842 modules can also be located on HMU16 termination boards for general purpose applications or on BPMH16 / BPMH16U / BPSH16 / BPSH16-32 backplanes for IS isolator requirements.

The **DIN-rail mounting** HCU16 and HCU16AOHART® connect to 16 general purpose field instruments while maintaining channel to channel isolation. Resistor conditioning options are compatible with all I/O cards. It allows pass-through connections for transmitter power supply, input signal and common.

The **HCU16AO** unit includes HART® filters for I/O cards incompatible with HART® signals.

BPMH16/BPMH16U/BPSH16/BPSH16-32 backplanes with MTL4840 HART® modules fitted, connect either 16 or 32 IS field instruments. Adapter cards are available for the BPMH16U for easy integration to I/O cards and users have a choice of a DIN-rail mounting option.

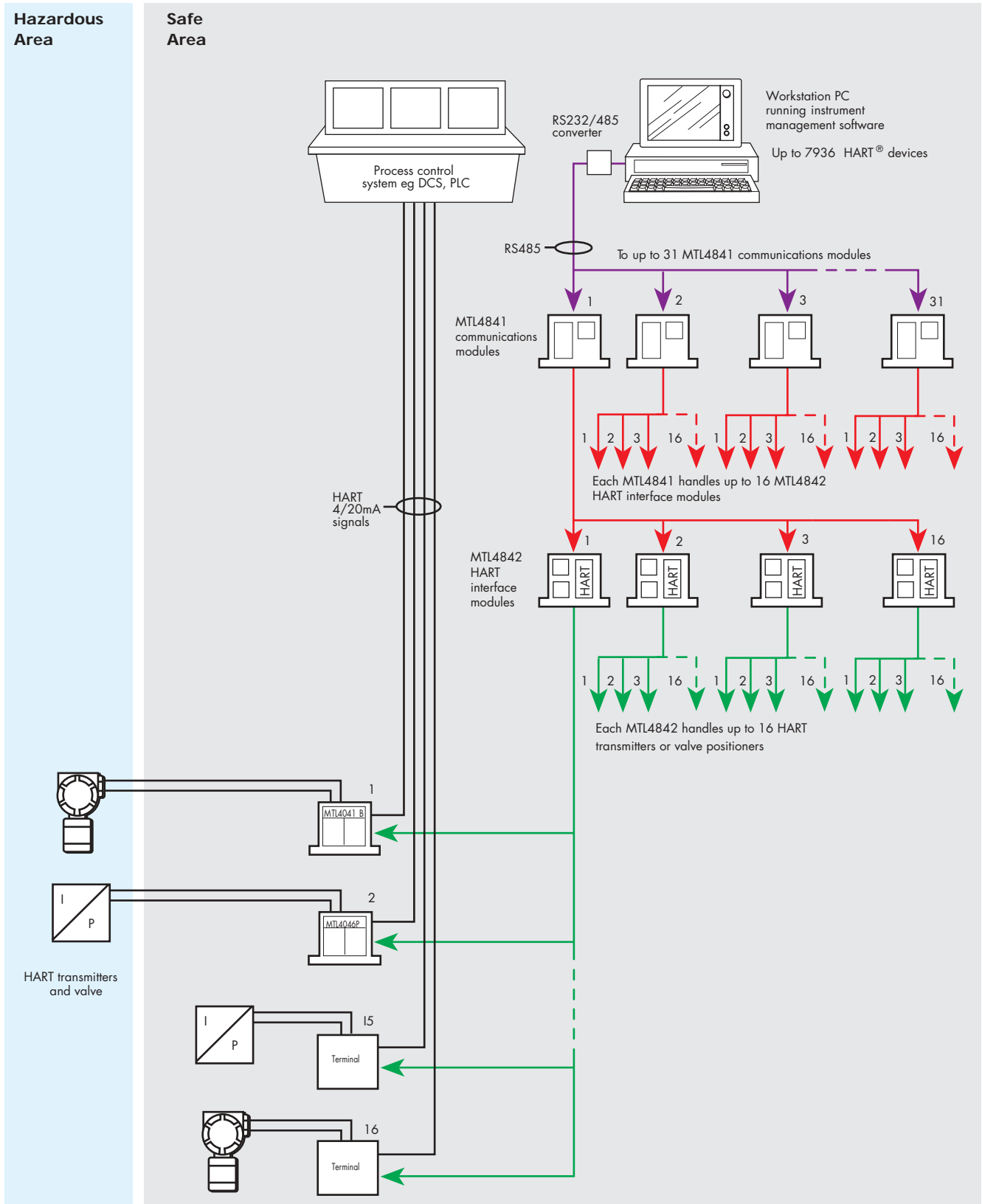
Numerous features may be included in the connection units and backplanes, as required. Channel to channel isolation; resistors where required for HART® signal conditioning; and HART® filters for analogue systems where the output signal interferes with HART® data or becomes unstable with the presence of the HART® signal.

Customised backplanes and connection units are available to provide direct connection from DCS I/O cables, replacing the standard termination board.

MTL HART multiplexers are certified by BASEEFA as a safety related sub-system to IEC61508. See the SR Series Interfaces section of this catalogue.



MTL4840 SERIES SYSTEM DIAGRAM



MTL4840 SERIES MODULE SPECIFICATIONS

MTL4841 COMMUNICATIONS MODULE

Host system interface

RS485 2-wire multidrop
Up to 31 MTL4841 modules can be connected to one host station
Unit address: switch-selectable on top of module

Isolation

RS485 output isolated from backplane power supply

Serial communication parameters

RS485 Baud rate: 1.2, 9.6, 19.2, 38.4kbaud, switch-selectable on top of module
RS485 highway length: up to 1km

MTL system interface

Links with up to 16 MTL4842 HART® interface modules via interface bus on backplane/ribbon cable

LED indicators

Green: one provided for power and status indication

Power requirements

Powered from backplane

Power consumption

<1.0W

Instrument management software supported

See 'Instrument management software'

MTL4842 HART® INTERFACE MODULE

MTL systems interface

Links up to 16 loops via backplanes
Receives multiplexer control signals via interface bus from MTL4841 and selects one channel for communication

Unit address

Switch selectable on top of module

Interface bus

Total length of interface bus between module 1 and module 16 must not exceed 4m

LED indicators

Green: one provided for power
Amber: one to indicate unit is selected by MTL4841
Red: four to identify loop address

Power requirements

Powered from backplane

Power consumption

<0.1W

MTL4000 SERIES MODULES

(See 'MTL4000 Series' for detailed specifications and circuit diagrams)

MTL4041A: Current repeater, 4/20mA, passive input for smart transmitters

MTL4041B: Repeater power supply, 4/20mA, for 2- or 3-wire transmitters

MTL4041P: High power repeater power supply, 4/20mA, for 2- or 3-wire transmitters

MTL4044: Repeater power supply, 4/20mA, two channel, for 2 wire transmitters

MTL4046/C: Isolating driver, for HART® valve positioners

MTL4046P: High power isolating driver for HART® valve positioners

COMMON SPECIFICATION

(applies to all MTL4840 and 4000 Series modules)

Location of units

Safe area (MTL4840 can be located in Div2)

Long-term drift

No recalibration necessary

Ambient temperature limits

-20 to +60°C continuous working
-40 to +80°C storage

Humidity

5 to 95% RH (non-condensing)

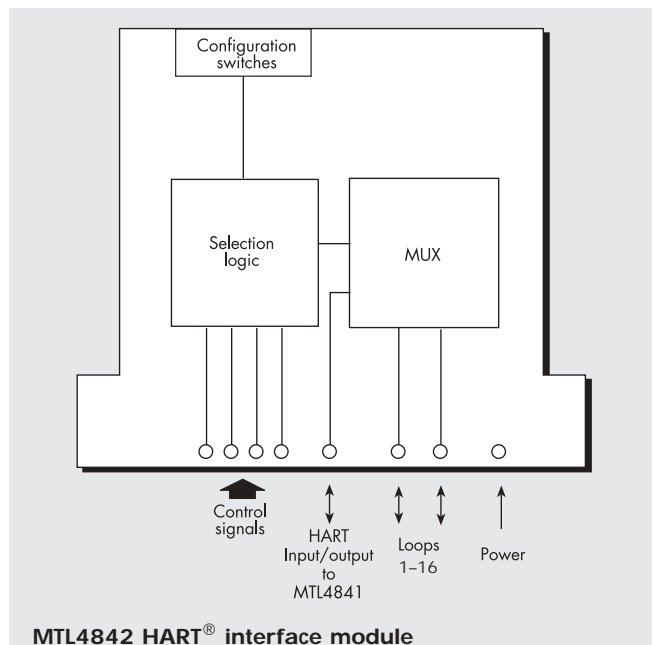
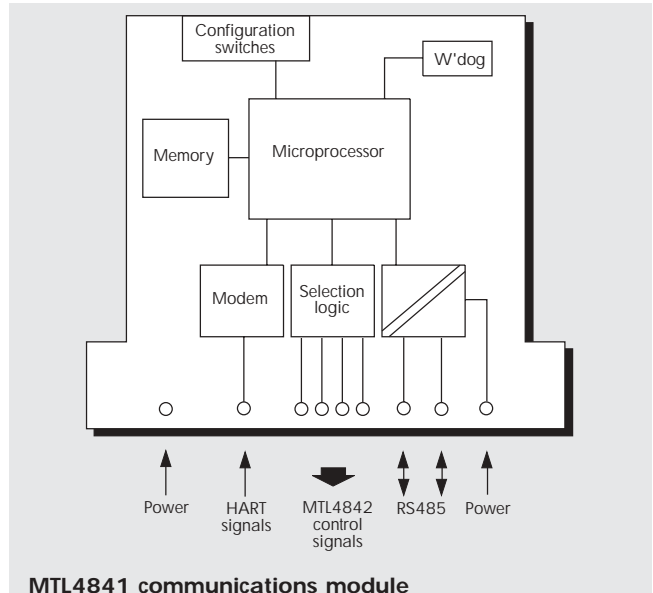
Mounting

On MTL or custom backplanes which, in turn, can be surface or DIN-rail mounted.

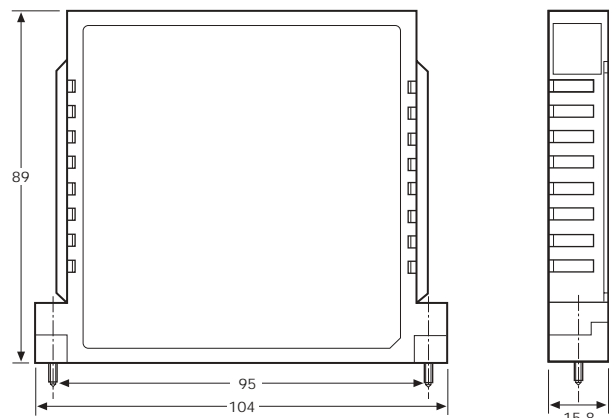
Mounting pitch 16mm

Weight

100g approximately



DIMENSIONS (mm)



MTL4840 SERIES BACKPLANES SPECIFICATIONS GENERAL PURPOSE VERSIONS

BPHM64 BACKPLANE

Capacity

- 1 x MTL4841 communications module
- 4 x MTL4842 HART® interface modules
- NB: An MTL4841 module is needed for only one in every sixteen MTL4842 modules

Maximum power requirements

- 1.35W when equipped with:-
- 1 x MTL4841 communications module
- 4 x MTL4842 HART® interface modules

HART interface connectors

- 4 x DIN41651 20-way ribbon cables
- (16 HART® signal connections + 4 common returns on each cable. Connections to HART® signals via screw terminal interface or custom backplane. Contact MTL for details.)

Weight (excl. modules and accessories)

296g approx.

HMU16/32

Capacity

- 1 x MTL4841 communications module
- 2 x MTL4842 interface modules

Power requirements, Vs

- 21 to 35V dc through plug in connectors

Maximum power requirements

- 1.2W when fully populated

Interface bus connectors

- 10-way ribbon socket

RS485 port

- 2.5mm² screw terminals

Mounting

- Supplied fitted with DIN-rail (T-or G-section)

Weight (excl. modules and accessories)

330g

COMMON SPECIFICATION BPHM64 & HMU16

Power requirements, Vs

- 21 to 35V dc through plug-in connectors

Mounting

- Supplied fitted with DIN-rail (T- or G- section) carrier

Interface bus connector

- 10-way ribbon socket

RS485 port

- 2.5mm² screw terminals

HCU16 HART® CONNECTION UNIT

Accuracy (HCU16-P250 only)

250Ω ±0.05%

Connectors

- 2.5mm² screw clamp terminals
- 3 terminals per channel
- 20-way flat cable (to BPHM64)

Weight

383g

HCU16AO HART® CONNECTION UNIT WITH FILTERS

Series impedance

- dc < 2Ω
- HART® signal > 240Ω

Connectors

- 2.5mm² removable screw clamp terminals
- 2 terminals per channel in groups of 4 channels
- 20-way flat cable (to BPHM64)

Weight

768g

COMMON SPECIFICATION HCU16 & HCU16AO

Capacity

- 16 channels

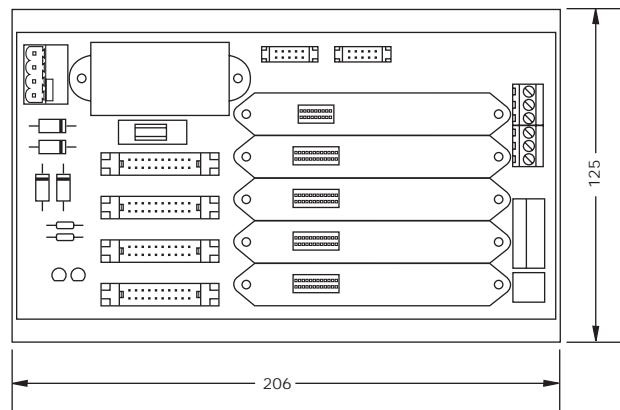
Isolation

- Channel to channel 50V dc

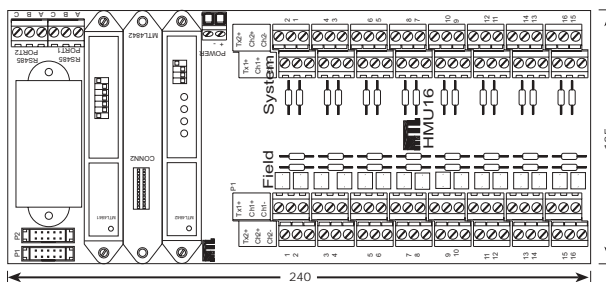
Mounting

- Supplied fitted with DIN-rail (T- or G- section) carrier

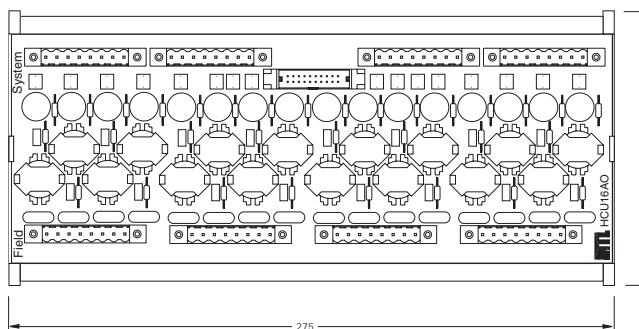
DIMENSIONS (mm)



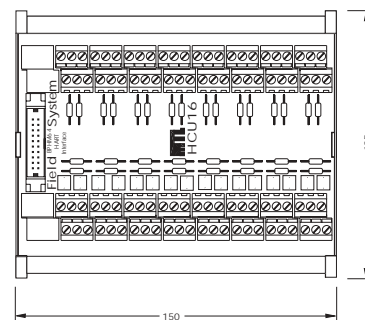
BPHM64



HMU16AI



HCU16AO



HCU16

