



PRODUCT INSTALLATION MANUAL

HART TERMINATION BOARD

HISHPSM/32/MM-01



With regard to the supply of products, the current issue of the following document is applicable:

The General Terms of Delivery for Products and Services of the Electrical Industry, published by the Central Association of the Electrical Industry (Zentralverband Elektrotechnik und Elektroindustrie (ZVEI) e.V.) in its most recent version as well as the supplementary clause: "Expanded reservation of proprietorship."

Contents

1. Safety	5
1.1 Validity.....	5
1.2 Safety-relevant symbols used.....	5
1.2.1 Warning!	5
1.2.2 Note!.....	5
1.3 Target group / personnel.....	5
1.4 Reference to further documentation	5
1.5 Intended use	6
1.6 Improper use.....	6
1.7 Mounting/Installation	6
1.8 Operation, maintenance, repair.....	7
1.9 Delivery, transport, disposal	8
2. Disclaimer	8
3. Copyright and trademark information	9
4. General information	10
4.1 Introduction.....	10
4.1.1 System overview	10
4.1.2 HART overview.....	11
4.1.3 AMS software overview.....	11
4.2 Conditions of safe use	11
4.3 Product marking.....	11
4.4 Technical specifications	12
4.5 Quality assurance.....	13
4.6 Certifications and compliance	13
5. Installation	14
5.1 Storage.....	14
5.2 Unpacking and inspection	14
5.3 Environmental conditions.....	15
5.4 Intrinsic safety	15
5.5 Mounting	15
5.6 Cables	15
5.7 Wiring.....	16
5.7.1 Power	16
5.7.2 Grounding	17
5.7.3 RS-485	18

5.7.4 Field connections20

5.7.5 Control connections.....22

6. Operation..... 24

6.1 Start-up sequence 24

6.2 Configuration..... 24

7. Troubleshooting 24

7.1 General..... 24

8. Maintenance..... 24

9. Glossary..... 25

10. Contact information 25

1. Safety

1.1 Validity

The chapter “Safety” is valid as instruction manual.

Specific processes and instructions in this document require special precautions to guarantee the safety of the operating personnel.

1.2 Safety-relevant symbols used

This document contains information that you must read for your own personal safety and to avoid property damage. Depending on the hazard category, the warning signs are displayed in descending order as follows:

1.2.1 Warning!



This symbol indicates a possible fault or danger.

Non-observance may cause personal injury or serious property damage.

1.2.2 Note!



This symbol brings important information to your attention.

1.3 Target group / personnel

Responsibility for planning, assembly, commissioning, operation, maintenance, and dismounting lies with the system operator.

Mounting, installation, commissioning, operation, maintenance and disassembly of any devices may only be carried out by trained, qualified personnel. The instruction manual must be read and understood.

1.4 Reference to further documentation

Laws, standards, or directives applicable to the intended use must be observed. In relation to hazardous areas, Directive 1999/92/EC must be observed.

Laws, standards, or directives applicable to the intended use must be observed.

The corresponding data sheets, declarations of conformity, EC-type-examination certificates, certificates and control drawings if applicable (see data sheet) are an integral part of this document. You can find this information under www.pepperl-fuchs.com.

Due to constant revisions, documentation is subject to permanent change. Please refer only to the most up-to-date version, which can be found under www.pepperl-fuchs.com.

1.5 Intended use

The devices are only approved for appropriate and intended use. Ignoring these instructions will void any warranty and absolve the manufacturer from any liability.

The device must only be operated in the ambient temperature range specified.

The device must only be operated at the relative humidity (non-condensing) specified.

The device must only be operated in the ambient temperature range and at the relative humidity (non-condensing) specified.

If the device replaces a predecessor device, the documentation for the verification of intrinsic safety must be adjusted.

1.6 Improper use

Protection of the operating personnel and the overall system is not ensured if the product is not being used according to its intended purpose.

The equipment is not suitable for isolating signals in high current applications unless this is noted separately in the corresponding datasheet.

The device is not used to separate intrinsically safe circuits from non-intrinsically safe circuits.

1.7 Mounting/installation

Prior to mounting, installation, and commissioning of the device you should make yourself familiar with the device and carefully read the instruction manual.

The device must not be installed at locations where corrosive vapors may be present.

Do not install damaged or polluted devices.

Only use accessories specified by the manufacturer.

Place warning label "Warning – Refer to operating instructions!" visibly on the housing.

Place warning label "Warning – Refer to operating instructions!" visibly on the surrounding enclosure.

In order to ensure protection against electric shock, observe the following instructions:

- Keep sufficient separation distance between conductors, terminals, housing, and environment.
- Insulate conductors, terminals, and housing from the environment.

1.8 Operation, maintenance, repair

Prior to using the device you should make yourself familiar with the device and carefully read the instruction manual.

The devices must not be repaired, changed or manipulated.

Do not use damaged or polluted devices.

If there is a defect, the product must always be replaced with an original device.

If there is a defect, the product must be returned to the manufacturer, Pepperl+Fuchs.

1.9 Delivery, transport, disposal

Check the packaging and contents for damage.

Check if you have received every item and if the items received are the ones you ordered.

Keep the original packaging. Always store and transport the device in the original packaging.

Store the device in a clean and dry environment. The permitted ambient conditions (see data sheet) must be considered.

Disposing of devices, packaging material, and possibly contained batteries must be in compliance with the applicable laws and guidelines of the respective country.

2. Disclaimer

While the HART Interface Solution (HIS) Replacement Panels from Pepperl+Fuchs, Inc. (“HIS Replacement Panels”) are designed to extract the digital HART data from standard 4 ... 20 mA loops, the HIS Replacement Panels may not provide all of the features, or duplicate all the functions, of the panels they replaced, and Pepperl+Fuchs, Inc. makes no warranty or representation (and specifically disclaims any express or implied warranty or representation) that such HIS Replacement Panels are identical to, or will provide all of the same features or duplicate all of the same functions of, the panels they replace. The terms, conditions and limitations of any product warranties covering HIS Replacement Panels may be obtained from Pepperl+Fuchs, Inc.

The information set forth in this Manual is designed to assist the Purchaser in the installation, operation and maintenance of an HIS Replacement Panel. Such information should not be construed as a warranty or representation, express or implied, regarding the HIS Replacement Panel or its use in, or suitability for, a particular application, any such warranties or representations being specifically disclaimed. The terms, conditions and limitations of any product warranties covering HIS Replacement Panels may be obtained from Pepperl+Fuchs, Inc. Pepperl+Fuchs, Inc. reserves the right to modify or improve the designs, specifications, features and/or functions of HIS Replacement Panels at any time without notice.

3. Copyright and trademark information

This manual is copyright of Pepperl+Fuchs with all rights reserved. This manual may not be copied, in whole or in part, without the written consent of Pepperl+Fuchs. Pepperl+Fuchs reserves the right to make changes to this manual without notice.

Model Listing	
Model	Channels/function
HISHPSM/32/MM-01	32 I/O

To avoid damage, failure, or improper operation, read this manual carefully before installing and operating the equipment.

4. General information

4.1 Introduction

This manual provides guidance for the installation, operation, and maintenance of your Pepperl+Fuchs termination board, for use with the HiDMUX2700. The solution is designed for easy multiplexer integration with any control system.

HISHPSM/32/MM-01	Generic point-to-point wiring. Can be connected to any control system
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The HiDMUX2700 multiplexer will be referred to in this manual as “MUX 2700.” For setup and specific details on operating the MUX 2700, see the manual, datasheets, and other documentation for this product.

The HISHPSM/32/MM-01 will be referred to as “HPSM.” The combined solution of a MUX 2700 and an HPSM will be referred to as a “HART interface solution” or “HIS.”

4.1.1 System overview

Your HART interface solution interfaces up to 32 field-located HART devices. The MUX 2700 is a HART signal multiplexer unit that allows access to HART communications on existing 4 ... 20 mA wiring. It acts as a gateway device, routing communications between the maintenance workstation PC and the HART devices. The MUX 2700 uses Manchester encoding of the HART protocol for the RS-485 link to the maintenance workstation PC. To link to each of the HART devices, the MUX 2700 communicates using Bell 202 frequency-shift keying (FSK). It interrogates each HART device, retrieves device information, and stores it in an internal database. This information is available to the maintenance workstation software. In this way, the MUX 2700 gives the user access to each HART device as if connected directly at the device itself. A maintenance workstation PC can use this information for configuration, maintenance, calibration, diagnostics, and data access.

The termination board design allows the DCS and field device wiring to be brought together with the MUX to complete the system. Various HPSM board designs allow interface with different I/O cards and may include configurable options such as fused or filtered signal lines, current to voltage conversion, and loop or device powered instruments. HART Interface Solutions are supplied by Pepperl+Fuchs in several models in order to allow simple and reliable connection between SMART devices and various DCS systems.

4.1.2 HART overview

HART is an acronym for “highway addressable remote transducer.” The HART protocol makes use of the Bell 202 FSK standard to superimpose digital signals at a low level on top of the 4 ... 20 mA signal. This enables two-way communication and makes it possible for additional information beyond just the normal process variable to be communicated to/from a SMART field instrument. The HART protocol allows a host application (master) to receive two or more digital updates per second from a field device. Because the digital FSK signal is phase continuous, there is no interference with the 4 ... 20 mA signal.

4.1.3 Asset Management Solutions (AMS) Software Overview

AMS software provides an easy-to-use means for integrating various device management software packages into a unified system. AMS operates under the Microsoft® Windows® format. It combines the various device (or asset) management tasks into an application with a common look-and-feel and centralized data storage.

AMS provides access to functionality available via the HART communications protocol for any HART device whose Device Description (DD) is registered with the HART Communication Foundation.

For more information on installation of AMS software, consult the AMS Installation Guide.

4.2 Conditions of Safe Use

1. The device shall be installed in an enclosure that maintains an ingress protection rating of at least IP54 and meets the enclosure requirements of IEC 60079-0.
2. Non-intrinsically-safe circuits are to be connected or disconnected only when the area is known to be non-hazardous or when not energized.
3. Fuses are to be removed or replaced only when de-energized.

4.3 Product Marking

 PEPPERL+FUCHS 68307 Mannheim, Germany www.pepperl-fuchs.com	 
MODEL: HISHPSM/32/MM-01	Supply: 21V to 30V / 0.05A -20°C ≤ Ta ≤ 60°C
 CML 17 ATEX 3337X IECEx CML 17.0178X II 3 G Ex ec IIC T4 Gc Ex ec IIC T4 Gc	<u>Warning:</u> Do not connect or disconnect unless area is known to be non-hazardous. <u>Warning:</u> Do not remove or replace fuses when energized. See manual for fuse information.

4.4 Technical specifications

Mounting	T type (EN 50022, DIN 46277-3) or G types (EN 50035, DIN 46277-1) DIN rail
Environmental conditions	
Operating temperature	-20 °C ... 60 °C (-4 °F ... 140 °F)
Storage temperature	-20 °C ... 60 °C (-4 °F ... 140 °F) long-term (days) -25 °C ... 70 °C (-13 °F ... 158 °F) short-term (hours)
Relative humidity	5 ... 90 % non-condensing
Connections	
Power (Supply 1 and Supply 2)	5.08 mm removable screw terminals Supply voltage: 21 ... 30 VDC Supply current: 50 A max Wire size: 24 ... 12 AWG (0.2 ... 2.5 mm ²) Strip length: 7 mm Terminal torque: 0.5 ... 0.6 Nm
Field wiring (TB1)	5.08 screw terminals Maximum common mode signal voltage: 30 VDC 4 ... 20 mA signal with HART communication Wire size: Wire size: 24 ... 12 AWG (0.2 ... 2.5 mm ²) Strip length: 7 mm Terminal torque: 0.5 ... 0.6 Nm
Control wiring (TB2)	5.08 screw terminals Maximum common mode signal voltage: 30 VDC 4 ... 20 mA signal with HART communication Wire size: Wire size: 24 ... 12 AWG (0.2 ... 2.5 mm ²) Strip length: 7 mm Terminal torque: 0.5 ... 0.6 Nm
RS-485	Combicon style 5.08 mm removable screw terminals Wire size: 24 ... 12 AWG (0.2 ... 2.5 mm ²) Strip length: 7 mm Terminal torque: 0.5 ... 0.6 Nm
Power fuse (F1, F2)	3.15 A, 5 x 20 mm (sealed type)
Dimensions	
Length	222 mm (8.75 in)
Width	122 mm (4.8 in)
Height	79 mm (3.1 in) without MUX, 208 mm (8.2 in) with MUX

4.5 Quality Assurance

Pepperl+Fuchs is an ISO 9000 certified company and as such all production is performed under a quality assurance program following written procedures which are specific for each product family. During the manufacturing, intermediate testing and inspection, and final inspection phases, all products are built according to controlled documentation.

4.6 Certifications and compliance

HART Interface Solutions are CE compliant in accordance with EN61326.

This product is rated for use in Zone 2 (EPL Gc), per the following certificates:

- CML 17ATEX3337X II 3 G Ex ec IIC T4 Gc (see also declaration of conformity for EU)
- IECEx CML 17.0178X Ex ec IIC T4 Gc

IEC/EN60079-0 and IEC/EN 60079-7 were the standards used for the investigations. See the certificates and declaration of conformity for the specific edition of the standards.

5. Installation

Before installation, consider the compatibility of this device and the environment. Chemicals or other environmental conditions may not be compatible with materials in this device. If details on materials are required, contact the factory.

Make all electrical and mechanical connections per this manual and local/national laws and regulations as required. For hazardous locations, consult IEC 60079-14 in addition to other requirements.

5.1 Storage

When storing instruments and accessories, proper care should be taken to protect them from any possible damage. Always store instruments in their sealed original packaging until they are installed.

Provide adequate protection to prevent damage that may be caused by exposure to:

- Rain, excessive humidity and/or temperature excursions (inadequate sheltering)
- Dust (build-up of a corrosive patina that may cause oxidation and reduce isolation)
- Aggressive and polluting atmospheres with consequent corrosion
- Access by insects/rodents (damage of packing or content)
- Mechanical shocks or unauthorized packing opening
- Intense vibration (loosening of fastened parts, fatigue failures, etc.)
- Any other possible risk

Make sure that the storage temperature does not exceed the limits of -20 °C ... 60 °C (-4 °F ... 140 °F) for medium/long-term storage (days/months) and -25 °C to +70 °C (-13 °F to 158 °F) for short-term storage (a few hours) during transportation or shipment.

5.2 Unpacking and inspection

Upon receipt of the materials, you should check the integrity of the packing and the contents. In case of damage due to shipping, you should promptly and properly report to the shipper, supplying all necessary information.

If the instruments are not for immediate use, we recommend that you check that all characteristics shown on the instrument's label meet order specifications (model, supply voltage and frequency, input/output range, certification, tag etc.) as well as the actual application requirements.

If not installed, equipment should be stored following the recommendations of the previous section.

5.3 Environmental conditions

HIS products, like most modern electronic equipment, can operate in wide temperature and humidity ranges. However, practical consideration suggests a guideline on operating environment for best results.

- Keep operating temperature below 35 °C (95 °F), ideally between 20 °C and 25 °C (68 °F and 77 °F), avoiding wide and rapid temperature excursions.
- Control relative humidity within 40 to 60 % to avoid risks of static charges or condensation.
- Limit the presence of corrosive atmosphere, fumes and dust, sealing and purifying the control room area and using air filters in the cabinet air intakes (clean cable entry path), if necessary.
- Reduce vibrations (if any) to safe levels.

5.4 Intrinsic safety

The HIS system can interface HART devices located in hazardous areas by interposition of suitable galvanically isolated intrinsically safe barriers. The barriers must allow bi-directional HART signal communication in addition to the normal 4 ... 20 mA loop current processing.

5.5 Mounting

The MUX 2700 is a plug-in unit that must be inserted in the appropriate termination board position. Exercise care in the insertion to mate the connector's pins, then firmly press the module to engage the connector. Finally, engage the quick lock tabs on either side to secure the module to the termination board.

The HPSM is designed to be mounted on a 35 mm DIN rail.

5.6 Cables

HART signals are brought to the MUX 2700 from the field via the 5.08 mm, 3-tier screw terminal block designated TB1. The HIS interfaces to the DCS through terminal block TB2.

Table 1: Connector Function

Field connector designation	HISHPSM/32/MM-01
TB1	Channels 1-32
Control connector designation	
TB2	Channels 1-32

5.7 Wiring

The MUX 2700 is a plug-in unit and is connected to the HPTB by two 40-pin connectors. Therefore, all electrical connections (supply, field connections, serial lines, etc.) are made at the termination board unit.

Refer to Figure 1 for a simplified representation of the termination board configuration.

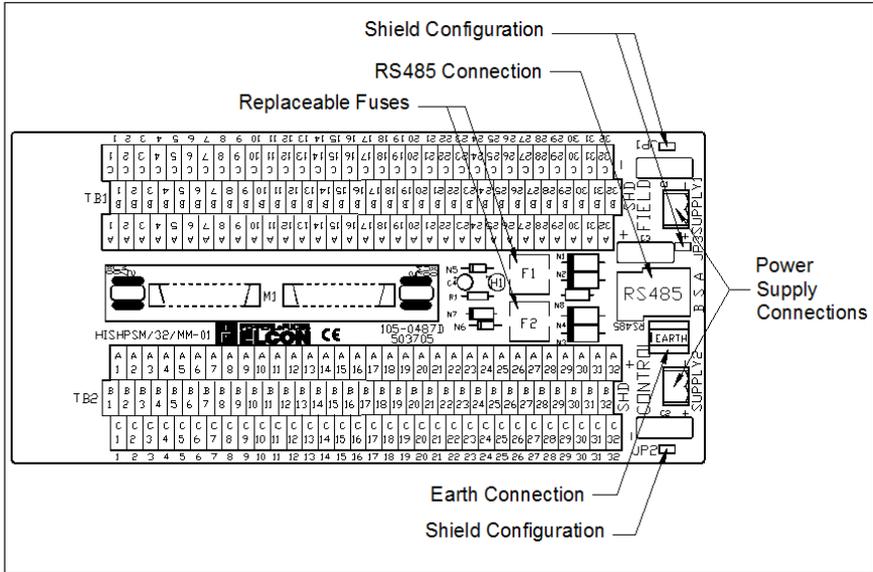


Figure 1: Termination Board Configuration

5.7.1 Power

Connect 24 VDC to the 2-pin removable terminal at the end of the HPSM. The connector is polarized, so you cannot insert it incorrectly. The polarity is marked on the terminals. A reverse polarity shunt diode and series fuse protection are provided to avoid damaging the module in case of accidentally reversing the polarity connection. In this case, the reverse voltage is clamped at -1.2 V and the fuse blows. Restore correct supply polarity and replace the blown fuse. Be certain to reinstall a good, properly sized, new fuse. See chapter 4.4.1 for fuse specifications.



WARNING!

Improper supply connections can seriously damage the instrument and result in risk of fire or explosion in hazardous locations!

**NOTE:**

DC supply requirements: The MUX is nominally rated for 24 VDC but will function from 21 ... 30 VDC. The MUX draws a maximum of 50 mA from the supply. If the power LEDs fail to light, check that the polarity of the supply line is correct.

**WARNING!**

Note that a crude, poorly filtered, or unregulated supply can produce destructive (hundreds of volts) voltage spikes during supply transformer switch-off transient. This could cause minor problems to electromechanical components like relays or solenoids but will surely degrade or destroy electronic equipment.

**NOTE:**

Supply conductors sizing: Since this HIS board only supplies power for the MUX, a single unit will require 50 mA and will have a conductor sizing based on mechanical strength rather than current carrying capacity. Pepperl+Fuchs recommends 20 AWG or larger wire be used to power this product.

5.7.2 Grounding

The HPSM provides an earth terminal lug for connecting the various shield wires to earth. Also included with the HPSM is a DIN rail mountable terminal block. Use of the terminal lug and terminal block for earth grounding will provide the shortest path and best practice for grounding of the HPSM. A 10-14 AWG cable should be secured between the terminal lug and DIN rail block which provides a single point to properly ground field wiring cable shields. This terminal may not be necessary to use if best practice grounding techniques are employed.

The HPSM also provides customer selectable capacitive coupling for the shielding. Setting the shield to be direct coupled or capacitively coupled is accomplished through jumper shunts. Placing the jumper shunt across the pins will bypass the capacitor and direct couple the corresponding shield to earth. Refer to Table 2 for a complete list of the shunts and the associated shield. For best practice, any shield should be direct coupled at one end of the circuit.

Table 2: Shield Configuration

Jumper Shunt #	HISHPSM/32/MM-01
JP1	Channels 1-32 Field
JP2	Channels 1-32 Control
JP3	RS-485

5.7.3 RS-485

An RS-485 network permits up to 32 devices to communicate over a maximum of 1200 m (4000 ft) of cable. The length of this network can be extended if necessary by using RS-485 repeaters. The communication occurs via a differential signal over a shielded twisted pair of wires. Per the RS-485 specification the signal wires should be labeled “A” and “B”, but sometimes a “+” and “-” are used instead. In these cases connect the “+” to “B” and the “-” to “A”.



NOTE:

A MUX 2700 that is cross-wired on the RS-485 network will not be damaged, but it also will not communicate.

Since the MUX 2700 is optically isolated it is important to link the signal grounds of the different network nodes to the host ground through the cable shield. This helps prevent ground potential differences from causing a loss of data or damage to equipment on the RS-485 network.

Many cable manufacturers make cable specifically designed for RS-485 networks. Pepperl+Fuchs Elcon recommends using shielded twisted pair cabling and then utilizing the shield as the RS-485 network ground. This shield should be grounded at the RS-485 converter if possible.

RS-485 wiring must be connected as shown in Figure 2. These wires carry data from the HIS to the PC via an RS-485/RS-232 converter cable. Connect the converter to a serial port on the PC as indicated in the converter’s documentation.

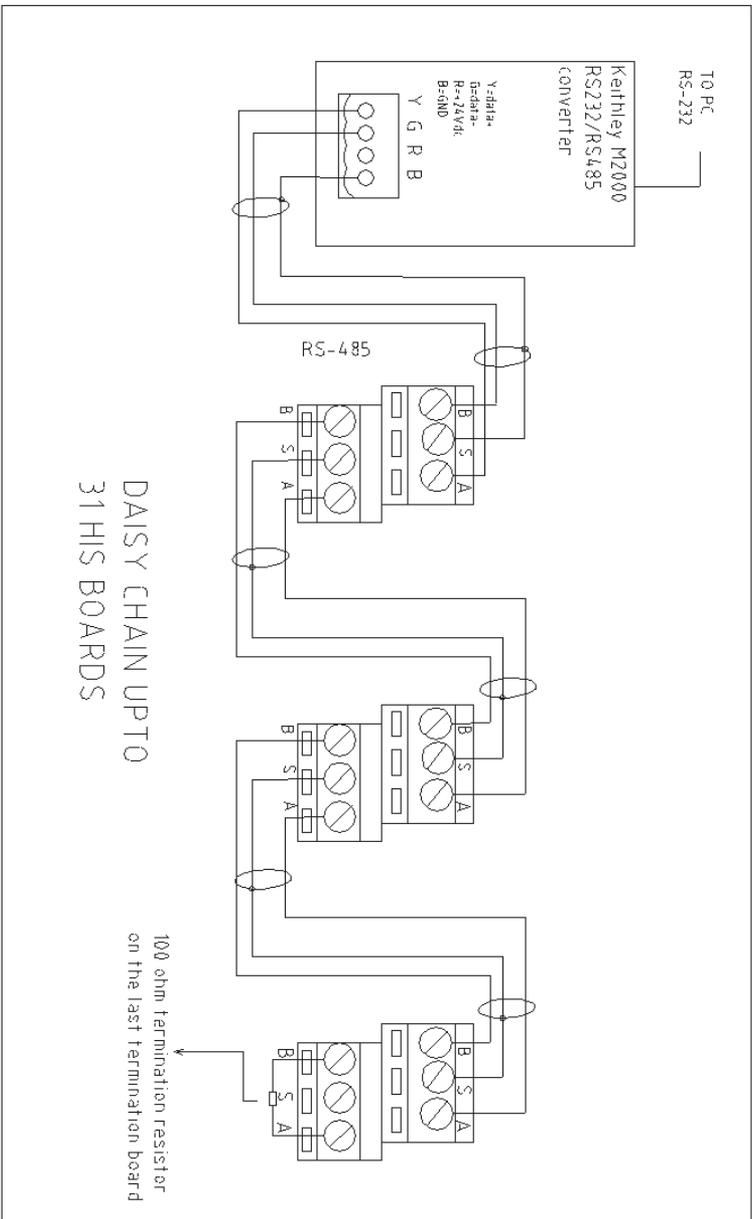
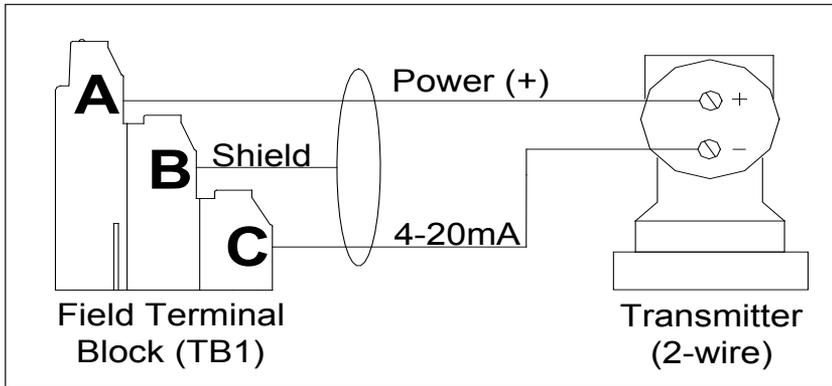


Figure 2: RS-485 Wiring

5.7.4 Field connections

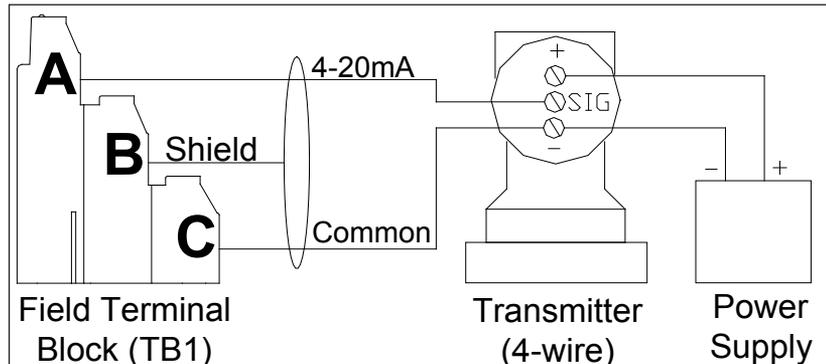
All field wiring is connected via the 3-tier screw terminal block (TB1). To obtain the best results from this device, the use of shielded cables is strongly recommended. In the case of cable lengths greater than 30 m, shielded cables are required to ensure proper function of the HPSM. See Figures 3-5 for specific device connections.

Figure 3: Loop-powered Transmitters (2-Wire)



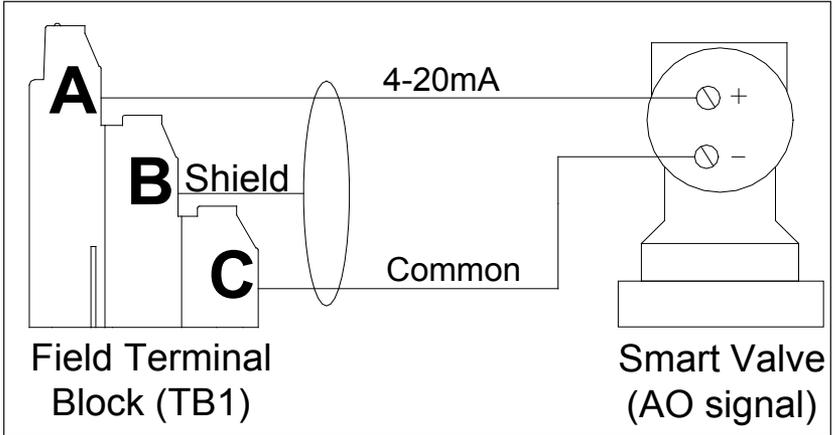
Pepperl+Fuchs recommends that all shield drain wires be connected from as close to TB1 as possible to the nearest grounding point and this point be linked to earth by as short a route as possible. The HPSM terminal Row B and the Earth terminal lug have been provided to conveniently allow this. Unless the transmitter has galvanic isolation between its output and power, supply the analog loop from the transmitter will link the DCS common to the transmitter power supply common through terminal Row C.

Figure 4: Self-Powered Transmitters (4-Wire)



Pepperl+Fuchs recommends that all shield drain wires be connected from as close to TB1 as possible to the nearest grounding point and this point be linked to earth by as short a route as possible. The HPSM terminal Row B and the Earth terminal lug have been provided to conveniently allow this.

Figure 5: Smart Valves (AO Signals)



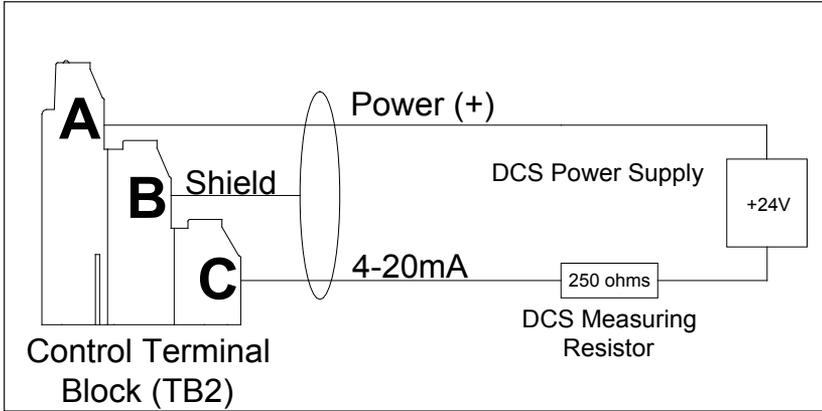
Pepperl+Fuchs recommends that all shield drain wires be connected from as close to TB1 as possible to the nearest grounding point and this point be linked to earth by as short a route as possible. The HPSM terminal Row B and the Earth terminal lug have been provided to conveniently allow this.

5.7.5 Control connections

All control wiring for the HISHPSM/32/MM-01 is connected via the 3-tier screw terminal block (TB2).

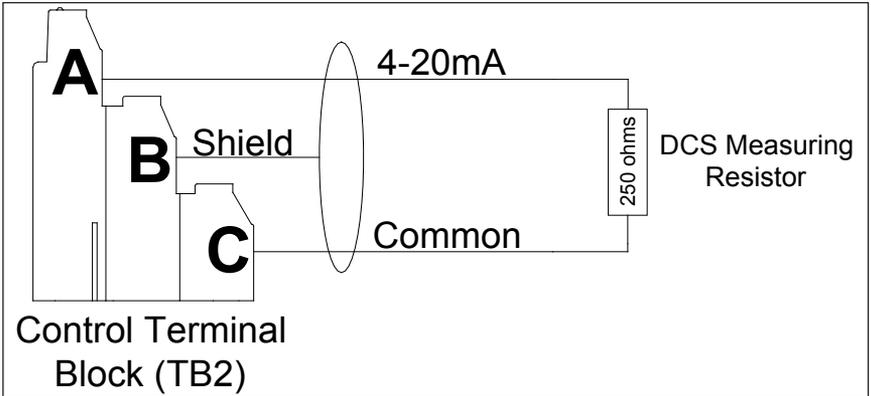
It is strongly recommended to use shielded cables. Shielded cables are required when line lengths are greater than 30 m. See Figures 6-8 for specific device connections.

Figure 6: Loop-Powered Transmitters (2-Wire)



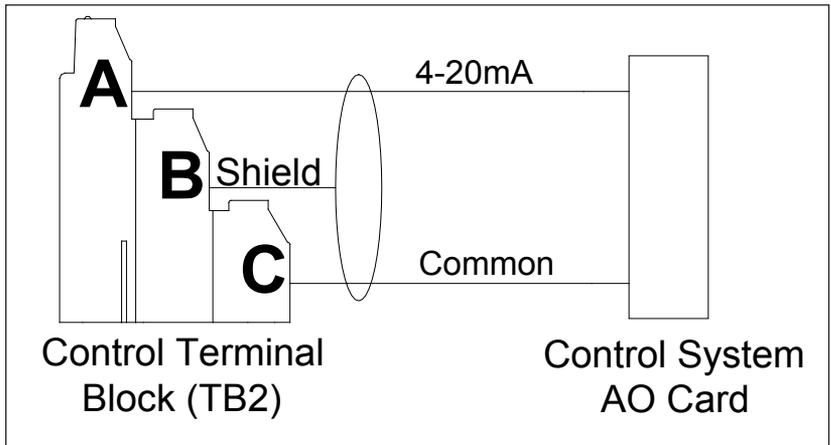
Pepperl+Fuchs recommends that all shield drain wires be connected from as close to TB1 as possible to the nearest grounding point and this point be linked to earth by as short a route as possible. The HPSM terminal Row B and the Earth terminal lug have been provided to conveniently allow this.

Figure 7: Self-Powered Transmitters (4-Wire)



Pepperl+Fuchs recommends that all shield drain wires be connected from as close to TB1 as possible to the nearest grounding point and this point be linked to earth by as short a route as possible. The HPSM terminal Row B and the Earth terminal lug have been provided to conveniently allow this.

Figure 8: Smart valves (AO signals)



Pepperl+Fuchs recommends that all shield drain wires be connected from as close to TB1 as possible to the nearest grounding point and this point be linked to earth by as short a route as possible. The HPSM terminal Row B and the Earth terminal lug have been provided to conveniently allow this.

6. Operation

6.1 Start-up sequence

The proper start-up sequence for the HIS system is as follows:

1. Make all field and control connections to the termination board.
2. Connect RS-485 communications and adjust network settings as appropriate.
3. Plug the MUX 2700 into the termination board.
4. Apply 24 VDC to HIS board or power up field devices.
5. After the MUX start-up sequence is complete then initiate AMS.

6.2 Configuration

Each channel of the HIS board can accommodate a SMART device. For details on device and control wiring, refer to Sections 5.7.4 and 5.7.5 respectively. For information on setting the shield jumpers, refer to Section 5.7.2. No other configuration is required on the HPSM.

7. Troubleshooting

7.1 General

Due to the modular nature of the HIS system, a communication failure may occur anywhere in the data transfer link from the software to the field device. In order to identify where the loss of communication has occurred, it is important to understand which components are working correctly. Often, some simple checks will save hours of troubleshooting. Some of the most common mistakes are: improper wiring connections; baud rate mismatches; improper network settings; and improper addressing of the MUX 2700.

8. Maintenance

Pepperl+Fuchs' apparatus do not require any particular maintenance under normal operating conditions. They are designed to operate trouble-free and with high stability for long periods.



WARNING!

Any repair made by unauthorized personnel may completely invalidate the safety characteristics of the unit and could void all warranties. Repair not made by Pepperl+Fuchs is fully at user's risk and responsibility. In addition, the warranty terms of the unit will be null and void to all effect.

9. Glossary

DCS	Distributed control system
FSK	Frequency-shift keying
HART®	Highway addressable remote transducer
HIS	HART interface solution
HHT	Handheld terminal
HPSM	HART panel single Mux
IS	Intrinsic safety
PLC	Programmable logic controller

10. Contact information

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Notes

Notes

Your automation, our passion.

Explosion Protection

- Intrinsic Safety Barriers
- Signal Conditioners
- FieldConnex® Fieldbus
- Remote I/O Systems
- Electrical Ex Equipment
- Purge and Pressurization
- Industrial HMI
- Mobile Computing and Communications
- HART Interface Solutions
- Surge Protection
- Wireless Solutions
- Level Measurement

Industrial Sensors

- Proximity Sensors
- Photoelectric Sensors
- Industrial Vision
- Ultrasonic Sensors
- Rotary Encoders
- Positioning Systems
- Inclination and Acceleration Sensors
- Fieldbus Modules
- AS-Interface
- Identification Systems
- Displays and Signal Processing
- Connectivity

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