



## HART® INTERFACE SOLUTIONS



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## PEPPERL+FUCHS COMPANY OVERVIEW

### PROTECTING YOUR PROCESS

Pepperl+Fuchs is the market leader in intrinsically safe explosion protection components.

As a preferred partner of industries such as oil and gas, chemical, pharmaceutical, as well as power and utility, we offer comprehensive, application-oriented system solutions, including customer-specific control cabinets and enclosures for the process automation industry.

We are more than just a supplier. We provide expert development, manufacturing, and commissioning of a wide range of solutions – at every step along the way. From the initial start up and commissioning to support after installation, we provide professional service and unmatched performance.

### SELECTION OF CHOICE

We offer the widest selection of products for protection of electrical signals located in hazardous areas or demanding environments.

From simple zener barriers, isolated barriers, and signal conditioners to complex and highly functional logic control units or HART multiplexers, these systems guarantee high signal availability from the field device through the interface module to the control system.

Suited to meet the requirements of the modern-day process plant, our interface technology products are the perfect choice to meet all applications and installation requirements.

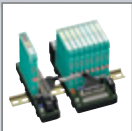




## HART COMMUNICATION

HART is the global standard for smart process instrumentation. The majority of smart field devices installed in plants worldwide are HART enabled. These HART enabled devices are the largest of all globally installed communication protocols and number more than 30 million.

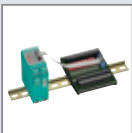
▶ p. 4



## H-SYSTEM

Each H-System HART Multiplexer (HID MUX 2700) provides communication to 32 HART devices. A network is built by multidropping multiplexers; up to 31 multiplexers are connected to support a single network with a maximum of 992 field instruments per communication port on your PC workstation.

▶ p. 6



## K-SYSTEM

The K-System HART Multiplexer works as a master/slave system and when fully occupied can drive up to 256 HART field devices. Up to 15 additional slaves can be connected to the master, each of which can support another 16 channels. This allows up to 7936 field devices to be addressed through one RS485 interface.

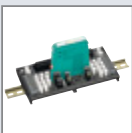
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## HART LOOP CONVERTER

The HART Loop Converter (HLC) is a single-loop solution. Each HLC is able to power and communicate with one HART field device. It sets the field device into burst mode and converts up to three HART variables into analog output signals. Trip values can be realized by optional relay outputs.

▶ p. 10



## CUSTOMIZED SOLUTIONS

For reduced wiring, DCS-specific termination boards with integrated system connectors replace the factory termination assemblies (FTA) and allow the HID MUX 2700 to be mounted directly on the board.

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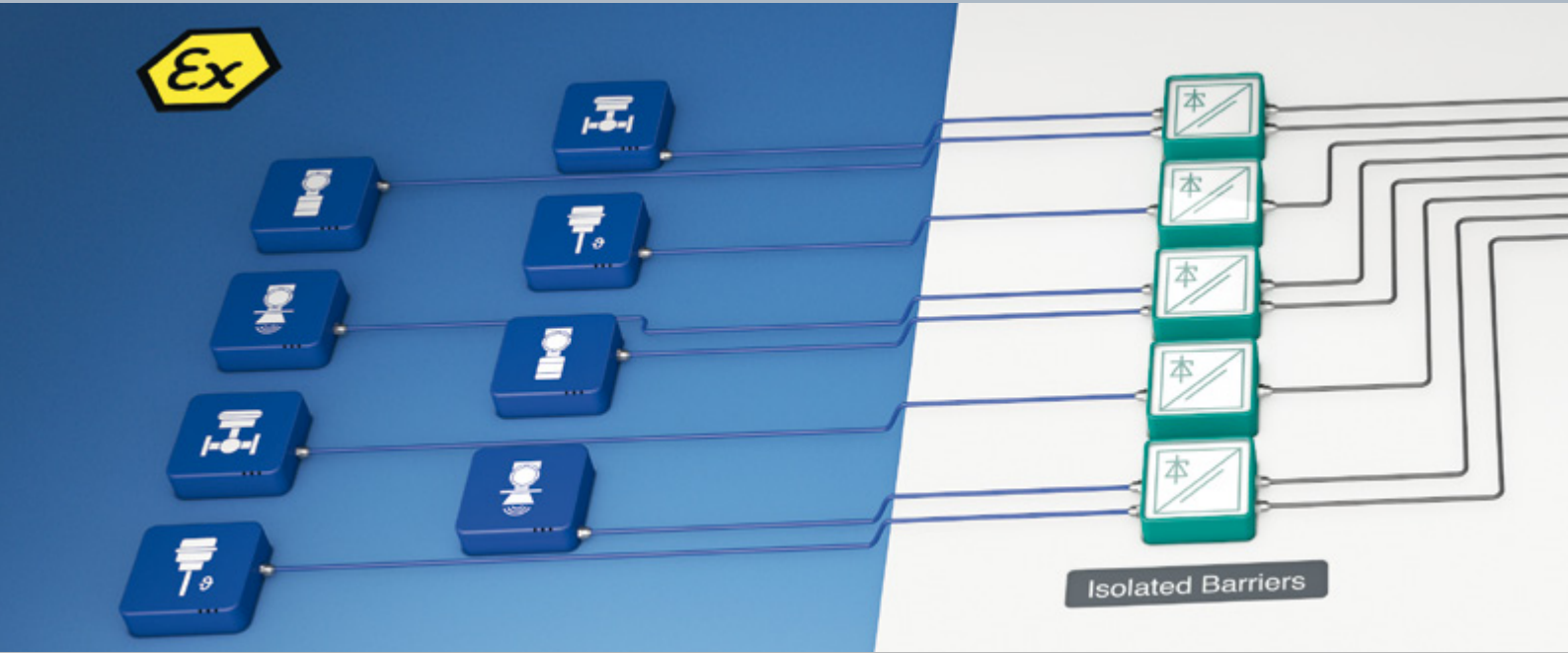


## ACCESSORIES

Accessories are helpful in your installation. They make your HART project a well-rounded solution.

▶ p. 14

# THE HART COMMUNICATION



## WHAT IS HART?

### GLOBAL STANDARD

HART communication is a bidirectional industrial field communication protocol used to communicate between intelligent field instruments and host systems. HART is the global standard for smart process instrumentation. The majority of smart field devices installed in plants worldwide are HART enabled. These HART-enabled devices are the largest of all globally installed communication protocols and number more than 30 million. HART technology is easy to use and very reliable.

A host system can be a distributed control system (DCS), programmable logic controller (PLC), asset management system, safety system, or a handheld device.

HART is a master/slave field communications protocol developed in the late 1980s to facilitate communication with SMART field devices. HART stands for highway addressable remote transducer. The HART protocol makes use of the Bell 202 frequency-shift keying (FSK) standard to superimpose digital communication signals at a low

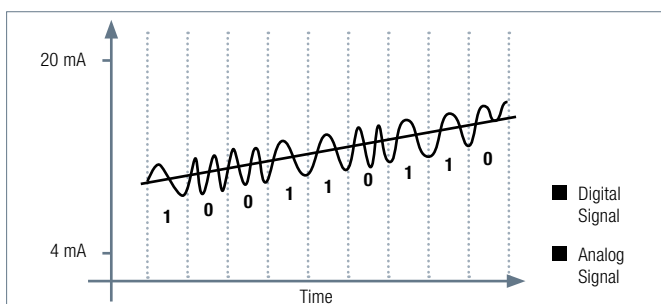
level on top of the 4...20 mA control signal. This enables two-way field communication to take place and makes it possible for additional information beyond the normal process variable to be communicated to/from a smart field instrument.

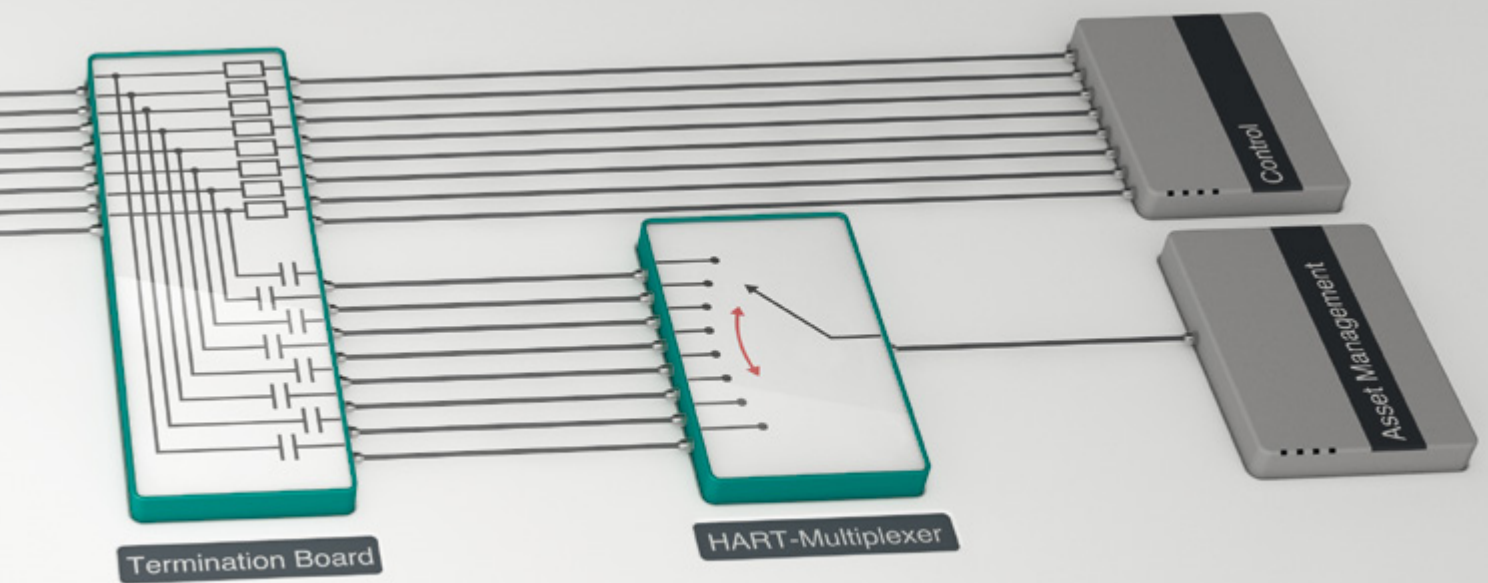
### NO INTERFERENCE TO ANALOG SIGNAL

The HART protocol communicates at 1200 bps without interrupting the 4...20 mA signal and allows a host application (master) to get up to three digital updates per second from a field device. As the digital FSK signal is phase continuous, there is no interference with the 4...20 mA signal.

### MASTER / SLAVE COMMUNICATION

HART is typically a request-response communication protocol, which means that during normal operation (2–3 data updates per second), each field device communication is initiated by a host communication device. Two hosts can connect to each HART loop without interfering. The primary host is generally a DCS, PLC, or a personal computer (PC). The secondary host can be a handheld terminal or another PC. Field devices include transmitters, actuators, and controllers that respond to commands from the primary or secondary host. There is also an optional “burst” communication mode where a single slave device can continuously broadcast a standard HART reply message. Higher update rates are possible with this optional digital communication mode and use is normally restricted to point-to-point topologies.





## EASY COMMUNICATION TO THE PROCESS

### HART MULTIPLEXER

The K- and H-system HART Multiplexers are used to connect HART field devices to asset management systems like AMS™ Suite: Intelligent Device Manager from Emerson Process Management. At the heart of HART Interface Solution (HIS), the HART Multiplexer acts like a gateway device, routing communications between the maintenance workstation PC and the HART field devices. It interrogates each HART device, retrieves device information, and stores it in an internal database. This information is made available by the AMS Device Manager or PACTware. The HART Multiplexer also acts as a message coordinator for communication between the maintenance workstation PC and the HART devices.

Our HART Multiplexers provide two essential benefits: small size and low cost per point. The small footprint is especially important for retrofit installations where cabinet space is costly and often unavailable. For new installations, we offer a wide range of termination boards that can be used instead of the DCS factory termination assemblies (FTAs) and onto which the multiplexer can be mounted directly.

Customized termination panels replace proprietary DCS, PLC, and ESD panels or are ideal for new and upgrade installations where a HIS panel replaces the standard field termination panel normally supplied by the DCS system vendor.

External termination boards are used in conjunction with proprietary DCS FTA panels. These solutions are ideal for retrofit installations. For use with requirements for functional safety, there are assessments for loop views up to SIL3.

### HART LOOP CONVERTER

A HART-enabled transmitter, valve positioner, flowmeter or other “smart device” imposes a digital signal on its 4...20 mA process signal. The HART digital signal often contains additional process measurements and other variables that may include instrument status, diagnostic data, alarms, calibration values and commands.

Many HART field transmitters are hard at work measuring process values, and producing 4...20 mA signals that are used for process control by a DCS, PLC, or some other control system. For a variety of reasons, the rest of the HART data often goes unused. The one-channel HART Loop Converter KFD2-HLC-EX1.D opens up the full potential of new and installed multivariable HART devices. The HLC provides three user-selectable, isolated analog signals proportional to a multivariable transmitter’s primary, second, third, or fourth variables. The HLC shows these process variables from the smart device with no additional process penetrations or wiring.

### YOUR BENEFITS

- Device configuration or reconfiguration
- Device diagnostics or troubleshooting
- Reading the values of additional measurements provided by the device
- Device health and status

## H-System – PLUG AND PLAY

H-System interface technology offers the ideal termination board solution. Customize your termination board to your own I/O specification with system connectors. The installation can easily be expanded with fault indication boards, HART Communication Boards and additional termination boards assembled with the complete range of isolated barriers. The HART control loop is fed to the HART communication board with a ribbon cable.

### TRANSPARENCY INTO THE FIELD

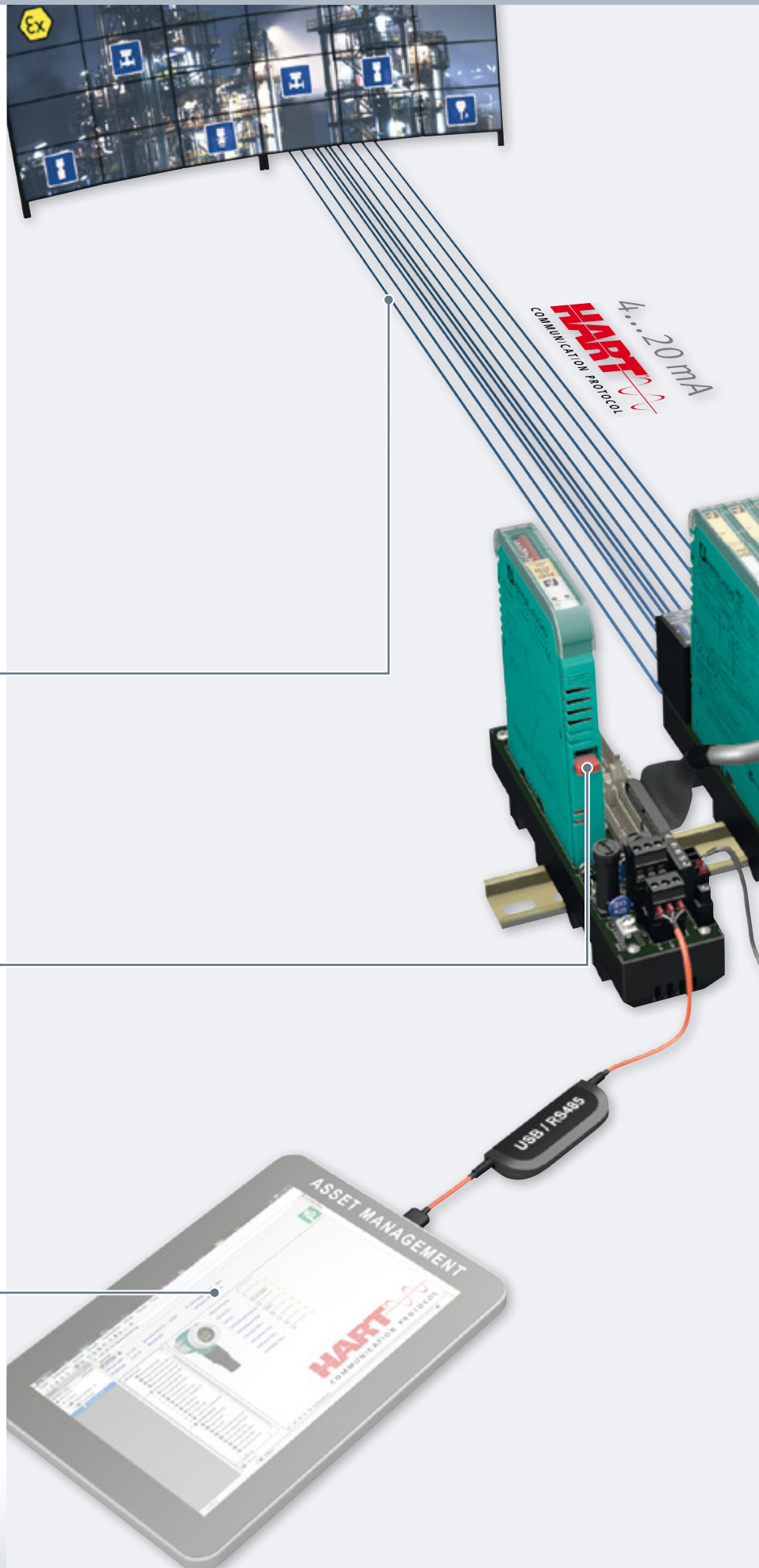
Smart transmitters and positioners use the analog 4...20 mA signal. Service and maintenance cost savings are realized in digital HART protocol communication.

### FAST CONNECTING TO THE PROCESS

The HART Multiplexer HID MUX 2700 is mounted on the HART Communication Board. The connection to the termination boards is accomplished via flat ribbon cable connectors. Each H-System HART Multiplexer can address up to 32 channels.

### EASY COMMUNICATION WITH THE FIELD DEVICE

Software tools like AMS from Emerson, PDM from Siemens, Fieldcare from Endress+Hauser, or PACTware™ enable an easy configuration of the HART Multiplexer and the field devices of all loops.





## TERMINATION BOARD TECHNOLOGY

H-System isolated barriers protect the hazardous area and power the transmitters and positioners. H-System barriers are snapped onto termination boards and are transparent to HART communication.

## HIGH AVAILABILITY

Redundant and fused powered termination boards guarantee a high grade of system reliability. Diagnostic and line fault monitoring in the modules are sent via the fault bus to your control system.

## COST SAVINGS WITH SYSTEM CONNECTORS

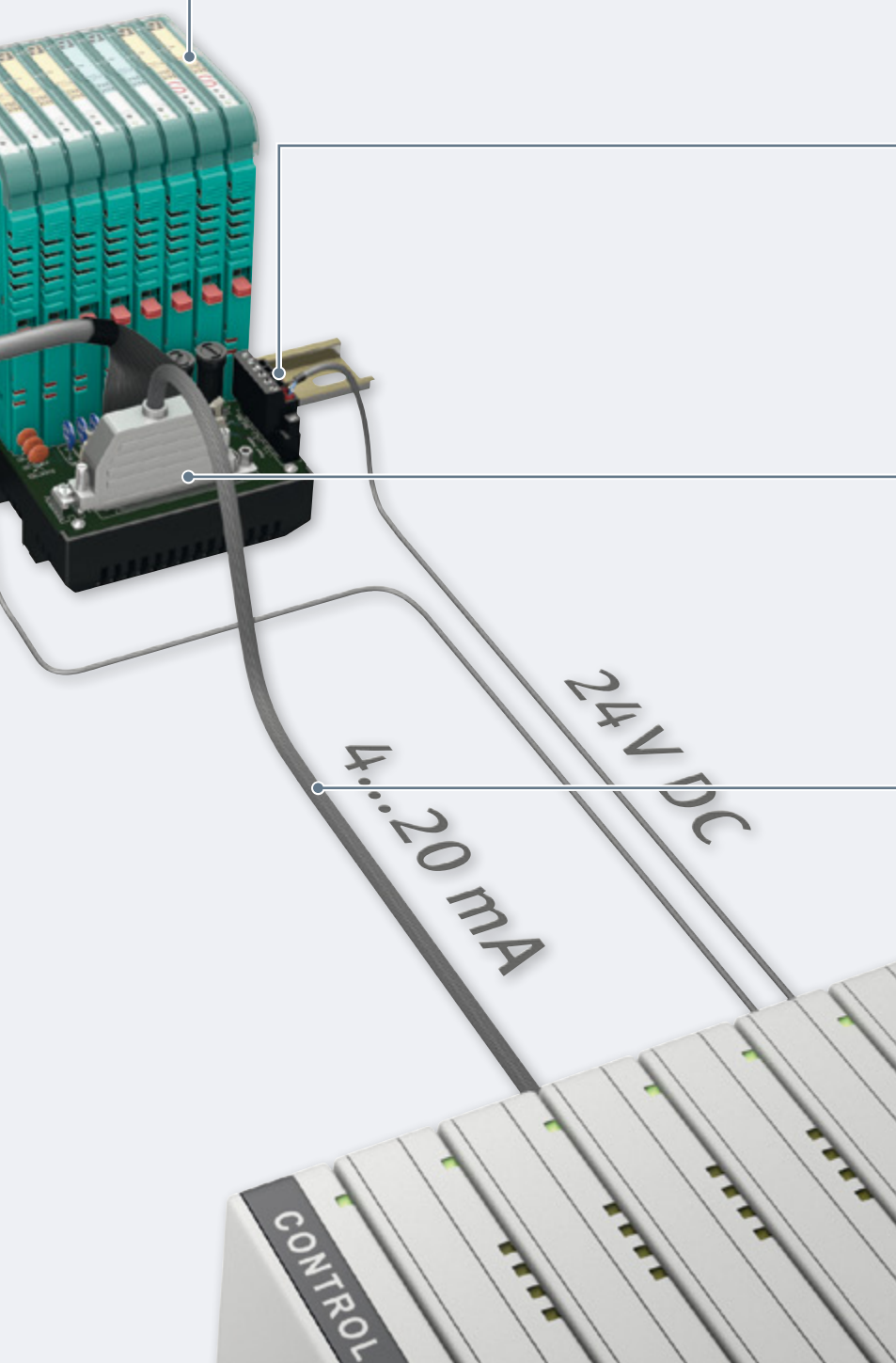
The analog 4...20 mA signals are transmitted to the DCS/PLS via system cables. This avoids errors and reduces costs compared to single wirings.

## UNINTERRUPTED SIGNAL PROCESSING

HART signals do not interrupt the 4...20 mA signals from the transmitters or valves to the PLC/DCS.

## FUNCTIONAL SAFETY

With the capacitive coupling the HART signals will not interfere the 4...20 mA information – up to SIL3.



## K-System – Multipurpose and flexible

The flexible, demand-oriented possibilities of installation – from a single module to a system solution for building a large-scale plant – characterize K-System. Our extensive line of isolators contains over 150 different models, each containing industry-leading features and benefits. K-System devices easily snap on to a 35 mm rail. An insert (Power Rail) is available that supplies power on gold-plated contact rails. Power and a collective error message are transferred to K-System modules over the Power Rail. It couldn't be easier!

### TRANSPARENCY INTO THE FIELD

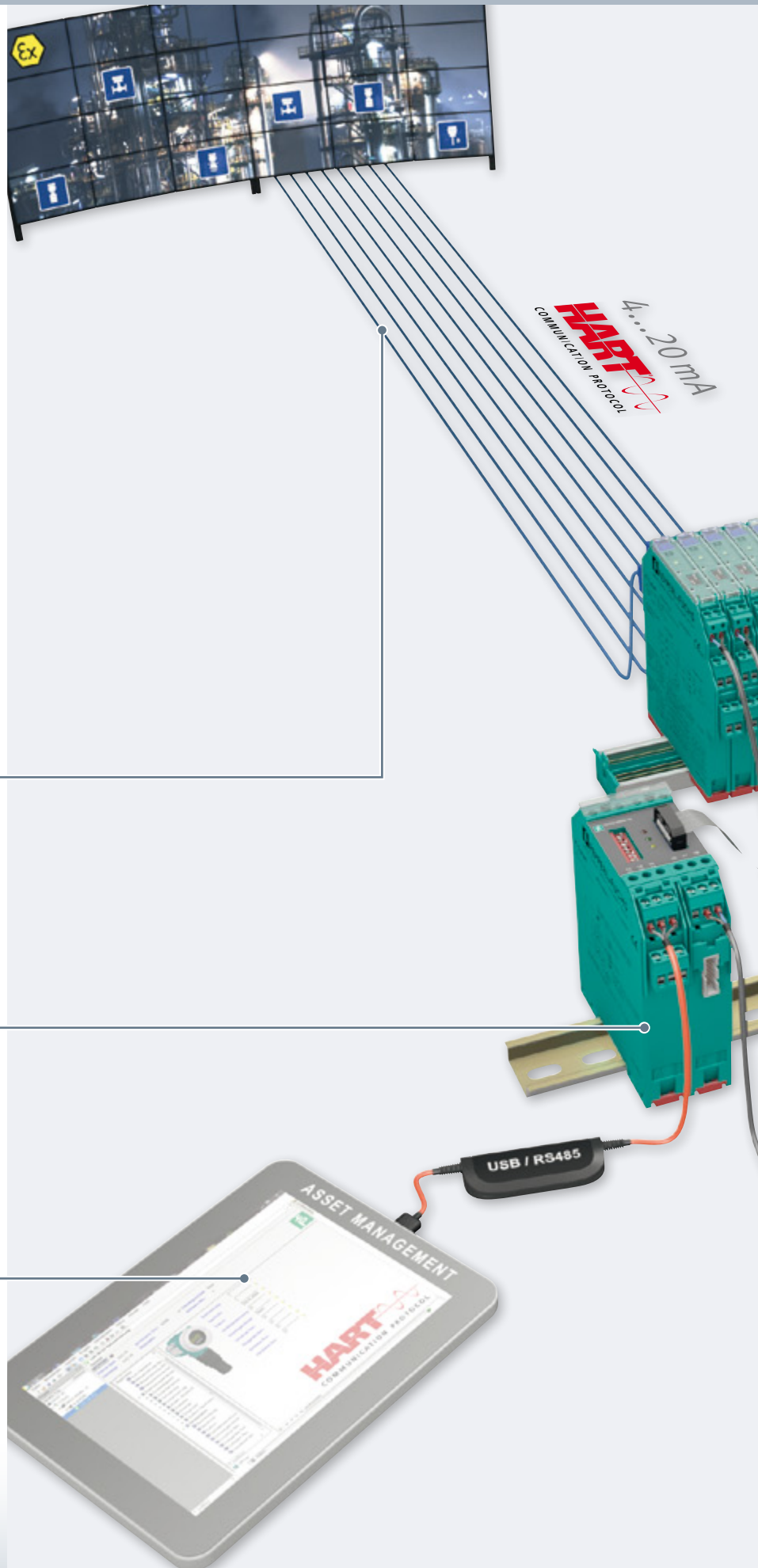
Smart transmitters and valve controllers use the analog 4...20 mA signal. Service and maintenance cost savings are realized in digital HART protocol communication.

### HART MULTIPLEXER

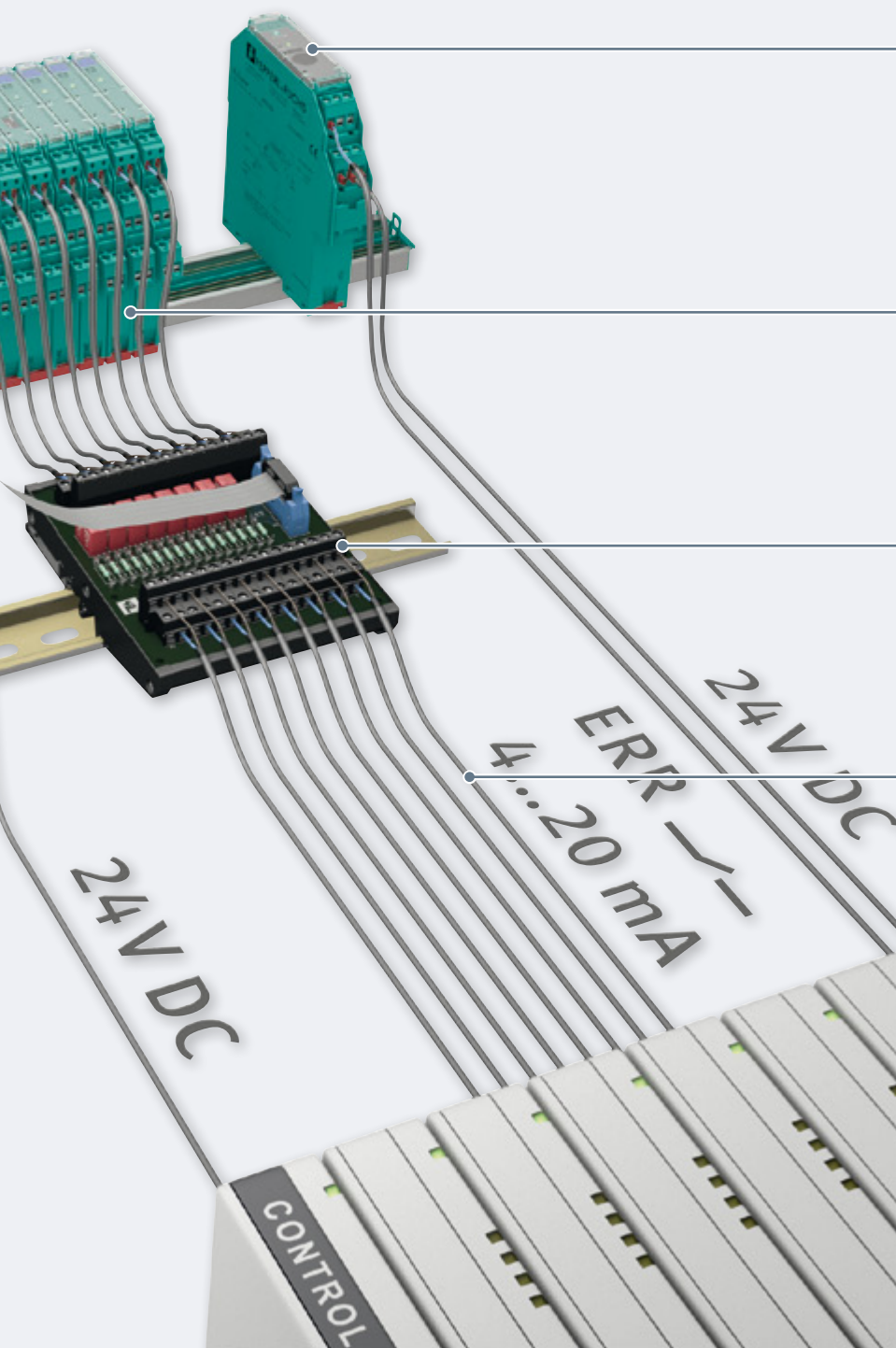
The HART Multiplexer is a master/slave system. The master can be combined with 15 additional slaves. With 31 masters, up to 7936 field devices can be used with each RS485 interface.

### EASY COMMUNICATION WITH THE FIELD DEVICE

Software tools like AMS from Emerson, PDM from Siemens, Fieldcare from Endress+Hauser, or PACTware™ enable an easy configuration of the HART Multiplexer and the field devices of all loops.







**HART**  
COMMUNICATION PROTOCOL



**SIL**  
IEC61508

#### EFFICIENT SUPPLY WITH POWER RAIL

Power Rail and the power feed module reduce the wiring of the interface modules. Additionally, a collective error message of all field loops is transmitted to the control system.

#### ISOLATED BARRIERS IN K-SYSTEM

K-System isolated barriers protect the the hazardous area and feed the transmitters and valves. K-System barriers are transparent for HART communication.

#### EASY FEED-IN OF HART SIGNALS

The HART termination board couples the HART signals into the loops. The galvanic isolation remains unaffected.

#### UNINTERRUPTED SIGNAL PROCESSING

HART signals do not interrupt the 4...20 mA signals from the transmitters or valves to the PLC/DCS.

#### FUNCTIONAL SAFETY

With the capacitive coupling the HART signals will not interfere the 4...20 mA information – up to SIL3.

## Hart Loop Converter – Signal Expander in the K-System

The one-channel HART Loop Converter KFD2-HLC-EX1.D opens up the full potential of new and installed multivariable HART devices like mass flow, temperature and pressure transmitters, or valve positioners. As a member of the K-System family, the KFD2-HLC-EX1.D has all the advantages of that system like Power Rail connection, galvanic isolation, and LED indication. The HLC provides three user-selectable analog signals proportional to a multivariable transmitter's primary, second, third, or fourth variables. The HLC shows these process variables from the smart device with no additional process penetrations or wiring.

### USE THE FULL POTENTIAL OF HART DEVICES

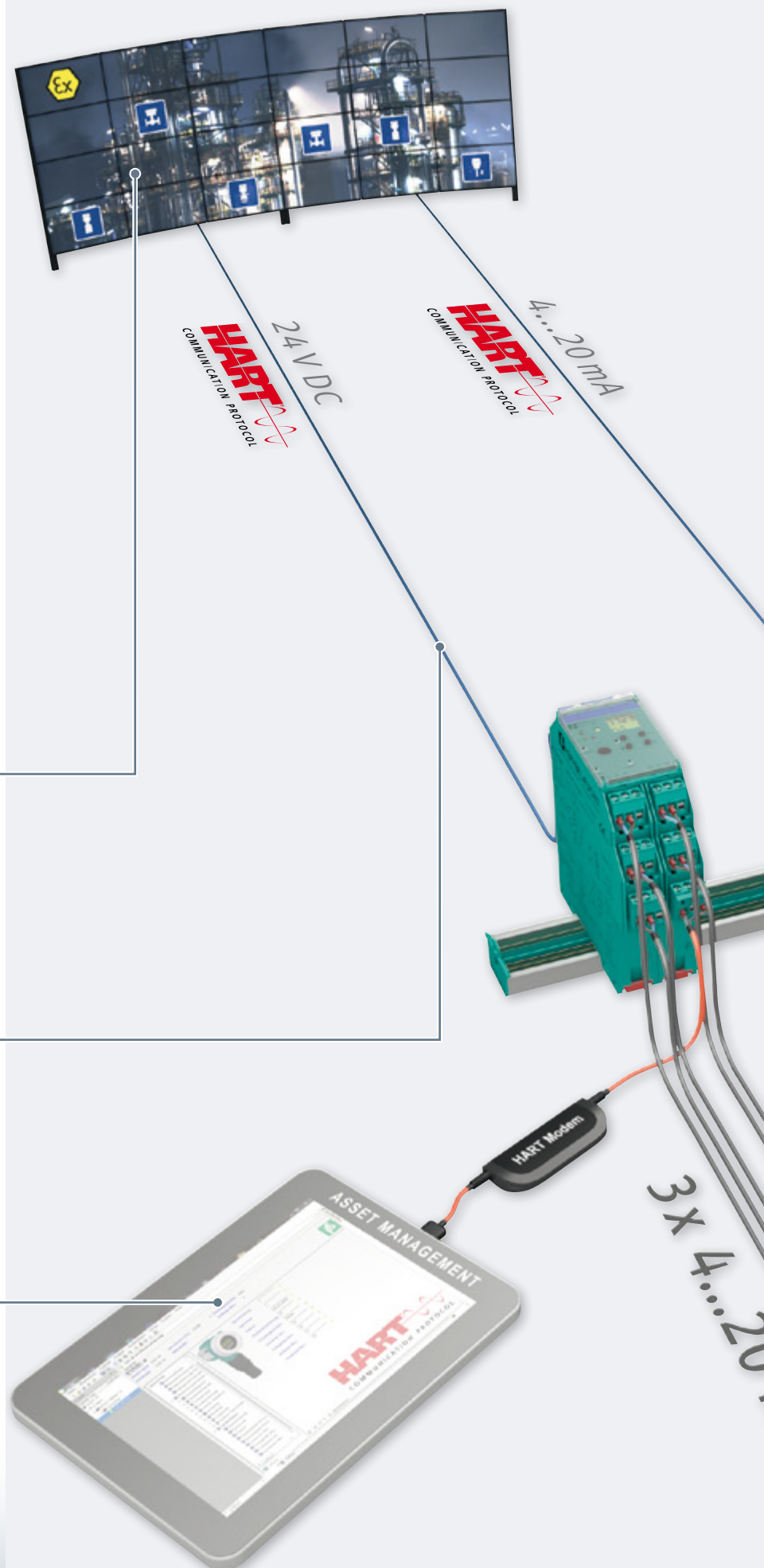
The HLC opens the full potential of new and installed multivariable HART transmitters and positioners.

### INTRINSIC SAFETY INTO THE FIELD

The power supply to the HART field devices is available directly with the HLC without additional isolated or zener barriers.

### HART COMMUNICATION TO FIELD DEVICE

With a HART communicator or other HART software tool, the connected field device can easily be parameterized from the safe side of the HLC.





#### ESTABLISHED INSTRUMENTATION

With the passive input, the HLC can be connected to existing loops. The HLC enables trusted HART transmitters and valves to remain in place and allows you to take advantage of the additional information they offer.

#### EASY SETUP OF THE HLC

The setup of the HART variables to the output signals of the HLC can easily be done via pushbuttons and display or with PACT*ware*<sup>™</sup>.

#### EFFICIENT SUPPLY WITH POWER RAIL

Power Rail and the power feed module reduce the wiring of the interface modules. Additionally a collective error message of all field loops is transmitted to the control system.

#### UNINTERRUPTED SIGNAL PROCESSING

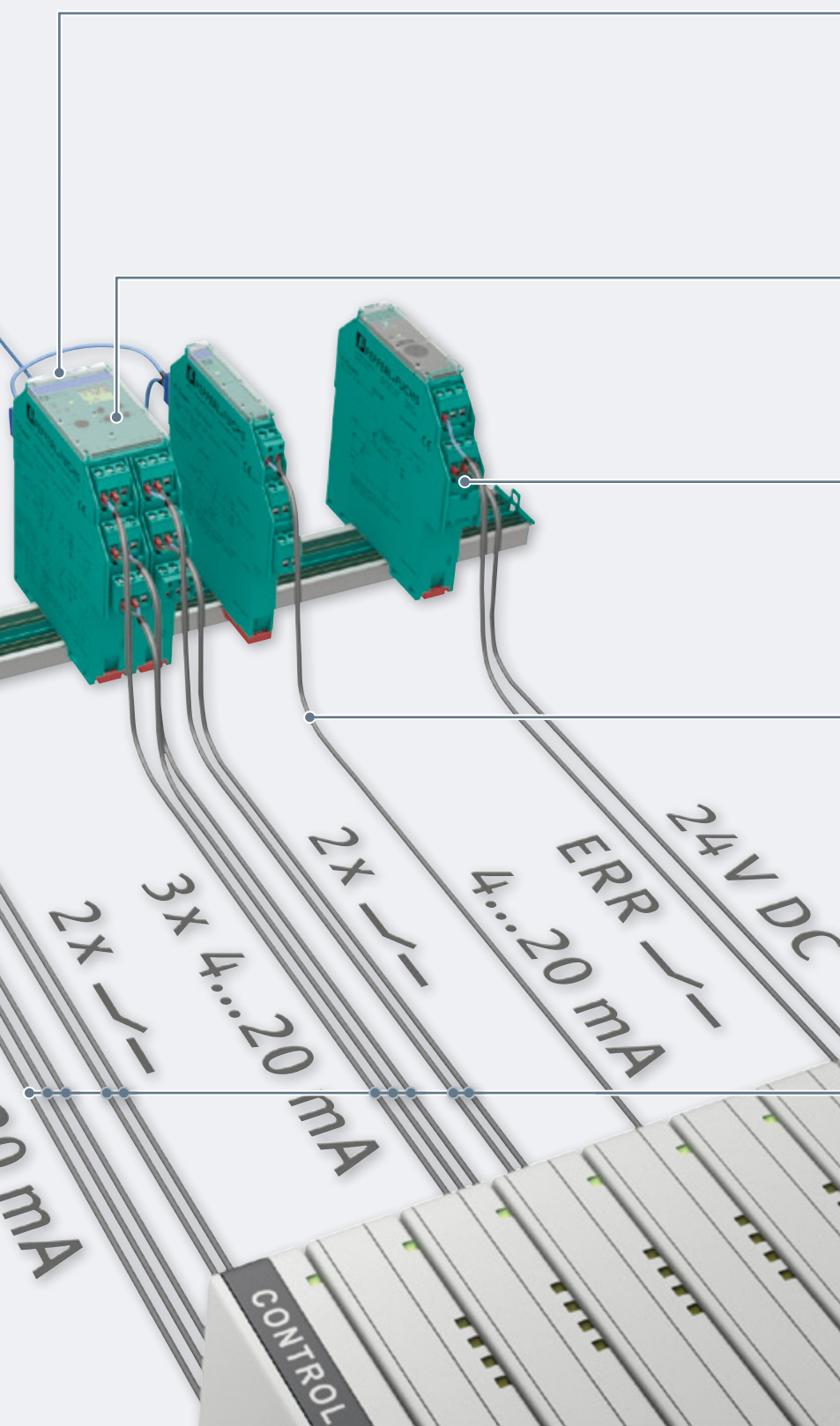
The existing analog loop won't be interrupted when accessing with the HLC.

#### FUNCTIONAL SAFETY

With the capacitive coupling the HART signals will not interfere with the 4...20 mA information – up to SIL3.

#### MORE SIGNALS WITH THE HLC

Installed transparency across the 4...20 mA can be expanded with continuous readout information of the multiple HART variables. This information can be used for additional alarms or displays.



## Customized HART Solutions

The Pepperl+Fuchs customized HART termination boards replace the proprietary termination boards provided by the DCS vendor, and provide a very simple and cost-effective solution for online HART communication. The HART information is extracted without interfering with the 4...20 mA signals used by DCS or PLC.

For proprietary DCS or PLC termination panels, the most cost-effective and integrated approach is to use a HIS termination board as the field wiring termination assembly. The H-System HART Multiplexer is directly mounted on the termination board and can address up to 32 field devices. This integrated concept reduces wiring and frees valuable control room space. This allows you to replace the proprietary DCS FTAs giving you access to all of your HART data.

### TRANSPARENCY INTO THE FIELD

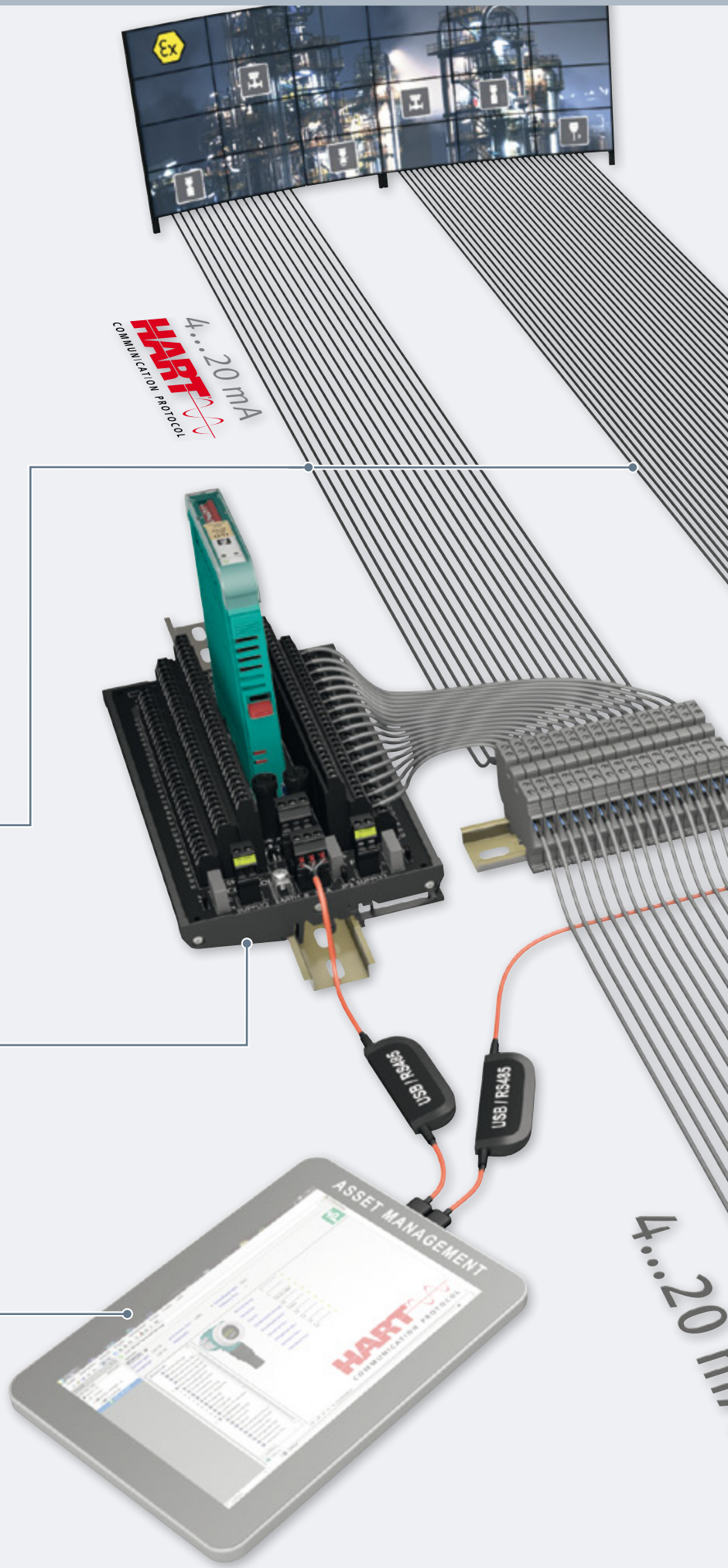
Smart transmitters and positioners use the analog 4...20 mA signal. Service and maintenance cost savings are realized in digital HART protocol communication.

### FAST CONNECTION TO THE PROCESS

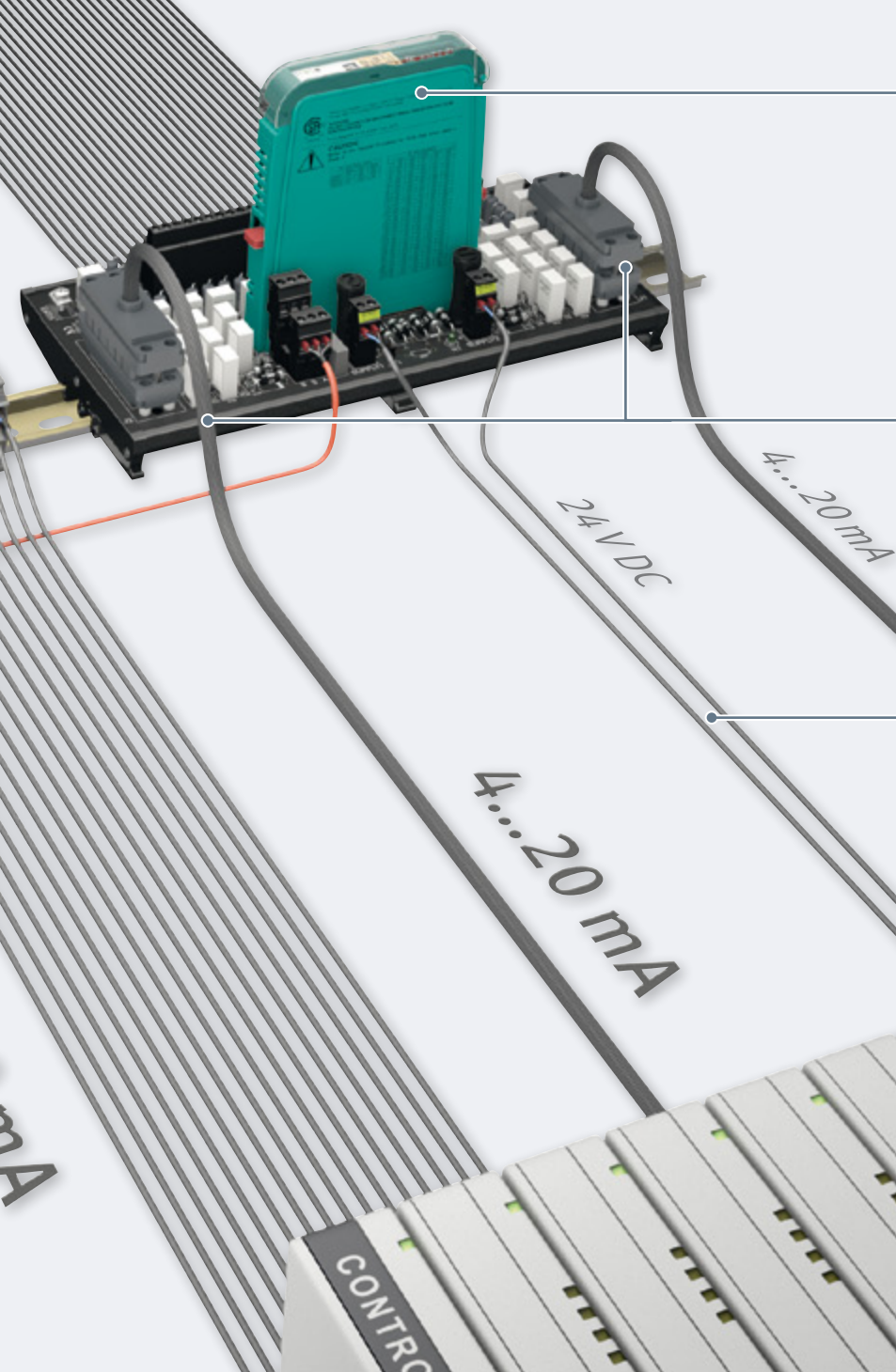
The HART Multiplexer HID MUX 2700 is mounted on the HART termination board. The connection to the field loops can be done in a parallel or serial connection. In existing control loops, the HIS termination board is connected in a parallel connection without interrupting the loop.

### HART COMMUNICATION TO FIELD DEVICE

With a HART communicator or other HART software tool, the connected field device can easily be parameterized from the H-System HART Multiplexer.



HART  
COMMUNICATION PROTOCOL  
4...20 mA



#### SERIAL CONNECTION OF FIELD TO CONTROL

These customized termination boards provide field termination connection, custom DCS-specific cable connectors, and house the HID MUX 2700 and filters (if required). They interface directly to your control system's I/O cards using standard DCS vendor cable sets.

#### COST SAVINGS WITH SYSTEM CONNECTORS

The analog 4 ... 20 mA signals are transmitted to the DCS/PLS via system cables. This avoids errors and reduces costs compared to single wirings. Use your existing DCS system cable or have custom cables made to complete your solution.

#### REDUNDANT POWER TO THE FIELD

Redundant and fused powered termination boards guarantee a high grade of system reliability.

#### CUSTOMIZED BOARDS

Customized boards replace your current FTAs without increasing cabinet space and can sometimes reduce and free up valuable cabinet room.

## H-SYSTEM – HART INTERFACE SOLUTIONS



### ISOLATED BARRIERS – TRANSMITTER POWER SUPPLIES AND CURRENT DRIVERS

The H-System interface modules are isolated barriers that transfer signals from the hazardous area to the safe side. Transmitter power supplies and current drivers feed your field device and transfer the 4...20 mA signal from and to the control side. The barriers are transparent for the HART signal. The interface modules (isolated barriers) are snapped onto the termination boards. Different connection options are available – from screw terminals to customized system cables. The HART signals are transferred to the HART Multiplexer with flat ribbon cable.



### HART MULTIPLEXER

The H-System HART Multiplexer HID MUX 2700 provides the communication for up to 32 HART devices. The inputs are galvanically isolated and are used in loops up to SIL3. The HART Multiplexer HID MUX 2700 can be mounted on the HART Communication Board and integrated termination board solutions. With the redundant power supply and RS485 terminals you get maximum availability for your application.



### INTEGRATED HART MULTIPLEXER – HPSM/32/MM-01

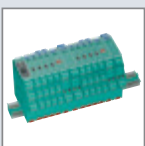
The integrated HART Multiplexer HPSM/32/MM-01 consists of a termination board and an integrated HART Multiplexer HID MUX 2700. This termination board is wired into the signal loop on the safe side and can communicate with up to 32 HART devices.



### CUSTOMIZED SOLUTIONS

The customized HART termination boards replace the proprietary DCS FTAs provided by the DCS vendor, and provide a very simple and cost-effective solution for online HART communications. The HART information is extracted without interfering with the 4 ... 20 mA signals used by DCS or PLC. The HART termination boards provide field termination connection, custom DCS-specific cable connectors, and house the HID MUX 2700 and filters (if required).

## K-SYSTEM – HART INTERFACE SOLUTIONS



### ISOLATED BARRIERS – TRANSMITTER POWER SUPPLIES AND CURRENT DRIVERS

DIN-rail mounted K-System interface modules are isolated barriers that transfer signals from the hazardous area to the safe side. Transmitter power supplies feed your field transmitter and transfer the 4...20 mA signal current to the safe side of the DCS. Current drivers transfer the signal current in the opposite direction. All barriers are transparent for the HART signal.



### HART MULTIPLEXER – HART MULTIPLEX MASTER AND SLAVE

The HART Multiplexer works as a master/slave system and when fully occupied can drive up to 256 analogue HART transmitters or HART control devices. The slave unit built into the KFD2-HMM-16 master runs the 16 channels. Up to 15 additional KFD0-HMS-16 slave units can be connected to the master, each of which can support another 16 channels.



### HART TERMINATION BOARDS

These flexible termination boards with HART pick-off connectors have 16 terminal blocks to connect up to 16 HART loops. Optional versions with built-in 250Ω HART resistors are available.



### HART LOOP CONVERTER – KFD2-HLC-EX1.D

The one-channel HART Loop Converter KFD2-HLC-EX1.\*\*\* opens up the full potential of new and installed multivariable HART devices. The HLC provides three isolated analog signals and trip values proportional to a multivariable transmitter's primary, second, third, or fourth variables from the smart device with no additional process penetrations or wiring.

## HART WITH WIRELESS TECHNOLOGY

### Wireless HART®

Whenever wired connections are impossible to install, Wireless HART® opens new opportunities. The new Wireless HART components from Pepperl+Fuchs free communication from the need of wires, while integrating conventional field devices into the wireless world.



### GATEWAY

It sets up the communication paths and determines when and over which channel the individual devices within the network communicate with each other. Additionally, the Wireless HART Gateway serves as the interface between the mesh network and the plant's process control or asset management system.



### ADAPTER

The Wireless HART Adapter upgrades a conventional HART or 4...20 mA field device with a Wireless HART interface. The adapter is battery operated and also powers the connected field device. Depending on the power requirement, the operating voltage required by the field device and the measuring cycles, operating times of several years can be achieved.



### TEMPERATURE CONVERTER

The 2-channel Wireless HART Temperature Converter is designed to connect RTDs or thermocouples and provide the according temperature values into a Wireless HART network.

## ACCESSORIES – USABLE FOR H- AND K-SYSTEM



### Wiring – HART Filter K-22µ

The new K-22 µ is the optimal solution to filter the HART signals from 4...20 mA signals. Even fast PLC cards will no longer be able to detect the HART ripple. The K-22 µ can be mounted easily into the safe side terminals. With its flat pins, it can be mounted together with the signal wires.



### ASSET MANAGEMENT – SOFTWARE

Pepperl+Fuchs' HART Multiplexer works with PACTware™ and other major plant asset management software packages. PACTware™ is a universal configuration tool for all P+F intelligent process automation products. These Windows-based packages are easy to use with simple interfaces for configuring and monitoring control devices.



### ASSET MANAGEMENT – USB HART MODEM

The USB HART modem is fully HART compliant for communication with any HART instrument and error-free slave testing. It draws the power from USB port and needs no external power supply. The modem is USB 1.1 compliant. An integral 6-foot USB connector cable and a galvanic isolated HART cable terminates in two test clips that are polarity insensitive so you may attach either one of the test clips to positive or negative poles.

## LITERATURE / DOWNLOADS



### ENGINEER'S GUIDE

In addition to over 300 product data sheets that can be used in a range of process applications, Pepperl+Fuchs Engineer's Guide reviews hazardous locations, ATEX and intrinsic safety, SIS, and SIL. It also details typical hazardous location applications and how they can be solved using intrinsic safety barriers.



# PROCESS AUTOMATION – PROTECTING YOUR PROCESS



For over a half century, Pepperl+Fuchs has been continually providing new concepts for the world of process automation. Our company sets standards in quality and innovative technology. We develop, produce and distribute electronic interface modules, Human-Machine Interfaces and hazardous location protection equipment on a global scale, meeting the most demanding needs of industry. Resulting from our world-wide presence and our high flexibility in production and customer service, we are able to individually offer complete solutions – wherever and whenever you need us. We are the recognized experts in our technologies – Pepperl+Fuchs has earned a strong reputation by supplying the world's largest process industry companies with the broadest line of proven components for a diverse range of applications.

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*Upstate New York*

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*PROTECTING YOUR PROCESS*