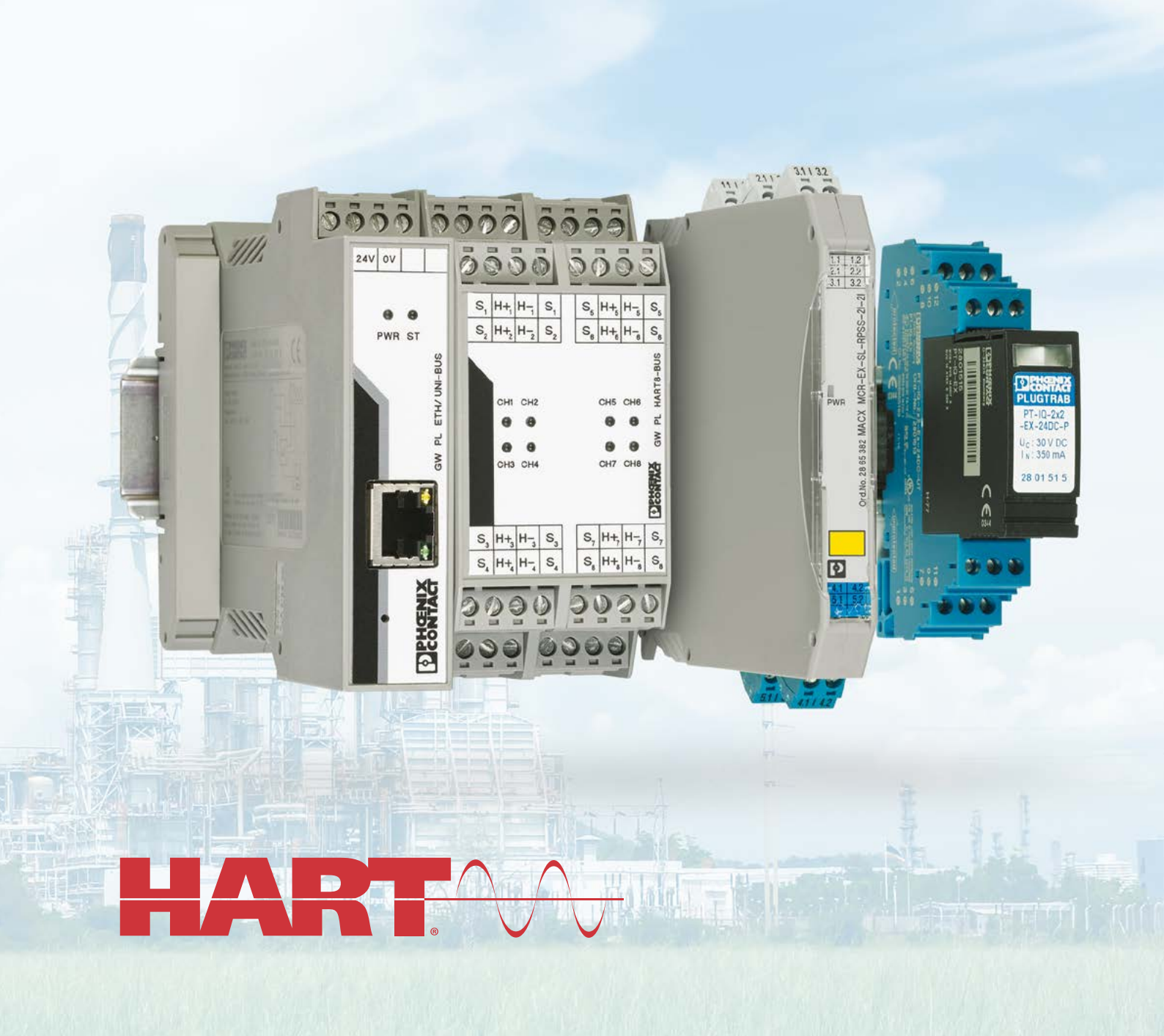


HART®

We make HART accessible

PHOENIX CONTACT
INSPIRING INNOVATIONS

HART technology
Optimize your process

Standardized nearly 30 years ago, HART (Highway Addressable Remote Transducer) is the most broadly supported protocol in the world for the process industry. HART was originally developed as a way to make analog process measurement devices "smarter" by superimposing digital data on a 4…20mA signal loop.

The standard continues to develop

Today, more methods of connecting are regularly being introduced – including wireless and Ethernet. Backward-compatibility and manufacturer interoperability safeguard you from the constraints of vendor-specific or regional solutions.

Your benefits

☑ Leverage intelligent device capabilities

- Use unified tools for device configuration
- Gain operational improvements by reducing troubleshooting time

☑ Increase system availability

- Detect device or process connection problems in realtime
- Avoid the high cost of unscheduled shutdowns

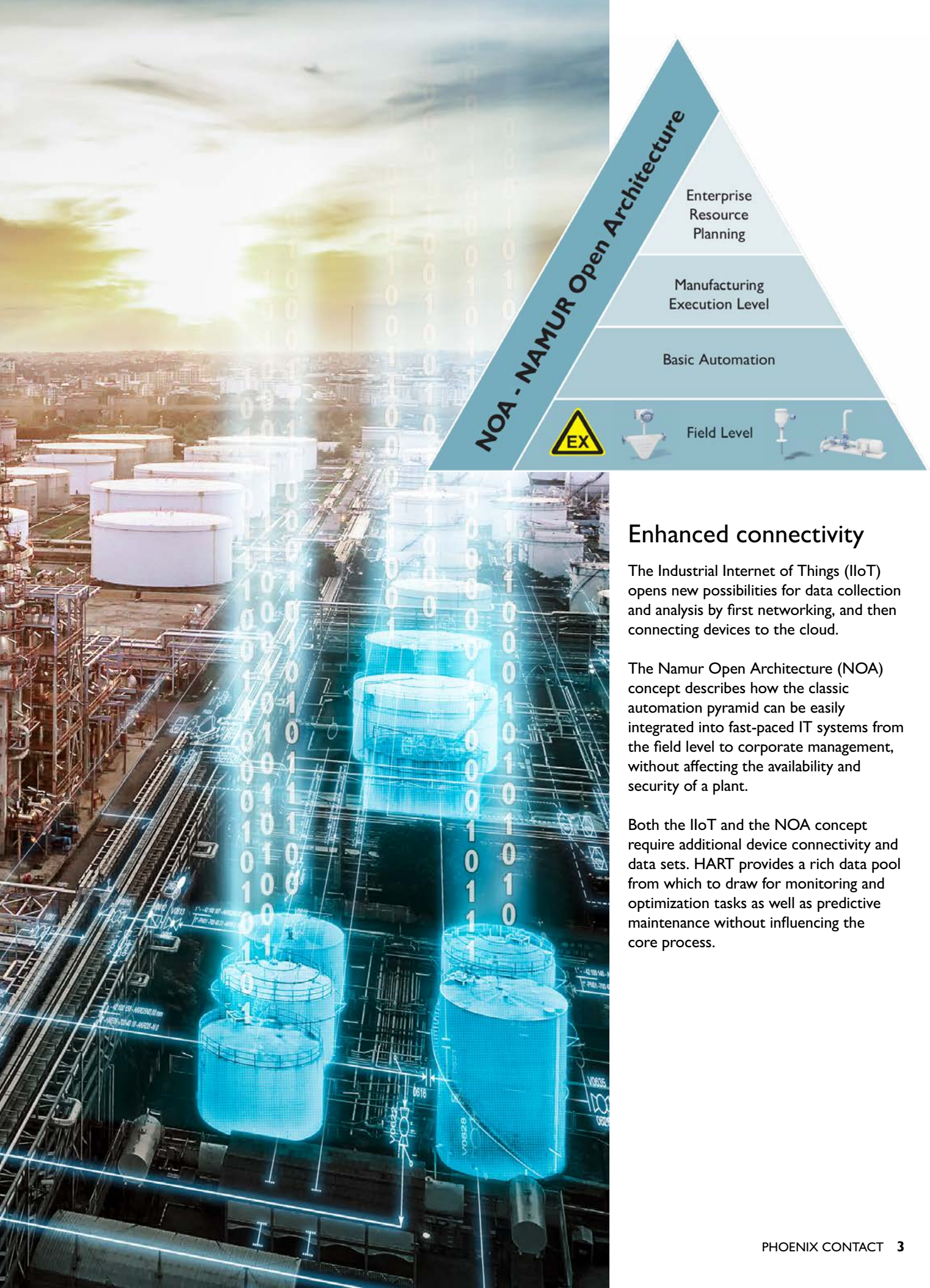
☑ Decrease maintenance costs

- Use remote diagnostics to reduce field checks
- Capture performance-trend data for predictive maintenance

☑ Improve regulatory compliance

- Enable automated record keeping of compliance data
- Take advantage of multivariable devices for more thorough reporting

Introduction to HART technology



Enhanced connectivity

The Industrial Internet of Things (IIoT) opens new possibilities for data collection and analysis by first networking, and then connecting devices to the cloud.

The Namur Open Architecture (NOA) concept describes how the classic automation pyramid can be easily integrated into fast-paced IT systems from the field level to corporate management, without affecting the availability and security of a plant.

Both the IIoT and the NOA concept require additional device connectivity and data sets. HART provides a rich data pool from which to draw for monitoring and optimization tasks as well as predictive maintenance without influencing the core process.

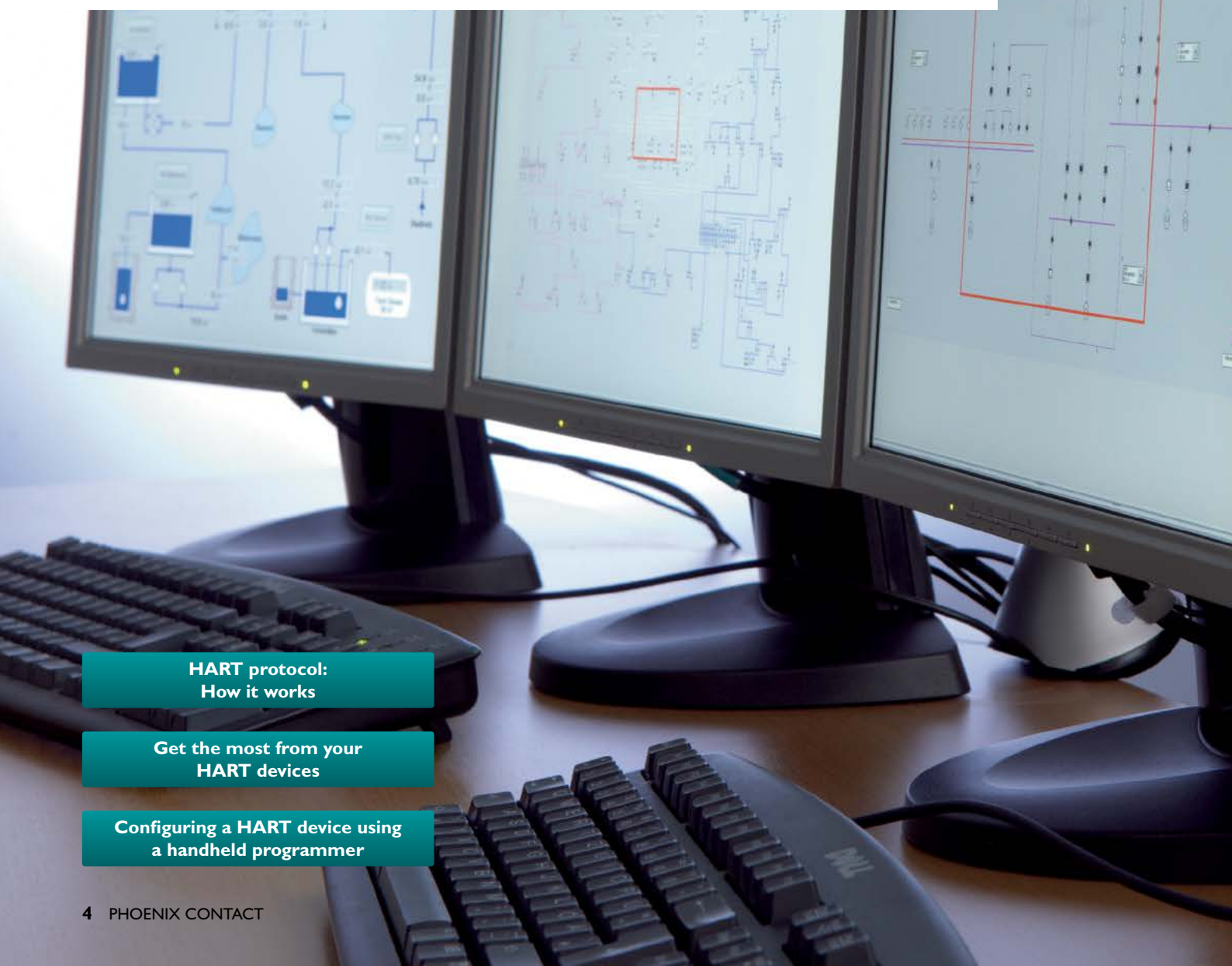
HART devices
Unlock your data

The most basic use of HART allows users to configure their devices, setting the zero, span, and engineering units, calibrating the 4…20mA loop, and selecting the sensor type. Most HART devices are multivariable, meaning that they can provide multiple measurement values, although only the primary variable is represented by the 4…20 mA signal.

Capabilities and benefits increase

Expanded use of HART-capable devices enables users to perform specialty operations, such as partial-stroke testing, data logging, and asset management using the information specific to each device type. These predictive maintenance operations help to increase plant availability and reduce operating costs.

You've already made the investment in HART. Now it's time to put that investment to work.

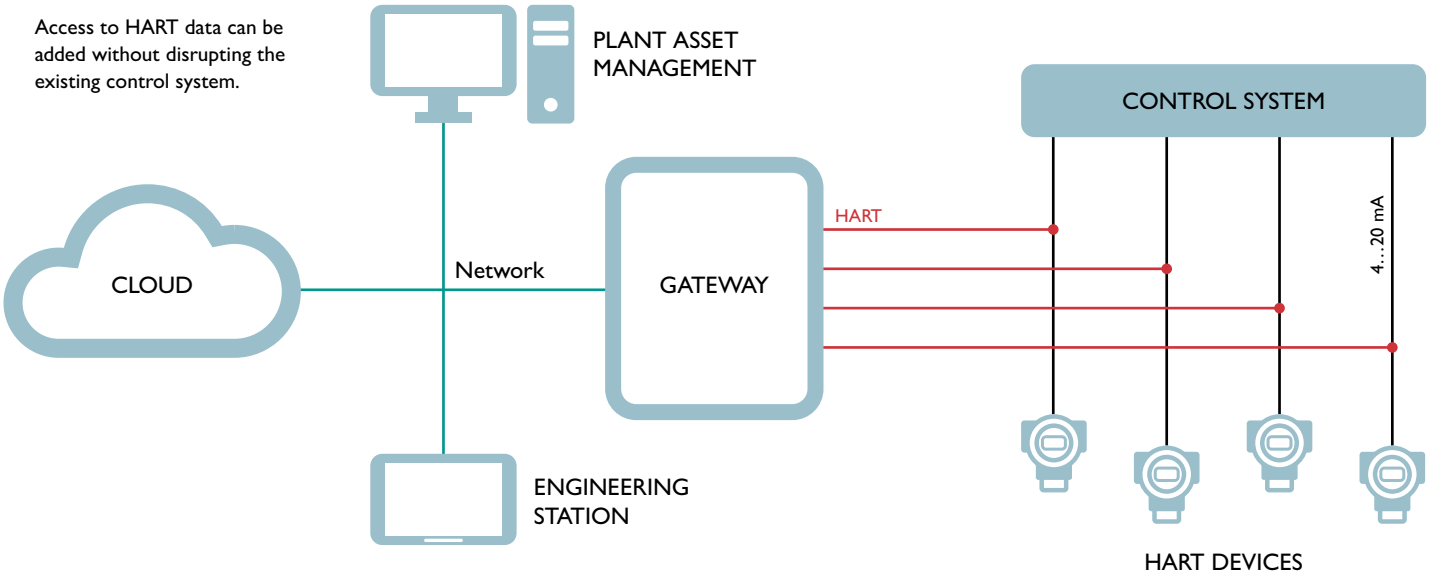


HART protocol: How it works

Get the most from your HART devices

Configuring a HART device using a handheld programmer

Access to HART data can be added without disrupting the existing control system.



Level

The status of the sensor can be reported to aid in troubleshooting faulty measurements. A level transmitter may also support high and low alarm set points.

Learn more

Temperature

In addition to the process temperature, ambient temperature can be reported along with cold junction temperatures. Further, the sensor breakage can be detected and reported to aid in troubleshooting.

Pressure

Differential pressure transmitters have variables for differential pressure, cell temperature, and static pressure that can be used for calculating flow. Sensor breakage and status can also be detected.

Flow

Coriolis mass-flow meters can report process media density. A DP-based mass-flow meter can report absolute pressure and temperature in addition to the main process measurement.

Learn more

pH

In addition to the pH measurement, a HART pH device can provide temperature measurement, as well as other indicators of the sensor health and possible failure.

Valve positioner

The actual valve position feedback can be obtained from a digital positioner. Comparing this value to the target position can indicate a valve that is sticking.

Learn more

Applications using HART

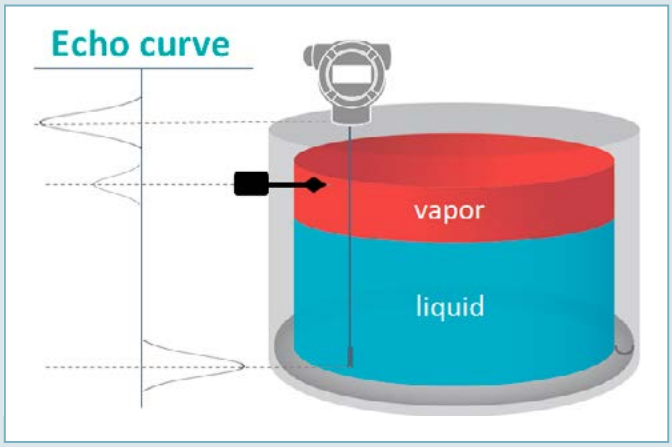
The utilization of HART data is very scalable, ranging from device configuration in the field or on the bench, to enabling facilities to implement a predictive maintenance program for a single device type (such as flowmeters), to implementing a complete plant asset management strategy.

Guided Wave Radar optimization

Guided Wave Radar (GWR) level transmitters work by sending a pulse down the guide (such as a cable, rod, or coax) and measuring how long it takes to receive the signal back. This is also called Time Delay Response, or TDR.

GWR level gauges frequently ship preconfigured from the manufacturer by specifying tank height, media dielectric, and other process conditions.

However, the mapping of the envelope curve of a particular solution cannot be factory configured and must be done with the transmitter installed. Obstructions that may be in the tank, such as mixing paddles, point level devices such as tuning forks or capacitive probes, valves, or other mechanical obstructions can cause faulty readings. By using HART, it is possible to graphically identify where these obstructions are, and "zero" out those obstructions to eliminate erroneous measurements.



Flowmeter verification

Flowmeters operating based on a Coriolis, electromagnetic, ultrasonic, vortex, or thermal measuring principle do not have moving parts subject to wear. But they can have problems that require recalibration, including failure of an internal part or degradation because of temperature effects on electronics — or corrosion, clogging, or coating buildups in the flowmeter body.

Flowmeter faults during operation that go undetected by diagnostics can result in an unexpected plant shutdown, product loss, or a reduction in product quality. Process manufacturing and other industrial facilities must often provide documented evidence of flowmeter performance to maintain compliance with various regulatory agencies, ensure product quality, and optimize production. Often, this is achieved with "wet calibrations," in which the flowmeter is removed from the process and taken to a lab for formal testing and certification or re-calibration. After calibration, the instrument is then sent back to the facility to be reinstalled.

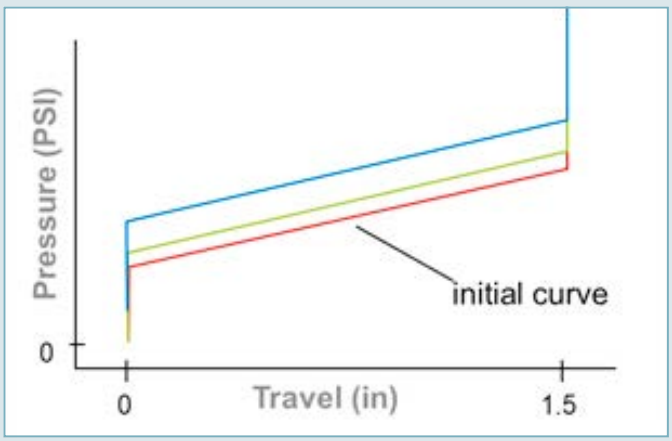
Using HART helps plants accomplish these tasks through built-in verification techniques. The flowmeter's transmitter electronics run an onboard diagnostics program during which all relevant components of the instrument are checked to confirm and document that the instrument is still in calibration and none of the meter components have drifted outside original tolerances.

Valve maintenance

Valves account for up to 90% of safety failures in a facility and 20 to 50% of maintenance turnaround time when using preventative maintenance schedules.

Using diagnostic data provided via HART, operators can periodically review valve signatures to find early indicators of wear or damage before a failure occurs.

A valve signature is a chart that plots two diagnostic parameters against each other, such as the air pressure and the valve travel distance. The valve signatures are checked periodically and compared to earlier signature data to see how the performance has changed over time.



Ethernet HART multiplexer

The GW PL...-BUS modular gateway system provides a simple way to parameterize and monitor HART devices via HART-IP, PROFINET, Modbus TCP, OPC UA, and FDT/DTM for easy integration into nearly any host system. It is a modern alternative for traditional RS-485 HART multiplexers.

Suitable for any application

The multiplexer consists of a head station and a variety of HART expansion modules to suit any application need. A digital I/O expansion module enables alarm and status monitoring, as well as actuation of motors, pumps, blowers, and other equipment. Communicate with up to 40 HART devices per system. The modular design provides a scalable solution for modern distributed control systems and phased roll-outs.

Your advantages

- ☑ Avoid unplanned downtime with a plant asset management (PAM) system
- ☑ Collect additional process variables from HART transmitters
- ☑ Add new measurement points to maxed-out control systems

OPC UA

Learn more

HART-IP

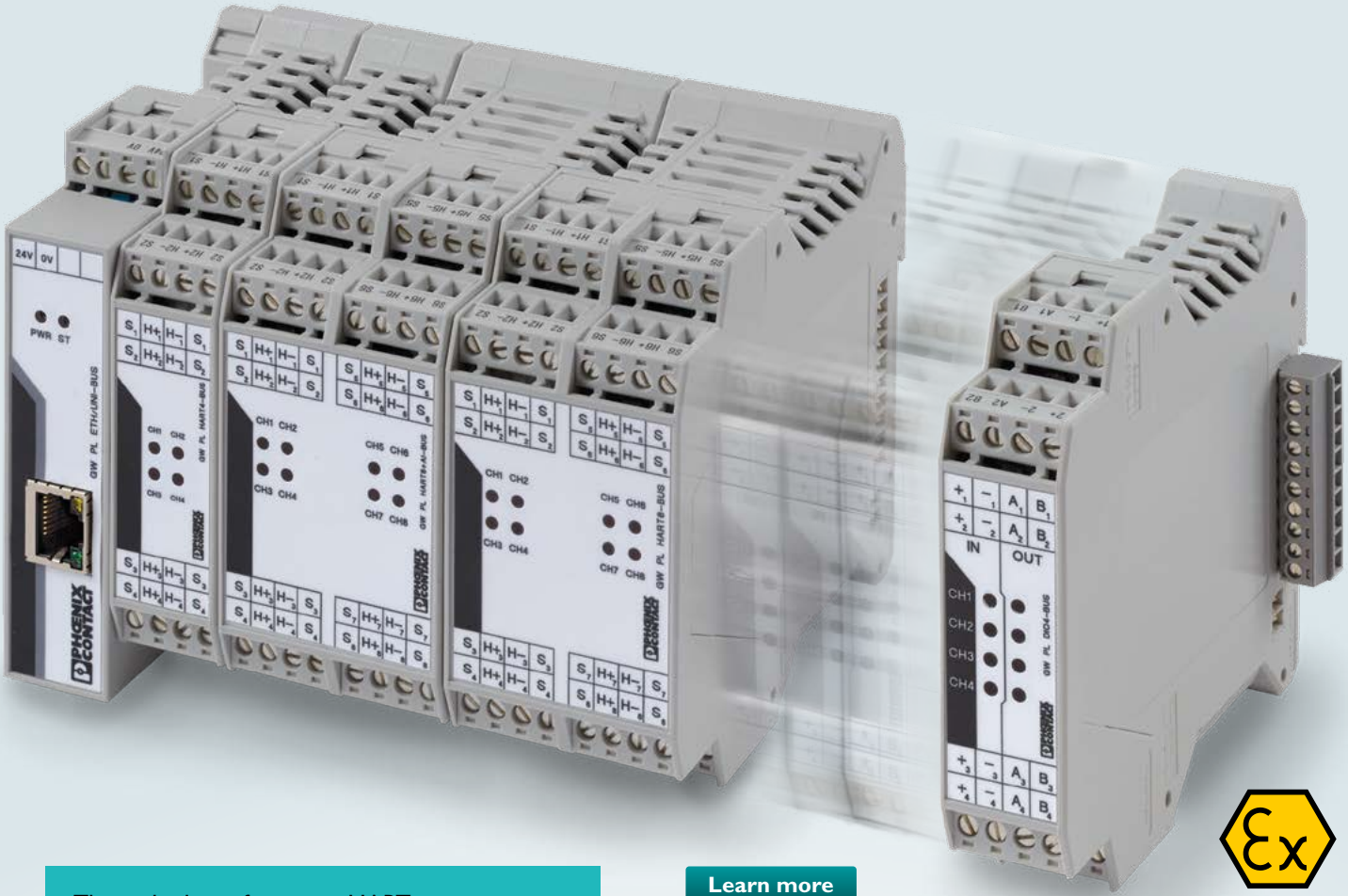
PROFINET INDUSTRIAL INTERNET

Learn more

Modbus

FDT Group

Learn more



The multiplexer features a HART master on each channel for the fastest possible updates and execution times, optimizing partial-stroke testing, valve diagnostics, and batch data transfers.

Learn more

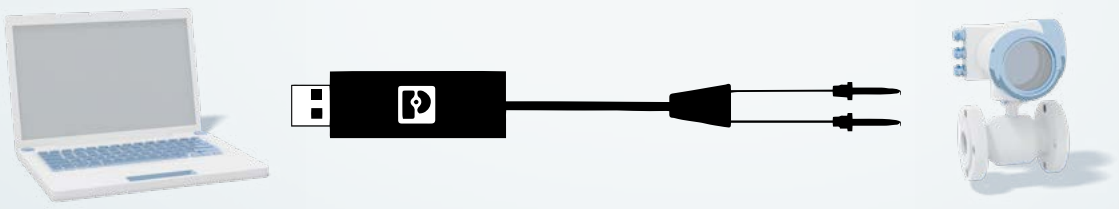
Type description	Ord. no.	Description
GW PL ETH/UNI-BUS	2702233	Ethernet HART multiplexer head station with HART-IP, FDT/DTM, Modbus TCP, and PROFINET protocols. Connect up to five expansion modules.
GW PL ETH/BASIC-BUS	2702321	Ethernet HART multiplexer head station with HART-IP, FDT/DTM, and Modbus TCP protocols. Connect up to five expansion modules.
GW PL HART4-BUS	2702234	Four-channel HART expansion module for Ethernet HART multiplexer for use with existing HART loops.
GW PL HART8-BUS	2702235	Eight-channel HART expansion module for Ethernet HART multiplexer for use with existing HART loops.
GW PL HART8+AI-BUS	2702236	Eight-channel HART expansion module for Ethernet HART multiplexer with built-in loop current supplies and terminating resistors.
GW PL HART4-R-BUS	2702879	Four-channel HART expansion module with screw connection and 250 Ohm internal input resistors.
GW PL HART8-R-BUS	2702880	Eight-channel HART expansion module with screw connection and 250 Ohm internal input resistors.
GW PL DIO4-BUS	2702237	Digital I/O expansion module for Ethernet HART multiplexer with four digital inputs (0…30 V DC) and four digital outputs (0….30 V DC, 1 A), addressable via Modbus TCP.

USB modem

The GW HART USB MODEM, a cost-effective alternative to expensive handheld devices, is compatible with major automation software packages such as Simatic PDM, Emerson AMS®, ABB Smart Vision, and the HCF OPC Server.

The GW HART USB MODEM is also supplied with a CommDTM for use with any FDT container application, such as Pactware, which allows the communication between devices on the HART bus and their DTMs. With this technology, the calibration, commissioning, and configuration of HART devices can be accomplished quickly and simply.

Learn more



Type description	Ord. no.	Description
GW HART USB MODEM	1003824	SB HART modem cable for communication between a PC and HART devices, cable length: 1m.

Fieldbus gateways

The GW PL...HART fieldbus gateways connect HART devices to a fieldbus network such as PROFIBUS DP, PROFIBUS PA, or Foundation Fieldbus.

The HART process variables are thus available as transducer blocks to the fieldbus controller.

Learn more

Type description	Ord. no.	Description
GW PL DP/HART	2316362	HART to PROFIBUS DP protocol converter
GW PL PA/HART	2316361	HART to PROFIBUS PA protocol converter
GW PL FF/HART	2316360	HART to Foundation Fieldbus protocol converter

HART multiplexer

The MACX MCR-S-MUX HART multiplexer enables communications between an engineering station or asset management system to HART field devices.

The multiplexer connects to a host system via RS-485 and supports up to 32 HART devices.

The HART multiplexer connects to termination boards and termination carriers from Phoenix Contact.

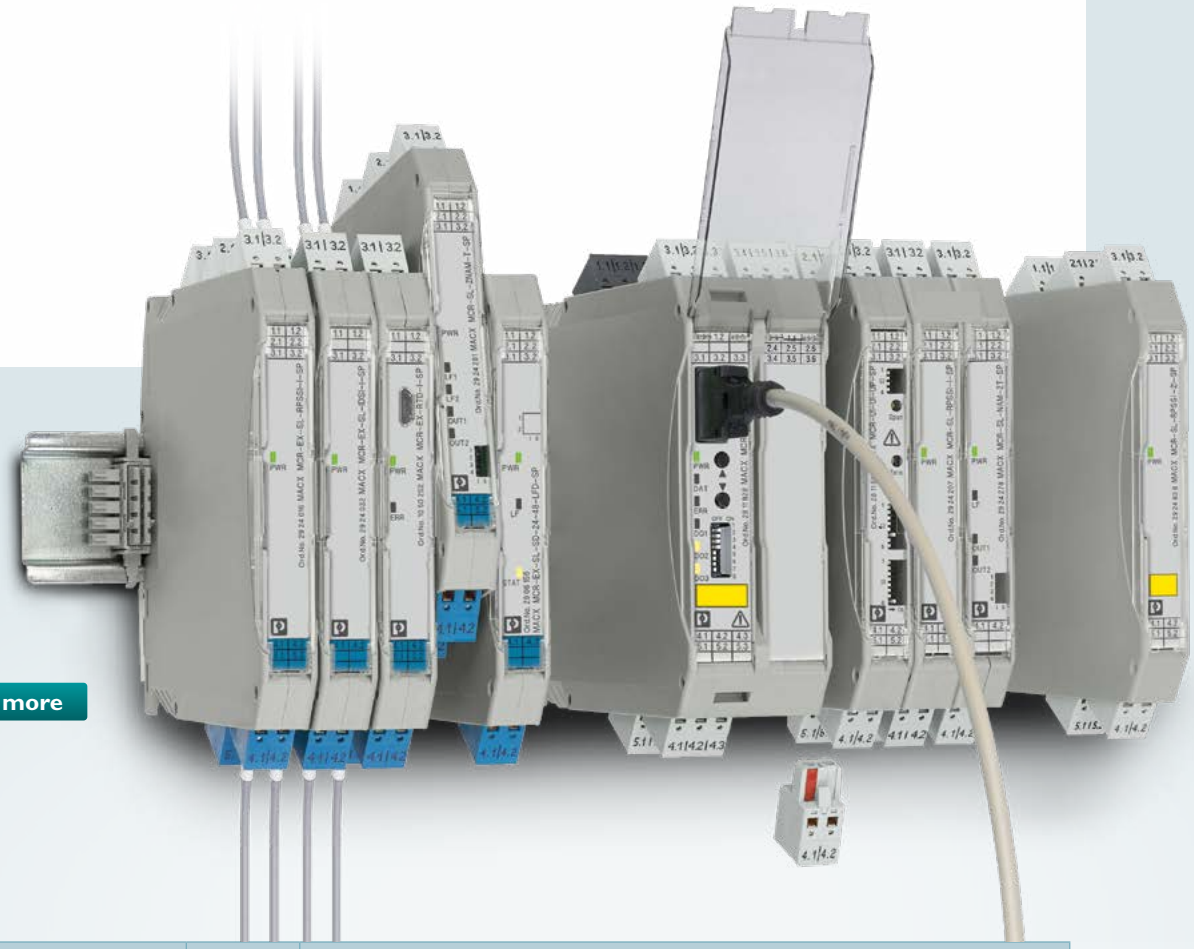
Learn more

Type description	Ord. no.	Description
MACX MCR-S-MUX	2865599	HART multiplexer for online configuration and diagnostics of up to 32 HART-compatible field devices.
MACX MCR-S-MUX-TB	2308124	16-channel termination board for connection to MACX MCR-S-MUX, supports two-, three-, and four-wire HART devices.
GW DEVICE SERVER 1E/1DB9	2702758	Serial device server for converting serial data (RS-232/422/485) to Ethernet data (RJ45). Supports TCP and UDP protocols.

Signal conditioners

Phoenix Contact offers a complete range of analog signal conditioning solutions for use in a variety of applications.

Repeater power supplies and output isolators are available specifically for use with HART-capable devices. They are designed to provide isolation and boost the voltage in the loop to compensate for long cable runs, while maintaining transparency to the HART communication.



Learn more

Type description	Ord. no.	Description
MINI MCR-2-RPSS-I-I	2902014	Repeater power supply with three-way isolation, input signal 0(4)…20mA, output signal 0(4)…20mA. 6 mm wide, and -40° to 70°C operating temperature.
MACX MCR-SL-RPSSI-I	2865955	Repeater power supply with three-way isolation, input signal 0(4)…20mA, output signal 0(4)…20mA. SIL 2 according to IEC 61508.
MACX MCR-EX-SL-RPSSI-I	2865340	Intrinsically safe Ex-i repeater power supply with three-way isolation, input signal 0(4)…20mA, output signal 0(4)…20mA. SIL 2 according to IEC 61508.
FA MCR-EX-HT-TS-I-OLP-PT	2908743	The output loop-powered head transmitter transmits up to two sensor signals from RTD and TC sensors as well as from resistance-type sensors and voltage sensors via HART communication or 4 ... 20 mA, configurable. SIL 2/3, intrinsic safety.
MACX MCR-EX-TS-I-OLP	2908660	The output-loop-powered temperature transmitter transmits up to two sensor signals from RTD and TC sensors as well as from resistance-type sensors and voltage encoders via the HART communication or 4 ... 20 mA, configurable. SIL 2/3, intrinsic safety, screw connection.

Surge protection

Phoenix Contact offers a full range of surge protection products for power supply systems, measurement and control technology, data communications, and transceiver systems, including multiple surge protection options for HART interfaces.

Pluggable and fixed

Pluggable surge arresters enable trouble-free replacement without rewiring or impacting loop impedance. Narrow-footprint fixed versions maximize cabinet space. All versions protect sensitive electronics from incoming high-energy surge voltages.

Learn more

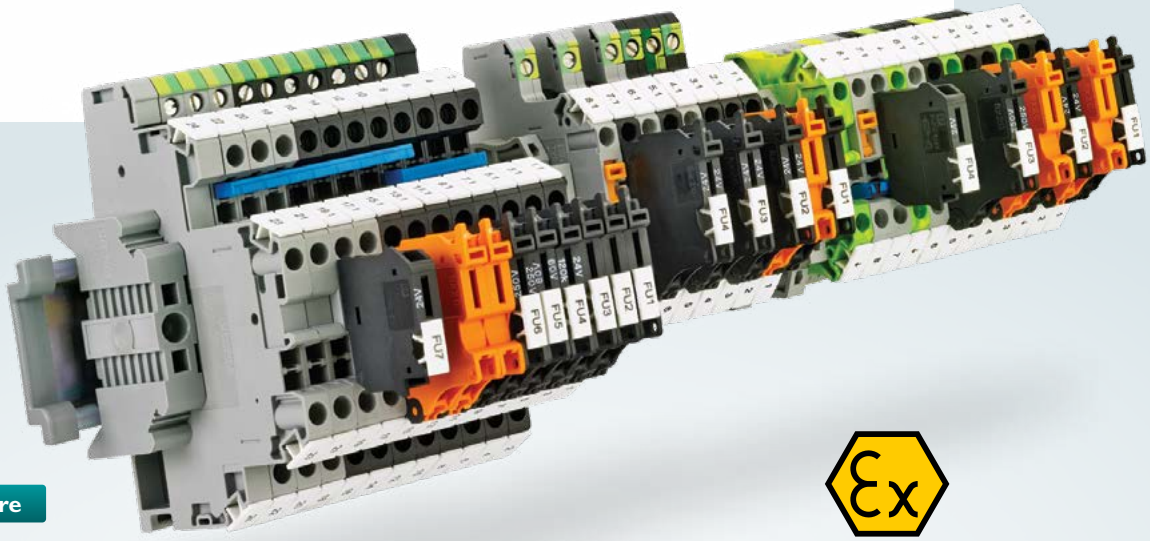
Type description	Ord. no.	Description
PT-IQ-1X2-EX-24DC-UT	2801512	Pluggable surge protection with integrated multi-stage status indicator on the module for one 2-wire floating Ex-i signal circuit. Includes base and protective plug element.
PT-IQ-2X2-EX-24DC-UT	2801513	Two-channel pluggable surge protection with integrated multi-stage status indicator on the module for 2-wire floating Ex-i signal circuits. Includes base and protective plug element.
PT 2XEX(I)-24DC-ST (plug) PT 2XEX(I)-BE (base)	2838225 2839279	Two-channel pluggable surge protection for two 2-wire floating Ex-i signals.
PT 1X2-24AC-ST (plug) PT 1x2-BE (base)	2856058 2856113	Pluggable surge protection for two 2-wire floating signal circuits in non-Ex applications.
TTC-6P-1X2-M-EX-24DC-UT-I	2906824	Surge protection, consisting of protective plug and base element, with integrated status indicator and disconnect knife for a 2-wire floating Ex-i signal circuit, e.g., 0(4) ... 20 mA current loop, HART-compatible.
LIT 2X2-24	2804623	Two-channel surge protection, 6.2 mm wide, for 2-wire floating Ex-i signal circuits.

Terminal blocks

Phoenix Contact has developed several terminal block configurations to aid in the wiring of control loops and minimize the amount of panel space required to terminate these signals. These terminal blocks incorporate a top-level fuse or disconnect function with a feed-through level and ground foot for shield connection.

Organize and simplify

This configuration perfectly organizes each wire of the signal loop into one terminal block, including a grounding location for each shield. A hinged fuse plug houses a 5 x 20-mm fuse for circuit protection and, when required, can also include a blown-fuse indication.



Learn more

Type description	Ord. no.	Description
UT 4-PE/L/HESI (5x20)	3214320	Double-level fuse block with ground foot and pass-through level without indication.
UT 4-PE/L/HESILED 24 (5x20)	3214321	Double-level fuse block with 24 V blown-fuse indication, ground foot and pass-through level.
UT 4-PE/L/HEDI	3214324	Double-level terminal block with ground foot and pass-through level and hinge disconnect.
UT 4-PE/L/MT	3214364	Double-level terminal block with ground foot and pass-through level and knife disconnect.
UT 4-PE/L/N	3214361	Double-level terminal block with ground foot and pass-through level.
UT 4-PE/L/TG	3214365	Double-level terminal block with ground foot and pass-through level and plug zone.
UT 4-PE/L/HESI (5x20)	3214320	Double-level fuse block with ground foot and pass-through level without indication.

Process displays

The FA MCR process displays allow you to monitor and display process variables from HART devices, providing a local view into the behavior of the process and the instrumentation.

Learn more

Type Description	Ord. no.	Description
FA MCR-EX-DS-I-I-OLP	2908800	Loop-powered process indicator with HART communication for installation in the control cabinet, Ex-rated for installation in Zone 1.
FA MCR-DS-I-I-OLP	2908781	Loop-powered process indicator with HART communication for installation in the control cabinet.
FA MCR-EX-FDS-I-I-OLP	2908801	Loop-powered process indicator with HART communication for installation in the field, Ex-rated for installation in Zone 1.
FA MCR-FDS-I-I-OLP	2908782	Loop-powered process indicator with HART communication for installation in the field.
FA MCR-D-RM	1032996	DIN rail mounting bracket for 2908800 and 2908781.
FA MCR-FDS-R250	2908802	HART communication resistor, 250Ω, for process displays.
FA MCR FDS-PM	2908783	Pole mounting bracket for 2908801 and 2908782.

We make HART accessible

Phoenix Contact's portfolio of HART products connects you to your process in ways never before possible.

- Access diagnostic data from anywhere via Ethernet
- Add new measurement points without the time and expense of wiring
- Connect your devices and provide convenient access for testing
- Protect your investment with surge protection and isolation

Phoenix Contact is your trusted partner for reliable HART communication.

HART®

For more information on our HART products, visit: **www.phoenixcontact.com**

Ongoing communication with customers and partners worldwide

Phoenix Contact is a global market leader based in Germany. We are known for our future-oriented components, systems, and solutions in the fields of electrical engineering, electronics, and automation. With a global network reaching across more than 100 countries with over 17,400 employees, we stay in close contact with our customers, something we believe is essential for success.

Our wide variety of innovative products makes it easy for our customers to find future-oriented solutions for multiple applications and industries. We focus predominantly on the fields of energy, infrastructure, process, and factory automation.

You can find your local partner at

www.phoenixcontact.com

INSPIRING INNOVATIONS