

Minimizing expenditure.
Maximizing convenience.
Simplifying operations.

WirelessHART®



Your automation, our passion.

 **PEPPERL+FUCHS**



**Automation is our world.
A perfect application
solution is our goal.**

A willingness to take entrepreneurial risks, a pioneering spirit, and a firm belief in their own inventive powers – these were the assets that Walter Pepperl and Ludwig Fuchs started out with when they opened their Mannheim radio repair shop in 1945. Their invention of the proximity switch a few years later proved their strength. It was also the starting point in a successful history defined by close customer relationships as well as innovative automation technologies and procedures.

Then as now, our focus is directed squarely on the individual requirements of each customer. Whether as a pioneer in electrical explosion protection, or as a leading innovator of highly

efficient sensors – the close communication with our customers is what allowed us to become the leader in automation technology. Our main objective is combining state-of-the-art technologies and comprehensive services to optimize our customers' processes and applications.

For more information, please visit our website:
www.pepperl-fuchs.com

Table of Contents

<i>WirelessHART</i> [®] Overview	4
Industries and Applications	6
Products	8
Application Examples	10
Software	12
Life Cycle of <i>WirelessHART</i> Networks	14

Minimum Effort. Maximum Flexibility.

Measurement points that are difficult to access, mobile plant equipment, or mobile process equipment – wherever cable connections are too complex, *WirelessHART* is the technology of choice. It combines wireless communication with the benefits of HART technology, allowing extensive network structures to be established. All Pepperl+Fuchs *WirelessHART* products are interoperable with all registered *WirelessHART* products.



Secure and convenient

Fast commissioning, easy maintenance, trouble-free operation – *WirelessHART* is less complicated than almost any other technology. Secure, wireless communication is also ideal for hazardous areas and allows network structures with up to 250 subscribers. A highly efficient alternative to laborious cable installations.

Extensive and efficient

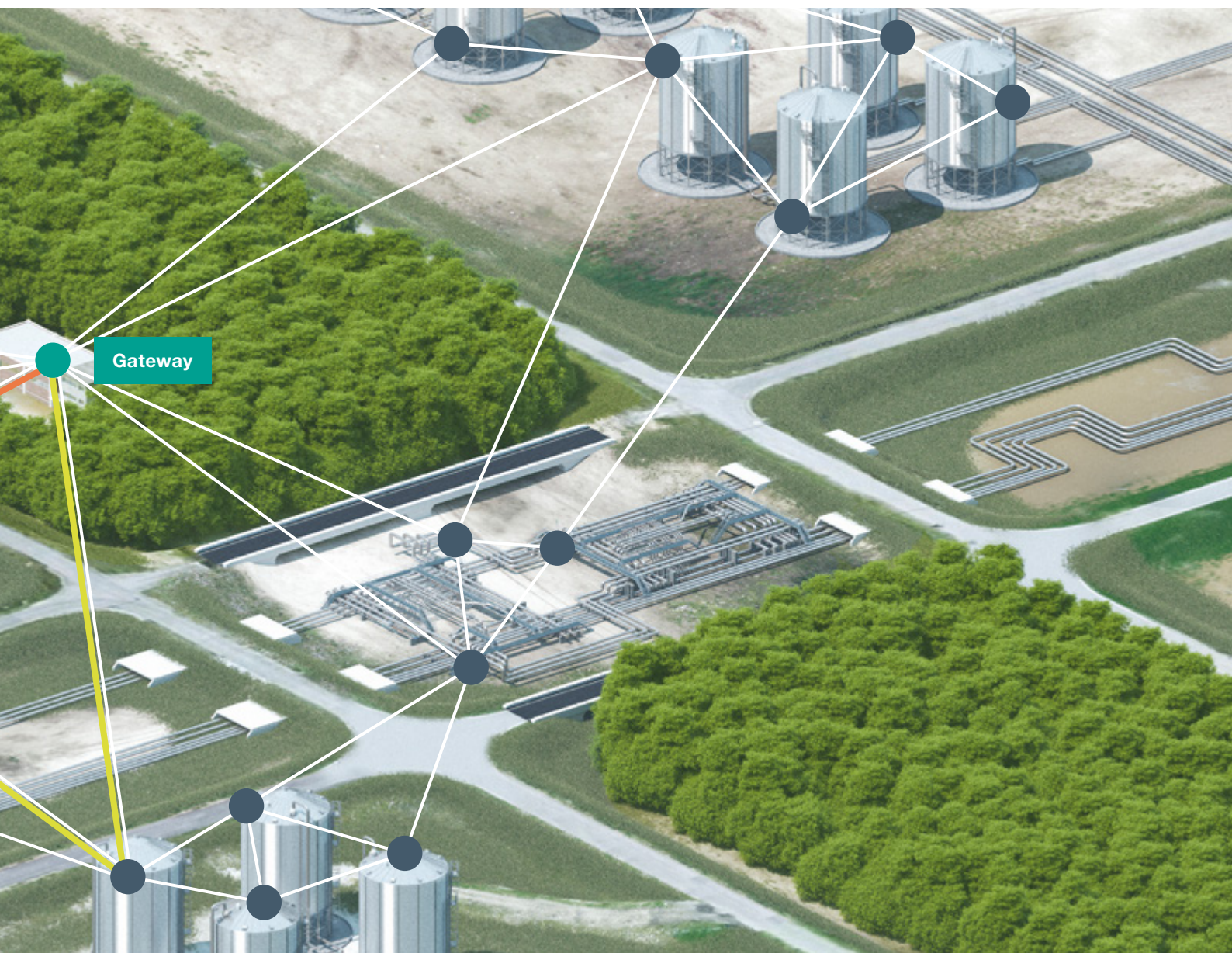
The principle of wireless communication is simple: all the sensors are connected to each other in the field, forming a mesh-like network. Once sent from the original emitter, the signal is quickly and reliably fed to the next subscriber until the gateway is reached. Thanks to its mesh-like structure, *WirelessHART* does not have to rely on the range of a central router and can cover large areas. The ideal solution for plants covering a large geographical area.

Self-healing and highly available

If a data path for the signal transmission fails, *WirelessHART* always has an alternative. Messages that are incomplete or do not arrive are resent to the same subscriber. If the transmission still fails after a specified number of attempts, the signal is routed through another subscriber. This system is referred to as a self-healing and self-organizing network. The network manager responds to the smallest changes to ensure the best possible connection and maximum availability at all times.

Transparent and flexible

Pepperl+Fuchs offers innovative *WirelessHART* tools for configuration, parameterization, graphical network analysis, and diagnostics. Parameterization and configuration are performed via FDT/DTM, EDDL, or a web interface, ensuring full flexibility when selecting the control system. The unique graphical network analysis ensures maximum transparency across the entire network. The communication paths and the quality of the link are easily and conveniently diagnosed via the web interface.



Wireless Networks. Worldwide in Any Environment.

WirelessHART is used as an economical alternative to complex and costly cable installations, regardless of the industry in question. The impressive technology offers simple upgrading of existing field devices and uses new intelligent *WirelessHART* field devices. Operation is trouble-free and user-friendly.

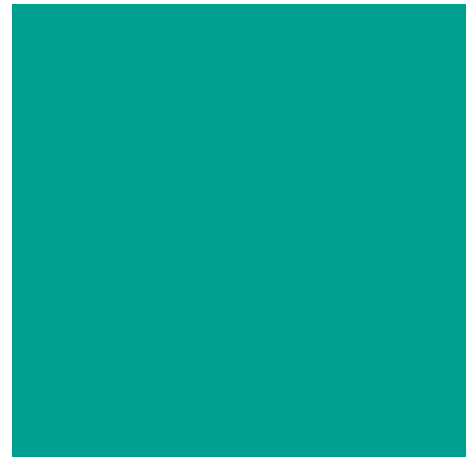
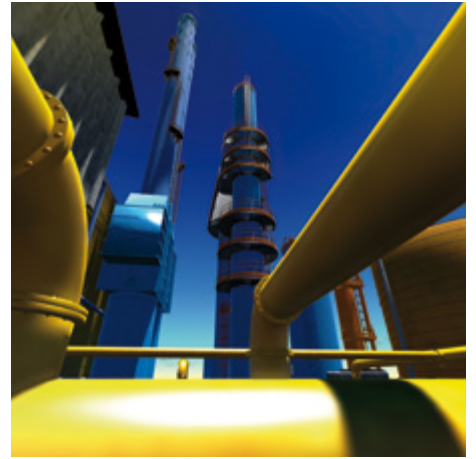
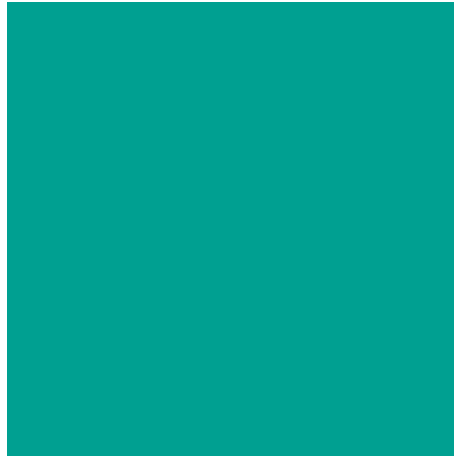
Efficient solutions for complex requirements

Whether in the chemical, pharmaceutical, or oil and gas industry, *WirelessHART* networks are used throughout the processing industries. Wireless technology offers the ideal solution if measurement points are spaced at significant distances, are inaccessible, or are constantly in motion. Applications that were not previously feasible, or that were only possible at great expense, are now made simple with *WirelessHART*. Existing field devices are retained and cost-effective upgrades are delivered via an adapter. New measurements can be taken by installing intelligent *WirelessHART* field devices.

In addition to measured values, *WirelessHART* can also retrieve important diagnostic information for preventive maintenance. This increases the transparency of the processes and the availability of the plants.

Typical applications for *WirelessHART* include:

- Monitoring slowly rotating machines
- Monitoring tanks and pipelines
- Monitoring pumps and filters
- Measuring fill levels
- Diagnosing valves and heat exchangers
- Calibrating field devices
- Controlling valves and other digital outputs
- Monitoring NAMUR sensors
- Monitoring temperatures



Perfectly Coordinated. The Products.

If you need flexibility, mobility, and efficiency, *WirelessHART* networks are the ideal solution. Pepperl+Fuchs offers a portfolio of perfectly coordinated products to shift communication away from cables and toward new wireless channels. An economical alternative to costly complex cable installations, *WirelessHART* adapters, gateways, and field devices make it simple to upgrade.



WirelessHART gateway: center of communication

The *WirelessHART* gateway from Pepperl+Fuchs is the core element of wireless mesh networks. The network manager decides when the individual subscribers send data and which paths are used.

This optimizes communication within the network and achieves the best possible level of performance in terms of speed, data throughput, reliability, and energy consumption.

MODBUS <i>WirelessHART</i> gateway	EtherNet/IP- <i>WirelessHART</i> gateway
<ul style="list-style-type: none"> Ethernet and RS-485 interface HART and MODBUS protocol via both interfaces Class I, Division 2 or Zone 2 	<ul style="list-style-type: none"> Ethernet and RS-485 interface HART protocol via both interfaces EtherNet/IP protocol via Ethernet interface Class I, Division 2 or Zone 2

The *WirelessHART* gateway acts as an interface between the mesh network and the process control system, and the connection can be established via MODBUS or EtherNet/IP as preferred. Both DTM/FDT and EDDL are available for planning, parameterization, commissioning, and maintenance – ensuring full flexibility in the choice of process control system.



BULLET *WirelessHART* adapter: flexible and simple connection

The BULLET is a loop or line-powered (7 - 32 V) *WirelessHART* adapter that enables new and existing wired 4 mA ... 20 mA and HART field devices to communicate wirelessly. Built to withstand the harsh environmental conditions in process plants, the BULLET is the only adapter available in an explosion-proof/Zone 0 housing. It supports up to 8 field devices in HART multidrop mode. It also features Pepperl+Fuchs' patented StepVolt™ technology, allowing users to set insertion voltage from 1 V to 2.5 V in order to optimize the usage of available loop power and wireless communication bandwidth. This technology enables the BULLET to deliver reliable data over long distances, even if only a low voltage is available. The BULLET is the only complete family of *WirelessHART* adapters designed to meet all your application and area classification needs including Class I, Div.1 explosion-proof and Zone 0.

Material	Hazardous area
Cast aluminum housing	General purpose
Cast aluminum housing	IS, Zone 0, 1, 20, 21 and Class I, Division 1
Cast aluminum housing	Ex d, Zone 1, 21 and Class I, Division 1



The *WirelessHART* temperature converter has two analog connections to connect resistance thermometers and thermocouples. This allows the temperature of connected devices to be monitored reliably.

The *WirelessHART* discrete I/O has digital inputs for NAMUR sensors or mechanical switches. These allow the direction of rotation, the frequency, or the limit levels to be monitored. The discrete I/O also has digital outputs; these allow apparatus such as valve position controllers, low-power piezo valves, motor switches, and pumps to be controlled for the first time.

The breakaway time and run time can also be measured to gather information about the status of connected devices.

Although communication with the process control system is wireless, the *WirelessHART* field devices are physically wired to the sensors and actuators. These can be powered via the durable battery in the *WirelessHART* field devices. This ensures the installation is independent of the power supply and provides maximum flexibility in the field.

**WirelessHART field devices:
wireless monitoring and control**

Pepperl+Fuchs offers two different *WirelessHART* field devices for a wide range of applications: depending on the device, a temperature converter and two variants of the discrete I/O provide analog or digital inputs or outputs.

Channels/ model type	DI NAMUR sensor and mechanical switch	DO relay	DO transistor	DO low power for piezo valves	RTD/TC	Hazardous area
WHA-UT					2	<ul style="list-style-type: none"> ■ Zone 1 ■ Class I, Zone 1 or Class I, Division 1
WHA-DI	4					
WHA-DIO ... SD	2			2		
WHA-DIO ... T	2		2			
WHA-DIO ... R	2	2				



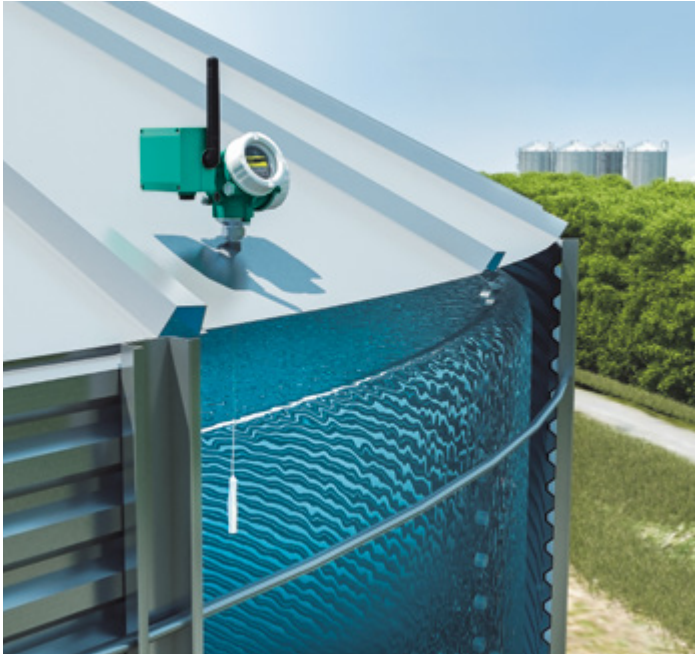
**WirelessHART adapter:
flexible and simple connection**

The battery-operated *WirelessHART* adapter powers itself as well as the connected field device, which ensures a high degree of flexibility. Although the adapters are permanently in operation to act as a router for the network, the connected field devices are powered only when needed. Depending on the power consumption of the device, and the frequency, duration, and operating voltage of the measuring process, the battery can have a lifetime of several years. Field devices with high energy consumption or long boot times can also be connected via externally powered adapters. This enables short measurement intervals.

Material	Hazardous area
Plastic	General purpose
Plastic	IS, Zone 1
Cast aluminum housing	IS, Zone 1, 21, and Class I, Division 1

Continuous Monitoring of Water Levels

Measuring the Fill Level If measuring equipment is positioned in areas that are difficult to access, establishing a connection via a *WirelessHART* adapter is the ideal solution. This allows reliable and efficient monitoring – without complex wiring.



Application

In process automation, different measuring procedures are used to monitor the fill levels of large processing and storage tanks. The measuring equipment often has to be positioned at height and in places that are difficult to access. In these circumstances, wiring is often not possible or not cost-effective. However, manual monitoring and documentation is extremely time-consuming and costly.

The *WirelessHART* solution

Using wireless networks is often the only way to measure the fill level of large tanks using measuring equipment. The measuring equipment is integrated into the wireless communication via a *WirelessHART* adapter, allowing efficient monitoring of these inaccessible areas. This increases process reliability and minimizes the risk for employees since frequent manual inspections are no longer necessary.

Identifying Changes Early

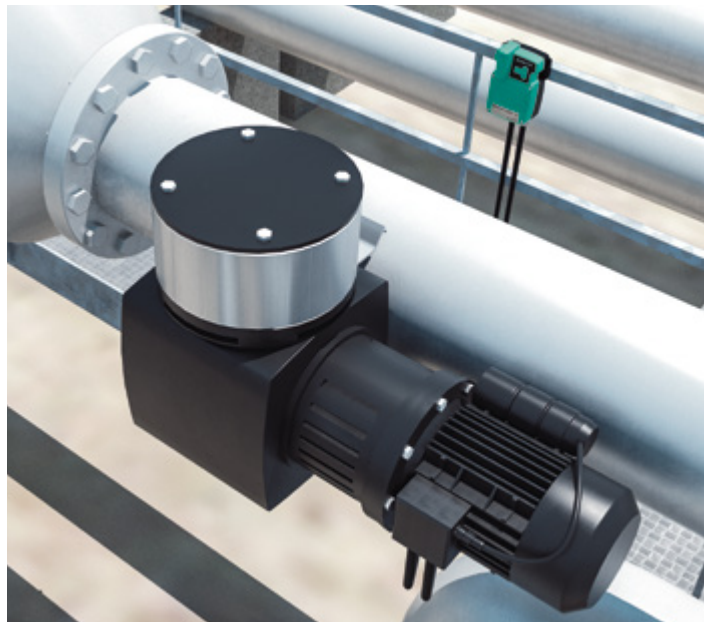
Monitoring Temperature The operating temperature gives key indications about the process and the status of the equipment used. This means that dedicated monitoring using temperature converters can significantly increase plant availability.

Application

Temperature measurements in process automation are vitally important. On the one hand, the values provide important information about the process. Temperature monitoring also provides the operator with crucial information about the status of pumps, motors, and other equipment.

The *WirelessHART* solution

The temperature of motors, for example, can be reliably monitored via *WirelessHART* temperature converters and connected RDTs or thermocouples. Even the smallest changes can be identified at an early stage. This means it is possible to intervene before devices become damaged through overheating, which would impair the availability of the plant.



Portable Mixing Tanks

Flexibility is a must in state-of-the-art portable applications: here, mixing tanks are a regular part of production and handle all relevant processing steps – from mixing to heating and cooling of the product.



Application

Mixing tanks often serve as preparation containers, material buffers, or as stores for dosed products. They are frequently used in safeguarded procedures that are subject to special monitoring processes. Therefore, the tanks are typically equipped with 4 mA ... 20 mA HART-compatible sensors that control the drive speed of the agitator and detect the temperature, pressure, pH value, and fill level of the tank.

The *WirelessHART* solution

Each portable mixing tank is equipped with several field devices. With power readily available, only two BULLETS (one running in multidrop mode) are required to transfer all HART data for up to eight HART transmitters (examples: level, PH, temperature, pressure) and one 4 ... 20 mA signal like a motor speed controller to the *WirelessHART* gateway, which interacts with the control system. The BULLET draws energy from the AC power supply of the mixing motor, keeping the wireless data transmission independent from the restrictions of batteries or extra power supplies. With its rugged housing, the BULLET also easily withstands the strain of typical clean-in-place (CIP) procedures.

Controlling Valves Wirelessly

Maximum Control in the Field The discrete I/O is a next-generation *WirelessHART* field device. It offers optimal monitoring and control in the field – even in areas where valves previously had to be controlled manually.

Application

In process automation, valves control important process steps such as the flow of media. Monitoring their status consistently and displaying their position is therefore crucial. This is especially the case if they are located in places that are difficult to access, or if they are activated only very rarely.

The *WirelessHART* solution

The new discrete I/O can record signals from NAMUR sensors, which provide information about the position of valves. Break-away times and run times are determined via the digital inputs and outputs. Final position sensors provide important information about the status of the valves. For the first time, apparatus such as low-power piezo valves or pumps can be activated and controlled via the outputs of the discrete I/O. This wireless monitoring and control of valves that are difficult to access is not only extremely efficient, but also increases the long-term plant availability.





Efficient Planning. Precise Simulation.

Precise planning and reliable simulation are vital in establishing large *WirelessHART* networks. Pepperl+Fuchs has developed the Wireless Network Checker (WiNC) software for this purpose. This 3-D tool means it is possible to model plants in accordance with the ambient conditions and to run simulations under real conditions. This considerably shortens the time required for commissioning and optimizes how the devices are used.



WiNC Modeling (WiNCMod)

3-D models of plants and buildings are created easily and precisely with WiNCMod. The level of detail can be selected to meet requirements. Anything can be represented, from simple shapes to complex structures. Even existing plans can be imported easily with WiNCMod.

- Create and edit 3-D plant models
- Import existing plant plans
- Select individual materials
- Select required level of detail

WiNC Simulation (WiNCsim)

WiNCsim accurately simulates the propagation of radio waves and the connectivity between each network node. This allows different network designs to be simulated in less time, and the number of required repeaters can be precisely determined. Not only does this save time and costs during commissioning, but the excellent network quality also ensures maximum plant availability.

- Check network under real conditions
- Simulate propagation of radio waves
- Simulate connectivity between network nodes
- Analyze results
- Include ambient conditions
- Optimize how devices are used

Step by Step. Custom-Made Tools.

The right tool in each phase. Whether planning with 3-D simulation or proactive maintenance: Pepperl+Fuchs supports the entire life cycle of *Wireless*HART networks with the right tools.

01 Engineering

Offline engineering

- Fault messages/warnings in the web interface or DTM
- Convenient offline editing in the DTM
- Parallel use of planning services with offline editing of the network reduces planning time and costs

Flexible MODBUS mapping

- Flexible MODBUS mapping makes network setup easier
- Adjust the MODBUS mapping register with a single mouse click

02 3-D Simulation

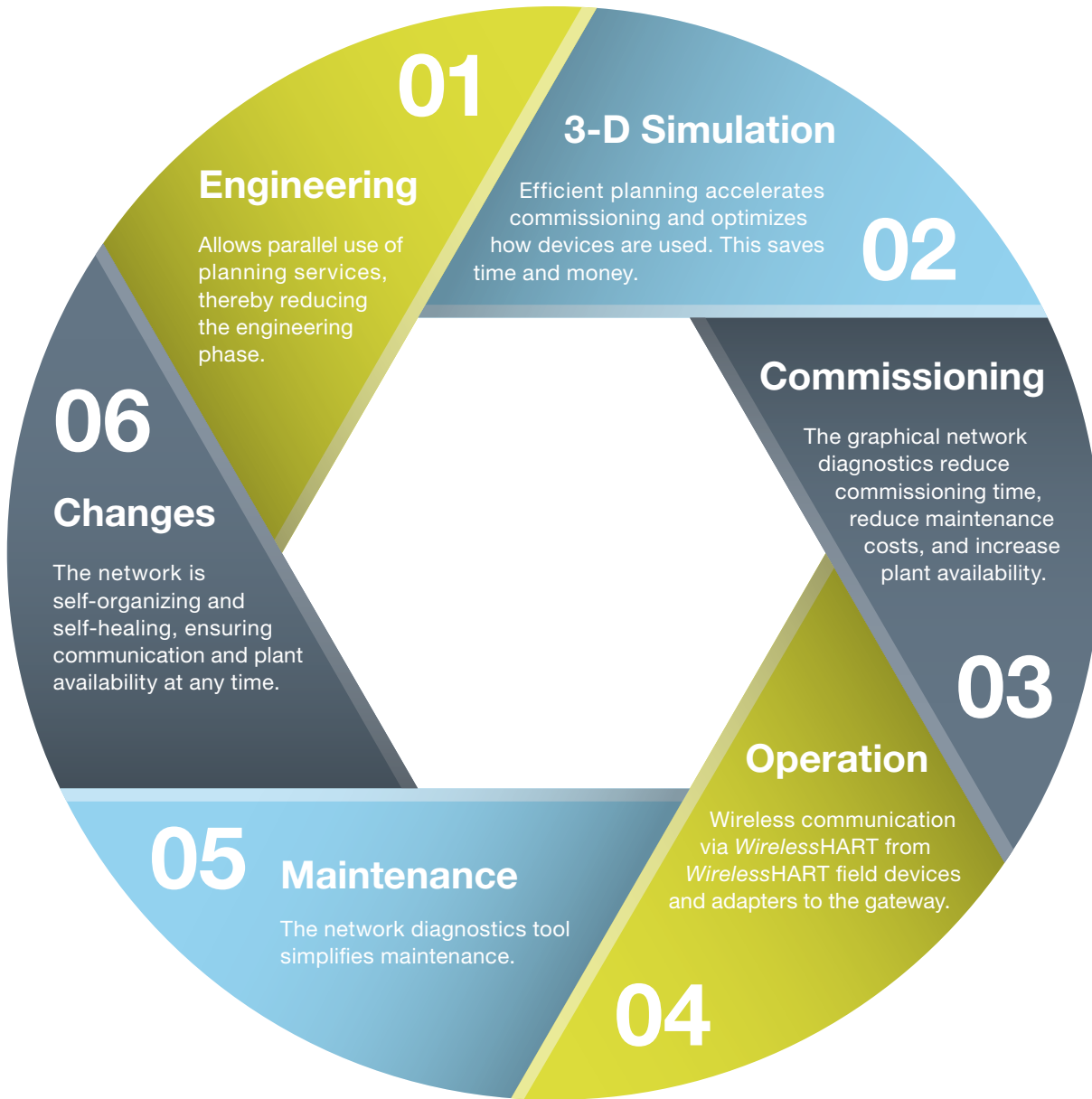
Simple and fast simulation

- Plan and model the plant
- Simulate the plant under real conditions

03 Commissioning

Graphical network diagnostics

- Complete visual representation of the network in the web interface
- Topology view in the web interface
- Display diagnostic information in a list
- Display connections between subscribers, participants, and their quality



04 Operation

Convenient parameterization and configuring

- Parameterize and configure field devices in operation
- Gateway compatible with any process control system

05 Maintenance (proactive)

Tools in the web interface and DTM

- Numerous tools for proactive maintenance
- Diagnostics tool with uniform graphical user interface for the web interface and DTM
- DDs and DTM available

06 Changes

Self-healing and self-organizing

- Network manager responds to any deviation
- Network manager selects alternative path if problems occur
- Minimal effort thanks to self-healing and self-organizing features

Your automation, our passion.

Explosion Protection

- Intrinsically Safe Barriers
- Signal Conditioners
- Fieldbus Infrastructure
- Remote I/O Systems
- HART Interface Solutions
- Wireless Solutions
- Level Measurement
- Purge and Pressurization Systems
- Industrial Monitors and HMI Solutions
- Electrical Explosion Protection Equipment
- Solutions for Explosion Protection

Industrial Sensors

- Proximity Sensors
- Photoelectric Sensors
- Industrial Vision
- Ultrasonic Sensors
- Rotary Encoders
- Positioning Systems
- Inclination and Acceleration Sensors
- AS-Interface
- Identification Systems
- Logic Control Units
- Connectivity