Field Network Engineering
Reduce risk and capital expenditure by working with the competent partner for fieldbus and wireless projects
Building a new plant? Extending or modernizing an old one? At the early stages of the project you will need to decide whether to use conventional analog field-based communications, one of the fieldbus protocols, Ethernet or even wireless technology.
Endress+Hauser will help you to choose the most appropriate process communications technology for your application. Our methodical approach to design, implementation and support will ensure that your communication networks are accurate, reliable and robust.

Unrivalled experience
With more than 50 years’ experience of working within the process industries, no other company has delivered more successful fieldbus projects or is more committed to sharing the benefits offered by fieldbus technologies than Endress+Hauser. We operate in all industrial sectors and can integrate our and third party devices into all common systems.

Proven benefits
Designing and implementing a fieldbus project brings new challenges. Our experience and understanding of your requirements allow us to apply the most appropriate technology in the most appropriate way, right from the start of the project.

Working with leading international process industry customers, our project teams have experience in delivering field network engineering projects with:
- Reduced capital expenditure and installation costs
- Faster commissioning
- Subsequent savings in operational costs through advanced maintenance and diagnostic techniques
- Centralised documentation and information management

Complete portfolio
We offer an unparalleled range of measuring instruments and field network components to ensure a perfect fit with your project and industry requirements. Our combined installed base of HART, PROFIBUS and FOUNDATION fieldbus instruments is one of the largest in the world.

Our design processes and choice of networking components, combined with your choice of plant asset management software, ensure that the wealth of information available today from modern field devices can be used to reduce your operating costs and deliver new levels of process automation excellence.

Harmonized processes
The processes and procedures followed by our team of fieldbus experts are Endress+Hauser approved, controlled through our Project Office and rolled out throughout the world. Our harmonised processes ensure:
- Clear communication and reliability
- Guaranteed quality
- Reduced risk
Reduce your expenditure and risk

Although digital communication is known to save at least 25% in project capital expenditure, you might be unsure about introducing a new technology. With Endress+Hauser as partner, you can reduce the risk by drawing on over 20 years of fieldbus project experience.

Experience counts

Introducing a new technology is always associated with risk. The more experienced a partner, the more smoothly a project will run.

Endress+Hauser has been involved in digital communication since the first devices were exhibited in 1989 and has tremendous experience in engineering and commissioning fieldbus installations. No matter whether you choose HART, WirelessHART, PROFIBUS, FOUNDATION fieldbus, MODBUS or Ethernet, we know how to integrate our and third-party devices into all popular control systems.

Together with Endress+Hauser

Endress+Hauser is willing to be your partner at every stage of the project. If you involve us right from the start, we can help you choose a suitable fieldbus system. Mistakes on the drawing board are much quicker and simpler to rectify than on an installed system!

With our help you can be sure to choose the correct devices and components for the job, correctly dimension the fieldbus segments for safe and hazardous areas and ensure that the response times fit your application. We will help in the engineering, installation, integration and commissioning of the devices, and provide you with full documentation on project completion.

Our commitment does not stop at the Factory Acceptance Test: we will continue to support you with software update services, maintenance contracts etc.

Fieldbus benefits

- No lock-in on components and devices thanks to open fieldbus technology
- Cost saving on wiring, barriers, racks and junction boxes
- Fewer potential weak spots due to simplified wiring scheme
- Lower costs for control system, I/O interface and power supply unit
- Fewer cabinets required
- Reduction in control room size
- On-line engineering and component documentation
- Fast commissioning, lower start-up costs
- Knock-on savings in operation and maintenance

Fieldbus savings

Although fieldbus is often perceived to be more expensive than 4–20 mA technology, when the complete hardware and infrastructure is taken into account, typical savings in capital expenditure are around 10%. Engineering contributes with a 3% saving, but the biggest difference is the 12% saving in commissioning costs.

As devices can be configured and loop-checks etc. can be performed from a central station, commissioning is accelerated and the plant can be started up significantly earlier than with 4–20 mA installations, where much manual work is involved. This cost advantage exists throughout the lifetime of the plant.
Earlier is best

Changes in project scope are best made at a time when they have the most influence but the least financial impact on the project, i.e. in the conception phase. The later a change comes, the more expensive it becomes to implement it. It is extremely difficult to improve projects late in the project life cycle when project execution and operation of the facility are already in place.

It is essential, therefore, to have the right expertise in digital communication as early as possible in the project. We at Endress+Hauser can help you reduce risk by being involved right from the start.

Quicker to profitability

Fieldbuses have a marked advantage over 4–20 mA technology, when expenditure is compared over the plant life-cycle:

- Capital costs for conventional 4–20 mA installations are significantly higher than for fieldbus systems
- Thanks to simpler electrical installation and faster commissioning procedures, plants using digital communication can be started up significantly earlier than conventional 4–20 mA ones
- The additional information provided by fieldbus devices (i.e. status) increases the availability and reliability of the plant while reducing operational and maintenance costs. As a result the break-even point is achieved much earlier and profits are higher
Global hubs of industry and application expertise

Endress+Hauser has created a worldwide network of Centres of Competence (CoCs), each of which acts as the ultimate authority for the group in their assigned industry or automation field. Regional Support Centers (RSC) and many Sales Centers (SCs) also provide expertise in implementing fieldbus projects, for example:

- Almaty, Kazakhstan (RSC)
- Dubai, United Arab Emirates (RSC)
- Greenwood, USA (CoC)
- Kuala Lumpur, Malaysia (CoC)
- Manchester, UK (CoC)
- Milan, Italy (CoC)
- Panama City, Panama (RSC)
- Reinach, Switzerland (CoC)
- Santiago, Chile (CoC)
- Singapore, Singapore (CoC)
- Weil am Rhein, Germany (CoC)

The strong focus of a CoC and its ability to utilize the know-how gained from numerous installations allows it to build and maintain its expertise. CoCs provide full support throughout the acquisition phase and take full responsibility for successfully executing fieldbus projects. Their staff of project managers, solutions architects, and systems engineers work to ensure maximum customer satisfaction.

The objectives of a CoC are to increase customer return on investment, improve business performance, increase safety of operations and to integrate information from field operations into the customer business systems.

The capabilities, commitment, industry specific knowledge and high standards of performance of our experienced teams will enable you to meet your project challenges. With us as a project partner, we can support the engineering activities with the right balance of services and resources to ensure overall success. Our expertise includes network design and calculation, installation, fieldbus integration, commissioning as well as training and service.

We also offer a wide range of innovative tools and services to assist you during procurement, installation and startup.
At Endress+Hauser we consider our people to be one of our strongest assets. Everywhere in the world, our loyal and committed staff members are highly trained to provide the best level of technical expertise and customer service in the process automation industry. Our team of project engineers provide project delivery to ISO 9001 standards, ensuring consistent quality of service for the benefit of our customers.

Our experts include:

- **Project Managers** to execute projects on time, on budget, safely, to your satisfaction, all in accordance with Endress+Hauser procedures and quality standards.

- **Project Engineers** who will design, test and commission engineered solutions that are specifically tailored to improve your automation and business processes.

- **Mechanical and Electrical Engineers** who design and build the network, including the panels and enclosures that house our networking components.

- **System Engineers** who analyze your process automation requirements and translate these into system designs that completely meet your needs.

- **Software Engineers** with vast knowledge and experience of the automation and control platforms normally used in the process industries.

- **Field Commissioning Engineers** who are fully trained on instrumentation and control and accredited to commission your projects safely and efficiently on-site.

- **Site Supervisors** who monitor the work of our subcontractors, collaborate with you and your subcontractors and ensure that everything runs smoothly from day one.
Harmonized engineering processes

At Endress+Hauser we appreciate that when you embark on a new project you need assurance that it will progress with minimum risk. That’s why we have clear and defined project procedures that are followed by Endress+Hauser teams across the world.

Known internally as Standard 201, our project process has been designed to improve communication and collaboration, the quality of project results and, most importantly, customer satisfaction.

Following a matrix structure, project resources are assigned to ensure that the right people are involved at the right time, using flexible teams that have clearly defined responsibilities. At the outset of a project an accountable person is appointed to take ultimate responsibility for decisions, risk and quality management and to support the Project Manager. At critical points in the project, additional risk management resources are introduced. Following a methodical procedure and involving the whole project team, the risk management process has four steps:

1. Risk identification
2. Risk analysis
3. Risk response planning (mitigation)
4. Risk monitoring and control

The process also utilizes a Quality Gate system, in which a verification checklist is agreed for each stage of the project. Fulfilment of each action on the checklist must be confirmed by the Project Manager and accountable person before the project moves to the next phase.

Endress+Hauser reduces your risk:

- Our company is characterized by its highly stable, experienced workforce, who are true experts in their field.
- We follow harmonised standards that are used by Endress+Hauser worldwide.
- We have the flexibility to adapt our services to enhance your business processes.
- We offer a high level of collaboration and communication of information, enabling you to concentrate on your core business.
V-model

The V-model forms the basis of our engineering activities, all documentation and specifications being verified against test procedures outlined in the IQ, OQ and PQ. For the IQ and OQ in particular, Endress+Hauser has developed several scalable test packages that can be customized to your needs:

- **Component Selection**
  Selection of best component for price, robustness and ease of use

- **Engineering Design**
  Deliverables of detailed engineering phase, e.g. CAD drawings, calculation notes for design compliance

- **Installation Design**
  Installer deliverables, e.g. cable schedules, installation charts and wiring diagrams

- **Integration & Startup Preparation**
  Integrator deliverables, e.g. qualification tests, type tests, coupling documentation, commissioning procedures and start-up procedures.

- **Field Network Inspection**
  Deliverables for the verification/validation of the bus functionality, quality of the installation and network communication

- **System Start-Up**
  Device parameterization, signal and data integration and final startup of the system and networks

- **Fieldbus Monitoring**
  Services to audit and maintain installed field networks

Endress+Hauser provides support and expertise in all phases of project execution.
Open to all fieldbus standards

As key to information flow, it is important that the control network fulfils the demands of the application. Before a project starts our specialist application engineers check that the proposed software and hardware combinations are viable and if problems are identified, we provide the solutions that will eliminate them.
HART/WirelessHART

4–20 mA/HART devices are nearly always integrated into conventional control systems by means of the 4–20 mA signal. Use of the HART signal is restricted to parameterization and diagnosis, normally by handheld. For fieldbus systems, HART instruments are integrated via Remote I/Os or multiplexers.

For WirelessHART, the situation is different. The devices communicate using the HART protocol and can be integrated into a system via a gateway with Ethernet or RS-485 connections. The solution is particularly suitable for monitoring applications as well as for measurements on moving, rotating or temporary equipment.

PROFIBUS DP/PA

Field network protocol, used for both factory and process applications. Enjoys a high level of support from network component manufacturers. Instrumentation can be integrated via PROFIBUS PA or PROFIBUS DP/HART Remote I/O or Multiplexer. A number of instruments are also available with PROFIBUS DP protocol.

FOUNDATION fieldbus

Favoured protocol for the oil & gas industry, specifically designed for the control of continuous processes. Instrumentation is integrated via the H1 fieldbus; motor control etc. is frequently integrated via PROFIBUS DP or DeviceNet interfaces.

Modbus

Well-established PLC protocol which runs on both Ethernet and RS-485 physical layers. Often used to “glue” together networks using different protocols, it offers Remote I/Os for HART, PROFIBUS DP and FOUNDATION fieldbus. Coriolis and electromagnetic flowmeters can be integrated directly into RS-485 systems.

Ethernet

Basis for several factory protocols, e.g. PROFINET, MODBUS TCP, EtherNet/IP. Flowmeters are available with Ethernet/IP protocol, otherwise instrumentation can be integrated via HART or PROFIBUS DP Remote I/Os.
Engineering Design Services

Every successful project begins with a robust design. Early involvement of Endress+Hauser’s engineers will ensure that your hardware and software requirements are expertly coordinated. Endress+Hauser brings together the expertise you need, tailoring our knowledge to the demands of each individual project.

Instrument engineering
Our instrument engineers will join your design team to create the documentation you need, including device schedules, instrument specification sheets and instrument location drawings. We ensure that the most accurate and reliable instrumentation is selected for the job.

Network component selection
Using network components that have been tested and proven in our Fieldbus Laboratory, “System World” in Switzerland, we help you to select the components that are ideal for your specific industrial, environmental and hazardous area requirements.

Cabinet and panel design
We design, build and test your bespoke fieldbus data collection enclosure with own team or local subcontractors. Following our proven and tested standards, costs are reduced and design time and errors are minimized. We ensure that every Endress+Hauser fieldbus installation is robust and healthy.

Performance & safety calculations
Our design service includes calculations to ensure that the networks are reliable and robust and deliver the cycle times required for your control requirements. For hazardous areas, we provide the necessary design and documentation to ensure that they are safe and easy to maintain.
**System architecture design**
Armed with a process description, control strategies and instrument location information, we use our experience and know-how, combined with your local standards and design rules, to create a control system architecture that is perfect for your plant’s automation needs.

**Network design**
We deliver a complete functional design specification for your fieldbus networks, considering all aspects of the installation, from cable selection to cycle times.

**Design deliverables**
Deliverables available from our standard design package include everything that you need to commission, maintain or even extend your plant in the future. Our services include the production of segment design drawings, segment data and hazardous area calculations.

**Preparation for Plant Asset Management**
Good fieldbus design will ensure that interfaces are available to remotely monitor and maintain the network as well as to provide access to the wealth of additional information available from fieldbus devices for maintenance and allied tasks. Endress+Hauser also offers Plant Asset Management solutions based on a suite of tools that will further reduce operation costs.
Field Engineering Services

Correct installation and commissioning ensure that the network performs as planned from day one. Endress+Hauser approved electrical and mechanical installation engineers provide the installation expertise, backed up by our extensive system testing and supported with the essential documentation that you need.

**Field services**

Within the scope of every Field Network Engineering project, our expert services include everything you need to guarantee a successful installation:

- Installation and cabling
- Loop checks
- Commissioning, including system integration, device configuration and testing
- Site Acceptance Test
- Assistance with the systematic qualification of design (DQ), installation (IQ), operation (OQ) and performance (PQ)
- Hand-over of complete documentation
- Staff training

**Installation**

Endress+Hauser takes complete responsibility for the project management and quality of conformance to the relevant standards, ensuring that the project is completed in budget and on time, whatever fieldbus you choose. We work either with our approved contractors, who are audited by Endress+Hauser for competency, training, safety and insurance, or supervise your own local sub-contractors.

**Commissioning**

Before being shipped to your site, all components and instruments are checked and accepted by you in the Factory Acceptance Test. Commissioning commences when the devices are installed and the network is ready to run.

The network is commissioned according to a set procedure in which every step is checked and documented. After connection to the network, the devices are integrated into the control system and, where necessary, configured. The complete system is then checked for functionality.
Test and verification

Our on-site test and verification services ensure that your installed networks are reliable, stable and robust. Hardware and software tools are used during network commissioning and operation to prove and record your fieldbus performance.

Project hand-over

Each system is installed, cabled and commissioned in full compliance with industrial guidelines, including ISO, FDA, GAMP, NAMUR, etc. The project is handed over to the customer only after successful completion of a Site Acceptance Test.

Staff training

Endress+Hauser will train any staff unfamiliar with fieldbus networks on the system and instruments deployed in the project. Training may be on site or at one of our many training centers around the world.
Testing and training

When you buy instruments from Endress+Hauser you know that you have purchased high-quality, durable products. Having the best device does not help, however, if after installation it does not communicate with the control system correctly. That’s why every Endress+Hauser device undergoes system tests before being put on the market.

DCS and PLC integration tests
System integration tests are performed to ensure that a device operates according to specifications in a particular system environment. The associated coupling documentation, which describes in detail how a device is integrated into a particular system, is available to all project partners. Depending upon fieldbus protocol, the tests comprise:

- Driver integration
- Offline/online configuration
- Methods execution
- Parameter download/upload
- Control strategy and schedule download
- Control-in-the-field and back-up LAS function (FOUNDATION fieldbus)
- Alarm reporting
- Bad PV status propagation and mode handling
- “Stress” Tests
  - Noise Simulation Test
  - Power-Up /Down
  - Load the network
  - Multi-vendor network

PROFIBUS Competence Center
The fieldbus laboratory is accredited by PROFIBUS International as a PROFIBUS Competence Center and can test for PROFIBUS conformance and issue the associated certificates in its own right. It is also a recognized PROFIBUS Training Center and can offer certified PROFIBUS training courses.

Vendor Cooperations
Agreements between some system vendors and Endress+Hauser mean that stress tests performed by either party are mutually recognized as proving conformance. This ensures that new devices are quickly certified for foreign systems.

Integration Office
Another cooperation has resulted in the Endress-Hauser/Rockwell Automation Integration Office which ensures that all new devices can be seamlessly integrated into Rockwell controllers. It also ensures that device templates are available for automatic linkage into the Rockwell SCADA system.

FDT/DTM Testing
The fieldbus laboratory is also an official and accredited DTM testing agency. All our DTM s have been rigorously tested and are registered at the FDT Group.
Know-how Transfer

The work of the fieldbus laboratory and training center are intimately linked. Know-how gained from testing new devices flows into guidelines, which in turn form the basis of our hands-on training courses. What is learned in the laboratory translates into quick and reliable installation of the network.

Training

Endress+Hauser sees training as a key success factor of every fieldbus project. We understand the importance of training at every stage of project execution for both our own engineers and your operation and maintenance staff. For this reason we decided many years ago to share our knowledge in fieldbus technology by providing hands-on experience for anyone who needs it.

- We act globally: in addition to courses at our training centers in, for example, Chile, India, China, Singapore, Europe, Middle-East, Canada etc, we can also offer on-site training
- We offer both certified and customized training
- Our customized courses have been booked by major players in the chemical, oil&gas and other industries
Customer satisfaction

Our Field Network Engineering (FNE) teams operate worldwide in many branches of industry. They have successfully installed numerous fieldbus networks to full customer satisfaction, even under the toughest of conditions.

**Arcelor Mittal, Sollac, France**

Renovated and equipped with the latest PROFIBUS instrumentation, the HF 1 blast furnace at Fos-sur-Mer in France restarted in 2007. Precisely planned over a period of two years, the actual refurbishing had to be completed in 95 days. FNE’s deliverables:

- Close involvement in Arcelor Mittal’s initial planning for refurbishment
- Supply of a specially trained 15-man Endress+Hauser installation team
- Instrument selection
- Network calculation and design
- Preconfiguration of 1200 devices
- Network installation and testing
- Device integration, commissioning and testing

**Changi NEWwater, Singapore**

The recently opened first phase of a multi-billion dollar Changi NEWwater plant will secure future supplies of clean and safe drinking water for the entire population of the country. Working with equipment supplier GEA Westfalia Separator, Endress+Hauser were responsible for the measuring instruments. FNE’s deliverables:

- Selection of instrumentation
- Concept, design, calculation and installation of the PROFIBUS network
- Preconfiguration and installation of the instruments
- Commissioning and testing of the instruments and network
**Pacific Rubiales Energy, Colombia**

When Pacific Rubiales Energy were looking for a more flexible solution to monitoring yield at their well heads, they chose WirelessHART technology. In comparison to conventional methods, this greatly reduces the installation costs, time, cabling, channelling and eliminated the need for Remote I/Os. FNE’s deliverables:

- Support in the selection and integration of the best field devices for the job
- Consultancy regarding wireless technology and network design
- Local user training in wireless technology at Bogata by FNE trainers

**Esperanza Mine, Chile**

Started up in 2010, the facility is designed to produce 190,000 t fine copper and 230,000 oz gold per annum at full capacity. As part of the overall project, FNE’s deliverables:

- Design and construction of pilot laboratory for FOUNDATION Fieldbus testing and internal training.
- Development of procedures for remote pre-commissioning of system and devices.
- Integration of 200 Endress+Hauser devices in the laboratory and on site (1600 km away)
- Development of test protocols for 20 different types of Endress+Hauser instruments (flow, level, pressure, temperature, analysis) for use in the implementation phase.

**Devon Energy Corporation, Canada**

Extracting the oil from Alberta’s oil sands presents a number of challenges, not least its separation from sand and water. To improve yield at their Jackfish facility, Devon Energy Corporation equipped two treaters and a FWKO vessel with Endress+Hauser’s density profile system, Profile Vision. FNE’s deliverables:

- Concept, design, calculation and installation of the PROFIBUS network
- Preconfiguration and installation of the instruments (18x FMG60 radiometric transmitters)
- Commissioning and testing of the instruments and network
- Integration of pressure and flow values in the Profile Vision HMI
People for Process Automation

Endress+Hauser is a global supplier of process automation solutions. We develop, manufacture and sell sensors, systems and services for the process industries. Used for both production and inventory control, these products acquire, transmit and evaluate process information. They offer excellent performance at an affordable price, backed up by innovative local and e-service. Their quality, safety and efficiency increase the competitiveness our customers.

A closely-knit network of production and sales companies, together with local representatives, gives Endress+Hauser a strong global presence. We pride ourselves on our industrial know-how, innovation, employee creativity and commitment to customers. Endress+Hauser stands for financial strength, continuity, an excellent instrument and service basket and lasting customer relationships.

Supplementary Documentation

PROFIBUS
Competence Brochure
CP00005S/04/en

WirelessHART
Competence Brochure
CP00013S/04/en

FOUNDATION fieldbus
Competence Brochure
CP00003S/04/en

FDT
Competence Brochure
CP00010S/04/en

HART
Competence Brochure
CP00004S/04/en