

Oil and Gas Production Measurement From Wellhead to Pipeline

Oil and Gas Production Measurement



Peace of mind - We've got you covered

We know it's tough out there – not enough manpower, harsh conditions, and even tougher timelines – we can help. **Endress+Hauser** is focused on the oil and gas markets to offer unparalleled industry knowledge, technology, field experience and support.

Endress+Hauser brings over 60 years of sensor innovation with a complete offering of products and supporting services that not only keep wells producing but helps automate production quickly and on budget.

Endress+Hauser's support network are close to you, providing you with easy access to sales support and service. This helps to maximize response time, uptime and production.

Endress+Hauser delivers expertise that maximizes production and efficiencies. Through creative thinking and innovation, we meet the growing needs of operators in the oil and gas industry. Endress+Hauser can deliver the right solution to meet your application needs.



Find out more about our US manufacturing locations and our service and support locations. We are close by to offer support when you need it.



Endress+Hauser has a full portfolio of services to support you through your entire process.



Customer support & services
www.us.endress.com/services

From Wellhead to Pipeline

Application	Flow Metering Technology	Other Instrumentation and Equipment
Well Testing	Coriolis, Vortex, Electromagnetic, Turbine, Positive Displacement and Ultrasonic Flowmeters	Continuous Level and Interface, Level Switch, Temperature, Pressure, Water Monitor
Wellhead	DP Flow	Wireless Options: Pressure and Temperature
Enhanced Oil Recovery - Waterflood - Steam Flood - Miscible Flood - Chemical Flood	Coriolis, Vortex, Electromagnetic, Turbine and Ultrasonic Flowmeters	Wireless Options: Level, Temperature and Pressure
Processing - Separation - Crude Oil Desalting - Crude Oil Dehydration - Crude Oil Stabilization - Condensate Stabilization - Gas Dehydration - Gas Sweetening - Stock Tank Vapor Recovery - Water Treatment	Coriolis, Vortex, Electromagnetic, Turbine and Ultrasonic Flowmeters	Wireless Options: Continuous Level and Interface, Level Switch, Temperature, Pressure, Electronic dP and pH Water treatment specific analyzers: pH Conductivity, Chlorine, ORP and Turbidity
Transportation - LACT Units - Gathering - Truck and Rail Car Loading - Truck and Rail Car Unloading	Coriolis, Positive Displacement and Turbine Flowmeters	Wireless Options: Continuous Level, Level Switch, Temperature, Pressure, Water Monitors and Ultrasonic Other: Valves, Strainers, Air Eliminators, Complete Skids, Presets and Flow Computers



Processing Overview

Produced wellhead fluids such as crude oil, natural gas and brine must be processed before sale, transport, reinjection or disposal. Oil and gas production involves a number of surface unit operations between the wellhead and the point of custody transfer. Collectively, these operations are called "field processing."

Field processing of crude oil from storage, transportation and sale involves three process objectives:

- Separating the crude oil from any entrained solids, emulsified water or brine
- Stabilizing the crude oil by removing dissolved gas so that it is safe to be transported and stored
- Removing impurities and any separated or free gas from the crude oil

Field processing natural gas for sale or reinjection into a pipeline or storage vessel for natural gas liquids involves the following process objectives:

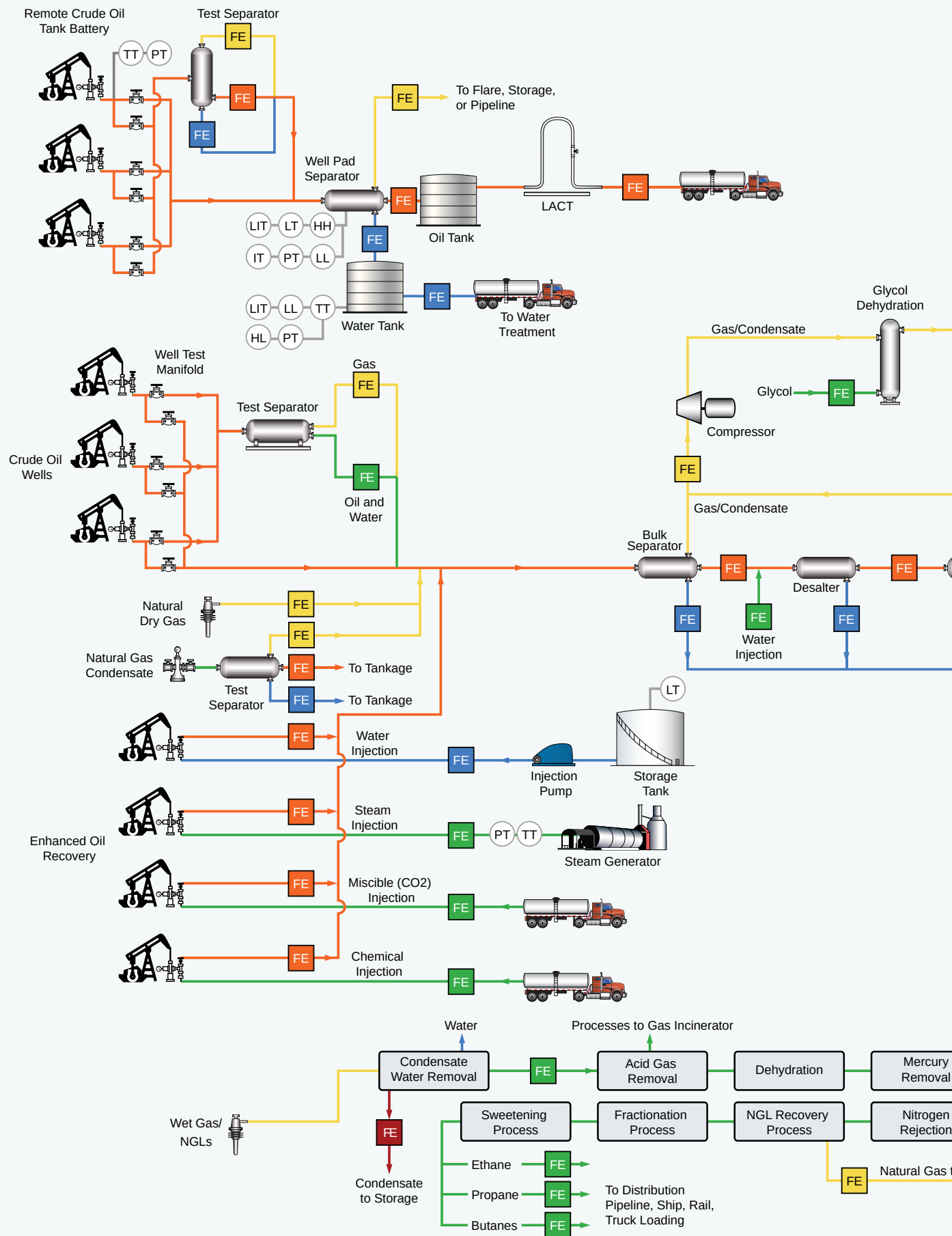
- Cleaning by removing liquids
- Sweetening," or treating, by removal of acidic gases (H₂S and/or CO₂)
- Dehydrating by removing water vapor and controlling H₂O dew point



Your complex process requires you to minimize capital expenditure while maximizing efficiency. Your complete solution partners understand the challenges you face.



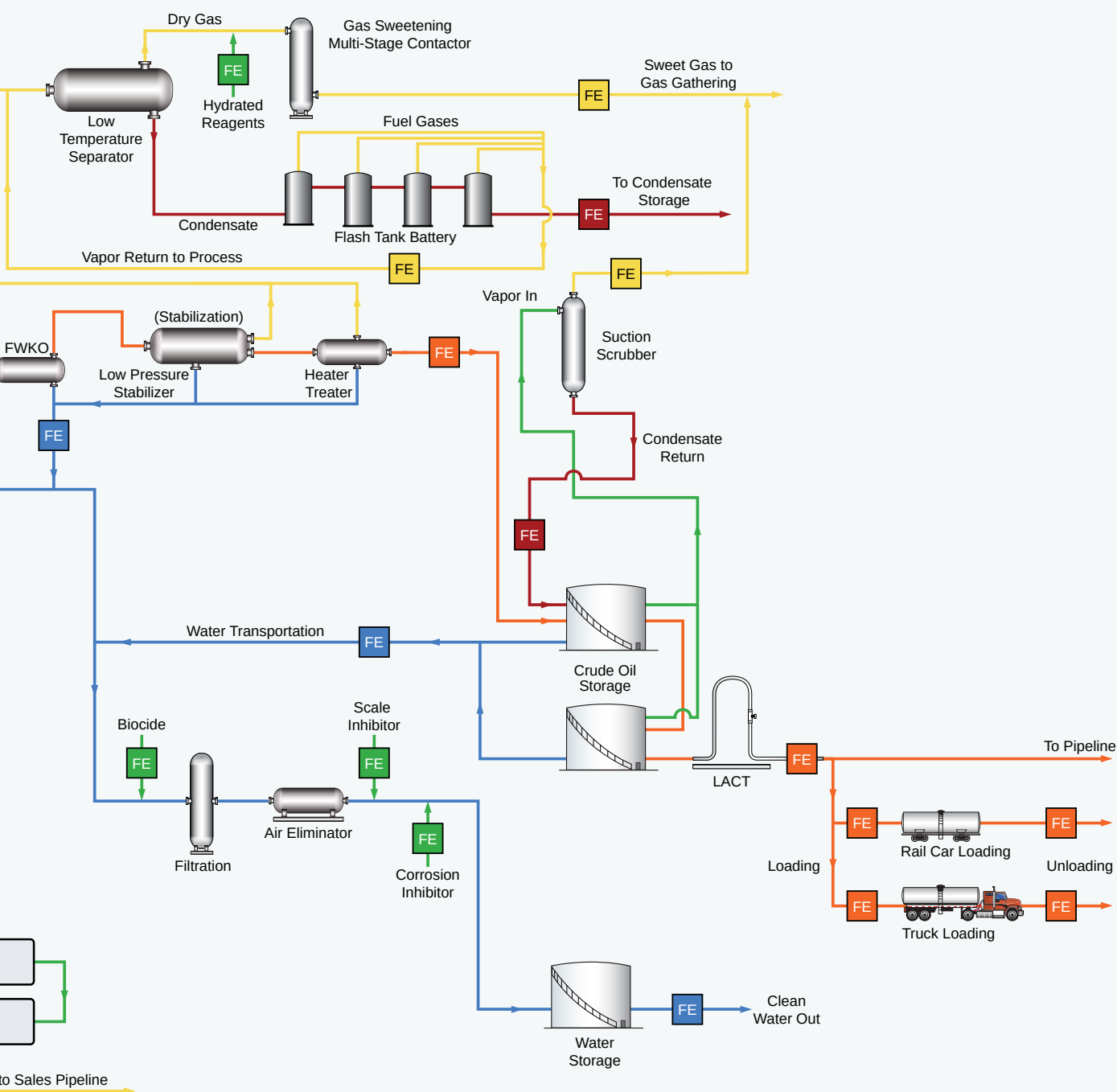
Measurement Value Chain



Key

Oil Lines		LT = Level Transmitter
Gases		LIT = Level and Interface Transmitter
Water		HH = High Level Switch
Condensate		LL = Low Level Switch
Other Process Liquids, Vapors, and Gases		PT = Pressure Transmitter
Flow Element		TT = Temperature Transmitter
		IT = Interface Transmitter

Note: Vessel instrumentation, tank vessels, and separation equipment may include instrumentation such as level, interface, pressure, and temperature transmitters, and high and low level switches. See individual line cards for more information.



Services and Support



Support

Your instrumentation is vital to the safe operation of your processes and the quality of the product you produce. Endress+Hauser customer support engineers are ready to provide you with support 24/7, 365 days a year, assisting you over-the-phone with on-site installation, commissioning and trouble shooting.

More than 80% of all Endress+Hauser instrumentation that is shipped in the US is built in the US to offer you maximum flexibility.

Start-up Services

Our certified service technicians provide quick and dependable start-up and commissioning services. Measurement and instrumentation expertise ensure that project milestones are met.

Training

We understand the daunting task of finding and retaining well-trained staff, and the ever-increasing demands for higher productivity. This is why we have taken years of experience and applied that to training schools so that your employees receive the hands-on experience and support needed. We offer training according to your needs – everything from online tutorials to premium training at Endress+Hauser PTU® (Process Training Unit) locations.



Training

www.us.endress.com/training

Flow Metering Technologies Review

When selecting a meter technology, the following criteria should be considered:

Measurement, Data and Accuracy

The kind of metering system and technology you need depends on the type of measurement you need to perform and the kind of data and accuracy the measurement provides. From custody transfer or the monitoring of the efficiency of critical processes to the measurement of product composition – including density, viscosity or BS&W – your applications require unique data output and accuracy goals for that data. The following are the ways the accuracy of metering products are measured:

- Repeatability: accuracy of measurements for a given flow rate
- Linearity: accuracy of measurements over a range of flow rates
- Stability: accuracy of measurements over time (ability to maintain repeatability and linearity)
- Quality: the accuracy of combined output data from multiple devices in a measurement system

Product characteristics

The characteristic of your product determines the kind of measurement technology you need for accurate measurement. Some common product characteristics include:

- Viscosity range
- API gravity range
- Density
- Percent water range
- Temperature and pressure
- Percent paraffin range
- » Type and amount of contaminants and deposits



Applicator Fast planning and dependable sizing.

Applicator is a proven selection and sizing program from Endress+Hauser. Applicator is built around 25 years of industry experience and expert knowledge.



Applicator

www.endress.com/applicator



With our complete range of products we have the right solution for your application needs. We've got you covered - we can suggest the right fit based on our consultation with you.

Flow Metering Technologies



Smith Meter® F4 PD Meter



Smith Meter® SC13 PD Meter

Positive displacement (PD) meters unique rotary vane design provides unsurpassed accuracy, long-term measurement stability and many years of maintenance-free performance. These meters can handle a wide range of viscosity and flow rate and have a low pressure drop to maximize delivery rate. Other features include the resistance to paraffin buildup and electric-free operation.



Coriolis Meters have a very wide turn-down flow range and, unlike volume, fluid mass is not influenced by changing process conditions such as temperature, pressure and viscosity. Besides offering high accuracy and bi-directional flow, Coriolis meters have the ability to measure several process variables at the same time. Mass flow, density and temperature are the primary variables that can be used to derive other values such as volume flow, solids content, concentrations and complex density functions.



Proline® Promass Coriolis Meters

Turbine meters are offered in several styles that offer rugged construction for long service life, high accuracy in the lower and medium viscosity range, high-resolution pulse output and low maintenance in clean service applications for maximum cost-effectiveness.



INVALCO Turbine Meters

Electromagnetic flowmeters measure the volume flow rate of electrically conductive fluids (greater than $1 \mu\text{S}/\text{cm}$) with or without solids. These measuring devices offer you cost-effective flow measurement with a high degree of accuracy for a wide range of process conditions. The tried-and-tested Promag sensors have no pressure loss and are not sensitive to vibrations.



Promag 53P

Flow computers are designed to monitor continuous or batch flow operations for liquid or gas. Microprocessor-based units, such as the Promag 53P, can be operated either stand-alone or as part of a SCADA system.



Heartbeat Technology™

- Maximum process reliability due to continuous self-diagnostics
- Clear diagnostic message with instructions for action
- Verification "at your fingertips" without process interruption



Instrumentation for Process Control

Endress+Hauser offers a complete line of products designed to meet your process control needs ensuring the best-fit technologies tailored to meet your specific application needs.

Level Measurement Selection

When selecting a level device, there are many considerations. Endress+Hauser offers many different technologies to measure level:

- Multiparameter (capacitance and guided radar combined)
- Guided radar
- Capacitive
- Vibronic
- Ultrasonic
- Hydrostatic
- Gamma
- Conductive

How do you know which technology is the best fit for your application? The experts at Endress+Hauser can help guide you through. Here are just a few things we take into consideration when helping you select the right device:

First you must decide if you need to measure **continuous overall level**, **point level**, or **interface level**.

Is it a separator or tank? Is the vessel vertical or horizontal?

Next, there are several process parameters to consider:

Is your **liquid still turbulent** or does it have an **emulsion layer**?

Is there any **buildup** potential?

We would need to consider the **density** range, **pressure** and **temperature**, as well as factors like viscosity, conductivity, and dielectric constant. We would also need to consider your accuracy needs. Finally, the installation requirements you have (process connections, tank height, mechanical fixtures in tank, etc.) also must be taken into consideration.

With this information – we find the best fit.

Pressure Measurement Selection

When measuring pressure, we first need to determine whether you need to measure gauge pressure, absolute pressure, differential pressure or hydrostatic pressure. No single instrument is suited for all applications areas – we find the right one for your application. If you have corrosive or abrasive materials in your process, this could be a good fit for our ceramic cell that we offer for pressure transmitters. If you have high temperatures or pressures in your process, we offer metal cells, with or without diaphragm seals, which are ideal under these extreme conditions.

Levelflex FMP55



Liquiphant M FTL51



Deltabar S PMD75



iTemp® TMT162



Temperature Measurement Selection

While temperature measurement may seem like a simple measurement – there are still several things to consider. Will you want or need a transmitter for your application? Field transmitter, head mounted or DIN rail? There are many mechanical variations to fit your tank or process perfectly available from Endress+Hauser – even for extreme conditions. Will you measure with thermocouples or RTDs? Our products are designed with your specific application in mind.

Analysis Measurement Selection

We offer a complete line of analytical systems that measure a variety of parameters:

- pH
- ORP
- Conductivity
- Chlorine
- Dissolved Oxygen
- Turbidity
- Chemical analysis (iron, hardness, nitrates, phosphates, ammonium, aluminum, chromate, copper, hydrazine, manganese and silicate)



✓ Endress+Hauser Operations App

The app offers fast access to up-to-date product information and device details including order code, availability, spare parts, successor products for old devices and general product information - wherever you are, whenever you need it. Simply enter the serial number or scan the data matrix code on the device to download the information.



For complete selection guides for level, pressure and temperature, please send a request to info@us.endress.com.

Superior Calibration

Flexible Calibration Management

Endress+Hauser offers laboratory and on-site calibration. We can not only calibrate our own instruments, but we can calibrate other vendor products as well. Accuracy is critical in measuring your products. Endress+Hauser can perform lab calibrations at our facilities in Greenwood, Indiana and LaPorte, Texas, both having A2LA and ISO 17025 accreditation.

There are times when it is not possible to take your instrumentation out of the process and send it back to our lab for calibration. In those cases, we offer on-site calibration. Our mobile trailers, with portable flow rigs, are stationed close to you.



A worker hoists an electromagnetic flowmeter into position to be factory calibrated on an ISO 17025 certified calibration rig



Only the measurement and flow experts at Endress+Hauser can combine products, services and expertise to provide a wide range of highly accurate, well designed devices and systems required for efficient and state-of-the-art oilfield techniques required in today's fast paced and competitive industry. Contact us for more information.



USA

Endress+Hauser, Inc.
2350 Endress Place
Greenwood, IN 46143
Tel: 317-535-7138
Sales: 888-ENDRESS
Service: 800-642-8737
Fax: 317-535-8498
info@us.endress.com
www.us.endress.com

CP01083A/24/EN/01.14
(04.14)