

Fossil Fuel Power Plants

Full range of proven field instruments, services and solutions in steam electric power generation





Power up your plant

Power plants play a vital role. We help minimize downtime whilst delivering safety and productivity.

The world needs reliable and safe power Whether your power plant serves the needs of ordinary homes, hospitals or factory production lines - the world needs reliable and safe power, and you need profitability. At Endress+Hauser, we bring precision and safety to power plants all over the world.

The power behind your plant Your plant needs a multi-skilled, versatile partner. You need reliable solutions that meet your application requirements and industry quality standards. And you may need to upgrade ageing plants with proven and state-of-the-art technologies, to keep the output consistently high.

As the industry shifts towards natural gas, renewables and the new market dynamics driven by shale gas, our mission is to provide the all-round support and experience you need.

This includes elevated standards of safety for your staff. And the ability to meet even-higher environmental demands in flue gas cleaning processes such as SCR catalysts for nitrogen oxide reduction, electrostatic precipitators (ESPs) for particle separation, and limestone scrubbing processes for desulfurization.

When you choose us, you:

Boost the efficiency of your plant Your equipment remains intact while we deploy best-practice field devices for your balance of plant equipment (BoP) and turbine/boiler islands.

Heighten safety Safety is about prevention, so choosing the right instrumentation is crucial to alert you to possible dangers to your people, plant and performance.

Maintain expertise Experienced engineers are now hard to find. We not only provide precision instrumentation – we are an expert partner supporting you from concept design right through to commissioning.

i Our scope Endress+Hauser is a leading supplier of instrumentation, services and solutions to the power generation industry in Europe, Asia and the Americas for decades.

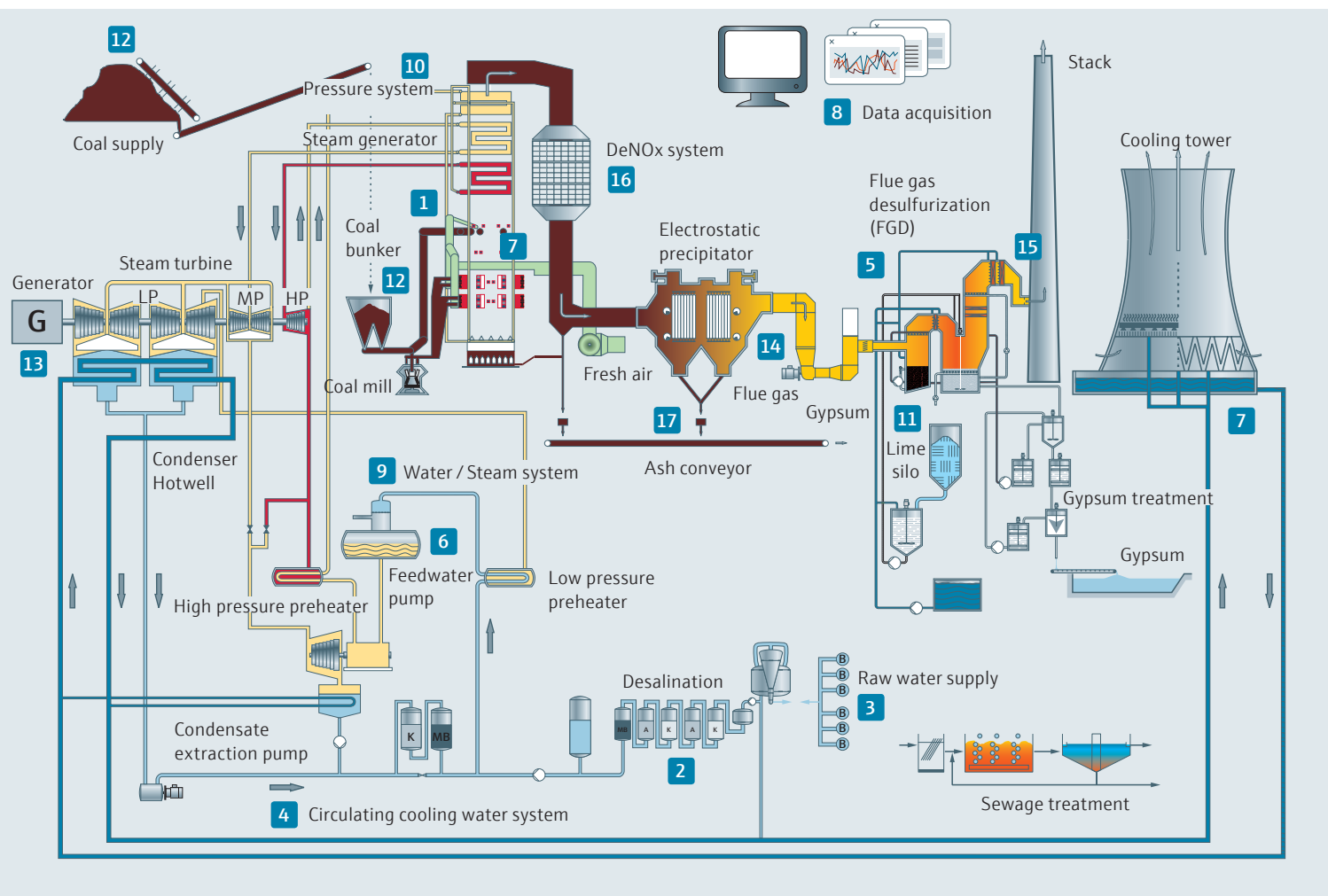
We have an comprehensive expertise and track record in all types of power generation, from the latest high-efficiency supercritical power plants to cutting-edge renewable energy solutions in solar, hydro, waste-to-energy and biomass.



www.endress.com/industry-power-energy

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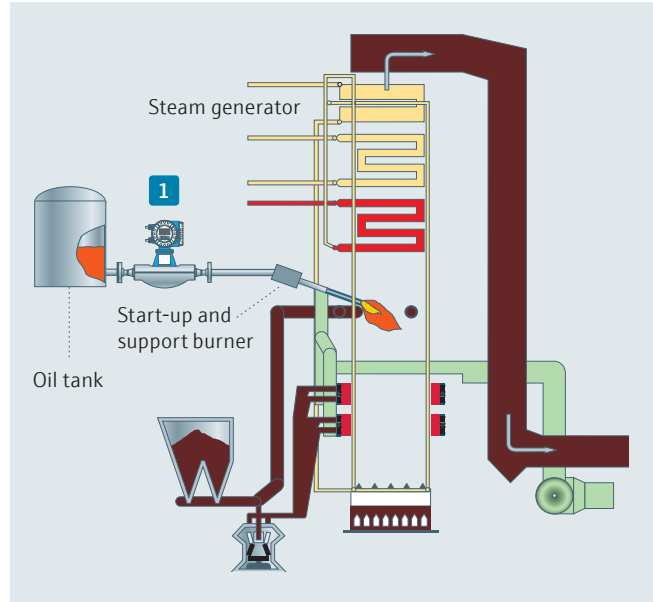
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Monitoring the start-up / support burner

Combination burners for coal and oil are used to fire the boiler. In order to initiate the combustion process and / or to support the coal fire, oil is used for the booster and supporting burner.

A precise mass measurement (kg/h), installed in the oil flow line, is required for the exact batching and control of the combustion process. The heavy oil is supplied to a ring heating system. This makes monitoring of the supply and feedback lines necessary.



1 Promass – coriolis mass flowmeter

Promass is a compact transmitter for direct measurement of mass (kg/h), where additional instrumentation is not necessary.

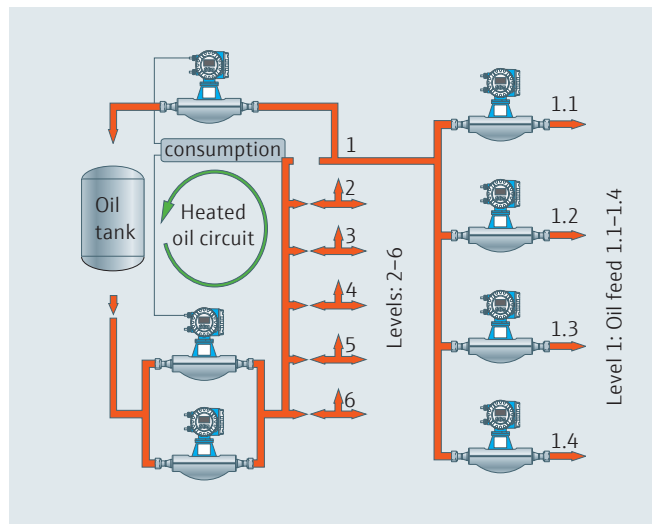
- Replacement of mechanical systems, which can obstruct and block the furnace oil flow line
- No moving parts for unimpeded flow and operation of the furnace
- Safe measurement, even with poor quality oil
- No inlet/outlet runs necessary
- Multivariable measurement – simultaneous measuring of mass flow, density, temperature and viscosity
- Very high measuring accuracy
 - typically: $\pm 0.1\%$ o.r.
 - optionally: $\pm 0.05\%$ o.r. (PremiumCal)



Promass Coriolis mass flowmeter



Promass compact version: due to the preheated oil, the pipes are isolated



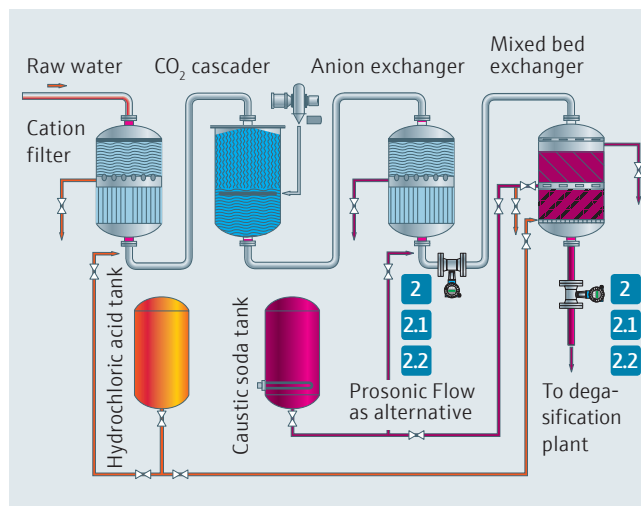
Oil supply system with various Promass flowmeters

Volume measurement in desalination

Full desalination requires the production of pure water necessary for the operation of steam boilers. For this purpose, cation filters, carbon dioxide (CO₂) cascaders, anion exchangers and gravel bed filters are installed. After exhaustion of the cation filter and anion exchanger, these units are regenerated with hydrochloric acid or caustic soda.

After the raw water has run through the desalination plant, it is free of salt and has low conductivity and low silica content. Volumetric flowmeters are required for the supply of deionized water in the water / steam circuit.

The flowmeters most commonly used in this application are dp flow solutions with primary elements like orifice plates (shown on page 15). There are alternatives, however, that can offer a better performance, provide more outputs, and reduced inlet runs: vortex, ultrasonic and thermal mass.



Prowirl
Vortex
flowmeter



Prowirl high
pressure version



Prosonic Flow ultrasonic
inline flowmeter

2 Prowirl – vortex flowmeter

Prowirl is a compact flowmeter for volume measurement in deionized water.

- Reliable measurement, independent of deionate conductivity
- Large measuring dynamics, little pressure loss
 - inlet runs can be reduced to 10D electronically
 - integrated temperature measurement
 - measurement of steam mass and energy
 - wet steam detection and measurement
 - developed per IEC 61508 for applications up to SIL2/3



t-mass T

2.2 t-mass T – thermal mass insertion flowmeter

Proline t-mass T is the cost-efficient alternative for measuring the flow of water irrespective of its conductivity. It can be used as a submeter in conjunction with a main meter.

- High turndown (100:1)
- Output of volume flow and temperature
- Low pressure drop
- Good repeatability ($\pm 0.5\%$ o.r.)
- Fair accuracy ($\pm 5\%$ of f.s.)

2.1 Prosonic Flow – ultrasonic flowmeter

Prosonic Flow is ideally suited for applications in process control and utility measurement in energy production.

- Short inlet and outlet length reducing the space required for installation
- Loop powered transmitter
- Accuracy up to $\pm 0.3\%$ (optional)
- Measures the flow of conductive and especially non-conductive liquids



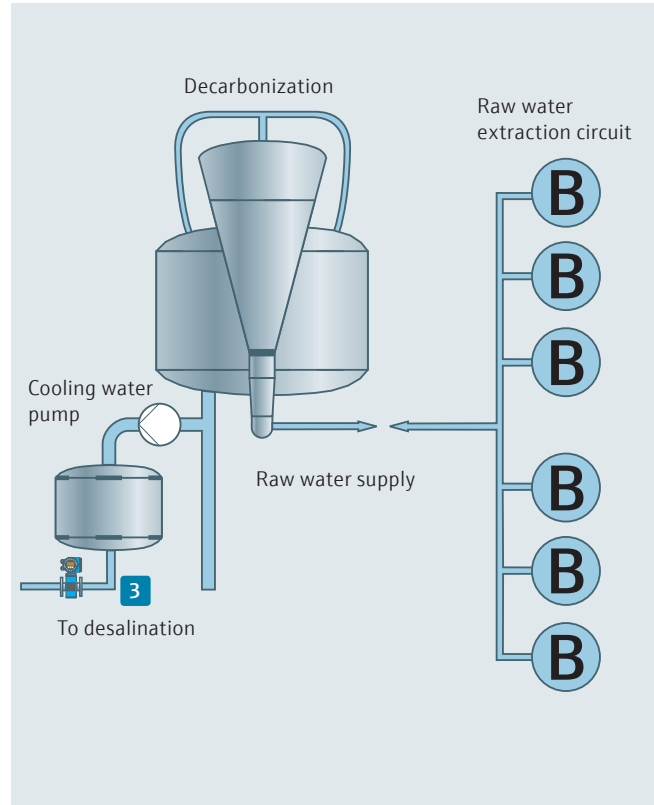
Prowirl monitors the volume flow of the fully demineralized water

Control of raw water supply

Additional water is required as replacement for the condensate loss in the cooling system and as replacement for the feedwater in the steam circuit. The raw water is taken from rivers. The extraction flow rate must be measured in order to control the chemical cleaning process, since raw water is not free of dirt particles.



Promag electromagnetic flowmeter



3 Promag – electromagnetic flowmeter

The compact Promag flowmeter, flanged version, is especially designed for raw water usage. It's available in sizes from 2 mm to 2400 mm.

- Simple commissioning and operation using integrated webservice
- Large display and plain language text
- Relay outputs can be configured for error indication, material and limit value monitoring
- Pulse and analog outputs are fitted as standard and are freely configurable
 - integrated datalogger for monitoring
 - easy verification without taking the device out of the line using Heartbeat Technology™



Promag electromagnetic flowmeter registers the cooling water volumes

Water volumes in the circulating cooling water system

The flash steam from the turbine is condensed in the condenser situated below the turbine. The condenser is a heat exchanger through which large volumes of cooling water flow. Following the laws of thermodynamics, great cooling capacities create a high degree of efficiency in the power plant. In order to measure these cooling water volumes, a measuring instrument is required which supplies reliable values even with large pipe diameters.



Prosonic Flow (clamp on version shown) is used to control cooling water for the condenser



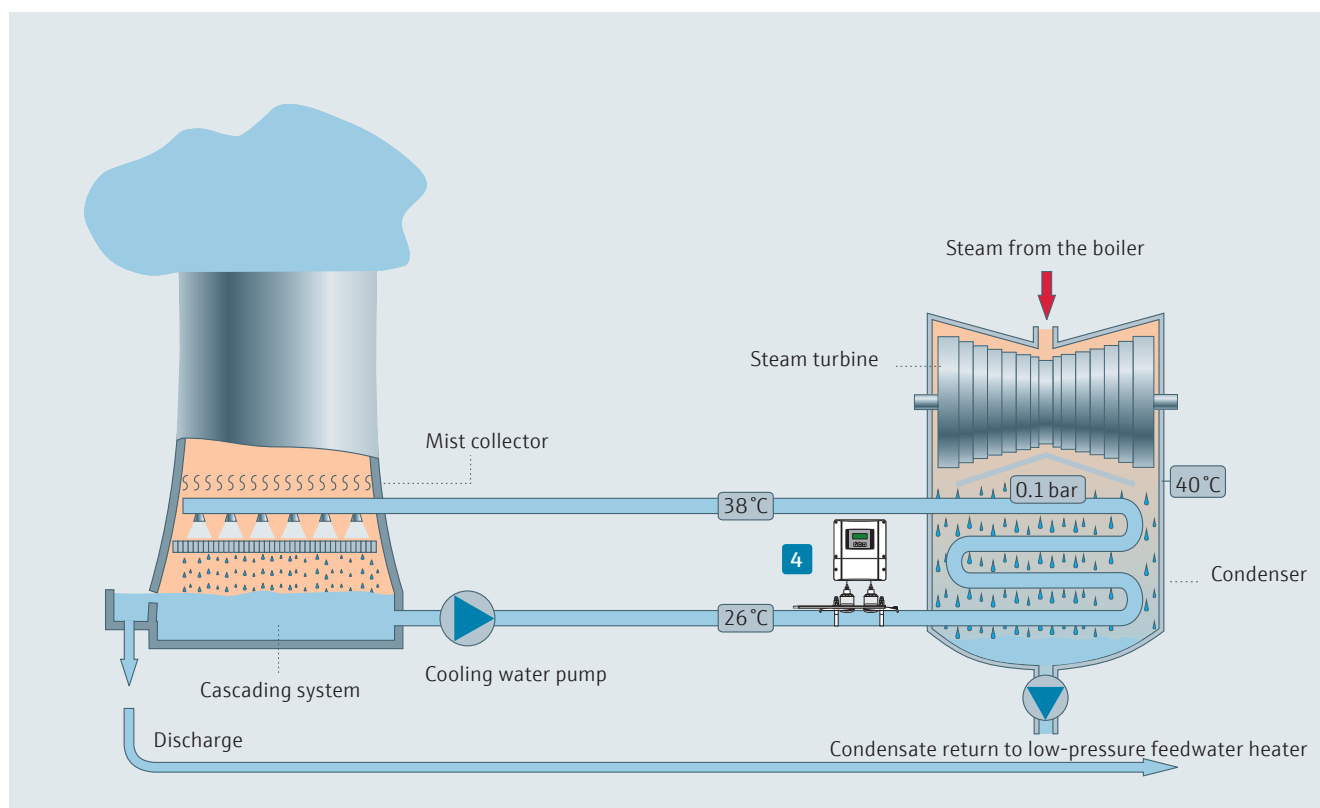
Prosonic Flow ultrasonic flowmeter

Portable version

4 Prosonic Flow – ultrasonic flowmeter

Prosonic Flow is an ultrasonic measuring instrument installed directly on pipelines via detecting sensors. The transmitter, which is mounted separately, completes the Prosonic Flow measuring system.

- External installation allowing easy retrofit with no intrusion into the pipe
- Maintenance free with no moving parts
- No obstructions in the pipeline and no pressure loss
- Economical alternative for large diameters up to 4000 mm
- Portable ultrasonic transmitter for temporary metering to verify already installed measuring devices



pH measurement in desulfurization

In the flue gas desulfurization plant (FGD), flue gas is sprayed with a limestone suspension. The sulphur dioxide (SO_2) contained in the flue gases reacts with the limestone. A gypsum suspension is produced by injecting air. The task of the FGD scrubber is to achieve an optimum desulfurization effect, as well as a high gypsum quality.

The main parameters to be controlled in this process are pH, density measurement and solid content in the suspension. Measurement of pH requires an ideal automatic measuring system well-suited to the difficult process conditions.



TopCal system in pH measurement for automatic cleaning and calibration

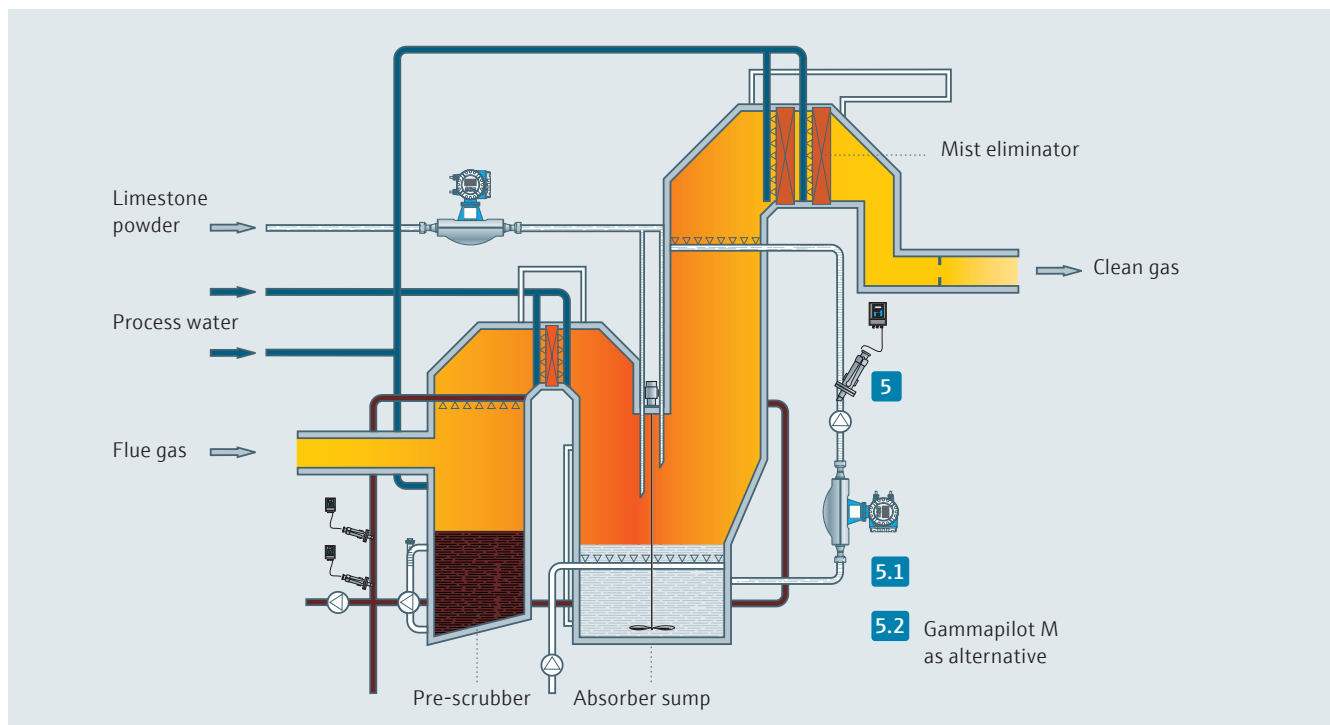
5 Memosens – digital pH sensor

A critical element in pH measurement is the electrode. Extremely low currents, high internal resistance at the electrode are a must in addition to high-impedance link between sensor/ transmitter. Presence of moisture can adversely impact the pH measurement. The use of Memosens technology revolutionizes data transfer by digitizing the measured value in the sensor. Data transfer from pH sensor to transmitter is digitally accomplished without a wired (moisture-sensitive) connection between sensor/ transmitter. Memosens technology saves the calibration/ configuration data that can simplify planned maintenance.

- Digital signal transmission between pH probe and transmitter
- Significantly higher availability and reliability of the measuring point
- Lab calibration is now a distinct reality
- Ease of installation and reduced cost of installation



Liquiline transmitter and pH sensor with Memosens technology together with Cleanfit retractable assembly for complete pH measurement



Density measurement in desulfurization

Density measurement of gypsum suspension is important for the efficiency of the flue gas scrubbers. If a certain concentration is achieved, the suspension will be grounded off. Density measurement can be provided by Promass Coriolis mass flowmeter or Gammapiilot radiometric measurement.



Promass installed in the absorber circuit

5.1 Promass – coriolis mass flowmeter

- Measures density and quantity with one device (two signal outputs)
- Effective in aggressive and abrasive gypsum suspension
- Accuracy up to 0.0005 g/cm³ for best controlling of the desulfurization plant
- Alternative to density measurement with radiometric measuring technology



Gammapiilot installed in the absorber circuit

5.2 Gammapiilot – radiometric measurement

- Measures density from outside the pipe
- No down-times
- Free of maintenance
- Unaffected by aggressive media



Quality control in the water / steam system

The steam which goes to the turbines has to be pure water. It is normal practice to keep the pH value of feed water at alkaline levels as it helps to minimize the corrosion of the pipe work and other equipment, thus preventing unscheduled downtime.

6 pH measurement in ultrapure water

1) Memosens pH electrode with salt ring in a grounded stainless steel flow chamber.

- Long time stable pH reading
- Elimination of flow dependency errors
- Digital Memosens technology
- Temperature compensation with NTC30k
- Gel reference electrode – no need for an external KCL reservoir – easy installation

2) pH measurement with differential conductivity: Two conductivity sensors together with Liquiline to realise calculated pH with differential conductivity.

3) pH measurement with liquid KCl reservoir



Digital pH electrode with salt ring


6.1 Silicate [SiO₄]⁴⁻/Silica SiO₂ monitoring

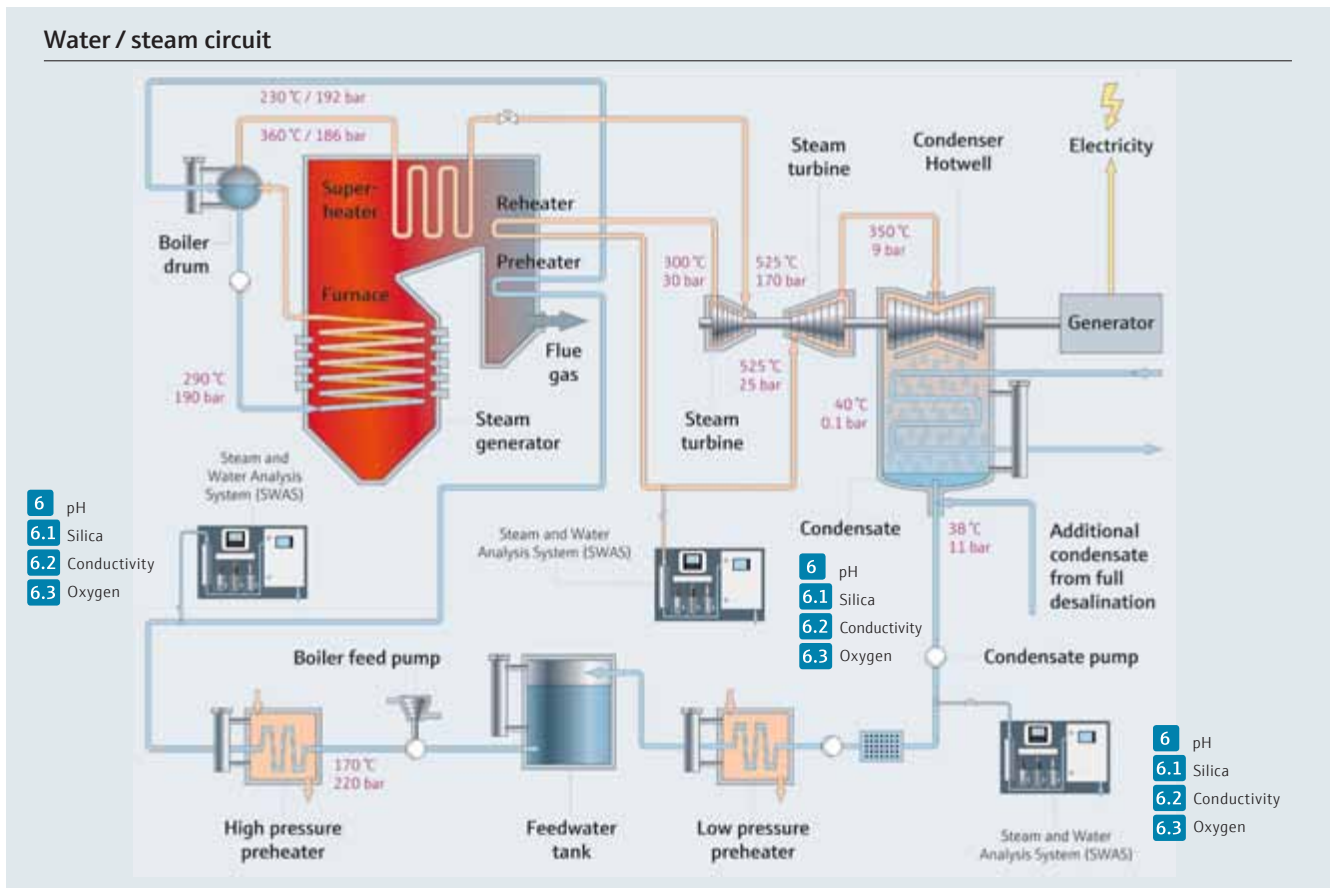
Among the many potential contaminants in the steam cycle, silica plays a crucial role because of its high solubility in steam. Due to this property, silica can deposit on any surface steam touches, creating issues with plant safety and efficiency. The compact Stamolys silica analyzer are:

- Designed for small consumption of chemicals
- Set up for minimal maintenance and downtime
- Proven for reliable measurement
- Easily integrated into our modular SWAS panel system



Precise control of silica to protect the turbine

 Overcoming corrosion and scaling
www.endress.com/quality-water-steam-circuit



Conductivity and oxygen measurement

6.2 Conductivity measurement

Conductivity indicates the quantity of dissolved solids that are present and how likely they are to create some scaling. High conductivity damages the turbine blades and low conductivity increases corrosion. It is a measure of the water purity and one of the most important parameters for any chemical control program in a power plant. A sudden increase in conductivity often indicates a leakage because carbon dioxide from the air has dissolved in the water. Beside the sensors transmitters make the measuring point complete. The wide range of multi-parameter transmitters from our Liquiline product line are:

- Quick and easy to commission
- Expandable
- Based on Memosens digital sensor technology
- Compact or panel mounted for more simplicity
- Have standardized and intuitive operation
- pH calculation based on differential conductivity in accordance with the guidelines from the association of large boiler operators VGB-R 450L

 Detect any conductivity variation
www.endress.com/power-conductivity



Multi-parameter Liquiline transmitter and conductivity sensor with Memosens technology



6.3 Dissolved Oxygen; DO

Dissolved oxygen (DO) is one of the main causes of corrosion in water circuits, which is why water is always thermally degassed before use. Oxygen should only be present in trace quantities (ppb). Even small quantities of DO in boiler water are capable of causing severe pitting in boilers of all pressures, and will reduce the boiler life dramatically. If the plant is to run efficiently, and to be cost effective with minimum down time the oxygen, solutions from Endress+Hauser on boiler plants is vital.

Thanks to Memosens digital technology, the DO sensor combines maximum process and data integrity with simple operation. It enables lab calibration and facilitates predictive maintenance.

- Reliable, long-term stability and linear measurement
- Low-maintenance design
- continuous determination of ppb-level

 Avoid corrosion by monitoring dissolved oxygen
www.endress.com/power-oxygen



Digital oxygen sensor Oxymax



Sampling & analysis system - SWAS panel solution with analytical instruments: pH, conductivity, O₂ and silica

Temperature measurement

Temperature is one of the most widely measured parameters in a power plant. No matter the type of plant, accurate and reliable temperature measurement is essential for operational excellence. Endress+Hauser offers a complete assortment of compact thermometers, modular thermometers, thermowells, measurement inserts, transmitters and accessories for all power plant processes.

The cooling water pumps play a very important role in the power-plant process. For reliable operation, the pump bearings must be adequately lubricated. In order to avoid damage to the pumps, the lube oil circuit must be monitored for pressure and temperature at all times.



7 Temperature measurement

Temperature measurements are typically made using a sensor; usually a thermocouple or an RTD a thermowell to protect the temperature sensor and a signal conditioning circuit; either a transmitter or a channel of an input card to a DCS or PLC to amplify the sensor's low level (ohm or mV) signal to a more robust 4-20mA current signal, HART®, PROFIBUS or Foundation fieldbus™ protocol.

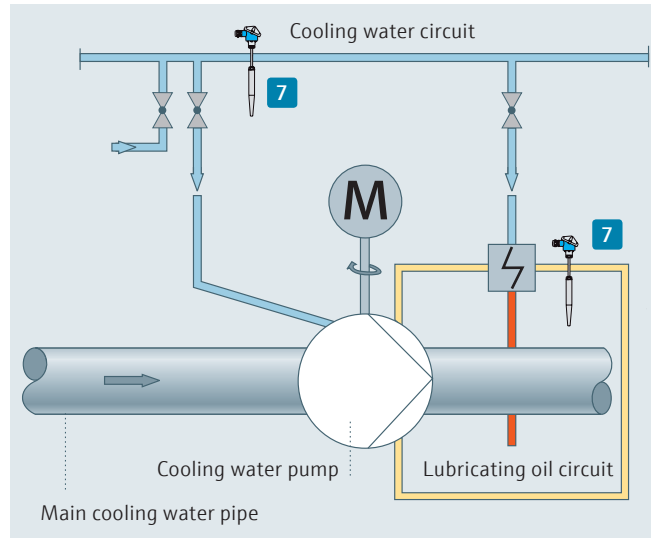
1) Sensors

Resistance temperature detectors (RTDs) and thermocouples (T/Cs) are both used in power plant temperature measurement. Each has its advantages and disadvantages, with the application determining which sensing element is best suited.

- Endress+Hauser developed an RTD that had up to 60g vibration resistance and handled higher temperatures. The construction of the RTD is far more robust than other RTDs on the market, making it suitable for both high temperatures and extremely high vibration.

2) Transmitters

- Despite the large installed base of direct wired sensors, the trend is toward using transmitters in conjunction with temperature sensors. Transmitters save time and money in installation, improve measurement reliability, reduce maintenance and increase uptime. The iTemp transmitter family offers rapid no-tools wiring due to optional spring terminal technology



For critical measurements: In this case, three temperature sensors in a steam pipe are set up with a two-out-of-three voting scheme for increased reliability and safety

- The benefits of using smart transmitters instead of direct wiring includes installation cost savings, reduced downtime and proactive maintenance through the use of advanced diagnostics.
- Smart transmitters incorporate remote calibration and some are capable of wireless operation.

3) Thermowell, SkinPoint and Multipoint

- Thermowells are the process wetted parts of thermometers. Basically, thermowells are divided into thermowells constructed from welded tubes and thermowells made of drilled barstock material.
- SkinPoint surface sensors are ideal for applications where intrusive measurements are complicated or not possible.
- Multipoint temperature assemblies contain of many individual T/Cs or RTDs mounted in only one process connection. These fully engineered solutions offer most accurate temperature profiling.

Data acquisition



Control room of a modern power plant

The central control panel is where all the important information from the power plant is collected and where the entire monitoring, control and regulation of the power generation process takes place.

Increasingly, paperless recorders are employed for data acquisition. These data managers are compatible with conventional paper recorders and can also be used as an electronic alternative for line and point recorders.

8 Ecograph / Memograph – Graphic Data Manager

These Data Manager are versatile solution with secure data recording and visualization. The innovative Data Managers are impressive devices because of the high functionality, modular construction and its intuitive and user-friendly operator concept via navigator and integrated web server.

- Safe: Reliable archiving reliably using the internal memory and separate SD card
- Flexible: Indication of the measurements in digital, bar graph and curve presentation modes
- Package: Including Field Data Manager software for manipulation free data storage and visualization
- System capability: Common interfaces such as Ethernet, RS232/485 and USB



Ecograph / Memograph

8.1 Field Data Manager (FDM) – Analysis and visualization software

The Field Data Manager (FDM) software can be used for the read out, storage and graphic presentation of the recorded data. Based on a SQL database data can read out, manipulation protected, from the device either from the internal device memory or a SD card using the various interfaces available, stored and internally managed.

- Complete archiving and management of the on-site recorded process data
- Transparent and flexible visualization of the historical data as a stable basis for the process analysis
- Fulfillment of burden of proof through automatic or manual report generation.
- Automatic readout of the connected devices and tamper-proof storage of the data in the database.
- Intuitive operation due to guided working steps – Wizard controlled

Field Data Manager (FDM)

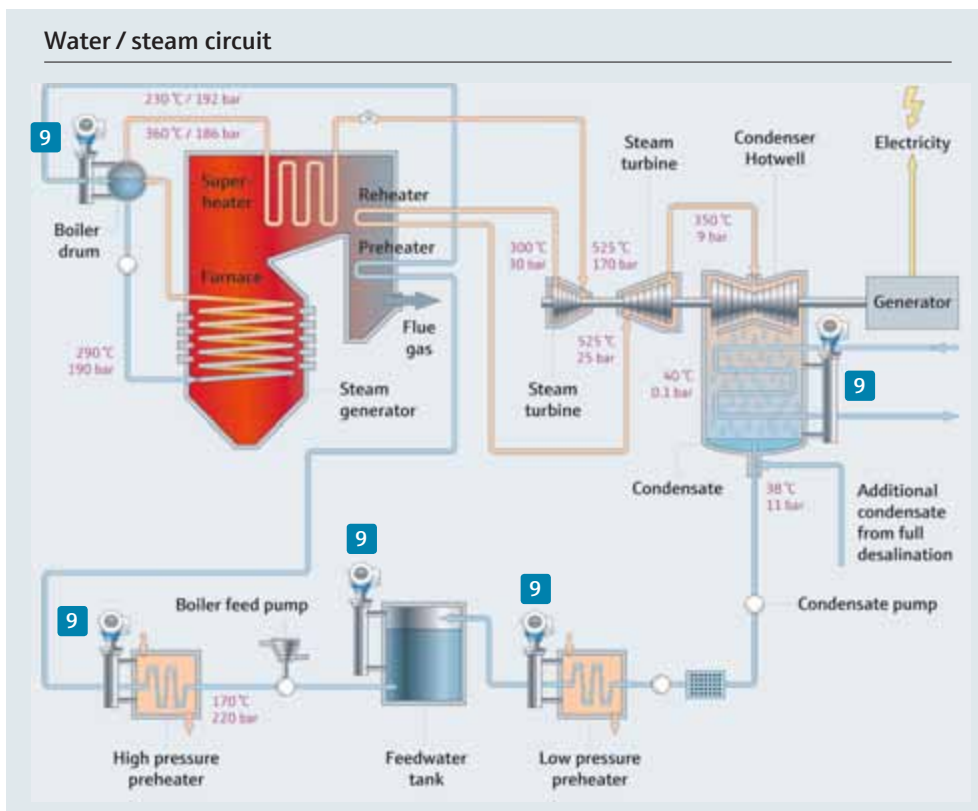


Level measurement in the water / steam system

The boiler feedwater circulates within the water / steam circuit. This is the main component in the power plant. After the steam has condensed in the condenser hotwell, pumps convey the feedwater through subsequent low- and high-pressure heaters into the boiler. When it arrives at the boiler, the feedwater is vaporized under high pressure (up to 260 bar) and high temperature (up to 550 °C). The steam is then supplied to the turbine in order to drive the generator.

Condensation in the condenser hotwell begins again and the entire procedure is repeated.

For safe operation of the circuit, monitoring levels in the vessels, control of flow volumes in water and steam lines and over pressure measurement in all parts of the plant are of great importance. This is accomplished with level, pressure and differential pressure transmitters.



Guided Wave Radar (GWR) level measurement (sensor remote) at low pressure preheater. Safety shutdown system 2 out of 3 voting architecture (2oo3 redundancy)

9 Levelflex – guided wave radar level measurement

Levelflex provides level measurement of condensed steam in front of the turbine in the condenser hotwell, as well as level measurement at the low pressure preheater, feedwater tank, high pressure preheater and boiler drum. Levelflex provides cyclic automatic gas phase compensation, the ideal solution for precise level measurement in all steam applications.

Levelflex is independent of:

- Density fluctuations
- Changing dielectric numbers
- Gas covering of steam

- Pressure and temperature changes
- Vacuum (e.g. in condenser hotwell)

This results in a better solution than differential pressure for level measurement, providing the benefits of:

- More reliable measurement
- Increased safety
- Easier installation

Levelflex is ideal as a displacer replacer. It has no mechanical moving parts and therefore, no wear and tear. Levelflex is suitable for pressures up to 400 bar or temperatures up to 450 °C.

 Level measurement in the water steam circuit www.endress.com/level-water-steam-circuit

dp level / dp flow in the water / steam system

9.1 Deltabar S – differential pressure for level measurement

Deltabar S differential pressure transmitter is used as a standard for level measurement in the water / steam system.



Deltabar S – differential pressure measurement

9.2 Deltatop – differential pressure for flow measurement

Deltatop constitutes the complete measuring system for flow measurement. It combines Deltabar S differential pressure together with orifice plates, pitot tubes and other primary elements for highly accurate flow measurement (volume or mass based) in gas, liquid and steam.



Deltatop – dp flow measurement



Hundreds of pressure and differential pressure transmitters for flow, level, p/dp measurement operate in power plants here shown with Harting plug Han®7 D electrical connection



Our service:

www.endress.com/applicator

gives you free of charge selection and sizing of your flow measuring system as per ISO 5167 standards. Furthermore, the dp-flow competence team at Endress+Hauser ensures that each custom-made Deltatop dp-flow solution fits correctly. This makes Endress+Hauser the right partner for dp-flow applications.

Pressure measurement in the water / steam system

10 Cerabar S – pressure transmitter

One example of pressure measurement in the water / steam system is the use of the Cerabar S pressure transmitter at the boiler drum. The boiler drum is the separating vessel between the water / steam phase in the circuit, and the highest system pressures are found here. For safety reasons, 2-out-of-3 voting architectures of pressure transmitters are typical. In order to protect against steam hammers, the instrument is fitted to a circular or U-shaped siphon.

The Cerabar S compact digital pressure transmitter is particularly well suited for use in the entire water / steam circuit.

- For pressures of 5 mbar to 700 bar
- Measuring ranges freely adjustable without calibration tools
- Turndown (measuring range spread) 100:1
- Standard linearity 0.05 % (0.025 % optional)
- Self-monitoring from sensor to electronics
- Compatible with Deltabar S – electronics for both instruments are interchangeable (reduced inventory)
- Use of additional functions via HART® protocol, PROFIBUS PA and FOUNDATION fieldbus™

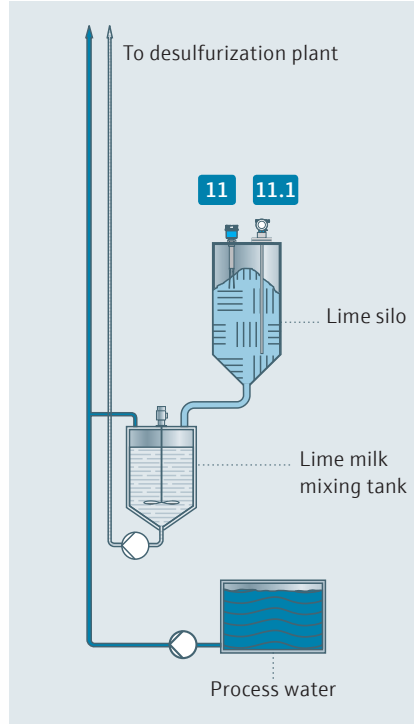


Cerabar S - Absolute and gauge pressure measurement

Level measurement in the lime silo

Lime plays a key role in many air pollution control applications. Lime is used to remove acidic gases, particularly sulfur dioxide (SO₂) and hydrogen chloride (HCl), from flue gases.

Lime for the production of lime milk for flue gas desulfurization (FGD) plant is stored in silos. A reliable level measurement is essential for trouble-free storage and material planning.



Soliphant M

Levelflex M

11 Soliphant M – vibronic point level switch for lime silo overfill protection

Soliphant is a robust point level switch for use in silos containing fine-grained or powdery solids even with a low bulk density. It is used as a high or low level indicator in the lime silo.

- Easy commissioning
- Maintenance free – no moving parts
- Compact design
- Simple and cost effective

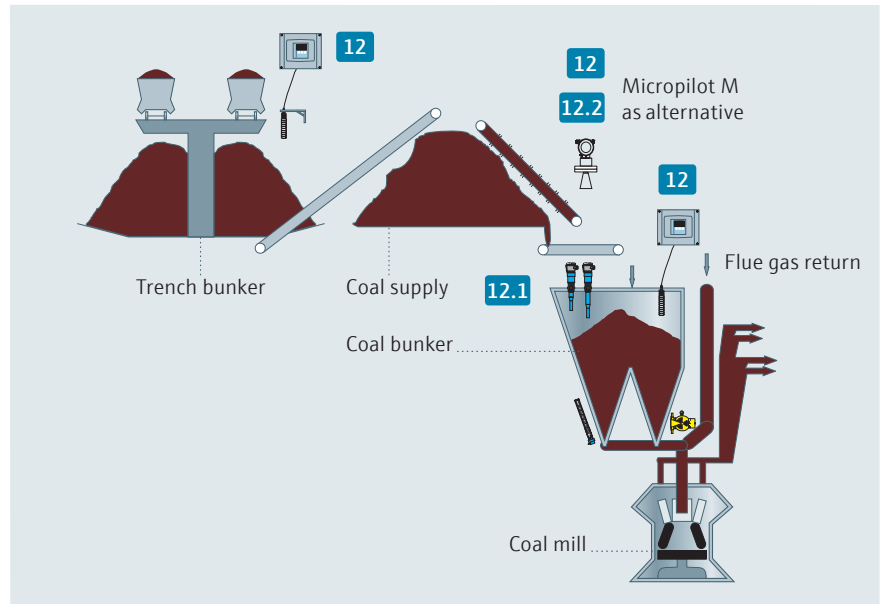
11.1 Levelflex – guided wave radar level measurement in the lime silo

Levelflex is a compact radar instrument for continuous measurement, especially for fine grained bulk material. It measures independently of changing product characteristics.

- Suitable for narrow silos or containers
- Ideal for fine grained bulk material such as lime, fly ash and pulverized coal
- Maintenance free – no moving parts
- Highest process safety due to Multi-Echo Tracking

Level measurement in coal

Coal that arrives by train or ship is collected in the coal plant for distribution. From the coal bunker (the storage area), it is passed on to the milling plant. Subsequently, the fine coal is injected into the boiler to be incinerated. The level in the coal bunker is decisive for steady loading of the coal mills. Thus, a continuous measurement device, as well as point level detection, are needed to monitor the level.



12 Prosonic S – ultrasonic level measurement

Prosonic S is a measuring system for continuous, non-contact level measurement for all kind of materials from sludge to coarse bulk solids. Transmitters are available for 1 or 2 sensors or an optional scanning system for 5 or 10 sensors.

- Insensitive to dirt and build-up
- Level limit control (up to 6 relays)
- Simple, menu-guided operation with 6-line plain text display
- Measuring range up to 70 m
- Prosonic S offers moreover application for flow measurement in open channels and weirs with 1 or 2 sensors

12.1 Solicap M – capacitive point level switch

The Solicap compact transmitter is used for point level detection in bulk solids and can be operated in minimum or maximum failsafe mode, e.g. in a coal storage bunker.

- Extremely robust design for harsh process conditions
- Easy and fast commissioning as calibration is performed at the press of a button
- Rod- or rope probes for min/max detection in coal bunker
- Two-point control (e.g. to control a screw conveyer)

12.2 Micropilot – microwave level measurement

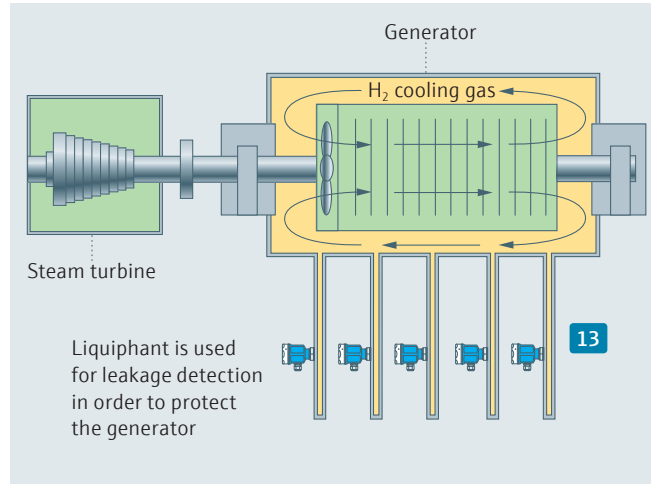
Micropilot free space radar performs continuous, noncontact level measurement for the highest demands in bulk solids and best suited for measurements in high silos, bunkers or stockpiles. Dust, filling noises, temperature layers and gas layers do not affect the measurement.

- Two-wire technology reduces wiring costs and allows easy implementation into existing systems
- Non-contact measurement reduces maintenance costs
- Intuitive user interface in national languages
- Integrated air purge connection for extremely dusty conditions or media tending to create build-up
- Measuring range up to 70 m



Leakage detection at the generator

Because of heat build-up, generators in a power plant must be cooled. This is usually done with hydrogen cooling gas. Discharge lines are located at the generator housing. If lubricants reach the housing due to leakage in the thrust bearings, the rise in liquid is detected by the Liquiphant point level switch at the end of the discharge lines. The problem is then recognized and can be eliminated.



13 Liquiphant – point level detection for liquids

Liquiphant is a compact instrument for point level detection in liquids using the vibration principle. Due to its very small fork size, it is the ideal solution for applications where space is limited.

- Leakage detection to protect generator
- Pump dry run protection
- Simple commissioning
- Ex version for use in hazardous areas where hydrogen may be present
- Maintenance free – no moving parts



Liquiphant - compact vibration point level switch for liquids



Liquiphant installed to protect the pump from running dry

Monitoring the lubrication circuit

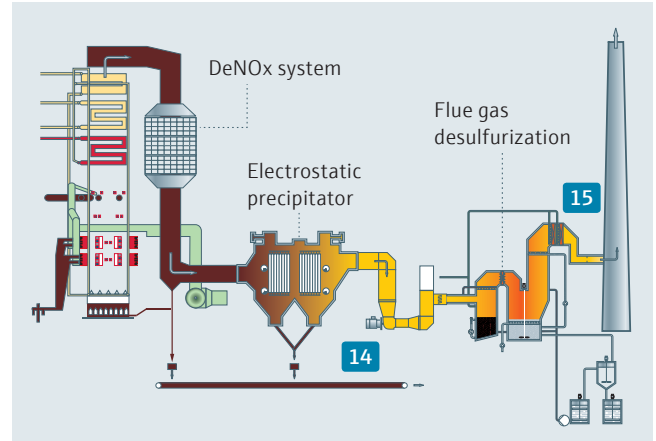
The induced draught is an important component in the flue gas circuit. The feeding of the induced draught is to exhaust the flue gas out of the boiler to the stack, via the flue gas treatment plant. In order to ensure lubrication of the bearings, the level of the lubrication oil must be continuously monitored and controlled.



14 Liquicap – capacitance probe

Liquicap is designed to measure level in very small containers. It monitors the oil level in the lubricant pump.

- Technology tried and tested in millions of applications
- Short reaction times
- Automatic monitoring of electronics
- Simple and cost-effective probe
- Build-up compensation



Liquicap maintains level in lubrication oil surge tank

Flue-gas flow rate

15 Deltatop Maxiclean – differential pressure with averaging pitot tube

Deltatop offers advanced features, satisfying international environment regulatory bodies in order to monitor the volume- or mass flow of gas emissions. For flue-gas flow-rate measurement, Deltatop comprises the Deltabar S transmitter with the Maxiclean averaging pitot tube.

- Apertures for internal mechanical cleaning
- Maxiclean system with large internal diameters enables dust free continuous operation
- Air purge system to prevent blockage (optional)
- Special materials against abrasion, corrosion and high temperatures
- Deltabar S offers easy and time saving commissioning



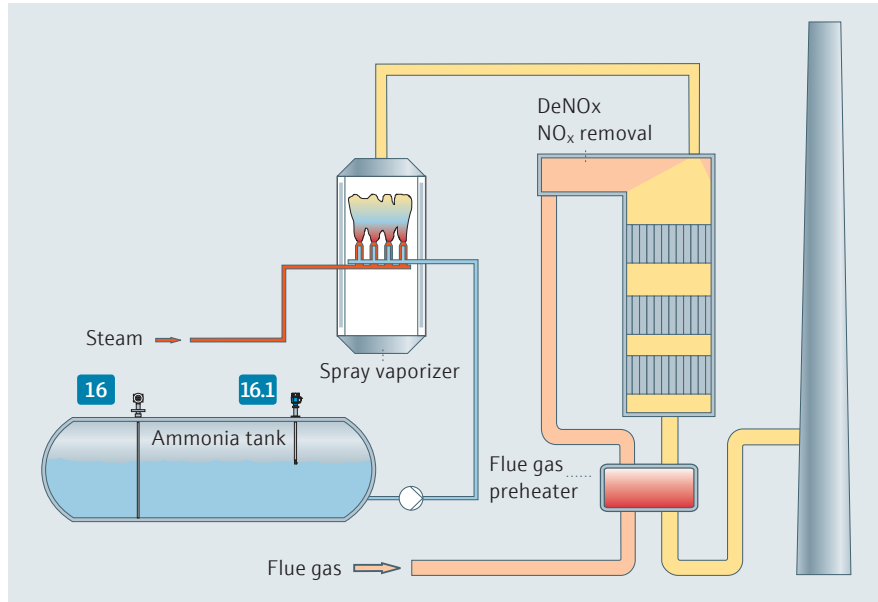
Deltatop – Deltabar S with air purge system and Maxiclean averaging pitot tube

Level measurement in the ammonia tank

Nitrogen oxides in the flue gas are reduced in a DeNO_x system. This is achieved through absorption in the catalyzer. The ammonia is stored in a tank, which must be continuously monitored.

The diffusion behavior of ammonia is extreme, which considerably limits the choice of measurement technology available.

Levelflex high temperature version and Liquiphant offer a welded gastight feedthrough, preventing ammonia gas from penetrating through. This increases safety to personnel and to the electronics of the devices.



16 Levelflex – guided wave radar level measurement

Low frequency guided microwaves have proved to deliver very reliable measurement results in ammonia tanks. Levelflex can be mounted either in the tank or in a bypass. Levelflex is a compact, guided wave radar instrument for continuous level measurement.

- Special welded gastight feedthrough provides uncompromising protection against diffusion
- The precise measurements bring a high level of certainty to the process
- Maintenance free, no moving parts
- Simple, menu-guided on-site operation with four-line plain text display
- With coax probes, the measurement is completely independent of internals in the tank and of the installation in the nozzle



Levelflex with gastight feedthrough guarantees additional safety in toxic media like ammonia

16.1 Liquiphant – point level switch for all liquids

Liquiphant is the ideal point level switch for the ammonia tank. The device is not affected by flow, turbulence, bubbles, foam, vibration, solids content or build-up.

- Due to the completely metallic process separation, ammonia diffusion is no problem for Liquiphant
- No calibration: quick, low-cost start-up
- No mechanically moving-parts: no maintenance, no wear, long operation life
- Self monitoring of fork for damage increases plant safety



Liquiphant with extension tube

- Switching point is simply defined via the length of the sensor
- The closed, welded construction is diffusion tight and guarantees a high degree of process stability

Point level detection at the electrostatic precipitator

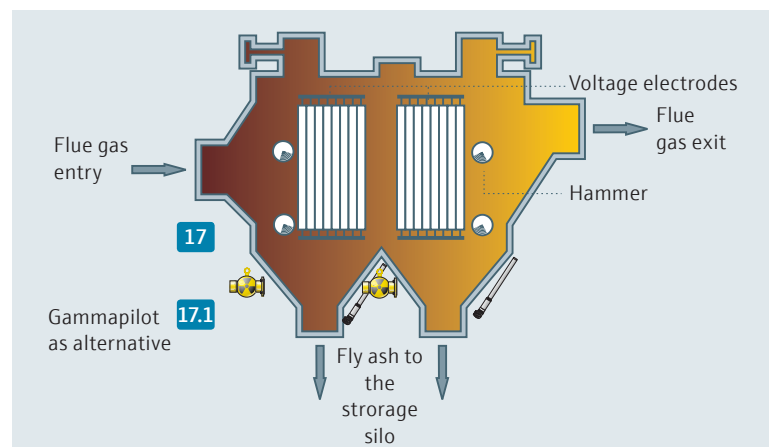
The Electro Static Precipitator (ESP) consists of charged electrical grid creating an electrostatic field. The fly ash and particulate matter in the flue stream attach to the grids. "Hammers" on top of the precipitator lift and drop to cause the ash to shake off the grid and fall into the collection hoppers below. The flue stream runs through filters in a "Bag House". The filters that capture the ash are mechanically shaken to cause the ash to fall into the collection hoppers. It is necessary to have high level switches to indicate when the fly ash hoppers are full. The fly ash collected in the hopper is cleared out by a vacuum system attached to the bottom of the hopper. Failure to empty the hopper could cause damage to the surrounding equipment and/or plug of the fly ash removal system or worse lead to a hazardous spillover. The environment around the fly ash collection system tends to be hot and abrasive. Two technologies that have proven themselves well in this challenging environment are Radiometric (Gamma) and Capacitance.



Capacitance switch for high level fly ash indication inserted through the hopper wall at the point where indication is required

17 Solicap – capacitance level limit switch
Solicap is a compact and rugged limit switch for min / max detection in bulk solids, e.g. fly ash hoppers – electro static precipitator (ESP's) and filter bag houses.

- Extremely robust design for harsh and high temperature process conditions
- Sensing element "Sword" with large active area to provide stable and reliable high level fly ash indication
- Non-nuclear technology provides a lower cost of maintenance and infrastructure



17.1 Gammapiilot – radiometric measurement

Using a nuclear source and receiver for high level indication of fly ash has several advantages. First, it is well recognized in the power industry as a reliable solution to this measurement. Many facilities have used this technology for years and will use nothing else.

- No down-times
- Independent of build-up at the walls and abrasive material
- No temperature limits
- Point level detection from outside



Gammapiilot - nuclear solution with its advantage of being mounted external to the hopper, away from the heat and abrasive ash

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W@M Life Cycle Management enhances your processes with easy access to device information. The up-to-date data enables you to shorten engineering time, increase plant uptime and optimize maintenance.

Improved productivity with information at your fingertips
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More information about W@M

www.endress.com/lifecyclemanagement



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Applicator provides clear process guidance and a straightforward module structure:

- Selection – determine the suitable measuring system for the application. Product areas include level, flow, density, pressure, analysis, temperature, registrations and system components
- Sizing – choose the correct dimensioning for the measuring device
- Free access to the online tool or download and install the tool locally including project module.

System Integration – from individual sensor through to complete solutions

With the introduction of communication technologies such as HART®, PROFIBUS and FOUNDATION fieldbus™, the barriers between field instrumentation and the systems level began to disappear. The instruments became more intelligent and an integral part of the automation architecture. Having recognized this development at an early stage, Endress+Hauser has been actively involved in standardization committees and user organizations from the introduction fieldbus technology in order to ensure that our customers do not lose touch with new trends.

A fieldbus output is both an interface to the field instrument and a carrier of additional information from the field. Instrument status, maintenance and diagnostics information from the process to the control room increases plant availability.

Endress+Hauser ensures the integration of this information into the system environment.

Maintain expertise

Rely on knowledgeable partner that supports you from conceptual design to commissioning services

Whether operating domestically or internationally, you are looking for a reliable partner for your power plant industry and/ or thermal waste treatment. As a power plant operator, plant builder, package supplier, main equipment supplier, or an EPC, you want to increase productivity and performance and we can help you. Our scope of supply:

- Project Management
- Engineering (including installation)
- Instrument Delivery
- Installation/Verification
- Documentation
- Training

Re-engineering

- Approval of seasoned power plants concerning technical and safety standards
- Technical adjustments for necessary standards
- Adjustments of parts in a power plant for new operational needs (Heat value, steam supply etc.)

Power improvement, process optimization

- Proposal for modernization concepts
- Optimization of throttle valves and flow reduction devices for power improvement
- Analyzing figures and optimizing parameters

Maintenance and inspection

- Maintenance and weakness analysis
- Proposal for maintenance and inspection plans
- Preventive inspection and maintenance

Maintenance optimization

- Maintenance consulting/Installed Base Audit (IBA)
- Collecting technical data in power plants Improvement proposal of a solution concept
- Definition of well-balanced maintenance plan for field instrumentation

 More information at www.endress.com/services



 **Endress+Hauser** men and women work closely together with worldwide and local organizations, foundations and institutes, such as First Point Assessment Limited (FPAL) for cost reduction and performance improvement. Our instruments are designed and manufactured according to globally standardized certifications such as API, ISO, SIL and IP. Global approvals and certificates include:

Approvals for hazardous areas (Ex certificates)
 ■ ATEX ■ FM ■ CSA ■ TIIS ■ IECEx ■ NEPSI

Further approvals
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