

## Wet steam measurement with Proline Prowirl F 200

For maximum safety and  
energy efficiency in steam  
applications



# Innovative vortex flow metering

For simultaneous measuring of steam quantity and quality

Are you responsible for the safe and efficient operation of steam plants in your company? If so, you know that wet steam not only poses a potential safety risk, but also contains significantly less energy than saturated steam. This is now a thing of the past because the new Prowirl F 200 vortex flowmeter from Endress+Hauser measures not only the steam quantity but also its quality around the clock. This is unique worldwide and opens up completely new perspectives for the safe and efficient operation of your steam plants.



## ✓ Your benefits

- A world first: simultaneous measuring of steam quantity, steam quality, condensate quantity, temperature, pressure, heat and energy flow
- Increased operating safety thanks to an automatic wet steam alarm (dryness fraction < 80%)
- Efficient and exact mass measurement of wet steam (80 to 100% dryness fraction) and condensate thanks to a unique correction algorithm
- More accurate steam balancing (mass and energy) for more efficient operating of the system
- Highest resistance to vibration, temperature shock and water hammer
- Tried-and-tested, maintenance-free sensors with over 400 000 installations worldwide
- Exact calculations of heat/energy flow through a multivariable measuring concept and globally accepted standards (IAPWS-IF97/ASME)
- The best long-term stability thanks to a "lifetime" calibration factor (K-factor)
- Traceable measuring results due to accredited calibration facilities: SAS (Switzerland), A2LA (USA) and CNAS (China)



# Don't give wet steam a chance

## For increased operational safety around the clock

Time and time again, insufficient insulation, defective condensate drains, as well as pressure and temperature fluctuations lead to condensation of steam and a subsequent formation of dangerous wet steam. In addition, disruptions in boiler control can cause water to overflow and enter the steam line. The consequences are often severe:

- Low efficiency in energy transfer because wet steam contains less energy than saturated steam
- Formation of dangerous, undesired occurring water hammer
- Severe corrosion due to entrained boiler water and the dissolved salts it contains

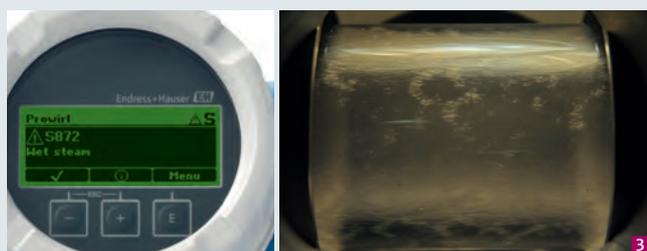
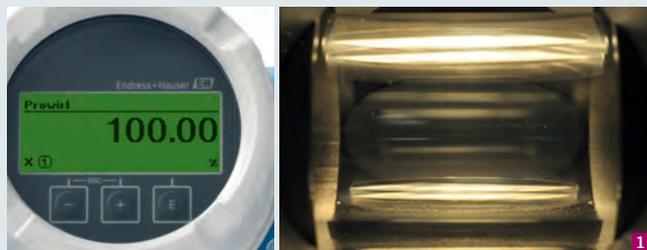
But how can wet steam in a pipe be detected in time? Endress+Hauser, in collaboration with the University of Applied Sciences and Arts in Windisch, Switzerland, has found an answer to this question frequently posed by users. With the help of a newly developed steam research rig it is now possible to record continuously the influence of the dryness fraction, or rather of developing condensate, on the signal behavior of the Prowirl F 200 vortex flowme-

ter. The result from many years of research has enabled Endress+Hauser to offer a range of innovative functions for assessing the real existing steam quality in pipes.

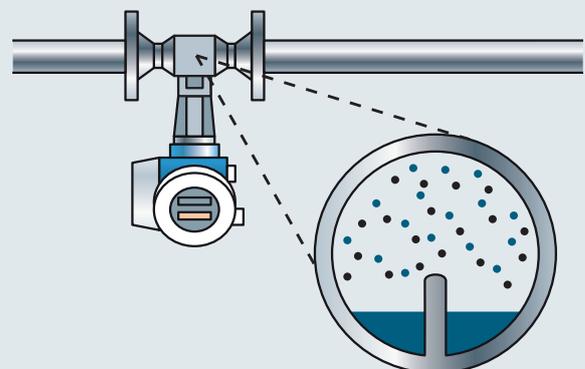
- Permanent measurement of the dryness fraction between 80 to 100% and thus determination of the steam type (wet, saturated or superheated steam)
- Alarm signal for a dryness fraction below 80% (configurable between 80 and 100%)
- Exact mass measurement of the steam and condensate quantity (e.g. in kg/h)

**i** Our product range also includes measuring devices for water analysis, which allow you to consistently monitor the properties of feed and boiler water, e.g. dissolved oxygen, pH value, lime content and electrical conductivity. The advantage: optimum control of steam generation in a heating boiler, leading to real cost savings through increased efficiency.

### Wet steam measurement – View through sight glass



Wet steam occurs through the condensation of steam. First, the condensate flows at the bottom and then smears up the pipe walls, which affects the measuring signal of the Prowirl F 200 vortex flowmeter. This effect can be used to determine steam quality, which can also be outputted as measured variables. It is thus possible to correct the mass and energy of steam whenever necessary.



- 1 100% dryness fraction (saturated steam,  $x = 1$ )
- 2 90% dryness fraction ( $x = 0.9$ )  
10% condensate (with wavy flow)
- 3 80% dryness fraction ( $x = 0.8$ ) → Alarm  
20% condensate (with annular flow) 

# Technical data

## Prowirl F 200

Device type	Vortex flowmeter in two-wire loop-powered technology. Developed as a volumetric flowmeter conforming to IEC 61508 and suitable for SIL 2/3 applications.
Nominal diameters	<ul style="list-style-type: none"> <li>– DN 15 to 300 (½ to 12")</li> <li>– DN 25 to 300 (1 to 12") with wet steam detection/measurement</li> </ul>
Process temperature	<ul style="list-style-type: none"> <li>– Standard: –200 to +400 °C (–328 to +752 °F)</li> <li>– Optional: up to +450 °C (+842 °F)</li> <li>– Wet steam detection/measurement: 120 to 250 °C (248 to 482 °F)</li> </ul>
Process pressure	PN 10 to 100, CI 150 to 600, 10 to 20K
Outputs	<ul style="list-style-type: none"> <li>– Current outputs</li> <li>– Pulse/frequency/switch output</li> </ul>
Inputs	Current input for easy wiring of an external temperature device (delta heat)
Communication	HART, PROFIBUS PA
Ex approvals	ATEX, IECEx, cCSAus, NEPSI, INMETRO



Prowirl F 200 with integrated pressure measurement for liquids and gases

Subject to modification

## Everything from one supplier



**Registration**  
RSG45



**Oil feed**  
Promass I  
300



**Gas feed**  
t-mass 65F



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Prosonic  
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**Pressure**  
Cerabar M



**Temperature**  
Omnigrad TR



**Level**  
Levelflex



**Controller**  
Liquiline CM442  
(pH, conductivity,  
dissolved O<sub>2</sub>)

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