

Technical report of gas analytic technology to the topics:

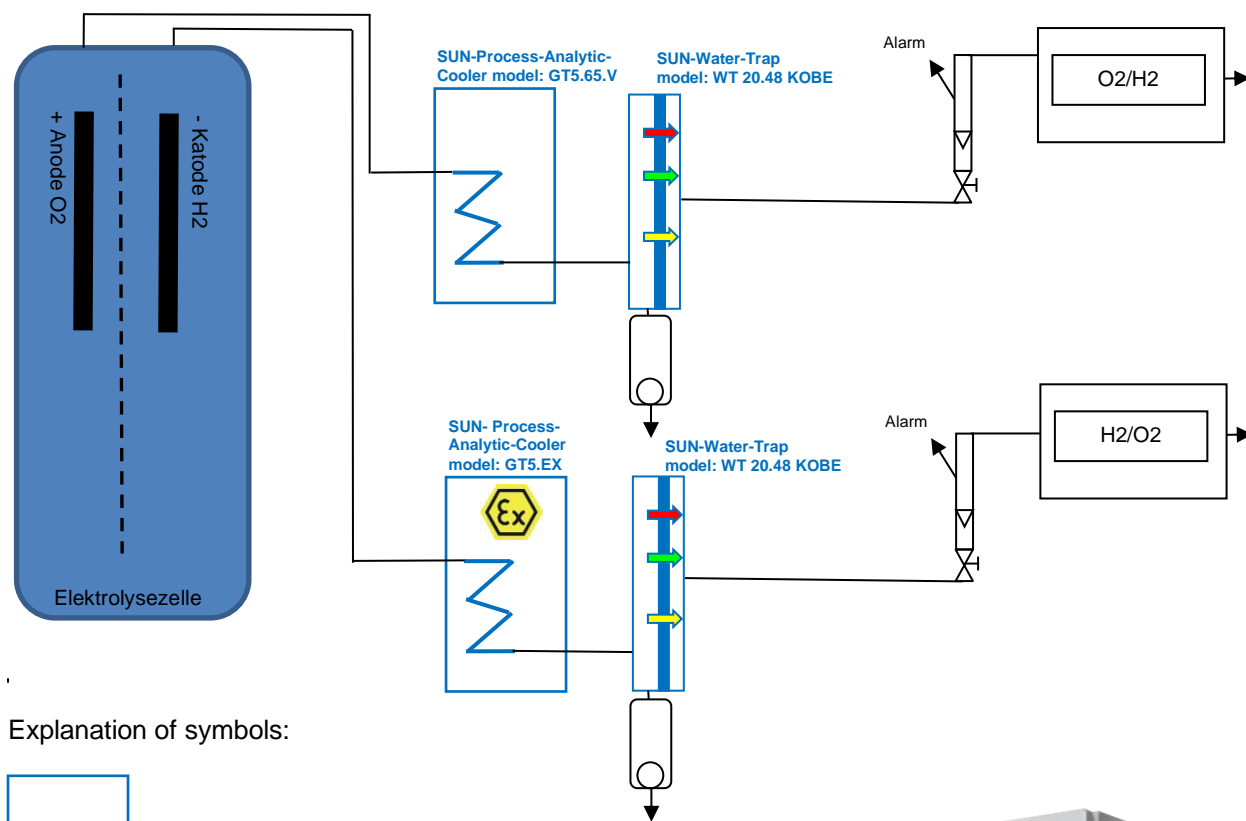
Gas analysis technology, gas processing, extractive gas analysis, green hydrogen, electrolyzer, power to gas and power to liquid, process analysis, process analysis technology (PAT)

Safety-related operational measurement of oxygen (O₂) and hydrogen (H₂) on electrolyzers for the production of hydrogen.

In the course of climate change, there is an increasing focus on the production of **renewable hydrogen**, so-called **green hydrogen**. **Power to gas** and **Power to liquid** processes are being used to replace fossil fuels. The hydrogen electrolysis is monitored for gas quality, impurities and explosive gas mixtures (oxyhydrogen) by means of extractive gas analysis technology from **SUN-Control-Analytik-GmbH**.

Via electric current, the individual compounds are separated from each other during water electrolysis ($2H_2O \gg 2H_2 + O_2$). If the electric current comes from renewable energy sources (sun, wind), it is considered green hydrogen.

Gas flow diagram:



Explanation of symbols:



SUN-analytic gas cooler model: GT5.65.V

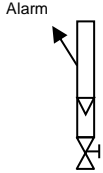


SUN-Water-Trap model: WT 20.48 KOBE

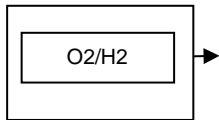




Automatic condensate drain



Flow meter with regulator valve and alerting



Gas analyser

Function description:

The electrode gas is cooled down to a defined dew point via the **Process-Analytic-Cooler** model GT5.65.V from **SUN-Control-Analytik-GmbH**[®]. An automatic condensate drain removes the resulting liquid.

The **Water-Trap** model WT 20.48 KOBE with the built-in **SUN-Control-Analytik-Membrane**[®] protects the high-quality analyzer from penetrating condensate and fine dust.

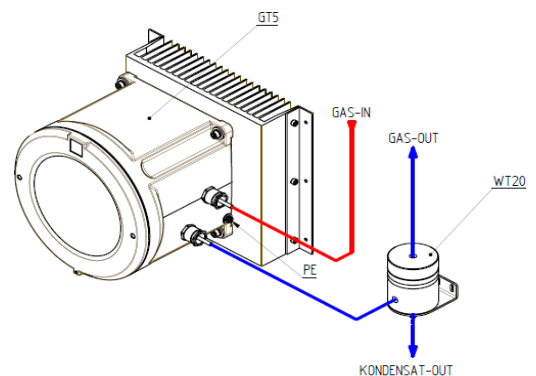
The gas flow monitoring is carried out by a variable area flow meter with a regulating valve. Optical and electrical alarms are standard. The analyzer converts the required gas concentrations into an analog or digital signal, which is processed further as a control, regulation and alarm signal.

The alternative to installation in potentially explosive areas is the Process-Analytic-Cooler model GT5.EX is available. zur Verfügung.

The company **SUN-Control-Analytik-GmbH**[®] is an official supplier of gas analysis technology for **hydrogen electrolyzers**.



EU - Baumusterprüfbescheinigung



IEC/EN 60079-0, 60079-1, 60079-31

EPS 17 ATEX 1 072

- Gas: II 2G Ex db IIC T4 Gb (Tamb +60°C)
- Gas: II 2G Ex db IIC T6 Gb (Tamb +40°C)
- Staub: II 2D Ex tb IIIC T130° Db (Tamb +60°C)
- Staub: II 2D Ex tb IIIC T80° Db (Tamb +40°C)

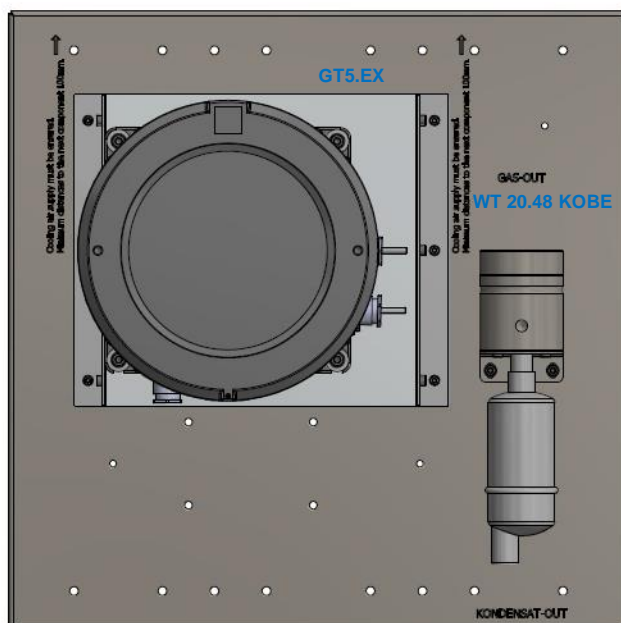
IECEX EPS 17.0036

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- Gas: Ex db IIC T6 Gb (Tamb +40°C)
- Staub: Ex tb IIIC T130° Db (Tamb +60°C)
- Staub: Ex tb IIIC T80° Db (Tamb +40°C)

Installation example:

The picture shows an analysis Mounting plate with the components listed in the gas flow plan:

- SUN- Process-Analytic-Cooler model: GT5.EX
- SUN-Water-Trapmodel: WT 20.48 KOBE
- Automatic condensate drain



Hydrogen fact sheet:

- Non-toxic, colorless, odorless gas
- Combines with oxygen to give water (H₂O)
- Burns with an invisible hot flame
- Norm density 0.089 kg/m³, west lighter than air
- Ignition range 4 - 77 vol.%, ignition temp.: 560°C
- Most abundant element on earth.
- Highly flammable -Keep away from ignition sources
- Forms dangerous gas mixtures with oxygen (oxyhydrogen)
- High diffusion rate
- conversion 1 ppm = 0.08 mg/m³
- Consider material selection (danger of hydrogen embrittlement of metals such as pipes and instrumentation components)
- Environmentally friendly properties, with air emission-free combustion to water
- Considered an energy carrier of the future that will replace fossil fuels in the medium term

Oxygen fact sheet:

- Colorless, odorless, combustion-promoting gas -Strong oxidant.
- Important component in combustion -Danger of asphyxiation in the event of oxygen deficiency
- Norm density 1.429 kg/m³ -Conversion 1 ppm = 1.33mg/m³
- Strong oxidizing agent and, under unfavorable conditions, can cause carbons such as oils, greases and particles to spontaneous combustion. To avoid such undesirable reactions in plant components, the SUN-Control-Analytik offers a coordinated cleaning procedure for the surfaces in contact with the media.

After the **SUNOX100-Process**, the surfaces in contact with the media are free of residues.

**Technology leader in
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