

# Meters, Regulators, Controls and Safety Accessories for the Pipeline-bound Supply of Climate-neutral Hydrogen to the General Public

For more than 150 years we, the equipment suppliers of the gas industry, have been supplying the gas network operators with products for the transmission and distribution of fuel gases rich in hydrogen and methane. We will continue to do this today and, in the future, accelerating the introduction of technologies enabling the use of climate-neutral gases such as hydrogen.

## H<sub>2</sub>-Readiness of equipment deployed in gas grids

Our products are part of the safety-oriented gas grid design and contribute to secure safe operation of the infrastructure over its useful life. This applies to all permissible combustible gases, including hydrogen.

We declare our products as "H<sub>2</sub>-Ready / suitable for hydrogen" if the technical, in particular safety-related, and legal requirements are met that allow the immediate operation of our products with all permissible combustible gases, i.e. also for hydrogen (H<sub>2</sub>-Readiness).

The suitability for hydrogen is declared by the manufacturer as part of a manufacturer's declaration. Among other things, the following topics are specified

- the suitability for hydrogen or the maximum permissible fluctuation range of the hydrogen content in the natural gas
- Characteristics of the device (e.g. flow measurement range, control characteristics, accuracy, reproducibility, etc.)
- Design parameters and limit values of operating pressure / operating temperature with regard to compressive strength
- Chemical resistance through the use of suitable materials for parts that come into contact with the medium in accordance with the Pressure Equipment Directive 2014/68/EU (PED)
- Conformity to the ATEX equipment directive 2014/34/EU

In the case of restrictions in the hydrogen suitability, the permissible hydrogen content in the gas is noted in the product documentation.

## Manufacturer tests and certificates

Our products usually fall in the scope of European directives such as the pressure equipment (PED), measuring instrument (MID) and/or the ATEX equipment directive. They therefore undergo a conformity assessment before they are placed on the market. This may include the assistance of a "notified body". By affixing the CE mark, the respective manufacturer declares

that his product corresponds to the basic harmonization regulations of the European Community. Basic product requirements, especially safety-related ones, are defined by standards. The area of application is specified in the product manuals and certificates. In the scope of the MID the permissible gas quality range is also determined.

To ensure and verify the product properties, we use risk assessments as well as tests during production by factory experts, quality assurance officers and external inspection and product testing organizations, which are based on product standards and / or product requirements of the customer.

Based on this, we issue our test certificates, factory and acceptance certificates, declarations as well as our data sheets, manuals or technical reports for a specific application, which can also include the suitability for the transport and distribution of hydrogen-containing fuel gases and hydrogen.

### **Test marks and seals of quality**

Not all assurances of product properties desired by the user fall in the scope of European directives and regulations and the national implementation of these regulations. Conformity to national installation and user practices are often covered by product and quality certifications. The equipment suppliers use these options, among other things, to validate the suitability for hydrogen independently of their own quality assurance measures. The test basis for these test marks and seals of quality can be obtained from the respective publisher or testing institution and from the product manufacturer.

### **Tasks of gas infrastructure operators**

Proven equipment properties guaranteed by the manufacturer according to product standards meet a specific application in the gas network. Devices and components are usually deployed in network sections or stations whose properties are defined by system standards. If the use of the products for hydrogen applications there is not state-of-the-art or has not been well-tried and tested in practice, the operator of the network section must check and determine the conformity of the product properties with his requirements, in particular with regard to functionality and safety, based on his specification. Methods for this conformity check include expert reports, risk assessments, operational testing, test reports or certificates from manufacturers. The equipment suppliers and manufacturers are happy to provide their experience, internal test reports, risk assessments and practical results to the network operator to support the conformity checks.

However, the determination of suitability for the hydrogen application does not release the operator from his responsibility for the correct design and for ensuring the safe operation of the network section or station in which the product in question is used. Furthermore, it does not replace the operational tests and approvals for commissioning and, if required by codes of practice or law, the job safety analysis for operating the equipment of the network section and the entire system.

## **Current status of H<sub>2</sub>-Readiness of the gas grid equipment**

A large number of power-to-gas projects and field tests with hydrogen injections into network sections have been implemented using standard devices deployed by the gas industry. The area of application extended from hydrogen content in the lower percentage range in the fuel gas up to pure hydrogen. The experiences gained in these projects are the basis for ongoing optimization of the products, new devices for hydrogen applications and the revision of technical regulations and standards.

When using standard equipment of the gas infrastructure, the suitability for hydrogen is therefore not always sufficiently proven and should be tested in practice if there are any ambiguities. It is currently still necessary to specify the suitability for hydrogen in the specific project for each device and to inquire with the manufacturer.

National and European gas industry associations are frequently publishing new findings and standards on the hydrogen suitability of the gas network infrastructure. These findings are particularly helpful when converting network sections from natural gas to hydrogen-containing fuel gases with hydrogen proportions above permissible limits and hydrogen.

## **Transition of gas grids to hydrogen**

Supplying the general public with climate-neutral gases will lead to the conversion of existing networks from methane rich fuel gases to hydrogen-containing gases and hydrogen. The conversion requires an analysis and assessment by the network operator of the extent to which the network section under consideration leads to new or changed hazards and risks when operating with hydrogen fractions in the fuel gas or hydrogen. Moreover, operators' measures cover the assessment of the deployed equipment with respect to their H<sub>2</sub>-Readiness under the conditions of use, i.e., the entire range of permissible hydrogen content, pressure cycle stress and the maximum operating pressure.

In the meantime, technical regulations, best available practice, and scientific papers on the conversion of pipelines and systems as well as gas stations have been published, which suggest conversion procedures and related assessments. In general type tests are recommended for devices to limit time and effort. If not otherwise possible, case-by-case reviews supplement the conversion process. In addition, operational tests of the converted network section and stations are required, e.g., leakage tests, check of internal tightness, function and response characteristics of safety accessories, valves and regulators with respect to the modified gas and material characteristics.

Despite the first ongoing conversion projects, the conversion of sections of the gas network to hydrogen-containing gases and hydrogen is not yet common practice. Procedures used are not generally tried and tested in practice. In this context, the suppliers of the gas networks offer their expertise on their products to support the network conversion to climate neutral gas supply and identification of the H<sub>2</sub>-Readiness.