
	<b>Certification programme ZP 4500</b> <b>Supplementary tests for metallic connectors for gaseous fuels for a hydrogen content of up to 100 % by volume</b>	54500.100-00-N-GB	
		Doc. type	ZP
		Author	DVGW CERT GmbH
		State	10.09.2024

**Certification programme ZP**  
**“Zertifizierungsprogramm” 4500**  
**of DVGW CERT GmbH, Bonn**

**Supplementary tests for metallic**  
**connectors for gaseous fuels for a**  
**hydrogen content of up to 100 % by**  
**volume**

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## 0 Preliminary remark

The following certification and testing basis describes the supplementary tests required to qualify metallic connectors for use with up to 100 % hydrogen (H<sub>2</sub>) by volume.

This ZP applies until the described requirements and supplementary tests for hydrogen suitability have been regulated in the mentioned regulations for basic certification or in test standards. The ZP applies to connectors to be placed on the market for the first time.


The list of metallic connectors covered by this certification programme will be expanded as required. The current initial status includes press fittings in accordance with DVGW G 5614. The entire list can be found in Table 1 in Chapter 5.

The ZP refers to the gases of the 2<sup>nd</sup> gas family (methane-rich gases) and the 5<sup>th</sup> gas family (hydrogen) defined in DVGW standard G 260 as well as mixtures of these gases.

This certification and testing programme is based on DVGW research projects (e.g. G 201205 [1], G 201615 [2], G 201824 [3], G 202138 [4], G 202021 [5]), the Technical Regulation PD CEN/TR 17924, industry research and the diverse literature on hydrogen use in chemistry and industry (e.g. Marchi et al. [6], NASA publication series [7]).

### Bibliography

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- [2] Scholten, F., Dörr, H., Werschy, M., „Mögliche Beeinflussung von Bauteilen der Gasinstallation durch Wasserstoffanteile im Erdgas unter Berücksichtigung der TRGI“, DVGW 201615, DVGW Deutscher Verein des Gas- und Wasserfaches e. V. Technisch-wissenschaftlicher Verein, Bonn, 2018.
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- [4] Anghilante, R., Bhagwan, R., Dörr, H., Burmeister, F., Joormann, N., Oberschelp, L., Tali, E., „Experimentelle Charakterisierung der Leckraten von Prüflecks mit Wasserstoff und/oder Methan-Gasmischungen gegenüber Luft“, DVGW G 202138, DVGW Deutscher Verein des Gas- und Wasserfaches e. V. Technisch-wissenschaftlicher Verein, Bonn, 2023
- [5] Erler, F., Knorr, C., Wiersig, M., Strauß, A., Anghilante, R., Dörr, H., Elhami, O., Janßen, N., Burmeister, F., Kinnen, W., „F&E als Grundlage für den Einsatz von Wasserstoff in der Gasversorgung und der Umsetzung in Prüfgrundlagen – F&E für H<sub>2</sub>“, DVGW G 202021, DVGW Deutscher Verein des Gas- und Wasserfaches e. V. Technisch-wissenschaftlicher Verein, Bonn, 2024.
- [6] C. S. Marchi, B. P. Somerday, Technical Reference for Hydrogen Compatibility of Materials, Sandia Report SAND2012-7321 (unlimited release), (2012)
- [7] NASA, SAFETY STANDARD FOR HYDROGEN AND HYDROGEN SYSTEMS, Guidelines for Hydrogen System Design, Materials Selection, Operations, Storage, and Transportation, Report NSS 1740.16 (1997)

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## 1 Certification procedure

Products Gas, national DVGW certification (European non-harmonised area)

## 2 Accreditations

An accreditation No. D-ZE-16028-01 exists for the procedure at German accreditation body (die Deutsche Akkreditierungsstelle GmbH) (DAkkS), Berlin.

## 3 Marks

### 3.1 Certification mark

DVGW resp. DIN-DVGW certification mark Products



Registration number scheme:

DG-4550DN0001      resp.      NG-4550DN0001

DG      = DVGW certification mark for gas,


NG      = DIN-DVGW certification mark for gas,

4550    = product code, DP = 2024, 0001 = consecutive no.

### 3.2 Note on use



Note: The H<sub>2</sub>-Ready mark of DVGW CERT GmbH has no direct reference to the tests described in this ZP. It is an indication that the connectors can be used with natural gas-H<sub>2</sub> mixtures or pure hydrogen.

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#### 4 Type of certificate and test procedure

The subject of this ZP are tests on connectors that have already been certified for gases of the 2<sup>nd</sup> and 5<sup>th</sup> gas family in accordance with DVGW standard G 260 or for which such certification has been applied for.

Based on this ZP, the certification of the products is extended regarding their hydrogen suitability. As a result of the extension, the terms of the type examination certificates and the registration number scheme of the certifications remain unchanged.

#### 5 Scope of application

*Table 1: Test bases and assigned product codes within the scope of the ZP*

Product Code	Product type	Test basis
4550	Compression joint for metallic gas pipes	DVGW G 5614:2013-12
8531	Compression joint for metallic gas pipes	DVGW G 5614-B1:2016-06

#### 6 Testing laboratories

Testing laboratories accredited in accordance with EN ISO/IEC 17025 for the relevant test bases and contractually bound to DVGW CERT GmbH.

#### 7 Requirements


##### 7.1 General requirements

Certification by DVGW CERT GmbH for use with gases of the 2<sup>nd</sup> and 5<sup>th</sup> gas family in accordance with DVGW standard G 260 must be available or applied for the connectors.

##### 7.2 Requirements for material suitability

The materials of the connector must be resistant to gaseous hydrogen. The materials used in the connector must be specified and documented by inspection certificates 3.1 in accordance with DIN EN 10204. Resistance to gaseous fuels must be verified by manufacturer's declarations or test reports.

The connector must be explicitly designed for static or dynamic loads caused by hydrogen pressure load changes. This must be verified by a manufacturer's declaration as part of the supplementary test.

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### 7.3 Requirements for use with up to 100 % hydrogen by volume

The additional tests listed below consider that the connectors can be operated with different hydrogen concentrations between 0 and 100 % by volume and that the basic requirements for the respective gas category are still covered. In general, only properties such as pressure and temperature range that have been specified in the type examination certificate are confirmed.

## 8 Examinations

The tests described in this certification programme can be carried out for the first time as a supplementary test in the course of the type examination, a certificate extension or renewal. If the certificate is extended, the tests must be carried out again if the supplementary test report is older than two years.

### 8.1 Sample selection


For a series with a proven identical design, this series is qualified by testing one sample each of the smallest and largest connector and a selected medium size of the series. If series of a type consist of 2 to 4 nominal sizes, it is sufficient to test only one sample of the smallest and largest connector. If the smallest/medium connector of the series is not a common stock standard, a sufficiently representative nominal size can be used in consultation with the testing laboratory.

### 8.2 Test procedure (overview)

The following verifications and supplementary tests are required for the proof of hydrogen suitability.

*Table 2: Supplementary tests, assigned to the corresponding product codes and standards*

Product Code	Standard/ Section	Feature	Test condition
<b>4550</b> <b>8531</b>	Section of the product standard relating to material suitability	Material suitability	See section 7.2 of this certification programme
<b>4550</b> <b>8531</b>	DVGW G 5614:2013-12		Requirements and test sequence according to Annex A1
	DVGW G 5614-B1:2016-06		
	Section 4.6		
	Section 4.7	Operating temperatures	

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## 9 Labelling

The product is labelled in accordance with the specifications

- of the corresponding product standard in accordance with chapter 5 Scope,
- the requirements of the DVGW CERT Rules of Procedure, section "Labelling" and
- may optionally include the indication "H<sub>2</sub>-tested" in conjunction with the DVGW registration number. Example of labelling: "DG-4500DP0001 H<sub>2</sub>-tested".

## 10 Applicable documents

In the case of undated references, the current edition of the following documents applies:


- DVGW CERT GmbH <40014> Geschäftsordnung der DVGW CERT GmbH zur Zertifizierung von Produkten im nicht harmonisierten Bereich
- DVGW-Arbeitsblatt G 260:2021-09  
Gasbeschaffenheit
- DVGW G 5614:2013-12  
Unlösbare Rohrverbindungen für metallene Gasleitungen; Pressverbinder
- DVGW G 5614-B1:2026-06  
Unlösbare Rohrverbindungen für metallene Gasleitungen; Pressverbinder; Beiblatt 1: Ergänzungen für Pressverbinder für Rohre aus unlegiertem Stahl
- DIN EN 10204:2005-01  
Metallische Erzeugnisse - Arten von Prüfbescheinigungen
- PD CEN/TR 17924:2023-05<sup>1</sup>  
Sicherheits- und Regeleinrichtungen für Brenner und Brennstoffgeräte für gasförmige und/oder flüssige Brennstoffe. Leitfaden zu wasserstoffspezifischen Aspekten
- EN ISO/IEC 17025  
Allgemeine Anforderungen an die Kompetenz von Prüf- und Kalibrierlaboratorien

The currently valid issue status applies.

## 11 Period of validity

This certification programme is valid from 10.09.2024.

<sup>1</sup> Note: 2<sup>nd</sup> edition expected for 10/2024

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## 12 Annex A1: Supplementary tests for press fittings according to DVGW G 5614

DVGW G 5614 describes, among other things, mechanical tests for press fittings. For certification in accordance with this certification programme, the tests for static bending strength and operating temperatures must be carried out as described below. Different test samples are required for the various mechanical tests. Before and after each mechanical test, leak tests are carried out on the corresponding test sample, first with air or nitrogen and then with hydrogen.

The material requirement according to Table 2, No. 1 must be met for the press fittings.

### 12.1 Static bending strength

The static bending strength according to section 4.6 of DVGW G 5614 must be tested with hydrogen. A test sample according to Figure 2 of DVGW G 5614 is used. Before and after testing the static bending strength, the tightness in the compressed state must be tested with air/nitrogen and hydrogen in accordance with section 4.4.2. If there are already leaks after the tightness test with air/nitrogen, the tightness test with H<sub>2</sub> must be rejected and the test assessed as failed.

Table 3: Supplementary tests for the static bending strength of press fittings

Section according to DVGW G 5614	Requirements	Test conditions	Test gas
4.4.2	Tightness in pressed condition	4.4.2	Air/N <sub>2</sub> and NPG <sup>2</sup>
4.6	Static bending strength	4.6	NPG
4.4.2	Tightness in pressed condition	4.4.2	Air/N <sub>2</sub> and NPG

### 12.2 Operating temperatures

The test of the operating temperatures is carried out analogue to section 4.7 of DVGW G 5614. Before and after testing the operating temperatures, the tightness in the compressed state must be tested with air/nitrogen and hydrogen in accordance with section 4.4.2. If the tests within the meaning of this certification programme are carried out at the same time as the type examination, the operating temperature test does not have to be carried out twice. It is sufficient to carry out the leak tests with hydrogen in addition to the tests described in DVGW G 5614.

Table 4: Supplementary tests for operating temperatures of press fittings

Section according to DVGW G 5614	Requirements	Test conditions	Test gas
4.4.2	Tightness in pressed condition	4.4.2	Air/N <sub>2</sub> and NPG
4.7	Operating temperatures	4.7 (with 4.4.2)	Air/N <sub>2</sub> and NPG

<sup>2</sup> Standard test gas "NPG": H<sub>2</sub>, purity at least 99.9 % by volume (based on ISO 14687:2019-11 Grade B)