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|  | <b>Certification programme ZP 4500</b><br><b>Supplementary tests for metallic connectors for gaseous fuels for a hydrogen content of up to 100 % by volume</b> | 54500.100-01-N-GB |                |
|  |  | Doc. type         | ZP             |
|  |  | Author            | DVGW CERT GmbH |
|  |  | State             | 28.05.2025     |

**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**

|      |   |   |
|------|---|---|
| 0    | Preliminary remark.....   | 3 |
| 1    | Certification procedure.....  | 4 |
| 2    | Accreditations.....   | 4 |
| 3    | Marks.....  | 4 |
| 3.1  | Certification mark.....   | 4 |
| 3.2  | Note on use.....  | 4 |
| 4    | Type of certificate and test procedure.....                                   | 5 |
| 5    | Scope of application.....   | 5 |
| 6    | Testing laboratories.....   | 5 |
| 7    | Requirements.....   | 5 |
| 7.1  | General requirements.....   | 5 |
| 7.2  | Requirements for material suitability.....                                    | 5 |
| 7.3  | Requirements for use with up to 100 % hydrogen by volume.....                 | 6 |
| 8    | Examinations.....   | 6 |
| 8.1  | Sample selection.....   | 6 |
| 8.2  | Test procedure (overview).....  | 6 |
| 9    | Labelling.....  | 7 |
| 10   | Applicable documents.....   | 7 |
| 11   | Period of validity.....   | 7 |
| 12   | Annex A: Supplementary tests for press fittings according to DVGW G 5614..... | 8 |
| 12.1 | Static bending strength.....  | 8 |
| 12.2 | Operating temperatures.....   | 8 |
| 13   | Annex B: Supplementary tests for test couplings according to DVGW VP 604..... | 9 |
| 13.1 | Tightness.....  | 9 |
| 13.2 | Serviceability.....   | 9 |

|  |  |                   |                |
|--|--|-------------------|----------------|
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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 second status includes press fittings in accordance with DVGW G 5614 and test couplings in accordance with DVGW VP 604. 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.
- [3] Köppel, W., Mörs, F., Hüttenrauch, J., Burmeister, F., „Entwicklung einer Roadmap zur Umsetzung des DVGW-Energie-Impulses bis zum Jahr 2050“, DVGW G 201824, DVGW Deutscher Verein des Gas- und Wasserfaches e. V. Technisch-wissenschaftlicher Verein, Bonn, 2023.
- [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-4550DQ0001      resp.      NG-4550DQ0001

DG      = DVGW certification mark for gas,


NG      = DIN-DVGW certification mark for gas,

4550    = product code, DQ = 2025, 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    |
| 8531         | Compression joint for metallic gas pipes | DVGW G 5614-B1 |
| 4513         | Test coupling                            | DVGW VP 604    |

#### 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> 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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|  |  | State             | 28.05.2025     |

### 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.


In deviation from this, for test couplings, for each design two samples of the first housing material and one sample for each additional housing material must be tested.

### 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                                      |
|----------------------|--|-------------------------|---|
| 4550<br>8531<br>4513 | Section of the product standard relating to material suitability | Material suitability    | See section 7.2 of this certification programme     |
| 4550<br>8531         | DVGW G 5614<br>DVGW G 5614-B1                                    |                         | Requirements and test sequence according to Annex A |
|                      | Section 4.6  | Static bending strength |   |
|                      | Section 4.7  | Operating temperatures  |   |
| 4513                 | DVGW VP 604  |                         | Requirements and test sequence according to Annex B |
|                      | Section 3.8  | Tightness               |   |
|                      | Section 3.9  | Serviceability          |   |

|  |  |                   |                |
|--|--|-------------------|----------------|
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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-4500DQ0001 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
- DVGW VP 604:1990-10  
Meßkupplungen für Gase nach DVGW-Arbeitsblatt G 260/I
- DIN EN 10204:2005-01  
Metallische Erzeugnisse - Arten von Prüfbescheinigungen
- DIN CEN/TR 17924:2025-06  
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 28.05.2025.

|  |  |                   |                |
|--|--|-------------------|----------------|
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## 12 Annex A: 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 Grade B)

|  |  |                   |                |
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### 13 Annex B: Supplementary tests for test couplings according to DVGW VP 604

DVGW VP 604 describes requirements and tests for test couplings. For certification within the meaning of this certification program, the tests for tightness and serviceability described below must be carried out.

The material requirements in Table 2, No. 1 must be met for the measuring coupling.

#### 13.1 Tightness

The Tightness must be tested in accordance with Section 3.8 of DVGW VP 604 using Table 5.

*Table 5: Supplementary tests for the tightness of test couplings*

| Section according to DVGW VP 604 | Requirements           | Test conditions (without test gas) | Test gas                   |
|----------------------------------|------------------------|------------------------------------|----------------------------|
| 3.8.1                            | External tightness     | 3.8.1                              | Air, then NPG <sup>3</sup> |
| 3.8.2                            | Internal tightness     | 3.8.2                              | NPG                        |
| 3.8.3                            | Tightness when coupled | 3.8.3                              | NPG                        |

#### 13.2 Serviceability

The serviceability must be checked in accordance with Section 3.11 of DVGW VP 604. The final leak test in coupled condition must be repeated with NPG in accordance with Section 3.8.3.

In addition, the external tightness must be tested in accordance with Section 3.8.1 and the internal tightness in accordance with Section 3.8.2 with NPG at room temperature, -20 °C and +70 °C.

<sup>3</sup> Standard test gas "NPG": H<sub>2</sub>, purity at least 99.9 % by volume (based on ISO 14687 Grade B)