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Approval requirement 154

Insulation union couplings in gas conduits

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Foreword

This GASTEC QA Approval requirement has been approved by the Board of Experts product certification GASTEC QA, in which relevant parties in the field of gas related products are represented. This Board of Experts supervises the certification activities and where necessary require the GASTEC QA Approval requirement to be revised. All references to Board of Experts in this GASTEC QA Approval requirement pertain to the above mentioned Board of Experts.

This GASTEC QA Approval requirement will be used by Kiwa Nederland BV in conjunction with the GASTEC QA general requirements and the KIWA regulations for certification.

Approved by Board of Experts : February 10, 2019

Accepted by Kiwa Nederland B.V. : February 10, 2019

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1 Introduction

1.1 General

This GASTEC QA approval requirement in combination with the GASTEC QA general requirements include all relevant requirements, which are adhered by Kiwa as the basis for the issue and maintenance of a GASTEC QA certificate for insulation union couplings in gas conduits.

This GASTEC QA Approval requirements replace the GASTEC QA Approval Requirements 154 for insulation union couplings in gas conduits up to 50 mm nominal diameter, dated March 2012.

List of changes:

- Update to the new format for GASTEC QA approval requirements
- These approval requirements have been fully reviewed textually.
- All general requirements have been deleted and included in the GASTEC QA general requirements document
- Change of paragraphs

The product requirements have not changed.

1.2 Scope

This Approval requirement specify the requirements for insulation union coupling, installed inside buildings after the main shutoff valve, for the transport of gaseous fuels in accordance with the 2nd and 3rd family as per NEN-EN 437.
Insulation union couplings are able to make a removable pipe connection which is not electrically conductive. The insulation union couplings have a maximum nominal diameter of 50 mm. The insulation union couplings can be supplied as a single part or in combination with other parts and are used in gas distribution systems for gas pressure up to 1 bar.

The specific functional recommendations for application of insulation pieces, like these union couplings, in gas systems are described in NEN 7244 and national and international standards and/or regulations.

2 Definitions

In this approval requirement, the following terms and definitions are applicable:

Bending moment: The bending moment is the force applied on the insulation union coupling to cause a specified bending.

Board of experts: The Board of Experts Gastec QA.

Compressive force: The compressive force is the axially force applied on the insulation piece during testing.

Creepage distance: The creepage distance is, with regard to the surface of the insulation part, the shortest distance between the electrically conductive parts of the insulation union coupling.

Clearance distance: The clearance distance is the shortest straight unimpeded distance measured between the electrically conductive components of the insulation union coupling.

Maximum pressure: The maximum pressure is the air pressure applied on the insulation union coupling during the test.

Test voltage: The AC voltage set for the test is the effective value of this AC voltage that is applied during the test period

Torsional moment: The torsional moment is the force applied on the insulation union coupling to cause a specific torsion.

Tensile force: The tensile force is the axially force applied on the insulation union coupling during the test.

3 Product requirements

3.1 General

3.1.1 Error-free installation

The insulation union coupling shall be made in such a way that errors during installation that jeopardize the function of the insulation union coupling are not possible.

3.1.2 Durability

The insulation union coupling shall be made in such a way that that the proper functioning and durability are ensured under normal use

3.2 Materials

3.2.1 Fit for use

The quality and thickness of the materials used shall be such that they can withstand the mechanical, chemical and thermal forces during the lifetime of the insulation union coupling.

3.2.2 Resistance to gas

Components of the insulation union coupling that come into contact with the gas flowing through shall be resistant against the constituents of the gas.

3.2.3 Rubber

Rubber components in the couplings shall comply with NEN-EN 682, type GAL or GBL or to NEN-EN 549 Class A2 (-20 to 60 °C).

3.2.4 Metals

Metal pieces shall be made from brass as specified in European product requirements for copper alloys or registered by CEN/TC 133 or from steel with a minimum tensile strength of 350 N/mm^2, provided that the union couplings manufactured from them meet the functional requirements of these approval requirements.

3.3 Construction

3.3.1 Diameter

The diameter of the opening of the insulation union coupling shall at no point be smaller than 0.75 x the greatest nominal diameter.

3.4 Threaded connections

3.4.1 Use in metal components

The threaded connections shall only be made in metal components.

3.4.2 Insulation

The threaded connections shall be made in such a way that no electrical contact of the insulated components can be made after installation.

3.4.3 Dimensions

The dimensions of the threaded connections of the coupling nut and the coupling bolt shall be compatible with NEN 2542 or shall conform to the Dutch Code of practice NPR 7028.

In case the insulation union coupling is a loose part with a gas-tight screw-thread connection at the other end as well, the gas-tight screw-thread connection shall be made according to NEN-EN 10226-1.

When a screw-thread connection is applied, the inlet and/or outlet concerned shall be provided with points where mounting tools can be made to engage.

3.5 Design of insulation components

3.5.1 Clearance and creepage distances

The insulation components shall be designed in such a way that the clearance and creepage distances are at least 3 mm.

3.5.2 Dirt protected clearance and creepage distances

Unlike is stated in paragraph 3.6.1, clearance and creepage distances that are protected against dirt deposits shall be at least 2 mm.

4 Performance requirements and test methods

4.1 Sequence

The inspection of the insulation union coupling shall be done in the sequence indicated.

4.2 Components of the insulation union coupling

4.2.1 Visual inspection

The inspection of the insulation union coupling is done visually and using measurement equipment.
The dimensions shall be measured with tools with an uncertainty of 0,1 mm.
Threads shall be measured with tools suitable for the purpose.

4.3 Leak tightness

The insulation union coupling shall have an externally gas tightness less than 30 cm^3 / h when the union coupling is fastened with a torque of 6 Nm per mm of the nominal diameter, and when the union coupling is fastened according to the instructions of the manufacturer.
The coupling shall be leak tight at temperatures of -5 °C, 23 °C and to +50 ^{0}C.

4.3.1 Test pressure

Air at 1.1 bar pressure (overpressure) is used as a medium for testing.

4.3.2 Leak tightness apparatus

The leak tightness tests shall be carried out with an apparatus fit for the purpose.
The uncertainty of measurement shall not be greater than 5 cm^3/h and the resolution shall be 1 cm^3/h.

4.3.3 Leak tightness

A leak tightness test is performed during 600 seconds at a temperature of -5 ± 3 °C, 23 ± 3 °C and +50 ± 3 °C.

Afterwards the union coupling shall be loosened. During the tests as described in paragraph **Error! Reference source not found.**4.4 to 4.5, the union coupling shall be fastened according to the instructions of the manufacturer.

4.4 Resistance to mechanical loads

The construction shall be such that all the components of the insulation union coupling have leak tightness less than 30 cm^3 / h after applying the loads as listed in table 1. The test shall be performed according to 4.4.1 and 4.4.2.

nominal diameter in mm	tensile force compressive force in N	torsional moment in Nm		bending moment in Nm
		at 50 ± 3 °C	at -5 ± 3 °C	at 23 ± 3 °C
10	1000	60	120	68
15	1300	80	160	125
20	1700	100	200	200
25	2500	120	240	400
32	4100	150	300	700
40	6400	180	360	925
50	9900	240	480	1700

Table 1: Resistance to loads

If angular deviation of 45° between the two halves of the insulation union coupling is reached before reaching the torsional moment according to table 1, the torsional moment that caused this 45° angular deviation will suffice.

4.4.1 Leak tightness after exposure to tensile force, compressive force and torsial moment.

The testing of the insulation union coupling for gas-tightness is done by placing the insulation union coupling in an oven at a temperature of 120 °C. Once the insulation union coupling has reached a temperature of 120 °C, it is kept at this temperature for 300 seconds and then cooled to room temperature in still air.

Then the following loads will be applied successively:

a. An axial tensile force in accordance with table 1 during 600 seconds at a temperature of 23 ± 3 °C.
b. An axial compressive force in accordance with table 1 during 600 seconds at a temperature of 23 ± 3 °C.
c. A torsional moment in accordance with table 1 or a torsional moment corresponding to an angular deviation of 45°. First during 600 seconds at a temperature of 50 ± 3 °C, then during 600 seconds at a temperature of -5 ± 3 °C.

After the last load has been removed, three gas-tightness tests are performed according to 4.3.

4.4.2 Insulation and leak tightness during and after bending

The test piece from paragraph 4.4.1 is then blown dry and stored for 24 hours in a chamber with a relative humidity of 40%.

At a temperature of 23 ± 3 °C, the test piece is then loaded with a bending moment in accordance with table 1. For the test, the test piece is placed on two support points and loaded in the middle of the support spacing. The support points are positioned 800 mm from each other. First, the test pressure is applied. The load P is increased every minute by 20% of its end value and registered using a recorder that is connected. For the chosen test setup, the following applies to the bending moment M_b:

$M_b = P \cdot L/4$ If $L = 0.8$ then $M_b = 0.2 \cdot P$ in Nm; load $P = 5 \cdot M_b$ in N.

During a test period of 300 seconds, no short circuit shall occur in the insulated part (to be checked with 24 V AC voltage).

The leak tightness is then tested for 600 seconds while applying the load. The leakage rate shall be less than 30 cm^3/h.

After the last load has been removed, three gas-tightness tests are performed according to 4.3.

4.5 Effectiveness of the insulation

When a DC voltage of 500 V is applied, the resistance shall be at least 100 kΩ.
No insulation breakdown and/or arcing shall occur when an AC voltage of 2500 V 50 Hz is applied.

For testing, the insulation union coupling mentioned in paragraph 4.4**Error! Reference source not found.** is blown dry and placed in a chamber for 48 hours at a temperature of 23 ± 3 °C and a relative humidity of 93% to 95%.

The insulation union coupling shall take up a maximum of 1/10th of the volume of the chamber. Immediately after the insulation union coupling is taken out of the chamber, it is subjected to a DC voltage of 500 V, with the resistance being measured.

The insulation union coupling is then subjected to an AC voltage of 2500 V, 50 Hz. The voltage is increased in 10 seconds from 0 to 2500 V. The voltage is maintained for 60 seconds.

4.6 Resistance to high temperature

The insulation union coupling shall be made of incombustible materials capable of withstanding a temperature of 425 °C without the cohesion of the coupling being adversely affected.

The insulation union coupling is placed in an oven at a temperature of 425 °C ± 10 °C for 900 seconds. The cohesion of the coupling being shall not be adversely affected.

4.7 Resistance to liquid pentane

Resistance against the action of liquid pentane is determined for components made of plastic. Two test pieces of about 2 grams with a thickness of about 2 mm (if necessary the entire component) are weighed to 0.1% accuracy after which they are submerged in liquid pentane at room temperature for 3 x 24 hours. The volume of the pentane shall be at least 25 x the volume of the test piece.

Immediately after the test pieces are removed from the pentane, and dried with filter paper if necessary, the weight is determined to 0.1% accuracy.

The weight change shall be no more than the following relative to the original weight:

- 15% weight for components that provide external gas-tightness, 20% for other components;

The test piece is then stored for 24 hours at room temperature and the weight is again determined to 0.1% accuracy.

- The weight change shall be no more than the following relative to the original weight: 10% for components that provide external gas-tightness, 15% for other components.

5 Marking and instructions

5.1 Marking

A permanent inscription shall be placed on each insulation union coupling in a clearly visible location that includes the following information:

- the GASTEC QA word mark or logo;
- nominal dimensions in mm;
- the name of the manufacturer or the trademark;
- a type indication;
- the flow direction if not intended for two directions.

5.2 Instructions

The manufacturer shall also supply assembly instructions in Dutch.

Installation instructions shall be provided for every insulation union coupling. If the insulation union coupling consists of separate components, the assembly of the separate components shall be clearly indicated in the installation instructions.

At the same time, it shall be stated that the insulation union couplings shall not be contaminated during assembly.

These insulation union couplings shall be installed inside buildings and shall be installed after the main shutoff valve.

The installation instructions prescribe the torque to tighten the insulation union coupling.

6 Quality system requirements

The supplier shall make a risk assessment of the product and production process according to chapter 3.1.1.1 and 3.1.2.1 of the GASTEC QA general requirements. The risk assessments shall be available to Kiwa for review.

7 Summary of tests

This chapter contains a summary of tests to be carried out during:

- The initial product assessment;
- The periodic product verification;

7.1 Test matrix

Description of requirement	Clause	Test within the scope of		
		Initial product assessment	Product verification	
			Verification	Frequency
Product requirements	**3**			
Error-free installation	3.1.1	X		
Durability	3.1.2	X		
Fit for use	3.2.1	X		
Resistance to gas	3.2.2	X		
Rubber	3.2.3**Error! Reference source not found.**	X	X	Each year
Metal	3.2.4	X	X	Each year
Diameter	3.3.2	X	X	Each year
Use in metal components	3.4.1	X		
Insulation	3.4.2	X		
Dimensions	3.4.3**Error! Reference source not found.**	X	X	Each year
Clearance and creepage distances	3.5.1	X	X	Each year
Dirt protected clearance and creepage distances	3.5.2	X	X	Each year
Perfomance requirements	**4**			
Leak tightness	4.3	X		
Resistance to mechanical loads	4.4	X		
Leak tightness after exposure to tensile force, compression force and tosion moment	4.4.1	X		
Insulation an leak tightness after exposure to bending	4.4.2	X	X	Each year
Effectiveness of insulation	4.5	X	X	Each year
Resistance against effects of elevated temperatures	4.6	X		
Resistance to N-pentane	4.7	X		
Marking	**5.1**	X	X	Each year
Instructions	**5.2**	X	X	Each year

[1)] Only bending test 4.3.5

8 List of referenced documents and source

8.1 Standards / normative documents

All normative references in this Approval Requirement refer to the editions of the standards as mentioned in the list below.

NEN-EN-ISO 228-1:2003	Pipe threads where pressure-tight joints are not made on the threads - Part 1: Dimensions, tolerances and designation
NEN-EN 437:2003+A1:2009	Test gases - Test pressures - Appliance categories
NEN-EN 549:1995	Rubber materials for seals and diaphragms for gas appliances and gas equipment
NEN-EN 682:2002+A1:2005	Elastomeric seals - Materials requirements for seals used in pipes and fittings carrying gas and hydrocarbon fluids
NEN 2542:1967	Fittings and connections with outside thread for gas conduits
NPR 7028:2015	Gas meters - Dimensions and connections
NEN 7244-6:2005	Gas supply systems - Pipelines for maximum operating pressures up to and including 16 bar - Part 6: Specific functional requirements for service lines
NEN 7244-10:2010	Gas supply systems – Pipelines for maximum operating pressure up to and including 16 bar – Part 10: Specific functional requirements for housing for installations and housing for meters with a maximum inlet pressure of 100 mbar and a maximum design capacity of 650 mn^3/h
NEN-EN 10226-1:2004	Pipe threads where pressure tight joints are made on the threads - Part 1: Taper external threads and parallel internal threads - Dimensions, tolerances and design.