English translation

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version

Approval requirement 1

Bendable hose assemblies

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Foreword Kiwa

This GASTEC QA approval requirement (Dutch version) 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 (Dutch version) will be used by Kiwa Nederland BV in conjunction with the GASTEC QA general requirements and the KIWA regulations for certification.

This approval requirement is a translation from the Dutch validated version and can only be used as supporting document.

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1 Introduction

1.1 General

These GASTEC QA Approval Requirements in combination with the GASTEC QA general requirements are used by Kiwa as the basis for the issue and maintenance of the GASTEC QA product certificate for bendable hose assemblies.

These GASTEC QA Approval Requirements replace GASTEC QA Approval Requirements 1 of October 1996 + amendment A1 of March 2012.

List of changes

- These approval requirements have been fully reviewed textually. All general requirements have been deleted and included in the GASTEC QA general requirements document. Requirements that cannot be verified have been deleted.
- The materials to be used are no longer prescribed. The supplier is responsible for proving the suitability of the material.
- Rubber seals shall comply with the EN 549 standard with a temperature class of at least A2.
- Lengths longer than 1 meter are permitted in accordance with the NPR 3378-11 Code of Practice.
- The mercury nitrate test has been replaced by the ISO 6957 standard.
- The tightening resistance has been adjusted. It only applies to seals with a flat gasket.
- The test resistance against high temperatures has been deleted. The goal of the test was to exclude specific materials. The manufacturer must prove that the material is suitable for the application in accordance with article 3.1.
- The test matrix has been adjusted.

1.2 Scope

These approval requirements describe the requirements with regard to stainless steel bendable hose assemblies with a nominal internal 10 mm up to and including 25 mm diameter for use in installation for natural gas with a pressure of no more than 200 mbar in accordance with the NPR 3378-11 Code of Practice.

2 Definitions

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

Natural gas: 2nd family gas in accordance with EN 437.

Bendable hose assembly: easy to bend corrugated stainless steel pipe with at least one detachable coupling.

Board of Experts: the GASTEC QA Board of Experts.

Bendable length: the corrugated section of the corrugated metal hose assembly.

Leak tightness: a product is regarded as being leak tight when it complies with the following:
No liquid may visibly leak when using a liquid as the testing medium.
When using gas as a test medium;

- No air bubbles are permitted when submerged.
- No continuous formation of bubbles is permitted when using leak detection fluid.

3 Product requirements

3.1 Material

The used metals shall be proven to be suitable for the application (pressure, ambient temperature, corrosion resistance and long-term behaviour).
The suitability of the metal can be proven through a risk analysis or referral to the relevant product standards (for example, ISO 10380) of comparable products in which the relevant material is prescribed.

The material shall be specified in accordance with the relevant material standardizations.

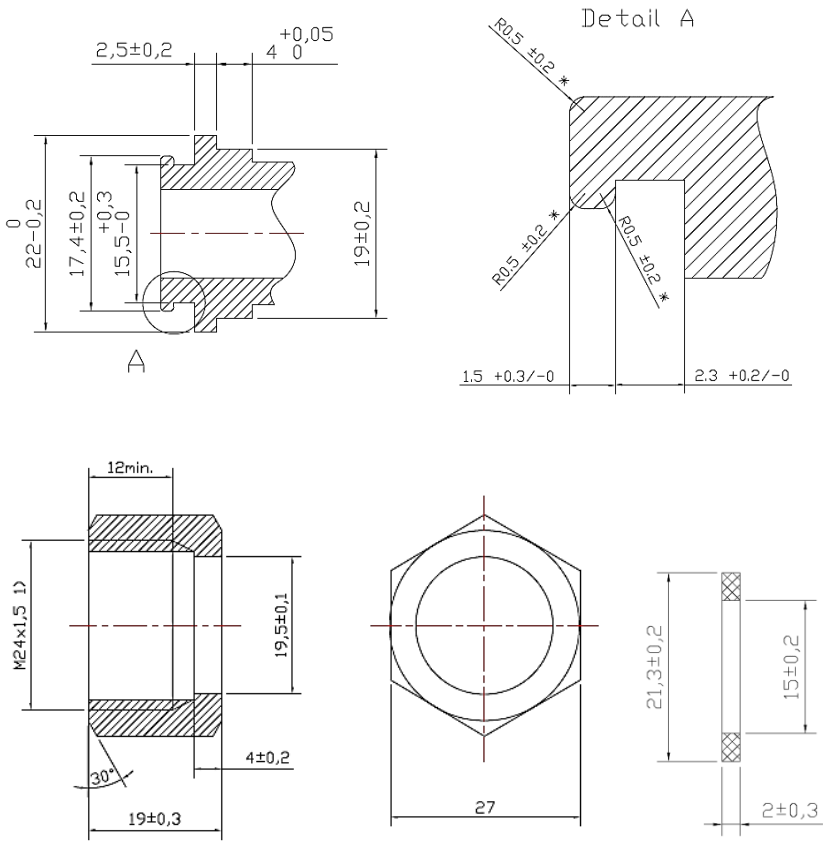
If plastic has been used for the protective layer, it shall be self-extinguishing and it may not negatively affect the metals.

Rubber seals shall comply with the EN 549 standard with a temperature class of at least A2.

3.2 Construction

The bendable hose assembly may not show any dents, holes, cracks, fractures or any other shortcomings.

The bendable hose assembly shall be provided with a detachable coupling on at least one side to connect to the gas valve (connection valve) in accordance with the figure below.



If the bendable hose assembly is provided with a detachable coupling on one side, the coupling on the other side shall comply with the relevant GASTEC QA approval requirements or, if no approval requirements are available, the relevant national or international standards.

If the coupling has spanner flats, the spanner width shall be in accordance with the series specified in the ISO 4032.

3.3 Dimensions

3.3.1 Wall thickness

The wall thickness of the bendable hose assembly shall not be smaller than 0.25 mm at any point. The thickness of any protective layer is not included in this.

3.3.2 Nominal inner diameter

The nominal inner diameter of the bendable hose assembly shall have been selected from the following series:
10 mm (3/8")
13 mm (1/2")
20 mm (3/4")
25 mm (1")

3.3.3 Length

The length of the bendable hose assembly shall have an overall length of between 200 mm and 1000 mm with a tolerance of +20 mm.
Lengths longer than 1 meter are permitted with additional specification on the packaging and/or manual.

3.3.4 Bendable length

The bendable length shall at least be 10 times the nominal inner diameter.

4 Performance requirements and test method

4.1 General

All tests shall be performed at an ambient temperature of 23 +/- 5 °C on samples with a length of 300 mm with couplings unless stated otherwise.
1 bendable hose assembly shall be used per test unless specified otherwise.

Leak tightness tests shall be performed using air.

No deformation or damage may occur to the product during testing.

4.2 Resistance against stress corrosion

All parts shall be free of stress corrosion.

The magnesium chloride test in accordance with 4.2.1 shall be used for stainless steel components. After exposure to the magnesium chloride solution, no cracks shall observed when assessing visually with a 5x magnification.

The ISO 6957 (9.5 pH) standard shall be used for copper alloy components.

4.2.1 Testing method (magnesium chloride)

The test shall be performed on a bendable hose assembly without a jacket.
The bendable hose assembly shall be degreased using acetone and shall be bent once over an angle of 90º with a radius in accordance with table 2. The bendable hose assembly shall be filled with glass beads. The ends of the bendable hose assembly shall be sealed to ensure the glass beads cannot fall out of the bendable hose assembly.

Dissolve 1000 g of MgCl2.6H2O for every 500 ml of distilled water or proportional parts thereof. Suspend the bendable hose assembly in the test vessel. There shall be sufficient liquid to submerge the entire bendable hose assembly and to suspend it freely from the bottom in the test vessel.

Heat the test vessel up to 130 ± 2 ºC and position the bendable hose assembly in the liquid for 108 hours. Next, allow the liquid to cool down up to 70 °C ± 2 ºC. Keep the bendable hose assembly at this temperature for 60 hours.

Small quantities of magnesium chloride or distilled water may have to be added to achieve the temperature of 130 °C.
Ensure that heating takes place uniformly. Prevent shocks and jolts.

Carry out a visual assessment using a 5x magnification.

4.3 Leak tightness

The bendable hose assembly shall be leak tight for 300 seconds with an internal pressure of 300 mbar.

4.3.1 Testing method

The bendable hose assembly shall be sealed on one side and the air pressure shall be increased up to 300 mbar on the other side. No leakage shall be observed during 300 seconds.

4.4 Determination of pressure loss

The measured flow rate (m^3/h standard) at an inlet pressure of 25 mbar shall match the table below. At this flow rate the pressure loss over the bendable hose assembly shall not be more than 0,9 mbar.

Inner diameter (mm/inch)	Air flow rate (m^3/h standard)
10 (3/8")	1
13 (1/2")	2,2
20 (3/4")	5,2
25 (1")	8,4

Table 1

4.4.1 Testing method

A set-up in accordance with figure 1 shall be used to determine the flow rate and the loss of pressure over the bendable hose assembly. The air flow rate shall be set according to table 1 by using the control valve on the outlet side. The inlet pressure shall be 25 mbar.

The pressure loss shall be determined for all bendable hose assembly diameters

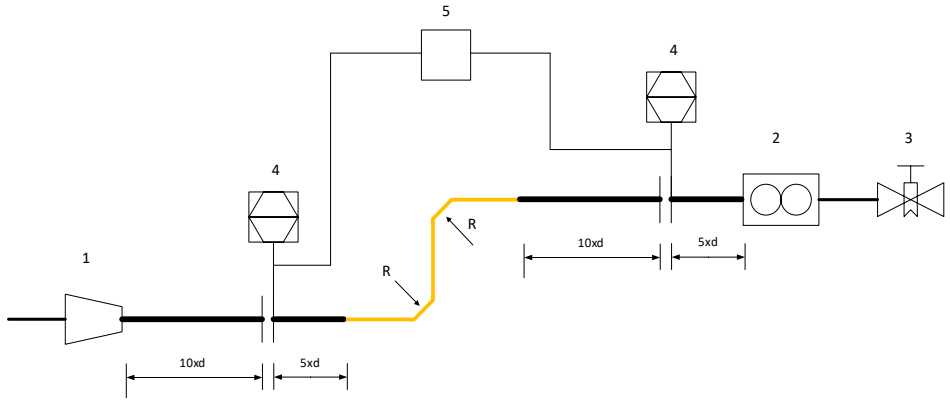


Figure 1

1 = inlet pressure regulator
2 = flow meter
3 = control valve outlet
4 = pressure meter
5 = pressure differential meter

Inner diameter (mm/inch)	R (mm)	d (mm)
10 (3/8")	25	13
13 (1/2")	25	16
20 (3/4")	35	21
25 (1")	55	27

Table 2

4.5 Resistance against internal pressure

The bendable hose assembly shall be able to withstand an internal water pressure of 16 bar during 300 seconds without presenting leaks.

4.5.1 Testing method

The bendable hose assembly shall be fully filled with water ensuring that all air has been removed. The internal water pressure of the bendable hose assembly shall be 16 bar and it shall be maintained for 300 s.

Check for leaks during the test.

4.6 Resistance to pull out

The bendable hose assembly shall be able to withstand a tensile load of 140 N per mm of inner diameter in the lengthwise direction without presenting leaks.

4.6.1 Testing method

The couplings of the bendable hose assembly shall be connected to a traction device. The internal air pressure of the bendable hose assembly shall be increased up to 300 mbar.

A tensile force shall be exercised on the bendable hose assembly by using a traction device during 300 s that matches 140 N per mm of the inner diameter of the bendable hose assembly. The pressure shall be maintained during the test.

Check for leaks during the test.

4.7 Resistance against bending

After having been stretched by 15% of the flexible section in the lengthwise direction a bendable hose assembly shall be able to be bend 30 times over an angle of 360º without presenting leaks.

4.7.1 Testing method

A bendable hose assembly with a length of 600 mm must be permanently stretched by 15% in the lengthwise direction (of the flexible section) and connected to a gas pipe in accordance with fig. 2. 2 mandrels (D) shall be installed on both sides of the fastening on the gas pipe (E) with a d diameter in accordance with the table below.

Inner diameter	d in mm
10 mm (3/8")	25
13 mm (1/2")	25
20 mm (3/4")	35
25 mm (1")	55

Table 3

The horizontal center line of the mandrels shall be located at the first full corrugation crest. The distance of the vertical center lines of the mandrels when compared to the center line of the gas pipe shall be such that the mandrels touch the corrugation crest of the bendable hose assembly as closely as possible without clamping.

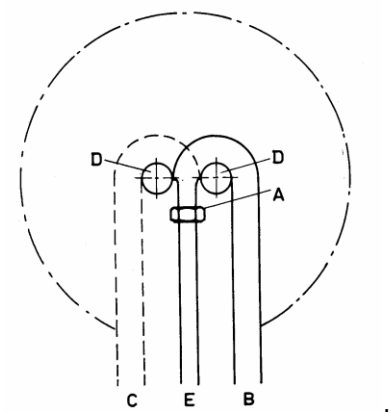


Figure 2

A = fixing point gas pipe;
B = starting position;
C = position after bending;
D = mandrels;
E = gas pipe

Next, the bendable hose assembly shall be bent in the start position indicated by the drawn lines and, subsequently, the free end shall be bent from position B to position C through the line-dot-circle arch.

Subsequent, the bendable hose assembly shall again be bent from position C to position B. The movement from B to C or from C to B is deemed to be one bending instance; one bending instance shall be performed in approximately 10 seconds at a uniform speed.

The bendable hose assembly shall touch the mandrel over 180º with regard to every bending instance.

Check the leak tightness of the bendable hose assembly in accordance with 4.3 after 30 bending instances.

4.8 Strenght of fittings

Couplings with a flat gasket shall be able to resist torsion with a moment of 3.5 Nm per mm of inner diameter of the bendable hose assembly without presenting leaks or deformation.

4.8.1 Testing method

The coupling of the bendable assembly shall be installed on a suitable counterpart component. The coupling shall be tightened with a moment that matches 3.5 Nm per mm of the inner diameter of the bendable hose assembly.

Check leak tightness in the installed state in accordance with 4.3. Check the fitting visually for deformation.

4.9 Resistance against falling loads

The bendable hose assembly shall be able to withstand a 10 kg weight falling from a height in accordance with table 2 that is directed perpendicularly to the center line of the bendable hose assembly without presenting cracks or leaks.

Inner diameter	**Height in mm** *Calculated till the flat surface*
10 mm (3/8")	400
13 mm (1/2")	600
20 mm (3/4")	800
25 mm (1")	1000

Table 4

4.9.1 Testing method

The bendable hose assembly of 4.8 shall be positioned on a horizontally flat surface. Next, allow a 10 kg weight to fall freely on the bendable hose assembly from a height in accordance with table 2 and do it in such a way that the bendable hose assembly is hit uniformly over a length of 70 mm.

The 70 mm length can be achieved by positioning a square wooden block perpendicularly to the lengthwise direction of the bendable assembly to start from the 2nd corrugation crest from the coupling.

After the test, cracks must not be discernible and the bendable hose assembly shall be checked for leak tightness in accordance with 4.3.

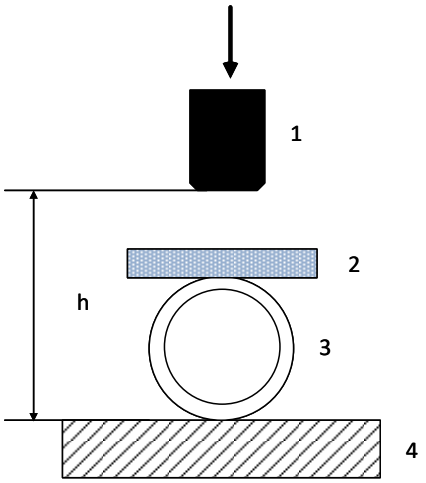


Figure 3

1 = weight 10 kg
2 = plywood block 70 mm length, thickness 30 mm
3 = hose assembly
4 = flat surface
h = height according to table 4

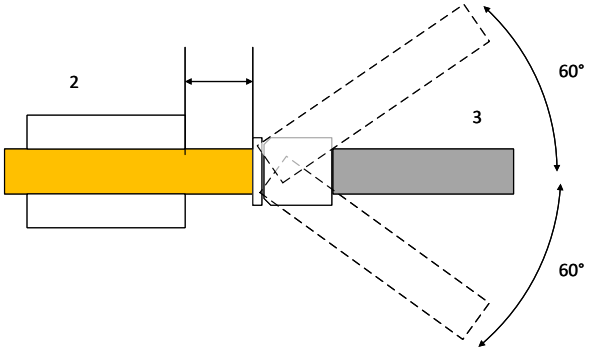
4.10 Resistance against repeated bending of the coupling

The bendable hose assembly shall be able to withstand repeated bending under different angles without presenting leaks.

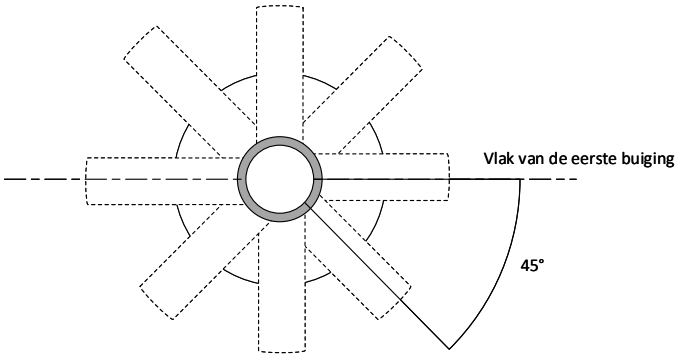
4.10.1 Testing method

A bendable hose assembly with a 600 mm length shall be installed using an appliance coupling on a gas pipe. The bendable hose assembly shall be clamped on the side of the appliance coupling in such a manner that the distance from the top side of the clamping to the connection of the coupling equals the inner diameter of the bendable hose assembly.

The gas pipe is used as a lever to load the connection of the bendable hose assembly with the coupling over an angle of 60° with the center line of the bendable hose assembly. The bendable hose assembly shall then be returned to its starting position and loaded over an angle of 60º in the opposite direction with the prior load. The movement of the gas pipe shall be within one flat plane.



This test shall be repeated in a 45º plane turned clockwise with the 1st plane. The load over an angle of + 60º to – 60º in a plane turned over an angle of 45º clockwise shall be performed 8 times.



Next, the other side of the bendable hose assembly shall be tested.

After the test, the bendable hose assembly shall be checked for leak tightness in accordance with 4.3.

4.11 Self-extinguishing testing method

The plastic of the protective layer shall be heated by the discolored flame of a fully lit Bunsen burner with a load of approximately 1.8 kW until flames can be observed. After the Bunsen burner is removed, the flames shall extinguish.

5 Marking, instructions and packaging

5.1 Marking

The product shall be marked with the following information:

- Name or identification marking of the supplier.
- Type designation
- Year and month of manufacture
- GASTEC QA or the GASTEC QA logo

The application method may not negatively affect or damage the corrugated section of the hose assembly.

5.2 Instructions

The product shall have Dutch installation instructions. At least the following instructions shall have been included in these instructions:

- Prevent all damage during installation activities.
- Ensure that the hose assembly cannot be twisted.
- Lay the hose assembly in such a way that no sharp kinks occur.
- A diagram with an example/examples on how the installation must be performed.
- The appliance load for which the hose assembly is suitable.

The instructions may be specified on the packaging.

5.3 Packaging

Every bendable hose assembly shall be protected against possible damage during storage and transport through suitable packaging.

If the length of the product is longer than 1 metre, the following text shall be specified on the packaging: bendable hose assemblies longer than 1 metre may only be used with regard to gas-fired decorative appliances'.

6 Summary of testing and control

This chapter provides a summary of the following tests:

- The initial evaluation test;
- The periodic product verification test

6.1 Test matrix

Description of requirement	Clause	Test within the scope of		
		Initial product assessment	Product verification	
			Verification	Frequency
Material	3.1	X		
Construction	3.2	X		
Dimensions	3.3	X	X	1x/year
Wall thickness	3.3.1	X	X	1x/year
Nominal inner diameter	3.3.2	X		
Length	3.3.3	X		
Bendable length	3.3.4	X		
Resistance against stress corrosion	4.2	X	X	1x/year
Leak tightness	4.3	X		
Determination of pressure loss	4.4	X		
Resistance against internal pressure	4.5	X		
Resistance to pull out	4.6	X	X	1x/year
Resistance against bending	4.7	X	X	1x/year
Strength of fittings	4.8	X		
Resistance against falling loads	4.9	X		
Resistance against repeated bending and coupling	4.10	X		
Self-extinguishing testing method	4.11	X		
Marking	5.1	X	X	1x/year
Instructions	5.2	X		
Packaging	5.3	X		

7 List of referenced documents

7.1 Standards / normative documents

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

EN 437: 2003+A1: 2009	Test gases- test pressure – appliance categories
ISO 10380: 2012	Pipework – corrugated metal hoses and hose assemblies
EN 549: 1995	Rubber materials for seals and diaphragms for gas appliances and gas equipment
ISO 4032: 2013	Hexagon regular nuts (style 1) – product grades A and B
ISO 6957: 1988	Copper alloys – ammonia tests for stress corrosion resistance
NPR 3378-11: 2007	Code of Practice gas installations – Section gas pipe work – Part 11: connecting pipe work and taps