KE 209
April 2017

GASTEC QA

Approval Requirements 209

Steel press fittings for steel pipes

Foreword

These GASTEC QA Approval requirements have 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.

These GASTEC QA Approval requirements will be used by Kiwa Nederland BV in conjunction with the GASTEC QA general requirements and the KIWA regulations for product certification. This regulation details the method employed by Kiwa during product certification.

Approved by Board of Experts : March 23rd 2017

Accepted by Kiwa Nederland B.V. : April 14th 2017

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Contents

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 steel press fittings for steel pipes.

1.2 Scope

These approval requirements apply to steel press fittings for use in combination with steel pipes in accordance with NEN-EN 10255, NEN-EN 10305-1/-2/-3, NEN-EN 10216-1, NEN-EN 10217-1 with a maximum pipe outer diameter of 114,3 mm (4”).
The press fitting is joined by means of a press machine which is prescribed by the fitting manufacturer.
The press fittings are intended to be used for indoor gas installations for 2nd and 3rd family gasses according to NEN-EN 437 with a maximum operation pressure of 5 bar (MOP) at an ambient temperature of -15°C to +50°C.

Note: Dutch installation guidelines shall be consulted for the conditions for using steel pipes in gas installations.

2 Definitions

In this approval requirement the following definitions are applicable:

Board of Experts: The Board of Experts Gastec QA.

Fitting: product to be used in a piping system for permanently connecting pipes to each other.

Fitting assembly: steel press fitting with steel pipes

IQC scheme: a description of the quality inspections carried out by the supplier as part of his quality system.

Leak tight: a product is considered leak tight under the following conditions:
- If the test fluid is a liquid, visually detectable leakage from any external surface is not permitted.
- If the test fluid is a gas:
  1) no bubbles from any external surface and breaking the surface of the water are permitted;
  2) no continuous formation of bubbles is permitted when the product is coated with a leak detection fluid.

Maximum operating pressure (MOP): maximum pressure that a component is capable of withstanding continuously in service under normal operating conditions.

Manufacturer: the party that produces the product.(not necessary the supplier).

Nominal diameter: nominal diameter of the fitting expressed as nominal outside diameter of the connection pipe.

Pipe size: Outside diameter of the pipe expressed in mm or inch according to table below.

Metric	10,2	13,5	17,2	21,3	26,9	33,7	42,4	48,3	60,3	76,1	88,9	114,3
Inch	1/8”	¼”	3/8”	½”	¾”	1”	1 ¼”	1 ½”	2”	2 ½”	3”	4”

Test piece: fitting under test.

3 Product Requirements

3.1 Material requirements

The fitting material shall be demonstrable suitable for its application (pressure, ambient temperature range, corrosion resistance, long term behavior) and shall be specified according to the relevant material standard.

The suitability of the material can be demonstrated by providing test reports or by reference to relevant product standards of similar products in which the material is specified as being suitable for use.

3.2 Surface condition

When visually inspected, fittings shall be free from sharp edges, burrs or signs of corrosion.

3.3 Plated or coated surfaces

Plated of coated surfaces shall not impair the performance of the fitting.

3.4 Adaptor fittings

The fitting may be provide with a threaded connection on one side of the fitting.
Threaded connection are allowed up to 2" thread size and shall comply with NEN-EN 10226-1.
Alternative connections are allowed as long as they are in compliance with relevant standards and common practice in Dutch gas installations.

3.5 Rubber sealing

Rubber parts used for sealing shall comply with NEN-EN 549 type A2 or NEN-EN 682 type GAL or GBL.

3.6 Tube abutment

The fitting shall be provided with a abutment to limit the pipe insertion and to ensure that the pipe is past the clamping and sealing part of the fitting.

4 Performance requirements

4.1 General
This chapter describes the performance requirements for the fittings. The test methods are described in chapter 5.

4.2 Hydrostatic strength
The press fitting shall be able to withstand a pressure of 24 bar for 48 hours without deformation or displacement between fitting and pipe.

4.3 Leak tightness
At an internal pressure of 25 mbar, 110 mbar and 1,1 x maximum working pressure with a minimum of 3 bar the press fitting assembly shall be leak tight for 10 minutes.

4.4 Leak tightness under static flexural strength
After being submitted to a bending force (see table 1) the fitting assembly shall be leak tight and shall show no displacement between pipe and fitting.
The bending force shall be applied for 1 hour. During the test the fitting assembly shall be pressurized to 1,1 x maximum working pressure with a minimum of 3 bar and remain leak tight.

Pipe size (mm)	10,2	13,5	17,2	21,3	26,9	33,7	42,4	48,3	60,3	76,1	88,9	114,3
Pipe size (inch)	1/8”	¼”	3/8”	½”	¾”	1”	1 ¼”	1 ½”	2”	2 ½”	3”	4”
Force F (N)	80	110	131	172	229	297	384	442	562	720	850	1105

Table 1

4.5 Resistance to pull-out
After being submitted to a axial tensile force the fitting assembly shall be leak tight and shall show no displacement between pipe and fitting.

Calculation of the tensile force:

$$F = \frac{\pi \times d_n^2 \times p_D \times 1{,}5}{4}$$

F force expressed in newton (N)
dn nominal diameter of the pipe in millimetres (mm)
p_D maximum operation pressure MOP in megapascal (MPa)

The tensile force shall be applied for 1 hour. During the test the fitting assembly shall be pressurized to 1,1 x maximum working pressure with a minimum of 3 bar.

4.6 Leaktightness after temperature cycling
Using a oven a fitting assembly is submitted to a temperature of 50 °C for one hour after which it is cooled down to room temperature. This cycle is repeated 6 times.
Following the 6 cycles the fitting assembly is placed at -15 °C for 24 hours after which it is brought back to room temperature.

After being submitted to a temperature cycle test the fitting assembly shall be leak tight and shall show no displacement between pipe and fitting.

4.7 Resistance to dynamic load

The fitting assembly shall be submitted to a dynamic load of $1x10^6$ cycles with a frequency of 10±1 Hz and a amplitude according to table 2.

Pipe diameter (mm)	Amplitude (mm)
≤ 42,4	5 ± 0,5
> 42,4	3,5 ± 0,5

Table 2

After being submitted to the dynamic load the fitting assembly shall be leak tight and shall show no displacement between fitting and pipe.

4.8 Resistance against torsion

The fitting assembly shall be submitted to a 10.000 circumferential displacements of 4 ± 1° with a frequency of 1 Hz.
After being submitted to the circumferential displacements the fitting assembly shall be leak tight and shall show no displacement between fitting and pipe.

4.9 Leak before press

When according to manufacturer's specification the fitting shall leak before pressing the following test shall be performed.

At an internal pressure of 25 mbar, 110 mbar and 1,1 x maximum working pressure with a minimum of 3 bar the press fitting assembly shall clearly show signs of leakage when using a leak detection fluid.

5 Test methods

5.1 General

Test shall be performed at an ambient temperature (23°C +/- 2°C) unless otherwise stated.
All tests shall be performed per size group on three sample of one size unless otherwise stated. In case the pipe diameters are specified in inches the closest size in millimetres shall be chosen.

5.1.1 Size groups

Fittings are divided in the following size groups.

Size group	1	2	3	4
Fitting size (mm)	10,2 – 17,2	17,2 – 33,7	33,7 – 60,3	60,3 – 114,3

Table 3

5.1.2 Samples

Samples shall be mounted according to the instruction of the manufacturer using pressing equipment supplied by the manufacturer.

The test shall be performed using the steel pipes as specified by the manufacturer by reference to the applicable EN standard. If multiply types of steel pipe are specified the tests shall be performed using these types of pipe.

Test shall be performed with the minimum wall thickness of the steel pipe as specified by the manufacturer of the fitting.

5.2 Hydrostatic strength test

The test piece shall consist of the fitting or fittings to be tested connected to a pipe of 200 mm on both sides of the fitting. One end of the pipe shall be fitted with an end cap to seal of the assembly.

The pipe is marked in order to verify displacement after testing.

The assembly is filled with water and the test pressure shall be applied to the assembly. After the test the assembly is visually checked for displacement and deformation.

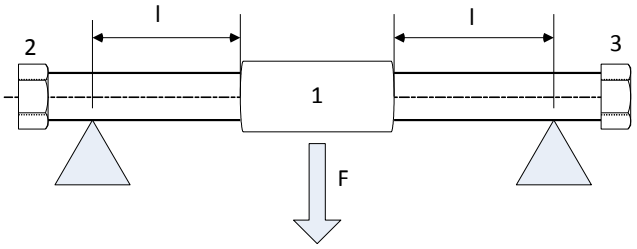
5.3 Leak tightness

The test piece shall consist of the fitting or fittings to be tested connected to a pipe of 200 mm on both sides of the fitting. One end of the pipe shall be fitted with an end cap to seal of the assembly.

The assembly is filled with air and the test pressure shall be applied to the assembly. During the duration of the test the assembly is visually inspected for leakage. The test is repeated with the second and third test pressure.

5.4 Leak tightness under static flexural strength

The test set up shall be according to figure 1.



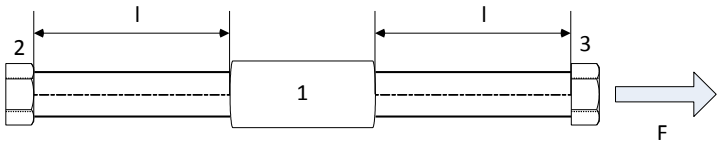
1 fitting
2 connection for supply gas pressure
3 end cap
l 1000 mm

Figure 1

During the test the assembly is visually inspected for leakage. After removing the bending force the assembly is visually checked for displacement and deformation, the leak tightness is determined according to 4.3.

5.5 Resistance to pull-out

The test piece shall be according to figure 2.



1 fitting
2 connection for supply gas pressure
3 end cap
l 200 mm

Figure 2

After removing the pulling force the assembly is visually checked for displacement and deformation, the leak tightness is determined according to 4.3.

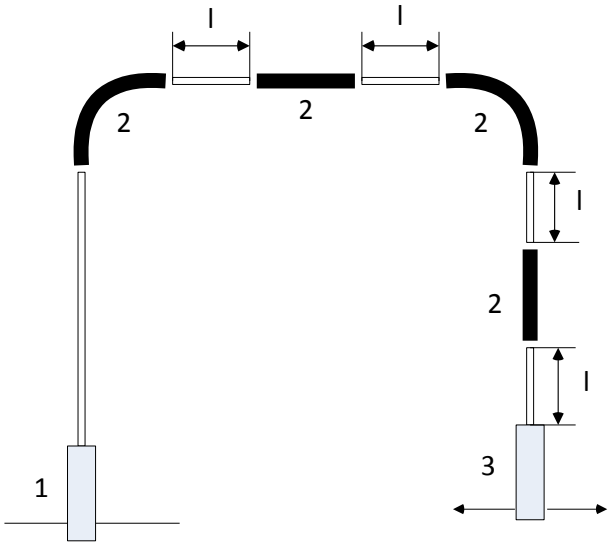
5.6 Leaktightness after temperature cycling

The test piece shall be according to figure 2.

After the temperature cycling the leak tightness is determined according to 4.3.

5.7 Resistance to dynamic load

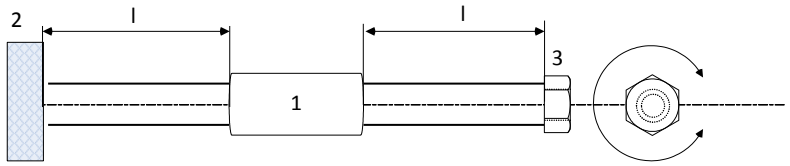
The test pieces and test set up shall be according to figure 3. The dynamic load according to 4.7 shall be applied. During the test the test piece shall be pressurised up to 300 mbar.
After the test the test pieces are visually checked for displacement and the leak tightness of the complete test pieces is determined according to 4.3.



1 fixed point
2 test pieces
3 actuating point
l 200 mm
Figure 3

5.8 Resistance against torsion

The test piece and test set up shall be according to figure 4. The torsion load according to 4.8 shall be applied. During the test the test piece shall be pressurised up to 300 mbar.
After the assembly is visually checked for displacement and the leak tightness of the complete test piece is determined according to 4.3.



1 test piece
2 fixed point
3 actuating point
l 400 mm
Figure 4

5.9 Leak before press

The test piece shall be according to figure 2.

The assembly is filled with air and the test pressure shall be applied to the assembly. During the duration of the test the assembly is visually inspected for leakage using a leak detection fluid. The test is repeated with the second and third test pressure.

6 Marking, instructions and packaging

6.1 Marking

The fitting shall be durably marked with the following information:

- The name or trade mark of the manufacturer.
- The external diameter of the pipe which is to be connected.*
- The production date (this may be in code).*
- The GASTEC QA word mark or logo.*
- The word mark GAS or a yellow marking.
- Maximum operating pressure.

* This information may be placed on the smallest packaging in which the fittings are packed.

6.2 Instructions

The supplier shall provide instructions. These instructions shall be in the Dutch language and shall contain information about:

- The use and installation of the product.
- The type of pipes including minimum wall thickness for which the press fittings are suitable.
- The type (jaw type and pressing equipment) of equipment that shall be used for pressing.
- The conditions under which it shall be used.
- How it can be determined if the product is correctly installed.
- The way the product shall be stored.

6.3 Packaging

The product including the associated components required for its assembly shall be packaged individually. Special storage or handling conditions shall be specified on the packaging. The packaging shall protect the product from dirt, dust and other contaminants during transport and storage until the point of use where the packaging will be removed.

7 Quality system requirements

This chapter contains the requirements that have to be fulfilled by the manufacturers in addition to the requirements specified in the GASTEC QA General requirements chapter 4.

7.1 Risk analysis product design

In case of new products or modification to existing products a risk analysis (e.g. FMEA) of the product design shall be made. The risk analysis shall be made available to Kiwa for assessment.

7.2 Risk analysis production process

A risk analysis (e.g. FMEA) of the production process related to the certified product shall be made. The risk analysis shall be made available to Kiwa for assessment. The IQC scheme relating to the production process shall be based on the risk analysis of the production process.

8 Summary of tests

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

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

8.1 Test matrix

Description of requirement	Clause	Test within the scope of		
		Initial product assessment	Product verification [1)]	
			Verification	Frequency
Material requirements	3.1	X		
Surface condition	3.2	X	X	Once a year
Plated or coated surfaces	3.3	X	X	Once a year
Adaptor fittings	3.4	X	X	Once a year
Rubber sealing	3.5	X		
Tube abutment	3.6	X		
Hydrostatic strength	4.2	X		
Leak tightness	4.3	X	X	Once a year
Leak tightness under static flexural strength	4.4	X		
Resistance to pull-out	4.5	X	X	Once a year
Leak tightness after temperature cycling	4.6	X		
Resistance to dynamic load	4.7	X		
Resistance against torsion	4.8	X	X	Once a year
Leak before press	4.9	X		

1) The samples required for these tests will be selected from the running production or stock during the surveillance audit at the production location.

9 List of referenced documents and source

9.1 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 437: 2003+A1: 2009	Test gases- test pressure – appliance categories
NEN-EN 10255: 2004 + A1: 2007	Non-alloy steel tubes for welding or threading – technical delivery conditions
NEN-EN 10305-1: 2016	Steel tubes for precision applications – technical delivery conditions – part 1 seamless cold drawn tubes
NEN-EN 10305-2: 2016	Steel tubes for precision applications – technical delivery conditions – part 2 welded cold drawn tubes
NEN-EN 10305-3: 2016	Steel tubes for precision applications – technical delivery conditions – part 3 welded cold sized tubes
NEN-EN 10216-1: 2013	Seamless steel tubes for pressure purposes – technical delivery conditions – part 1: non-alloy steel tubes with specified room temperature properties
NEN-EN 10217-1: 2002+A1: 2005	Welded steel tubes for pressure purposes – technical delivery conditions – part 1: non-alloy steel tubes with specified room temperature properties.
NEN-EN 10226-1: 2004	Pipe threads where pressure tight joint are made on the thread – part 1 taper external threads and parallel internal threads- dimensions, tolerances and designation
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

9.2 Source

Parts of the text of this approval requirement have been based on EN 1254-7 and DVGW G 5614.