

AR 198

March 2024

Approval requirement 198

Multilayer piping systems for indoor gas installations



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Foreword

This approval requirement (AR) is approved by the Board of Experts (BoE) 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 AR will be used by Kiwa Nederland BV in conjunction with the GASTEC QA general requirements and the KIWA regulations for certification.

In this AR is established which requirements a product and the requestor/ certificate holder of the GASTEC QA product certificate should meet and the matter to which Kiwa evaluates this.

Kiwa has a method which is established in the certification procedure for the execution of:

- The investigation for provisioning and maintaining a GASTEC QA product certificate based on this AR.
- The periodic evaluations of the certified products for the purpose of maintaining a provided GASTEC QA product certificate based on this AR.

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Kiwa Nederland B.V.

Wilmersdorf 50
Postbus 137
7300 AC Apeldoorn
The Netherlands

Tel. +31 88 998 33 93
Fax +31 88 998 34 94
info@kiwa.nl
www.kiwa.nl

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1 Introduction

1.1 General

This GASTEC QA approval requirement (AR) 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 product certificate for multilayer piping systems for indoor gas installations.

With this product certificate, the certificate holder can demonstrate to his or her customers that an expert independent organization monitors the production process of the certificate holder, the quality of the product and the related quality assurance.

Next to the requirements established in this AR and the general requirements, Kiwa has additional requirements in the sense of general procedural requirements for certification, as laid down in the internal certification procedures.

This GASTEC QA approval requirement replaces the version of September 2018.

List of changes:

- Requirements added for resistance to high temperatures
- Textual review
- Update of definitions
- Update of relevant standards

The product requirements have not been changed.

1.2 Scope

This approval requirement specifies the requirements for multilayer piping systems for indoor gas installations for the supply of gaseous fuels of the 2nd and 3rd family according to EN 437. This multilayer system consists of pipes and different type of fittings. The maximum operating pressure is 5 bar, with an operating temperature range of -20 °C up to 60 °C and a nominal diameter up to and including 63 mm.

For systems larger than 63 mm for indoor gas installations additional requirements are applicable.

2 Definitions

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

Board of Experts (BoE): The Board of Experts GASTEC QA.

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

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

See also the definitions mentioned in the GASTEC QA general requirements.

3 Material and product requirements

This chapter contains the requirements for the properties of the raw materials, materials and semi-products used during the production of the products to be certified under this AR (e.g., support bushes).

3.1 General

Multilayer piping systems for indoor gas installation shall meet the requirements of: ISO 17484-1 Plastic piping systems – Multilayer pipe systems for indoor gas installations with a maximum operating pressure up to and including 5 bar (500KPa) – Part 1: Specifications for systems.

For diameters larger than 63 mm for indoor gas installations, the requirements of ISO 18225 also shall be fulfilled.

In addition, the following requirements shall be met:

3.2 Pipes

3.2.1 *Color of pipes*

The outer layer of pipes shall be yellow.

3.2.2 *Outer layer of yellow pipe; Only for M-pipe*

For yellow outer layers reference materials may be used where the original pigment has been exchanged for yellow. The long-term pressure strength of these materials with a new pigment shall be equal to the original reference material, according to ISO 17484, clause 5.4.1.

3.3 Fittings

The reference in ISO 17484-1, clause 6 to ISO 10838 (all parts) should be replaced by ISO 17885, Plastic piping systems – Mechanical fittings for pressure piping systems – Specification, except clause 9.3, Fitting assemblies.

The reference in ISO 17484-1, clause 6 to ISO 14531-3 should be replaced by ISO 17885, Plastic piping systems – Mechanical fittings for pressure piping systems – Specification, except clause 9.3, Fitting assemblies.

3.3.1 *Construction*

The fittings for multilayer pipes shall be able to make a mechanical connection with the multilayer pipe by pressing or clamping.

3.3.2 *Plastic fittings*

Plastic body materials for fittings can be chosen from table 1 of ISO 17885. Contrary to ISO 17885, PVDF and PPSU fittings are suitable for the use of indoor gas installations. The plastic fittings shall comply to clause 3.4 of this approval requirement.

3.3.3 Metal fittings

Metal body material for fittings can be selected from table 2 of ISO 17885. Other metal materials can be used if proven to meet the requirements of ISO 17885.

3.3.4 Installation

During installation the pipe, aluminum layer and welded seam shall not torn. Using tools and aids for installation, no damage of the pipe and fitting shall occur.

In line with ISO 17885, clause 6.6, the fitting shall not induce twisting of pipes during assembly.

3.3.5 Transition fittings

Transition to other piping systems (e.g., copper, PE, or steel) shall be made by one of the following methods:

1. Thread according to EN 10226-1 (or ISO 7-1).
 - a. Male thread conical (R)
 - b. Female thread straight (Rp)
2. Compression fitting for joining copper tubes according to approval requirement 35.
3. Solder fittings (for copper tube) according to approval requirement 6.

3.3.6 Elastomers

Rubber seals shall comply with EN 549 minimum temperature class A2, or EN 682 class GAL or GBL.

3.4 Fitness for purpose

The reference in ISO 17484-1, clause 6 to ISO 10838 (all parts) should be replaced by ISO 17885, Plastic piping systems – Mechanical fittings for pressure piping systems – Specification.

3.4.1 Diameter classes

Contrary to the diameter classes in ISO 17484-1, clause 7.1, table 2, the below defined diameter classes shall be used. These classes are used to establish the number of test samples as referred to in ISO 17484-1, table 3: Requirements for fitness purpose of joint assemblies.

Table 1 - Diameter classes

Diameter classes	1	2	3
Outerdiameter (mm)	$D_e < 26$	$26 \leq D_e < 40$	$40 \leq D_e \leq 63$

For diameters larger than 63 mm, the diameter classes of ISO 18225 apply.

4 Performance requirements and test methods

In addition to the requirements from ISO 17484-1, the following requirement shall be met.

4.1 Resistance to high temperatures

The multilayer system (pipe and fitting) shall be resistant to a radiation heat of 10 kW/m² for 30 minutes. The leakage shall be ≤ 5 liters per hour after testing.

4.1.1 Test method

The test shall be performed at a temperature of 20 ± 5 °C. The test samples shall be conditioned at least 24h before testing at a temperature of 20 ± 5 °C and a relative humidity of 60 ± 20 %.

The test is performed in a horizontally test equipment as shown in figure 1. The leakage shall be measured in accordance with Annex A of EN 1775:2007.

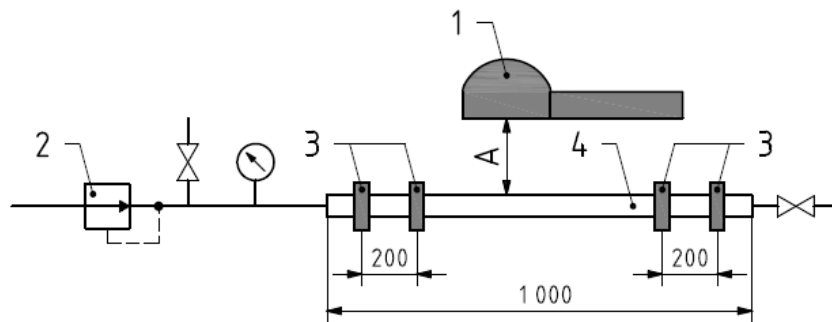


Figure 1

Legend:

1 heat cup

2 measuring system as described in appendix A of EN 1775:2007

3 mounting brackets

4 to be tested sample

A distance between heat cup and surface of the assembled component (for example the outside of a casing)

The test sample shall be mounted in the test equipment without stress or tension on the test sample, see figure 1.

Contrary to ISO 17484-1, which application is MOP 5 bar, the sample is tested on leakage at 200 mbar for 5 minutes. Record the leakage value (l/h)

Expose the test sample for 30 minutes to a heat radiation of 10 kW/m². The distance between the heating cup and the sample shall be calculated with the data on the calibration file of the heating cup.

Determine the leakage after the high temperature test during 5 minutes at 200 mbar. Record the value (l/h).

5 Marking, instructions and packaging

5.1 Marking of the pipe

The pipe shall be marked according to ISO 17484, but with the following modification:

- Internal fluid is not mandatory on the marking;
- GASTEC QA, GASTEC QA word mark or logo.

5.2 Marking on the fitting

The product shall be marked with the following information:

- Standard reference number;
- Manufacturer or trademark;
- Fluid to be conveyed or yellow marking;
- Body material;
- Nominal diameter(s) d_n to which the fitting is intended to joint;
- Material classification of pipe(s) to which connection is permissible, including reference to pipe manufacturer;
- GASTEC QA, GASTEC QA word mark or logo.

In case it is not possible to mark the product with all aspects, it is allowed to provide the marking on the smallest package. At least the production charge or code and manufacturer or trade name have to be mentioned on the fitting.

5.3 Instructions

The supplier shall provide instructions on how to apply and assemble the products. These instructions shall be in the Dutch language and describe that the product is GASTEC QA certified.

The instructions shall further meet the requirements of ISO 17484. For diameters larger than 63 mm, the instructions shall meet the requirements of ISO 18225.

5.4 Packaging

The product shall be pack in such a way that contamination or damaging is not possible.

6 Quality system requirements

The requirements for the quality system are described in the GASTEC QA general requirements. An important part of this are the requirements for drawing up a risk analysis (e.g., an FMEA) of the product and the production process in accordance with chapters 3.1.1.1 and 3.1.2.1. This risk analysis shall be available for inspection by Kiwa.

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
Multilayer pipes for indoor gas installations				
	ISO 17484-1			
Pipes	5			
Materials	5.1			
General	5.1.1	X	X	Once a year
Reprocessable material	5.1.2	X	X	Once a year
Metallic materials	5.1.3	X	X	Once a year
General characteristics	5.2			
General	5.2.1	X	X	Once a year
Multilayer construction	5.2.2	X	X	Once a year
Minimum design coefficient	5.2.3	X		
Dimension of pipes	5.3	X	X	Once a year
Mechanical properties	5.4			
Long-term pressure strength	5.4.1	X		
Strength of the joint line of M-pipes	5.4.2	X		
Resistance to slow crack growth of the outer layer for M-pipes	5.4.3	X		
Physical properties	5.5			
General	5.5.1	X		
Additional requirements	5.5.2			
• Resistance to gas constituent	5.5.2 Table 1	X		
• Thermal durability of the outer layer of M-pipes	5.5.2 Table 1	X		
• Oxidation induction time (OIT)	5.5.2 Table 1	X		
• Delamination: P-pipes	5.5.2 Table 1	X		
• Delamination: M-pipes	5.5.2 Table 1	X		
• Odorant permeability	5.5.2 Table 1	X		

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Additional requirements for pipes				
Color of the pipes	3.2.1	X	X	Once a year
Outer layer of yellow pipes	3.2.2	X		
Fittings for multilayer pipes for indoor gas installations				
	ISO 17885			
Manufacturers declaration for the field application	4	X		
Materials	5			
Plastic materials	5.1	X	X	Once a year
Metal materials	5.2	X	X	Once a year
Elastomers	5.3 and/or AR 198, 3.3.6	X	X	Once a year
Lubricants and/or greases	ISO 17885, 5.4	X	X	Once a year
General characteristics	6			
Appearance	6.1	X	X	Once a year
Color	6.2	X	X	Once a year
Ultraviolet protection	6.3	X		
Threads	6.4	X	X	Once a year
Transition fittings to metal pipes	6.5	X	X	Once a year
Combined fittings	6.6	X	X	Once a year
Geometrical characteristics	7	X	X	Once a year
Physical characteristics	8			
Evaluation of the MRS value of the plastic materials	8.1	X		
Verification of long-term behavior of the plastic materials	8.2	X		
Specific material characteristics of fitting materials	8.3	X		
Application-related characteristics	8.4			
Resistance to gas constituents	8.4.2	X		
Stress corrosion resistance	8.4.2	X		
Performance requirements	9			
General	9.1	X		
Pressure resistance of the fitting body	9.2	X		
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Additional requirements for fittings				
Plastic fittings	3.3.2	X		
Metal fittings	3.3.3	X		
Installation	3.3.4	X	X	Once a year
Transition fittings	3.3.5	X	X	Once a year
Elastomers	3.3.6	X		

Fitness for purpose for multilayer systems for indoor use for gas installation				
	ISO 17484-1			
Requirements for the system	4			
Pressure drop	4.1	X		
Bending	4.2	X		
Corrosive conditions	4.3	X		
Fitness for purpose	7	X		
Requirements	7.2	X		
• Long-term internal pressure test	7.2 table 3	X	X	Once a year
• Tensile load 1h	7.2 table 3	X	X	Once a year
• Tensile load 800h	7.2 table 3	X		
• Joint resistance to crushing	7.2 table 3	X		
• Impact resistance of the joint	7.2 table 3	X		
• Thermal cycling resistance	7.2 table 3	X		
• Repeated bending resistance	7.2 table 3	X		
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Fitness for purpose	3.4			
Dimension classes	3.4.1	X		
Resistance to high temperatures	4.1	X		
Marking, instructions and packaging				
	AR 198			
Marking of the pipe	5.1	X	X	Once a year
Marking of the fitting	5.2	X	X	Once a year
Instructions	5.3	X	X	Once a year
Packaging	5.4	X		

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.

EN 1775: 2007	Gas supply - Gas pipework for buildings - Maximum operating pressure less than or equal to 5 bar - Functional recommendations
ISO 17484-1: 2014	Plastics piping systems - Multilayer pipe systems for indoor gas installations with a maximum operating pressure up to and including 5 bar (500 kPa) - Part 1: Specifications for systems
ISO 17885: 2021	Plastics piping systems — Mechanical fittings for pressure piping systems — Specifications
ISO 18225: 2012	Plastics piping systems - Multilayer piping systems for outdoor gas installations - Specifications for systems

8.2 Source of informative documents

ISO 7-1: 1994+Cor 1: 2007	Pipe threads where pressure-tight joints are made on the threads - Part 1: Dimensions, tolerances and designation
ISO 6708: 1995	Pipe components - Definition and selection of DN (nominal size)
EN-ISO 3183: 2019	Petroleum and natural gas industries. Steel pipe for pipeline transportation systems
EN-ISO 6892-1: 2019	Metallic materials – tensile testing – part 1: method at room temperature
EN 437: 2021	Test gases- test pressure – appliance categories
EN 549: 2019+A1:2023	Rubber materials for seals and diaphragms for gas appliances and gas equipment
EN 682: 2002+ A1: 2005	Elastomeric seals - Materials requirements for seals used in pipes and fittings carrying gas and hydrocarbon fluids

EN 1092-2: 1997	Flanges and their joints - Circular flanges for pipes, valves, fittings and accessories, PN designated - Part 2: Cast iron flanges
EN 1333: 2006	Flanges and their joints - Pipework components - Definition and selection of PN
EN 10226-1: 2004	Pipe threads where pressure tight joints are made on the threads – Part 1 taper external threads and parallel internal threads.
EN 14901-1: 2014+ A1: 2019	Ductile iron pipes, fittings and accessories - Requirements and test methods for organic coatings of ductile iron fittings and accessories - Part 1: Epoxy coating (heavy duty)
NEN 1078: 2024	Supply for gas with an operating pressure up to and including 500 mbar - Performance requirements - New estate
NEN 7231: 2020	Plastics piping systems for gas supply - Fittings of modified poly(vinyl chloride) (modified-PVC) - Requirements and test methods
Approval requirement 6: 2019	Plumbing fittings with ends for capillary soldering, capillary brazing and/ or threaded connections
Approval requirement 35: 2019	Compression fittings for joining copper pipes
General requirements GASTEC QA	