Version
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English version

Approval requirement 137

POM gate valves installed in underground PE pipeines

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Preface Kiwa

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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Content

1. Introduction

1.1. General

This GASTEC QA approval requirement (AR) in combination with the GASTEC QA general requirements, is applied by Kiwa as the basis for the issuing and maintaining the GASTEC QA product certificate for POM gate valves installed in underground PE pipelines.

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 July 2023.

List of changes:

- This approval requirement has been adapted to the new layout of GASTEC QA approval requirements.
- The approval requirement is fully textually reviewed.
- In chapter 4, the temperature tolerances have been adjusted for some test temperatures as they were not all aligned.
- The chapter division has been adjusted
- The list of reference standards has been adjusted

The product requirements have not changed.

1.2. Scope

These approval requirements specify the requirements for the polyoxymethylene (POM) gate valves installed in underground PE pipelines applied for the transport of gaseous fuels in accordance with the 2nd and 3rd family as per EN 437.

These approval requirements are applicable to POM gate valves, with mechanical couplings and an outer diameter of ≤ 63 mm. The maximum permissible operating pressure is 4 or 10 bar.

The general and specific functional requirements and recommendations for PE piping systems are laid down in the NEN 7244 and EN 12007 series and national and international norms and regulations.

2. Definitions

In this approval requirement, the following 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.

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

3. Material and product requirements

This chapter contains the material and product requirements that the raw materials, materials and products used shall meet.

3.1. Construction

3.1.1. Influence of soil

The manufacturer shall declare that the valve is constructed in such a way that the action is not detrimentally influenced under any soil conditions (e.g. very wet or very dry soil).

3.1.2. Operating temperatures

The manufacturer shall declare that the valve is constructed in such a way that a good action is guaranteed at surrounding temperatures between -15 °C and + 40 °C.

3.1.3. Closure elments

The closure elements shall be connected to the spindle in such a way that it cannot come loose during normal use.

3.1.4. Spindle

The valve shall close by turning the spindle to the right. A “rising” spindle is not acceptable.

3.1.5. Safety mechanism

The valve shall have a safety mechanism fitted directly onto the spindle head, which protects the spindle against an unacceptable operating torque. The safety mechanism shall be securely fastened on the spindle head and shall be easy to replace.

3.1.6. High torque

The valve shall be constructed to prevent external leakage if the valve is operated with too high a torque.

3.1.7. Mechanical couplings

The mechanical couplings of the valve shall comply with GASTEC QA Approval Requirement 70.

3.1.8. Maximum operating pressure (MOP)

The gate valves are intended for use with an maximum operating pressure of 4 or 10 bar.

3.2. Surface quality and appearance

Internally and externally the valves shall be smooth and well made. The surface may not show grooves, pits, blisters or other irregularities. The surface may not show an indication of difference in temperature during the production process.

3.3. Materials

3.3.1. Plastic materials

The POM materials shall meet the requirements of ISO 17885 clause 5.1, 5.2, 8.1 and 8.2.

3.3.2. Material properties

The POM material shall meet the following minimum requirements:

- Tensile strength: 70 Mpa
- Elongation at break: 70%
- E-modulus: 2800 MPa
- Density: 1400-1420 kg/m^3
- Melt Flow Rate: 0-4 g/10 min

These properties shall be determined according to the following paragraph.

3.3.2.1 Test method – determination of material properties POM

Density and Melt flow rate (MFR)
The density and MFR shall be determined as indicated in ISO 17885:2021, using the test method as described in ISO 1133-1.

Tensile strenght, stretch on fracture and E-modulus
Make a test plate as described in ISO 295 and make 5 test pieces Type B according to ISO 527 from this.

Perform the test as in ISO/DIS 527 under the following conditions:

- Test temperature: 23 ± 2°C.
- Test velocity: 5 mm/min ± 20%.

Finally calculate the E-modulus as in ISO 527 using the results obtained.

3.3.3. Parts in contact with gas

The closing element and other parts that can come into contact with gas shall be made of a material that is resistant to gas condensate, tested according to ISO 17885 Annex E.

3.3.4. Metal Parts

The metal parts of the valves shall have at least the same corrosion resistance as steel that is alloyed with 13% chromium.

The following materials are considered similar: the copper alloys CuZn 40 Pb3 and CuZn 40 Ni.

3.3.5. Elastomeric materials

Elastomeric sealing components shall conform to the requirements of EN 682, type GAL or GBL.

3.4. Measurements and permissible deviations

The dimensions of the valves and the permissible deviations shall be in agreement with the values stated by the manufacturer and shall be recorded on a drawing.

3.5. Inserts

When declared by the manufacturer, it is allowed to use inserts for connecting a valve. The insert shall be supplied with the valve or separate available.

The insert shall be rigid and provide support over the entire compression area where the clamping force applies.

The insert shall not be able to displace in longitudinal direction after assembly. After installation of the insert, the pipe shall show no signs of damage, scratches or cracks to an extent that would prevent conformity to the requirements of the standard for PE pipes.

The material of the insert shall be fit for purpose. A valve shall hav only one insert for each combination of diamter and SDR series of the pipe with which its assembled and this shall be stated by the manufacturer in the installation manual.

4. Performance requirements and test methods

This chapter contains the performance requirements and associated test methods that the products shall meet. This chapter also specifies the limit values, if applicable.

4.1. General

The test pieces to be used for the various tests shall be at least 16 hours old. The tests shall be performed in triplicate, using air as test medium, in which a representative choice shall be made from various sizes of the measurement series of the valves.

The tests shall be performed with one approved type of PE pipe according to GASTEC QA Approval Requirements 8.

The measurements of the valves shall be checked at a temperature of 23 ± 2 °C with suitable tools.

Visually check the finish and appearance of the valves.

In this chapter the pressures are stated in bar. A factor 100 applies for the conversion to kPa (1 mbar = 0,1 kPa 1 bar = 100 kPa, 1 kPa = 0,01 bar).

4.2. Strength of the operating mechanism

The operating mechanism shall be able to resist a torque as stated in table 1 for 1 minute at -20 ± 2 °C and 40 ± 2 °C or until the safety activates . The valve shall not show permanent deformation and the external leakage shall not exceed ≤ 50 cm^3/h. If the valve is forced, there may be no leakage and the safety mechanism shall be activated.

Connection size d_e	Torque Nm
25	150
32	150
40	250
50	250
63	250

Table 1: Strength operating mechanism

4.2.1. Test method

Measure the prescribed torques with an accuracy of at least 5%.

Apply a closing torque as in table 1 to the operating mechanism at both -20 ± 2 °C and +40 ± 2 °C for 1 minute. Observe a conditioning time of at least 2 hours.

Check if there is external leakage by applying a pressure to the test piece of 25 ± 5 mbar, both during and after the test. Then force the valve until the safety mechanism is activated. The external leakage shall be recorded and the measurement shall be performed with equipment with an accuracy of at least 5 cm^3/h.

Change the safety mechanism after the test.

4.3. Internal leak tightness

The valve shall be able to resist an internal air pressure of 25 ± 5 mbar and 1.5 x MOP.

During 15 minutes of testing, the internal leakage shall not exceed 50 cm^3 / h at the temperatures of both 23 ± 2 °C and 0 ± 0.2 °C and using a closing torque as described in table 2.

Gate valves with a MOP of 4 bar shall be able to resist 6 ± 0.6 bar and gate valves with a MOP of 10 bar shall be able to resist 15 ± 1.5 bar.

Connection size d_e	Torque Nm
25	30
32	30
40	50
50	50
63	50

Table 2: Closing torque

4.3.1. Test method

Perform the test on the valves that have already been subjected to the test as in article 4.2.1. Measure the prescribed torques with an accuracy of at least ± 5%.

Determine the gas tightness of the valve by means of one of the following test series with equipment with an accuracy of ate last 5 cm^3 / h:

- Condition the valve for 2 hours at 23 ± 2°C.
- Close the closed valve with a closing torque as described in table 2.
- Set the pressure on one side at 25 ± 5 mbar and maintain this for 15 minutes.
- Check the valve for internal leak-tightness
- Then half open the valve.
- Set the pressure at 25 ± 5 mbar and maintain this for 15 minutes.
- Check the valve for external leak-tightness.
- Increase the pressure to 1.5 x MOP and maintain this for 15 minutes.
  The MOP at 4 bar is 6 ± 0,6 bar, The MOP at 10 bar is 15 ± 1.5 bar.
- Check the valve for external leak-tightness.
- Then close the valve with a torque as in table 2
- Set the pressure at 1.5 x MOP (see above for the pressures) and maintain this for 15 minutes.
- Check the valve for internal leak tightness.
- Condition the valve for 2 hours at 0 ± 2 °C.
- Repeat the series of tests at 0 ± 2 °C on the same valve and determine the gas tightness.

4.4. External leak tightness

The valve shall be able to resist an internal air pressure of 25 ± 5 mbar and 1.5 x MOP.

During 15 minutes of testing, no external leakage shall occur with the closure element in any random position and at temperature of both 23 ± 2 °C and 0 ± 2 °C.

Gate valves with a MOP of 4 bar shall be able to resist 6 ± 0.6 bar and gate valves with a MOP of 10 bar shall be able to resist 15 ± 1.5 bar.

Carry out the test as outlined in paragraph 4.3.1.

4.5. Tightness with external water pressure

The valve shall be able to resist an external water pressure of 10 ± 1 kPa for 2 hours and subsequently an external water pressure of 80 ± 8 kPa for 2 hours, at a temperature of 23 ± 2 °C, without external leakage occurring.

4.5.1. Test method

Subject the valve to an external water pressure of 10 ± 1 kPa for 2 hours at a temperature of 23 ± 2 °C. After applying the pressure for 2 hours, check for water leak in prior to applying the following pressure.

Subject the same valve to an external water pressure of 80 ± 8 kPa for 2 hours at a temperature of 23 ± 2 °C.

Determine if water has leaked in after 2 hours under the mentioned pressure.

4.6. Tightness with bending moment on the spindle

The valve shall comply with paragraph 4.2.1 with a bending moment of 55 ± 5 Nm applied to the operating mechanism. The test shall be performed as described in the following paragraph.

4.6.1. Test method

Apply a bending moment to the spindle during the test as in 4.3.1 of 55 ± 5 Nm sequentially in an axial direction and in a tangential direction of the valve.

Maintain the bending moment for at least 10 seconds. Check the valve for leak tightness according to 4.3.3.

Note: This test may be combined with the test of paragraph 4.3.1.

4.7. Durability

The valve shall comply with the requirements of paragraph 4.3, 4.4 and 4.5 after opening and closing 50 times at a temperature of 23 ± 2 °C, with a torque as stated in table 2.

4.7.1. Test method

Perform the test on valves that have already been subjected to the test as in paragraph 4.2.1 and 4.3. 3 under the following conditions:

- Closing torque: as in table 2.
- Temperature: 23 ± 2°C.
- Opening and closing rate: 5 ± 1 turns/min.
- Number of times open and close: 50.

Then perform the test as in paragraph 4.3.1 1.

4.8. Resistance of the valves and the connections to internal water pressure

Valves and the connections with the PE pipes shall have a resistance to the internal water pressure stated in table 3, at temperatures of both 20 °C and 60 °C, without a fracture or leak occurring.

Temperature	Time	Hoop stress [MPa]	Internal water pressure [MPa]		
°C	h		SDR 17.6	SDR 17	SDR 11
20 ± 0.5	100	12	1.40	1.50	2.40
60 ± 0.5	1000	5.6	0.68	0.70	1.12

Table 3: Resistance to increased pressure at 20 °C and 60 °C

4.8.1. Test method

Test pieces
The test pieces (total = 3) shall be composed of valve connected to PE pipes where the free length on both sides of the valve shall be 250 ± 10 mm. Put the valve in a half open position.

Testing equipment
Testing equipment as per ISO 1167 is required for the test. The test pieces can be connected simultaneously and subjected to the required water pressure.

Testing
Fix the test pieces in the testing equipment.

Subject the test pieces to the pressure and temperature stated in table 3. During the test the test pieces shall be fully submerged in water at the prescribed temperature.

Keep the water temperature constant during the test within ± 0.5 °C. Keep the pressure constant during the test within ± 2%.

Check if there has been a leak or fracture during the set test time.

Check the exterior for cracks.

4.9. Influence of temperature changes of the valves

Valves may show no dimension change in length or diameter of more than 3%, after exposure to a temperature of 160 ± 4 °C for 60 minutes in air or glycerin and subsequent cooling down to 23 ± 2 °C.

The angular change may not be more than 5°.

4.9.1. Test method

Determine the length and diameter of the valve intended for this test with an accuracy of 1 mm.

Place the test piece in an oven or a bath of glycerine at a temperature of 160 ± 4 °C for 60 minutes in such a way that the position of the test piece has as little hindrance on the lengthwise change as possible.

Re-determine the measurements of the test piece after cooling down to 23 ± 2 °C.

5. Marking and instructions

5.1. Marking

The following information shall be marked clearly and durably on the valves:

- GASTEC QA, GASTEC QA logo or punchmark
- The manufacturing mark.
- The material grade or trade name.
- The nominal connection measurements and the SDR indication for the PE pipes to be connected.
- The production period, in a code if needs be, which is accessible to the purchaser.
- Maximum Operating Pressure (MOP) in bar (e.g. MOP 4 or MOP 10)

The marks to be applied shall not have a detrimental influence on the properties of the valves.

5.2. Instructions

The supplier shall provide user instructions in the Dutch language and in the language of the country in which the product will be used. These instructions shall have the following information included:

- Clear processing instructions .
- If applicable the material of the inserts
- The pressure loss of the valve shall be presented in the following way:
  - graphically: log Δ p versus log Q, where Δ p is given in mbar and log Q in m_s^3/h (gas);
  - numerically: pressure loss at one or two different flow rates, in consultation with the inspecting body.

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 design 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 evaluation

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

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

7.1. Evaluation matrix

Description of requirement	Clause	Investigation within the scope of		
		Initial product assessment	Product verification	
			Inspection	Frequency
Construction				
Requirements on construction	3.1	X		
Surface quality and appearance	3.2	X	X	
Materials				
Plastic materials	3.3.1	X		
Material properties	3.3.2	X	X	Each year
Closing element and other parts in contact with gas	3.3.4	X		
Metal parts	3.3.5	X	X	Each year
Elastomeric materials	3.3.6	X	X	Each year
Functional Requirements				
Strength of the operating mechanism	4.2	X	X	Each year
Internal gas tightness	4.3	X	X	Each year
External gas tightness	4.4	X	X	Each year
Tightness with external water pressure	4.5	X		
Tightness with bending moment on the spindle	4.6	X		
Durability	4.7	X		
Resistance of the valves and the connections to internal water pressure	4.8	X	X	Each year
Influence of temperature changes on the valves	4.9	X		
Marking and documentation				
Marking	5.1	X	X	Each year
Instruction	5.2	X	X	Each year

8. List of referenced documents and source

8.1. Standards/ normative documents

Number	Title	Version *
ISO 295	Plastics - Compression moulding of test specimens of thermosetting materials	2004
ISO 527-1	Plastics - Determination of tensile properties	2019
ISO 1167	Thermoplastics pipes, fittings and assemblies for the conveyance of fluids - Determination of the resistance to internal pressure	2006
ISO 17855-1	Plastics - Polythylene (PE) moulding and extrusion materials	2014
ISO 17885	Plastic piping systems – Mechanical fittings for pressure piping systems – Specifications	2021
EN 682	Elastomeric seals - Materials requirements for seals used in pipes and fittings carrying gas and hydrocarbon fluids	2002 + A1: 2005
Approval requirement 8	Polyethylene pipes for carrying gaseous fuels	
Approval requirement 70	Mechanical fittings for plastic piping systems	

*) If no date of issuance is specified in this column, the current version of the document applies.

8.2. Source of informative documents

Number	Title	Version *
EN 437	Test gases- test pressure – appliance categories	2021
EN 12007-1	Gas infrastructure - Pipelines for maximum operating pressure up to and including 16 bar – part 1: General functional requirements	2012
NEN 7244	Gas supply systems - Pipelines for maximum operating pressure up to and including 16 bar	
	General requirements GASTEC QA	

*) If no date of issuance is specified in this column, the current version of the document applies.