

AR 87

April 2025

Approval requirement 87

External coatings for the corrosion protection of buried or immersed pipelines and joints



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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.

Approved by the Board of Experts: 22/04/2025

Accepted by Kiwa Nederland B.V.: 06/05/2025

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The use of this approval requirement by third parties, for any purpose whatsoever, is only allowed after a written agreement is made with Kiwa to this end

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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 external coatings for the corrosion protection of buried or immersed pipelines and joints.

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 October 2019.

List of changes:

- These approval requirements have been fully reviewed textually.
- Change of paragraphs
- Update of list of referenced documents

The product requirements have not changed.

1.2 Scope

This approval requirement specifies the requirements for external coating materials for the corrosion protection of buried or immersed steel pipelines.

This approval requirement is applicable to:

- External organic coatings based on tapes and shrinkable materials according to mechanical resistance (Class A, B or C) and to the maximum continuous operating temperature of 30 °C, 50 °C or class HT. In case of HT products, the manufacturer shall declare the temperature.
- Non-crystalline low-viscosity polyolefin-based coatings (Class 13A or 13B) and to maximum continuous operating temperature of 50 °C, 70 °C or 95 °C.

2 Definitions

In this approval requirement, the following definitions are applicable:

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

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 General for external organic coatings (tapes and shrinkable materials)

The products shall comply with the requirements specified in EN 12068: "Cathodic protection – External organic coatings for the corrosion protection of buried or immersed steel pipelines used in conjunction with cathodic protection – Tapes and shrinkable materials".

In addition, the products shall comply with the following requirements:

3.1.1 Dimensions

The manufacturer of the tape, shrinkable material shall create a listing, if applicable, of the following data:

- a) Length of the tape on a roll in meters.
- b) Width of the tape in millimetres.
- c) Nominal thickness of the tape/shrinkable material in millimetres.

The length of the tape shall not be shorter than stated by the manufacturer.

The width shall not deviate more than ± 5 mm.

The thickness of the tape shall not be less than stated by the manufacturer. In case of a multilayer structure, the manufacturer shall state the nominal thickness of each layer.

3.1.2 Saponification value

The polymeric film or reinforcement (see paragraph 3.2.3 of EN 12068) shall have a maximum saponification value of 10 mg KOH/g determined according to Annex L of EN 12068. Coating materials shall be separated from the polymeric film or reinforcement for testing.

Primers (solids), coating materials or fillers shall have a maximum saponification value of 25 mg KOH/g determined according to Annex L of EN 12068.

Tapes and shrinkable materials, of which the polymeric film or reinforcement does not meet the above-mentioned requirement, are supposed to meet these approval requirements if the requirements in paragraph 3.1.3 are met.

3.1.3 Resistance against ageing

This requirement is only applicable for tapes and shrinkable material that does not meet the requirements of the saponification value, as stated in paragraph 3.1.2.

After ageing of tape and shrinkable material in caustic soda during 100 days at 50 °C, the products shall comply with the following requirements:

- a) For tapes with laminate polymeric tapes and non-reinforced shrinkable material the alteration in tape strength or in burst strength and elongation at break is 25% at most.
- b) For reinforced polymeric tapes and shrinkable material with reinforced polymer backing, the change in tape strength or burst strength and elongation at break is 25% at most.

When tested according to paragraph 4.1., determination of resistance against ageing under action of caustic soda at 50 °C, the following requirements have to be met:

$$E_{100}/E_{70} > 0,8$$

and

$$S_{100}/S_{70} > 0,8$$

3.2 General for non-crystalline low-viscosity polyolefin based coating

The products shall comply with the requirements specified in clause 13 of ISO 21809-3: "Petroleum or natural gas industries – External coatings for buried or submerged pipelines used in pipeline transportation systems – Part 3: Field joint coatings".

In addition, the products shall comply with the following requirements:

3.2.1 Dimensions

The manufacturer of low-viscosity material shall declare, if applicable, the following data:

- a) Length of the tape on a roll in meters.
- b) Width of the tape in millimetres.
- c) Nominal thickness of the tape/shrinkable material.

The length of the tape shall not be shorter than stated by the manufacturer.

The width shall not deviate more than ± 5 mm.

The thickness of the tape shall not be less than stated by the manufacturer. In case of a multilayer structure, the manufacturer shall state the nominal thickness of each layer.

4 Performance requirements and test methods

In addition to the requirements of EN 12068, the products shall also comply with the following requirements. Products assessed according to ISO 21809-3 have no additional requirements to be met.

4.1 Determination of resistance against ageing

20 test pieces according to 4.1.1 resp. 4.1.2 are aged by hanging them freely in a caustic soda solution $C_{[\text{NaOH}]} = 0,1 \text{ mol/l}$ at 50 °C. After 70, resp. 100 days, in each case 10 test pieces are taken, flushed with distilled water and hung in distilled water for 24 hours.

Determination of tape strength (see 4.1.2) and elongation at break takes place after the test pieces have stayed for at least 48 hours in air at $20 \pm 5 \text{ °C}$ and RH between 45 and 75%.

4.1.1 Testing of elongation at break (Annex A1 of EN 12068)

Determination of elongation at break of polymeric tapes and non-reinforced shrinkable materials is performed according to ISO 527-3. For testing, specimen type 5 shall be used, and 10 test pieces shall be tested.

For tapes, the test pieces are circumferentially punched out of three different rolls. For shrinkable materials, the test pieces shall be circumferentially punched out of three different batches.

Measuring length and pulling speed shall conform to the values given in table 1. The value for elongation at break must be related to measuring length L_0 .

When testing, no break shall occur outside of measuring length L_0 . It is allowed to remove the coating near the clamps.

Test piece	Test pieces (4.1.1 / 4.1.2.1)	Test strips (4.1.2.2)
Measuring length L_0 [mm]	25	50
Pulling speed [mm/min]	200	50

Table 1: Determination of elongation at break, resp. tape strength of tapes and shrinkable materials

4.1.2 Testing of tape strength

4.1.2.1 Testing of tape strength of laminate polymeric tape and non-reinforced shrinkable material.

See A1 in Annex A of EN 12068. Testing is performed according to ISO 527-3. For testing, specimen type 5 shall be used. Ten test pieces shall be put to the test, prepared according to 4.1.1 of this AR. Measuring length and pulling speed shall conform to the values given in table 1. The value for elongation at break shall be related to measuring length L_0 .

When testing, no break shall occur outside of measuring length L_0 . It is allowed to remove the coating near the clamps.

4.1.2.2 Testing of tape strength of reinforced polymeric tapes and shrinkable material with reinforced polymer backing.

See A1 in Annex A of EN 12068. Testing is performed according to ISO 527-3. For testing, specimen type 5 shall be used. Ten test strips shall be used, width 50 mm at least and length 150 mm at least. These strips are circumferentially cut out of three different rolls and prepared according to paragraph 4.1.1 of this AR. Measuring length and pulling speed shall conform to the values given in table 1.

When testing, it is not allowed to pull out parts of the reinforcement out of the clamps.

5 Marking and instructions

5.1 Marking

The products shall be marked according to either clause 4.2 of EN 12068 or table 11 from ISO 21809-3.

Additionally, the products shall be permanently marked with the following:

- GASTEC QA, GASTEC QA logo, wordmark or punch mark.

5.2 Instructions

The manufacturer / certificate holder shall provide instructions according to EN 12068, clause 5.2 or according to ISO 21809-3, table 14. These instructions shall be provided in Dutch, English and in the language of the country in which the products are used.

For products falling under the scope of EN 12068 the following addition applies: In the documentation shall be stated clearly whether the product has been tested and approved for microbiological resistance, according to EN 12068, table 2, no 1.

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 tests

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

- The initial product assessment.
- The periodic product verification.

7.1 Evaluationmatrix for external organic coatings (tapes and shrinkable materials)

Description of requirement	Clause EN 12068	Test within the scope of		
		Initial product assessment	Product verification	
			Verification	Frequency
Impact resistance	table 1, N° 1	X	X	Once a year
Indentation resistance: - holiday detection and/or - residual thickness	table 1, N° 2	X	X	Once a year
Specific electrical insulation resistance	table 1, N° 3	X	X	Once a year
Cathodic disbondment resistance	table 1, N° 4	X	X	Once a year
Peel strength layer to layer	table 1, N° 5	X	X	Once a year
Peel strength to pipe surface	table 1, N° 6	X	X	Once a year
Lap shear strength	table 1, N° 7	X		
Microbiological resistance (by convention between manufacturer and user)	table 2, N° 1	X		
Thermal aging resistance (no requirement for petrolatum tapes class A)	table 2, N° 2	X		
Ultraviolet irradiation resistance (outer layer, class UV only)	table 2, N° 3	X		
Low temperature flexibility (class L and class VL only)	table 2, N° 4	X		
Low temperature unrolling test (no requirement for hot applied materials)	table 2, N° 5	X		
Drip resistance (petrolatum tapes only)	table 2, N° 6	X	X	Once a year
Polymeric film/reinforcement - Minimum total thickness or Mass per unit area	table 6: 4a or 4b	X		
Polymeric film/reinforcement - Nominal thickness or Mass per unit area	table 6: 5.3a or 5.3b	X		
Adhesive: - Nominal thickness or Mass per unit area	table 6: 6.2a or 6.2b	X		
Adhesive: Saponification value	table 6: 6.3	X		
Adhesive: Softening point ring and ball (if applicable)	table 6: 6.4	X		
- Tape strength or Bursting strength	table 6: 7.1a or 7.1b	X		
Modulus at 10% elongation (if applicable)	table 6: 7.2	X		
Elongation at break (if applicable)	table 6: 7.3	X		
Shrinkage (shrinkable material only)	table 6: 7.5	X		
Additional GASTEC QA approval requirements				
Dimensions	3.1.1	X	X	Once a year
Saponification value	3.1.2	X		
Resistance against ageing	3.1.3	X		
Marking and instructions	5	X	X	Once a year

7.2 Evaluationmatrix for non-crystalline low-viscosity polyolefin based coating

Description of requirement	Clause ISO 21809-3	Test within the scope of		
		Initial product assessment	Product verification	
			Verification	Frequency
Coating identification	13.1	X	X	Once a year
Description of the coating	13.2	X		
Surface preparation	13.3	X		
Application of the coating	13.4	X		
Non-crystalline low-viscosity polyolefin compound				
Minimum thickness	Table 12	X	X	Once a year
Glass transition temperature	Table 12	X		
Crystallisation temperature	Table 12	X	X	Once a year
Holiday detection	Table 12	X	X	Once a year
Drip resistance	Table 12	X	X	Once a year
Adhesion reinforced compound	Table 12	X	X	Once a year
Adhesion compound without reinforcement	Table 12	X	X	Once a year
Lap shear resistance	Table 12	X		
Specific electrical insulation resistance	Table 12	X	X	Once a year
Complete coating				
Impact resistance	Table 12	X	X	Once a year
Indentation resistance	Table 12	X		
Cathodic disbondment	Table 12	X	X	Once a year
Outer wrap – polymeric tape				
Peel strength outer to outer	Table 12	X	X	Once a year
Peel strength plant coating	Table 12	X	X	Once a year
Peel strength outer to outer at T _{max}	Table 12	X		
Peel strength plant coating at T _{max}	Table 12	X		
Elastic modulus at Tmax	Table 12	X		
Peel strength outer to outer at T _{max} + 20°C	Table 12	X		
Peel strength plant coating at T _{max} + 20°C	Table 12	X		
Outer wrap – heat-shrinkable material				
Peel strength outer to outer	Table 12	X	X	Once a year
Peel strength plant coating	Table 12	X	X	Once a year
Peel strength outer to outer at T _{max}	Table 12	X		
Peel strength plant coating at T _{max}	Table 12	X		
Elastic modulus at Tmax	Table 12	X		
Peel strength outer to outer at T _{max} + 20°C	Table 12	X		
Additional GASTEC QA approval requirements				
Dimensions	3.2.1	X	X	Once a year
Marking and instructions	5	X	X	Once a year

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 12068: 1998	Cathodic protection – External organic coatings for the corrosion protection of buried or immersed steel pipelines used in conjunction with cathodic protection – Tapes and shrinkable materials
ISO 527-3:	Plastics. Determination of tensile properties. Part 3: Test conditions for films and sheets
ISO 21809-3:2016	Petroleum or natural gas industries – External coatings for buried or submerged pipelines used in pipeline transportation systems – Part 3: Field joint coatings

8.2 Source of informative documents

General Requirements GASTEC QA