INTERNATIONAL STANDARD

ISO 21809-3

Second edition
2016-03-01

AMENDMENT 1
2020-03

Petroleum and natural gas industries — External coatings for buried or submerged pipelines used in pipeline transportation systems —

Part 3: Field joint coatings

AMENDMENT 1: Introduction of mesh-backed coating systems

Industries du pétrole et du gaz naturel — Revêtements externes des conduites enterrées ou immergées utilisées dans les systèmes de transport par conduites —

Partie 3: Revêtements des joints soudés sur site

AMENDEMENT 1: Introduction de systèmes de revêtement à support maillé

Reference number
ISO 21809-3:2016/Amd.1:2020(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, Subcommittee SC 2, *Pipeline transportation systems*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 459 *ECISS — European Committee for Iron and Steel Standardization*, Subcommittee SC 10, *Steel tubes, and iron and steel fittings*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

A list of all parts in the ISO 21809 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Petroleum and natural gas industries — External coatings for buried or submerged pipelines used in pipeline transportation systems —

Part 3: Field joint coatings

AMENDMENT 1: Introduction of mesh-backed coating systems

Clause 8, Table 1

Replace the following row:

Clause	Code	Type of field joint coating
12	12	Cold-applied polymeric tape coatings

with

Clause	Code	Type of field joint coating
12	12A	Cold-applied tape coatings with a polymeric continuous backing
	12B	Cold-applied tape coatings with a polymeric mesh backing

Clause 12

Replace text with the following:

12 Cold-applied polymeric tape coatings

12.1 Coating identification

Cold-applied polymeric tape coatings (FJC Types 12A or 12B) shall be identified in the APS in accordance with Table 2 and shall meet the requirements of Table 10. Data sheets for the coating materials shall be in accordance with Table 4 (primer) and Table 5 (tape).

Application instructions shall be provided by the manufacturer in accordance with Table 6.

12.2 Description of the coatings

12.2.1 Cold-applied tape coatings with a polymeric continuous backing (Type 12A)

Cold-applied tape coatings with a polymeric continuous backing consist of several layers of one or more continuous polymeric tapes, with or without a primer.

This coating type can be further subdivided into the following:

— **12A-1:** with a T_{max} not greater than 50 °C;

— **12A-2**: with a T_{max} not greater than 80 °C;

— **12A-3**: with a T_{max} not greater than 120 °C.

The T_{max} shall be stated in brackets, e.g. FJC Type 12A-1(30) or FJC Type 12A-1(50).

A T_{max} higher than 120 °C can be agreed as long as the requirements of Table 10 are met.

12.2.2 Cold-applied tape coatings with a polymeric mesh backing (Type 12B)

Cold-applied tape coatings with a polymeric mesh backing consist of a single layer or multiple layers of one or more mesh-backed tapes, with or without a primer.

The mesh-backed tape shall be composed of rubber or polymeric based adhesive and a supporting woven fabric backing.

This coating type can be further subdivided into the following:

— **12B-1:** with a T_{max} not greater than 50 °C;

— **12B-2**: with a T_{max} not greater than 80 °C;

The T_{max} shall be stated in brackets, e.g. FJC Type 12B-1(30) or FJC Type 12B-1(50).

A T_{max} higher than 80 °C can be agreed as long as the requirements of Table 10 are met.

12.3 Surface preparation

Surface preparation shall be carried out in accordance with the APS. The edges of the plant coating shall be bevelled and the plant coating shall be roughened for the minimum length according to the overlap on the plant coating (12.4.4).

The area to be coated shall be cleaned by abrasive blast-cleaning as described in ISO 8504-2 to a minimum grade Sa 2 according to ISO 8501-1. The profile/roughness shall be in accordance with the manufacturer's application instructions.

For FJC Type 12A-1 and Type 12-B, surface preparation can be achieved by power tool cleaning as described in ISO 8504-3 to a minimum grade St 3 according to ISO 8501-1, by agreement of the end user.

Dust contamination shall be grade 3 or better, measured in accordance with ISO 8502-3.

12.4 Coating application

12.4.1 General

Application of the coating, including the primer if applicable, shall be carried out in accordance with the APS.

12.4.2 Application of the primer

If applicable, application of the primer shall be carried out in accordance with the APS.

12.4.3 Application of polymeric tapes with continuous or mesh baking

Application shall be carried out in accordance with the APS.

As a general guide, the following application procedure shall be followed.

— Prepare the surface according to the approved method.

— Apply a thin coat of compatible primer (if any); allow the primer to dry.

— Spirally wrap the area being coated with tapes of an adequate width, employing the right overlap and using sufficient tension to ensure a complete conformability of the coating. Any tenting effect shall be prevented. A manual application tool should be used to achieve these goals.

A single piece of wrapping wide enough to cover the required area may be used in certain circumstances (in particular, for offshore installation on a conventional barge).

12.4.4 Overlaps

The minimum tape overlap shall be in accordance with Table 7, or the manufacturer's required overlap (Table 6) if greater.

The overlap of tape on plant-applied coating shall be in accordance with the manufacturer's application instructions (Table 6) and shall be at least 50 mm.

12.5 Testing of the applied coatings

12.5.1 General

The tests in 12.5.2 to 12.5.11 shall be carried out for production quality control, and for PQT and PPT if required.

12.5.2 Thickness

The nominal thickness is the calculated sum of the thickness of all the layers of the coating before application. The minimum thickness of the coating on the body of the joint shall be not less than 90 % of the nominal value or as otherwise agreed to by the purchaser.

Unless otherwise agreed with the purchaser, the minimum thickness on the weld cap shall be not less than 0,6 mm.

NOTE The coating thickness on the weld cap is normally less than on the body because some of the polymeric adhesive flows from the weld cap to the body, both during and after the application. This is necessary to prevent voids in the coating and is not detrimental to the corrosion protection.

The coating thickness shall be measured using the method given in Annex B.

12.5.3 Holiday detection

The entire surface of the coated joint shall be checked for holidays or other discontinuities according to the method defined in Annex C.

The voltage of the holiday detector shall be set at the following values:

— 5 kV/mm + 5 kV at a maximum of 25 kV for cold-applied polymeric continuous tape coatings (Type 12A)

— 5 kV/mm at a maximum of 15 kV for cold-applied polymeric mesh-backed tape coatings (Type 12B).

Holidays shall be repaired in accordance with the APS.

12.5.4 Impact resistance

The impact resistance shall be measured using the method given in Annex D and shall meet the requirements of Table 10.

12.5.5 Indentation resistance

The indentation resistance shall be measured using the method given in Annex E and shall meet the requirements of Table 10.

12.5.6 Cathodic disbondment

The cathodic disbondment shall be measured using the method given in Annex G.

The cathodic disbondment after 28 days at 23 °C shall meet the requirements of Table 10. A test duration of 48 h instead of 28 days can be used for PPT provided that the test temperature is increased to 65 °C and a comparison of results is performed during PQT.

The maximum cathodic disbondment after 28 days at maximum service temperature shall meet the requirements of Table 10. It shall be agreed between the end user and the applicator for Type 12A.

12.5.7 Peel strength between tape layers

The peel strength between tape layers shall be measured using the method given in Annex L and shall meet the requirements of Table 10.

12.5.8 Peel strength to pipe surface and plant coating

Unless specified otherwise by the manufacturer, the minimum waiting period between application of the coating and the peel strength test shall be 120 h. This waiting period may be reduced to 24 h. However, if this test fails, it shall be carried out again after a waiting period of 120 h.

The peel strength shall be measured using the methods given in Annex H and shall meet the requirements of Table 10. The method given in H.1 shall be used for PQT. The method given in H.2 can be used for PPT and production testing.

Failure shall not occur at the interface between steel and adhesive, nor between adhesive and polyolefin or mesh backing, except for coatings with a peeling strength 50 % higher than the values listed in Table 10.

12.5.9 Hot-water immersion test

A hot-water immersion test shall be carried out in accordance with Annex I with a duration of 28 days, the test temperature being the maximum service temperature of the joint coating, limited as specified in Annex I.

The peel strength after the hot-water immersion test shall be measured using the method given in H.1 and shall meet the requirements of Table 10.

12.5.10 Lap shear strength

The lap shear strength resistance shall be measured using the method given in Annex J and shall meet the requirements of Table 10.

12.5.11 Thermal ageing resistance

The thermal ageing resistance shall be measured using the method given in Annex M and shall meet the requirements of Table 10.

Table 10 — Requirements for Type 12A (Polymeric continuous tapes) and Type 12B (Polymeric mesh-backed tapes)

Property	Test temp.	Unit	Type 12A-1 (T_{max} ≤ 50 °C)	Type 12A-2 (T_{max} ≤ 80 °C)	Type 12A-3 (T_{max} ≤ 120 °C)	Type 12B-1 (T_{max} ≤ 50 °C)	Type 12B-2 (T_{max} ≤ 80 °C)	Test method
Thickness	—	mm	≥0,9 × nominal value					Annex B
Holiday detection: no holiday at:	—	—	5 kV/mm + 5 kV, max. 25 kV			5 kV/mm, max. 15 kV		Annex C
Impact resistance	23 °C	J/mm	≥4			≥1,25		Annex D
Indentation resistance, pressure	23 °C and	N/mm²	10,0	1,0	1,0	0,1	0,1	Annex E
— Residual thickness	T_{max}	mm	≥0,6	≥0,6	≥0,6	≥0,6	≥0,6	
Cathodic disbondment resistance 28 days	23 °C	mm	≤15	≤15	≤15	≤10	≤5	Annex G
	T_{max}	mm	[a]	[a]	[a]	≤15	≤10	
Peel strength between tape layers								Annex L

[a] By agreement after qualification.

[b] The test is considered passed when the tape leaves a film of adhesive on the substrate.

Table 10 *(continued)*

Property	Test temp.	Unit	Type 12A-1 (T_{max} ≤ 50 °C)	Type 12A-2 (T_{max} ≤ 80 °C)	Type 12A-3 (T_{max} ≤ 120 °C)	Type 12B-1 (T_{max} ≤ 50 °C)	Type 12B-2 (T_{max} ≤ 80 °C)	Test method
— inner/inner	23 °C	N/mm	≥1,50	≥1,50	≥2,00	≥1,50	≥1,00	
— outer/inner	23 °C	N/mm	≥1,50	≥1,50	≥1,50	n.a.	n.a.	
— inner/inner, outer/inner	T_{max}	N/mm	≥0,20	[b]	[b]	[b]	[b]	
— outer/outer	23 °C	N/mm	≥0,20	≥0,20	≥0,80	n.a.	n.a.	
— outer/outer	T_{max}	N/mm	≥0,20	[b]	[b]	n.a.	n.a.	
Peel strength								
— to steel surface	23 °C	N/mm	≥1,00	≥1,00	≥1,00	≥0,2	≥1,50	Annex H
— to steel surface	T_{max}	N/mm	≥0,10	[b]	[b]	≥0,04	[b]	
— to plant coating	23 °C	N/mm	≥0,40	≥0,40	≥0,40	≥0,40	≥1,50	
— to plant coating	T_{max}	N/mm	≥0,04	[b]	[b]	≥0,04	[b]	
— to plant coating after 28-day hot-water immersion test at T_{max}	23 °C	N/mm	≥0,40	≥0,40	≥0,40	≥0,40	≥0,80	Annex I
— to steel surface after 28-day hot-water immersion test at T_{max}	23 °C	N/mm	≥0,40	≥0,40	≥0,40	≥0,40	[b]	Annex I
Lap shear strength	23 °C	N/mm²	≥0,050	≥0,050	≥0,100	≥0,050	≥0,100	Annex J
	T_{max}	N/mm²	≥0,050	≥0,020	[b]	≥0,010	≥0,020	
Thermal ageing resistance	—	—						Annex M
Ratio of:								
— elongation at break			$1,25 \geq E_{100}/E_0 \geq 0,75$ $E_{100}/E_{70} \geq 0,8$	[a]	[a]	[a]	[a]	
— peel strength between tape layers			$P'_{100}/P'_0 \geq 0,75$ $P'_{100}/P'_{70} \geq 0,8$	[a]	[a]	[a]	[a]	
— peel strength to pipe surface			$P_{100}/P_0 \geq 0,75$ $P_{100}/P_{70} \geq 0,8$	[a]	[a]	[a]	[a]	

[a] By agreement after qualification.

[b] The test is considered passed when the tape leaves a film of adhesive on the substrate.