

Gasunie Technical Standard

Material Specification Mechanical

MSW-06-E

Insulating joints

DRAFT

Version 12A 25-09-2024

FOREWORD

This specification supersedes the eleventh version of MSW-06-E.

Key changes:

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Technical-content changes are marked with a left margin line.

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1. SCOPE AND APPLICATION

1.1 Scope

This specification contains the requirements for insulating joints with welding ends for use in gas systems with the following design criteria:

- nominal diameter: $50 \leq DN \leq 1200$;
- design pressure: $0 \text{ bar (e)} < P_d \leq 80,0 \text{ bar (e)}$;
- design temperature: $-20 \text{ °C} < T_d \leq + 50 \text{ °C}$.

If the requirements of the codes and specifications mentioned conflict with this MSW-06-E, MSW-06-E shall prevail.

1.2 Application

Insulating joints provide electrical insulation between pipe systems and stations and between mutually connected pipe sections.

1.3 Transport media

Table 1 indicates the transport media for which this specification is applicable.

Table 1: Transport media

Transport medium ¹	Natural gas	Hydrogen	Carbon dioxide	Nitrogen	(Hot) water	Ammonia
	Applicable	Applicable	Not judged ²	Applicable	Not judged ²	Not judged ²

- 1 The table is based on suitability of the transport medium concerned.
The scope and media for which this specification is suitable are not automatically the same as the scope and media of underlying specifications. The scope and suitability for a medium are described for each specification.
- 2 Suitability shall be determined on the basis of an impact analysis. The requirements that do appear to be applicable shall be observed.

2. REFERENCES

This specification makes prescriptive reference to the documents mentioned in this clause.

If the documents in this specification are mentioned with a date, this specific edition is applicable.

2.1 Gasunie documents

This specification refers to the following Gasunie documents.

MSA-25-E	Transport, packing and marking.
MSA-32-E	Requirements for inspection certificates of pressure parts.
MSW-01-E	Pipe for gas lines; seamless and welded line pipe.
MSW-04-E/1	Pipe fittings $450 \leq DN \leq 1200$.
MSW-04-E/2	Pipe fittings $15 \leq DN \leq 400$.
MSW-11-E	Shop coating of steel structures and pipeline elements.
GTS_RED-W05	Requirements for documents (RED): Insulating pipe connections.

2.2 Standards

This specification refers to the standards mentioned in this subclause. Any supplements and errata notices are also applicable.

The following applies to all NEN-EN standards: Depending on the country where the standard will be applied, DIN-EN or BS-EN, for example, shall be chosen.

ASME BPVC Section VIII, Division 1	ASME Boiler & Pressure Vessel Code - Section VIII: Rules for construction of pressure vessels; Division 1.
NEN 3650-2	Eisen voor buisleidingsystemen - Deel 2: Aanvullende eisen voor leidingen van staal. (Requirements for pipeline systems - Part 2: Additional specifications for steel pipelines).
NEN-EN 1594	Gas infrastructure - Pipelines for maximum operating pressure over 16 bar - Functional requirements.
NEN-EN 10160	Ultrasonic testing of steel flat product of thickness equal or greater than 6 mm (reflection method).
NEN-EN 10228-1	Non-destructive testing of steel forgings - Part 1: Magnetic particle inspection.
NEN-EN 10228-3	Non-destructive testing of steel forgings; Part 3: Ultrasonic testing of ferritic or martensitic steel forgings.

NEN-EN 14870-2	Petroleum and natural gas industries - Induction bends, fittings and flanges for pipeline transportation systems - Part 2: Fittings.
NEN-EN-ISO 3183	Petroleum and natural gas industries - Steel pipe for pipeline transportation systems.
NEN-EN-ISO 3834-2	Quality requirements for fusion welding of metallic materials; Part 2: Comprehensive quality requirements.
NEN-EN-ISO 5817	Welding - Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) - Quality levels for imperfections.
NEN-EN-ISO 8501-3	Preparation of steel substrates before application of paints and related products - Visual assessment of surface cleanliness - Part 3: Preparation grades of welds, cut edges and other areas with surface imperfections.
NEN-EN-ISO 9606-1	Qualification testing of welders - Fusion welding - Part 1: Steels.
NEN-EN-ISO 9712	Non-destructive testing - Qualification and certification of NDT personnel.
NEN-EN-ISO 10893-5	Non-destructive testing of steel tubes - Part 5: Magnetic particle inspection of seamless and welded ferromagnetic steel tubes for the detection of surface imperfections.
NEN-EN-ISO 10893-6	Non-destructive testing of steel tubes - Part 6: Radiographic testing of the weld seam of welded steel tubes for the detection of imperfections
NEN-EN-ISO 10893-8	Non-destructive testing of steel tubes - Part 8: Automated ultrasonic testing of seamless and welded steel tubes for the detection of laminar imperfections.
NEN-EN-ISO 10893-10	Non-destructive testing of steel tubes - Part 10: Automated full peripheral ultrasonic testing of seamless and welded (except submerged arc-welded) steel tubes for the detection of longitudinal and/or transverse imperfections.
NEN-EN-ISO 11114-2	Gas cylinders - Compatibility of cylinder and valve materials with gas contents - Part 2: Non-metallic materials.
NEN-EN-ISO 11666	Non-destructive testing of welds: Ultrasonic testing; Acceptance levels.
NEN-EN-ISO 14731	Welding coordination - Tasks and responsibilities.
NEN-EN-ISO 14732	Welding personnel - Qualification testing of welding operators and weld setters for mechanized and automatic welding of metallic materials.

NEN-EN-ISO 15609-1	Specification and qualification of welding procedures for metallic materials - Welding procedure specification; Part 1: Arc welding.
NEN-EN-ISO 15614-1	Specification and qualification of welding procedures for metallic materials - Welding procedure test - Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys.
NEN-EN-ISO 17637	Non-destructive testing of welds: Visual testing of fusion-welded joints.
NEN-EN-ISO 17640	Non-destructive testing of welds: Ultrasonic testing; Techniques, testing levels, and assessment.
NEN-EN-ISO 23936-2	Petroleum, petrochemical and natural gas industries – Non-metallic materials in contact with media related to oil and gas production - Part 2: Elastomers.
NEN-EN-ISO/IEC 17025	General requirements for the competence of testing and calibration laboratories.

2.3 European Directive

This specification refers to the following European Directives:

2014/68/EU	Directive 2014/68/EU of the European Parliament and of the Council of 15 May 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of pressure equipment (PED).
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3. DEFINITIONS, ABBREVIATIONS AND SYMBOLS

In this specification the following definitions, abbreviations and symbols are applicable.

3.1 Definitions

Client	The person or persons who is/are responsible, on behalf of Gasunie, for supervising the fulfilment of the contract in general and the execution of the work in particular.
Insulating joint	Electrically insulating joint, being a ridged and tight construction of concentric pipe elements with welding ends see annex DIMENSIONS AND CODE NUMBERS OF INSULATING JOINT.
Out-of-roundness	The difference between the maximum and the minimum inner diameter.
Pressure-bearing part	Part which is exposed to and contains pressure e.g.: pipe, flange, fitting, nozzle reinforcement plate, valve housing or shell.

3.2 Abbreviations

ASME	American Society of Mechanical Engineers
EWf	European Welding Federation
HFI	High-Frequency Induction
HFW	High-Frequency Welded
IIW	International Institute of Welding
ITP	Inspection and Test Plan
MPI	Magnetic Particle Inspection
MT	Magnetic Testing
NDT	Non-Destructive Testing
RED	Required Engineering Document
RGD	Rapid Gas Decompression
QT	Quenched and Tempered
RT	Radiographic testing
SAWH	Helical Submerged Arc Welding
UT	Ultrasonic Testing
VT	Visual Testing
WE	Welding End
WPAR	Welding Procedure Approval Records
WPS	Welding Procedure Specifications

3.3 Symbols

<u>Symbol</u>	<u>Description</u>	<u>Unit</u>
a	Round off radius	mm
A_f	Elongation	%
$D_{\max}$	Maximum external diameter of matching pipe	mm
$D_{\min}$	Minimum external diameter of matching pipe	mm
H_{joint}	Wall thickness of joint	mm
$H_{\max}$	Maximum wall thickness of joint	mm
$H_{\min}$	Minimum wall thickness of joint	mm
ID	Internal diameter of matching pipe ebonite coated flange	mm
ID_{joint}	Internal diameter of matching pipe insulating joint	mm
L_{joint}	Length of insulating joint	mm
P_{calc}	Calculation pressure	MPa
$P_{d, I}$	Design pressure of insulating joint	MPa
P_d	Design pressure of system	MPa
P_{test}	Test pressure	MPa
r	Interior corner radius	mm
$R_{e(c)}$	Specified minimum yield strength of joint welding-end material	N/mm ²
$R_{e(p)}$	Specified minimum yield strength of material of matching pipe	N/mm ²
R_m	Tensile strength	MPa
$R_{t0,5}$	Yield strength for 0,5 % total strain	MPa
t	Wall thickness of steel ring	mm
t_1	Nominal thickness of the insulation around the pipe	mm
t_{nom}	Nominal wall thickness of matching pipe	mm
T_d	Design temperature	°C
U	Out of roundness	%

4. GENERAL REQUIREMENTS

4.1 Directive

Insulating joints shall comply with the Pressure Equipment Directive (2014/68/EU).

4.2 Design codes and standards

Design, manufacturing, inspection and testing of insulating joints shall comply with NEN 3650-2, NEN-EN 14870-2 (fitting class B) and NEN-EN-ISO 3183.

ASME BPVC Section VIII, Division 1 appendix 2 shall be used as the calculation method.

The allowable design stress shall be $R_e/2$.

The design pressure of the insulating joints shall be two times the design pressure of the system.

$$P_{calc} = P_{d,IJ} = 2 \times P_d$$

The insulating joint shall be designed and constructed for a technical life span of 40 years. Within this time span no leakage is permitted, when used in accordance with the design criteria stated in the scope (chapter 1).

4.3 Certifying authority

The certifying authority shall be a Notified Body as defined in Directive 2014/68/EU. Gasunie reserves the right to impose additional requirements.

Obtaining the (EU) declaration of conformity shall be the responsibility of and at the expense of the manufacturer.

4.4 Requirements for documents

Drawings and other documents shall be submitted to Client for approval according the requirements of GTS_RED-W05

Required information on documents:

All drawings and documents as mentioned in the GTS_RED-W05 form shall contain at least the following information:

- Gasunie purchase order number, and
- item number.

And where relevant:

- design code;
- design data;
- applicable Gasunie specifications.

Additionally:

- outline details;
- construction details;
- weld details;
- material specifications;
- destructive and non-destructive test requirements;
- impact test requirements;
- heat treatment requirements;
- coating and conservation requirements;
- weight;
- test pressures (hydrostatic and/or pneumatic).

Manufacturing report:

A manufacturing report shall be compiled for each item of the purchase order. The required documents will be specified on the RED form.

5. MATERIALS

5.1 Certification

Materials for pressure-bearing parts shall be certified in accordance with MSA-32-E.

5.2 Insulating joint material

Base materials used for insulating joints shall be according to table 2 and 3.

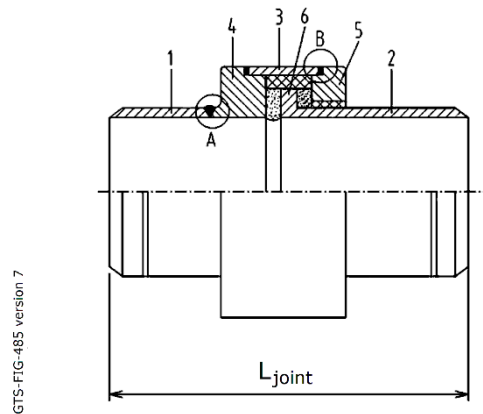


Figure 1: Insulating joint part numbers GTS-FIG-485

Table 2: Requirements of part numbers (figure 1)

Part number	Base material	Tensile properties*	In acc. with**	Additional requirements	Impact test temp.
1, 2 and 3	Seamless pipe	I	a	1	Table A.13 MSW-01-E
1, 2 and 3	(HFI) Welded pipe	I, II	a	1, 2, 3	Table A.13 MSW-01-E
1, 2 and 3	Plate	I, II	b	4	Table 5 MSW-04-E/1 / E/2
1, 2 and 3	Forging	I	b		Table 5 MSW-04-E/1
4, 5 and 6	Plate	I	b		Table 5 MSW-04-E/1
4, 5 and 6	Forging	I	a		Table 5 MSW-04-E/1
1 and 4 forging (one piece)	Forging	I	b		Table 5 MSW-04-E/1
7	Forging	I	a		Table 5 MSW-04-E/1
Weld A, B		II	b	5	Table 5 MSW-04-E/1

*Tensile properties of the final product:

- I. see table 3
- II. $DN \leq 400$ tensile strength (weld seam) min. 415 MPa
 $DN > 400$ tensile strength (weld seam) min. 550 MPa

**In accordance with:

- a MSW-01-E/NEN-EN-ISO 3183 PSL2 pipe;
- b MSW-04-E/1 and 2 / NEN-EN 14870-2.

Part number 1 and 2 (figure 1):

Quenched and tempered steel is not allowed for $DN \leq 400$ and a specified minimum yield strength > 360 MPa.

Additional requirements:

1. Sub-suppliers do not require approval by Client;
2. Helical-seam submerged-arc welding (SAWH) pipes shall not be used;
3. Weld of incoming longitudinal pipe shall be 100 % radiographic or 100 % UT tested by manufacturer of the insulating joint;
4. mechanical properties of the welded pipe to be determined;
5. 100 % RT of circumferential welds / 100 % UT of parts.

Table 3: Requirements for the results of tensile test of the parts as given in table 2

DN	Yield strength		Tensile strength		Ratio	Elongation
	$R_{t0,5}$ MPa		R_m MPa		$R_{t0,5}/R_m$	A_f %
	minimum	maximum	minimum	maximum	maximum	minimum
$DN \leq 400$	245	440	415	760	0,85	22
$DN > 400$	415	535	550	760	0,85	18

5.3 Sealing elements

The O-ring shall be an endless O-ring, shall be selected from Table 1 of NEN-EN-ISO 11114-2 and shall be usable in the conditions stated in de scope (chapter 1). Furthermore, the O-ring shall be resistant against RGD in combination with the medium (e.g. if the insulation join will be used in combination with H2 the O-ring will also be RGD tested is H2) and shall be inspected according to NEN-EN-ISO-23936-2 (chapter 6.9).

6. MANUFACTURING

6.1 Organisation

The company that performs welding shall be certified in accordance with NEN-EN-ISO 3834-2 by an authorised Notified Body.

The company shall have a qualified welding engineer available. This welding engineer shall be certified by the EWF or the IIW in accordance with NEN-EN-ISO 14731 as an International Welding Engineer.

Within the company, a welding technician shall be employed who is responsible for the actual welding activities of the company. This welding technician shall be certified by the EWF or the IIW in accordance with NEN-EN-ISO 14731.

6.2 Welding personnel

Welders of welds to and in pressure parts shall be qualified in accordance with NEN-EN-ISO 9606-1 or NEN-EN-ISO-14732.

The Welding Procedure Qualification (WPQ) shall be issued as required in 2014/68/EU by a Notified Body or a recognised third-party organisation for permanent joining.

6.3 Welding documentation

The following documents shall be prepared for welds to or joining pressure-containing parts and welds on parts which are subject to mechanical loading (for example supports and lifting lugs) and submitted to Client for approval:

- Welding Procedure Specification (WPS), in accordance with NEN-EN-ISO 15609-1, within the limits of NEN-EN-ISO 15614-1 and the applicable construction code if this is more restrictive than NEN-EN-ISO 15614-1.

The WPS shall be prepared and signed by the welding engineer of the company. Alternatively, the WPS can be prepared and signed by the welding technician.

- Welding Procedure Approval Record (WPAR), in accordance with NEN-EN-ISO 15614-1. The WPAR shall be issued as required in 2014/68/EU by a Notified Body or a recognised third-party organisation for permanent joining.

6.4 Production welding

Welds to and in pressure-containing parts or subject to mechanical loading shall be made by welders qualified as per subclause 6.2.

7. INSPECTION AND TESTING

Insulating joints shall be subjected to inspection and testing during manufacturing.

Inspection and testing shall be carried out by the manufacturer in accordance with the inspection and test plan submitted by the manufacturer and approved by all involved parties. The manufacturer shall afford the Gasunie inspector every opportunity and facility to convince the inspector that the design, materials and construction of the equipment are in accordance with the specified requirements.

A pre-manufacturing meeting shall be arranged if considered necessary by the manufacturer or Client.

The manufacturer shall submit a manufacturing report in accordance with subclause 4.4, for each fitting at the time of delivery.

A responsible person representing the manufacturer shall be present during the inspection to ensure that the inspection can proceed without delay. The charts from the recording instruments shall be available at the time of inspection.

7.1 Inspection and Test Plan

The manufacturer shall draw up an ITP covering all verification activities and indicating all tests/inspections to be witnessed by Client and/or an authorised inspection agency. The ITP shall be approved by Client prior to start of manufacturing. In principle, manufacturers may use their own procedure and format for the ITP, provided the minimum requirements are included. All verification activities shall be grouped in a logical sequence in line with the production plan.

The following information shall be provided on each activity:

- activity number;
- description;
- controlling document;
- acceptance criteria;
- type of record or document to be provided;
- verification action (witness, hold-point or review of documents);
- party (manufacturer, Gasunie, User Inspectorate).

The relevant work instruction/procedures shall be indicated in the controlling document column. The acceptance criteria column shall identify the specific clause/subclause of the applicable documents (codes, standards, requisitions, specifications and the like).

Reference to the following documents shall be included:

- manufacturer's written material specifications for pressure-containing parts, if different from NEN-EN 14870-2;
- Welding Procedure Specifications (WPS);
- Welding Procedure Approval Records (WPAR);
- Welder's Performance Qualification Records (WPQR);
- Non-destructive testing (NDT) procedures;
- functional testing procedures;

- mechanical testing procedures;
- final testing procedures;
- painting procedures;
- marking procedures;
- shipping procedures.

The welding procedure shall be submitted to Gasunie for approval.

For NDT procedure see subclause 7.3.

For hydrostatic pressure test see subclause 7.5.

For pneumatic pressure test see subclause 7.6.

Gasunie inspectors are authorised to carry out two types of inspection, either in the context of a Gasunie Quality Inspection and/or – if stated in the purchase order – as a User Inspectorate.

An update of the ITP and approval by Gasunie is required either every 3 years or following any change in the manufacturer's production procedures or a new revision of this specification.

7.2 Visual inspection

Each insulating joint shall be visually inspected to ensure conformity with the approved design drawings and the requirements of this specification.

The inspection shall be in accordance with the approved inspection and test plan and shall include the following items:

- dimensional check;
- surface quality;
- paint quality;
- execution of appurtenances;
- die-stamped identification numbers;
- marking and shipping requirements/procedure.

7.3 Non-destructive testing

Non-destructive testing shall meet the following requirements:

Organisation:

The manufacturer shall have NDT experts as a minimum available for the NDT methods employed. These NDT experts shall be certified according to NEN-EN-ISO 9712 level 3 in the method employed by the manufacturer.

The personnel performing the examinations shall have at least NEN-EN-ISO 9712 level 2 for the technique they use.

Documentation:

For each test method used, a procedure shall be written and approved by the level 3 expert for the relevant method. This NDT procedure shall fulfil the requirements of the relevant standards. All relevant information for performing the test, interpretation, evaluation of results and reporting shall be included in the procedure as a minimum.

The written procedures for each method employed in production shall be submitted to Gasunie for approval before start of manufacturing. A sketch or document showing the location of the NDT and the repairs shall be made for the manufacturing report.

Production NDT (see also table 2):

NDT on base materials:

- Pipe:
 - 100 % UT longitudinal/transverse imperfections in accordance with NEN-EN-ISO 10893-10 acceptance level U2 sub-category C.
 - 100 % UT laminar imperfections in accordance with NEN-EN-ISO 10893-8, acceptance level U2;
- Plate body : 100 % UT according to NEN-EN 10160 quality class S3;
- Plate edge : 100 % UT according to NEN-EN 10160 quality class E4;
- Forging:
 - 100 % UT in accordance with NEN-EN 10228-3 quality class 4;
 - 100 % MT in accordance with NEN-EN 10228-1 quality class 4.

Welding ends

- UT laminations and/or inclusions over a 50 mm wide band before machining in accordance with NEN-EN-ISO 10893-8, acceptance level U2, and
- MT after final machining in accordance with NEN-EN-ISO 10893-5, acceptance level M2.

Weld examination:

- 100% VT in accordance with NEN-EN-ISO 17637, acceptance criteria in accordance with NEN-EN-ISO 5817 level B.
- 100% RT in accordance with NEN-EN-ISO 10893-6 or, by agreement of Gasunie,
- 100 % UT in accordance with NEN-EN-ISO 17640, acceptance criteria in accordance with NEN-EN-ISO 11666 level 2.

7.4 Inspection certificates and NDT procedures

Inspection certificates of materials and approved NDT procedures shall be available to the NDT personnel and inspector(s) at the location where the testing is performed and at the time of inspection.

All NDT results (including X-ray films) shall be fully documented and available for Gasunie inspection at the production location.

In case of repairs, NDT shall be performed on the entire weld after the repair.

7.5 Hydrostatic pressure test

All slag, loose scale, dirt, grit, weld spatter, paint, oil and other foreign materials shall be removed thoroughly prior to the hydrostatic pressure test and the final inspection.

Hydrostatic testing shall be carried out before coating and painting.

The maximum allowable chloride content of the testing water shall be 50 ppm.

No repairs, welding or heat treatment shall be carried out after the hydrostatic test without Gasunie's permission. The hydrostatic test procedure shall be submitted to Gasunie for approval.

Insulating joints shall be hydrostatically tested according to table 4.

$$P_{\text{test}} = 1,3 \times P_{d,II}$$

During the tests, end caps shall be fixed to the ends, to induce the axial pressure-force in the joint. Insulated joints may be tested in series if the applicable axial pressure-force is exerted on each joint.

Table 4: Test pressures

Design pressure $P_{d,II}$ (bar (e))	Test pressure P_{test} (bar (e))
80	104
132,4	172
160	208

The test sequence shall be as follows:

1. at test pressure for 5 minutes;
2. reduce to zero;
3. at test pressure for 5 minutes;
4. at 10 bar for 5 minutes;
5. at test pressure for 5 minutes;
6. at 10 bar for 5 minutes.

Acceptance criteria for the test shall be:

- no leaks;
- no loss in pressure;
- no plastic deformation during testing.

Pressure versus time shall be recorded with automatic recording devices. The chart with test results shall be part of the quality/testing documents.

7.6 Air test

Air testing shall also be carried out before coating and painting.

After the hydrostatic tests, before air test, the insulating joint shall be dried. The joints shall be tested with air at 5 bar for 10 minutes, followed by a soap-test.

No leakage and pressure drop is permitted.

Pressure versus time shall be logged during air testing. The chart with test results shall be part of the quality/testing documents.

7.7 Electrical testing

Insulating joints shall be electrically tested in accordance with NEN-EN 1594.

7.8 Destructive testing

Materials requiring destructive testing shall be tested in accordance with NEN-EN 14870-2 (fitting class B).

7.9 O-ring testing

The O-rings type used shall be RGD tested according to NEN-EN-ISO 23936-2, as stated in this chapter.

The used laboratory shall be NEN-EN-ISO/IEC 17025 approved.

The following section is an amendment / supplement to NEN-EN-ISO 23936-2. The seals shall be tested in accordance with NEN-EN-ISO 23936-2 amended as specified in this section of this specification (MSW-06-E). A test report shall be submitted to client as required according to GTS_RED-W05.

Only seals with a tested rating "0000" are acceptable.

SECTION 3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

3.1.15 User

Substitution Substitute entire section with: "For the context of this specification, the user is the joint manufacturer."

3.1.16 Purchaser

Substitution Substitute entire section with: "For the context of this specification, the purchaser is the joint manufacturer."

3.1.16 Manufacturer

Substitution Substitute entire section with: "For the context of this specification, the manufacturer is the party that manufactures the seals."

Annex B

B.1 Test requirements

B.1.1 RGD test conditions

B.1.1.2 Test fluid

Substitution Should be representative for de mediums stated in de scope (chapter 1).

B.1.1.3 Test temperature

Substitution Substitute a) and b) with: "The RGD test shall be conducted at 100 °C."

B.1.1.4 Test pressure

Substitution Substitute a) and b) with: "The RGD test shall be conducted at 150 bar (e)".

B.1.1.6 Rate of depressurization

Substitution Substitute a) and b) with: "The rate of test cell depressurization shall be 20 bar/min."

B.1.2 RGD test specimen

Addition The test specimen shall be from the same production batch as the O-rings that are used in the insulating joint.

8. COATING, MARKING AND PACKING

8.1 Coating

For coating applications all prescriptions and terms from MSW-11-E shall be fulfilled.

8.2 Marking

The following information shall be shown on the material:

- name or symbol of manufacturer;
- number of purchase order;
- nominal size;
- P_d and $P_{d,II}$;
- supplier's type number;
- MCN;
- SCN.

8.3 Packing

For packing reference is made to MSA-25-E.

9. DOCUMENTATION

This specification refers informatively to the following documentation:

- 1 N.V. Nederlandse Gasunie, memorandum [OTWI 20.1099](#), "Memo bij MSW-06-E versie 10 Toelichting op de wijzigingen" d.d. 24-06-2020 (*not available for external parties*).

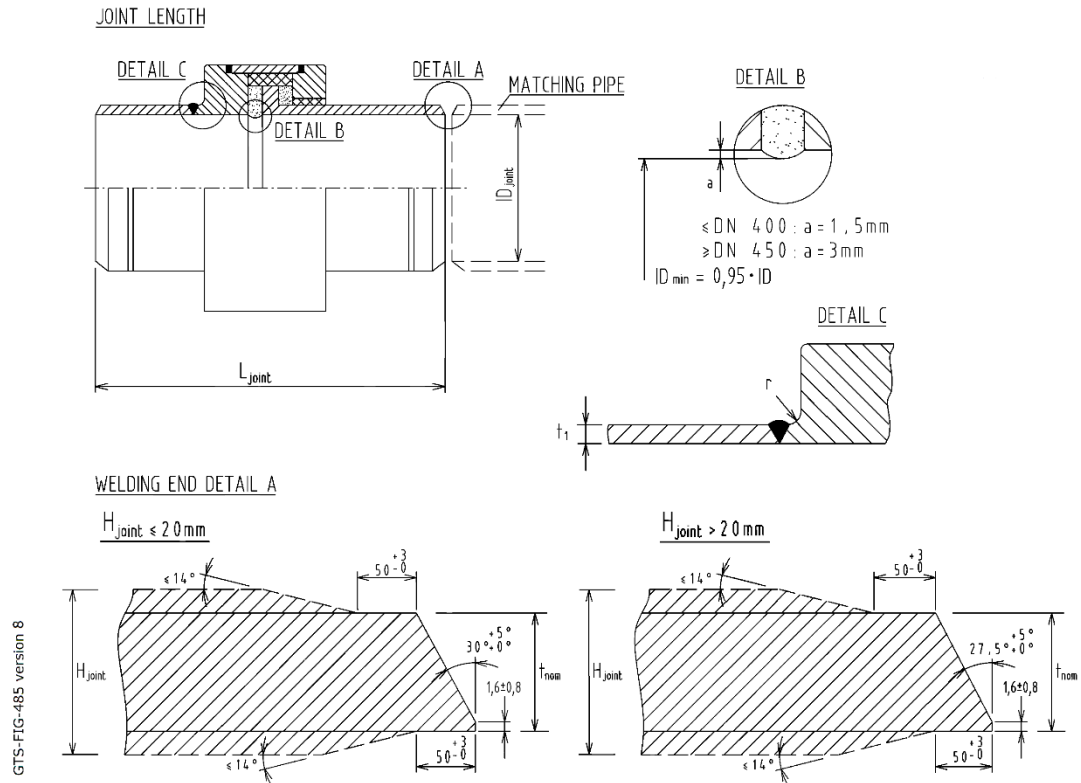
ANNEX**A DIMENSIONS AND CODE NUMBERS OF INSULATING JOINT**

Figure 2: Dimensions of insulating joint GTS-FIG-485

Notes:

- dimensions in mm;
- $H_{min} \geq t_{nom}$;
- t_{nom} is the nominal wall thickness of matching pipe as shown in detail A;
- $r = \frac{t_1}{2}$ (see detail C);
- r is the inner corner radius;
- t_1 is the nominal thickness of the insulation around the pipe;
- For insulating joints smaller than DN 150 the requirement " $ID_{min} = 0,95 \cdot ID$ " is not applicable;
- The tolerances of the internal diameter at the welding ends of the pipe ends shall be $\pm 1,0 \text{ mm}$ for all dimensions;
- Out-of-roundness at the welding ends: equal to the requirements according to table 5 (copied from NEN-EN-ISO 3183);
- The welding ends shall be bevelled to fit the matching pipe as shown in detail A;
- for a distance of at least the coating cutback length (according to MSW-11-E) from each end, the outside weld bead shall be removed by grinding such that it does not extend above the adjacent pipe surface by more than 0,5 mm;
- Finishing level of the steel surface and edges before coating: P3 in accordance with NEN-EN-ISO 8501-3;
- The design shall be such that it is impossible for the sealing O-ring to be stuck by glue, paint or other materials;

- The O-ring shall be made of a material resistant to natural gas with gas condensate, hydrogen and nitrogen;
- That part of the insulating ring of the joint in contact with the medium shall be rounded off (see detail B).

Table 5: Tolerances for diameter and out-of-roundness (copied from NEN-EN-ISO 3183)

Specified outer diameter D mm (in)	Diameter tolerances ^a				Out-of-roundness tolerances ^{a,e}	
	mm (in)				mm (in)	
	Pipe except the end		Pipe end		Pipe except the end	Pipe end ^{b,c}
SMLS pipe	Welded pipe	SMLS pipe ^b	Welded pipe			
<60,3 (2.375)	±0,5 (0.020) or	±0,5 (0.020) or ±0,007 5	±0,5 (0.020) or ±0,005 D^c (whichever is the greater)		Included in diameter tolerance	
≥60,3 (2.375) to 610 (24.000)	±0,007 5 D , whichever is the greater	D , whichever is the greater, but maximum of ±3,0 (0.125)	but maximum of ±1,6 (0.063)		0,02 D	0,015 D
>610 (24.000) to 1 422 (56.000)	±0,01 D	±0,005 D , but maximum of ±4,0 (0.160)	±2,0 (0.79) ^d	±1,6 (0.063) ^d	0,015 D , but maximum of 15 (0.6) for $D/t \leq 75$	0,01 D , but maximum of 13(0.5) for $D/t \leq 75$
					0,02 D for $D/t > 75$	0,015 D for $D/t > 75$
1 422 (56.000)	As agreed ^d		As agreed ^d		As agreed ^d	

^a The pipe end includes a length of 100 mm (4.0 in) at each of the pipe extremities.

^b For SMLS pipe, the tolerances apply for $t \leq 25,0$ mm (0.984 in) and the tolerances for heavier wall pipe shall be as agreed.

^c Subject to agreement, the diameter tolerance may be applied to the inside diameter for $D \geq 219,1$ mm (8.625 in).

^d Unless otherwise agreed, the diameter tolerance applies to the inside diameter.

^e When the diameter tolerance is applied to the inside diameter, the inside diameter shall also be the basis for the out-of-roundness requirements.

Table 6: Dimensions and code numbers of insulating joint WE/WE

DN	Insulating joint	Matching Pipe						Gasunie art. number of insulating joint		
	Length L (mm)	Internal diameter ID (mm)			Nominal wall thickness t_{nom} (mm)			Pressure ratings		
	All ratings P_d	40 bar	66,2 bar	80 bar	40 bar	66,2 bar	80 bar	40 bar	66,2 bar	80 bar
50	600	-	-	49,3	-	-	5,5	-	-	1139702
80	625	-	-	77,9	-	-	5,5	-	-	1139703
100	650	-	-	102,3	-	-	6	-	-	1139704
150	725	-	-	155,7	-	-	6,3	-	-	1139706
200	775	206,5	-	203,3	6,3	-	7,9	1139758	-	1139708
250	850	260,5	-	254,5	6,3	-	9,3	1139760	-	1139710
300	900	309,7	-	301,9	7,1	-	11	1139762	-	1139712
400	1000	389	-	378	8,7	-	14,2	1139766	-	1139716
450	1050	-	443	440,4	-	7	8,3	-	1139768	1139718
500	1100	-	492,4	489,6	-	7,8	9,2	-	1139770	1139720
600	1200	-	591,4	587,8	-	9,3	11,1	-	1139774	1139722
750	1350	-	738,8	734,4	-	11,6	13,8	-	1139780	1139728
900	1500	-	886,2	881,2	-	13,9	16,4	-	1139786	1139736
1050	1650	-	1034,8	1028,8	-	16,1	19,1	-	1139792	1139742
1200	1800	-	1182,4	1175,6	-	18,3	21,7	-	1139798	1139748