Gasunie Technical Standard

Material Specification Mechanical

MSW-03-E/6

Control valves

External

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N.V. Nederlandse Gasunie

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Material Specification Mechanical
MSW-03-E/6

Control valves

This specification is drawn up by the Gasunie department
"Projects; Mechanical Engineering".

The specification may be distributed to suppliers and contractors.

Issued by Gasunie department "Document Support".

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FOREWORD

This specification supersedes the fourth version of MSW-03-E/6.

With respect to the former version the requirements regarding authenticity and traceability of materials are changed.

Alterations are marked with a left margin line.

CONTENTS

ANNEXES

1. SCOPE AND APPLICATION

This specification contains the requirements for control valves of DN 25 and larger, ANSI class 150, 300 and 600. These valves will be used in natural gas or nitrogen systems under the following conditions:

- medium: non-corrosive natural gas or gas-condensate or nitrogen;
- working pressure: 80 bar or less;
- design temperature range: -20 °C to +80 °C.

Note:
If the conditions deviate from those mentioned above, this shall be specified in the purchase order.

Gasunie will indicate specific requirements in the request for quotation and/or the purchase order.

This specification refers to materials which have been standardised within Gasunie. Other makes and/or types are not permitted[1].

[1] Alternatives shall be subjected to the Gasunie product evaluation procedure to demonstrate that they are equivalent (in terms of function and cost).

2. REFERENCES

This specification is subject to the requirements of the documents mentioned in this clause. The latest edition that is valid when the project specification was approved will be applicable in each case. If the documents in this specification are mentioned with a date, this specific edition is applicable.

2.1 Gasunie specifications

In this specification reference is made to the following Gasunie specifications.

CSM-01-E	Instrument tubing and tube fittings (installation and testing).
MSA-25-E	Transport, packing and marking
MSM-01-E	Instrument tubing and tube fittings (material and sizing).
MSW-11-E	Shop coating of steel structures and pipeline elements.

2.2 Standards

In this specification reference is made to the standards mentioned in this subclause. Any supplements and errata notices that are valid when the project specification was approved are also applicable.

ASME B16.34	Valves - Flanged, threaded and welding end
ASME B16.5	Pipe flanges and flanged fittings: NPS ½ through NPS 24 metric/inch standard.
ASTM A 193/A 193M	Alloy-steel and stainless steel bolting for high temperature or high pressure service and other special purpose applications.
ASTM A 194/A 194M	Carbon and alloy steel nuts for bolts for high pressure or high temperature service, or both.
EN 1369	Founding - Magnetic particle inspection.
EN 1503-1	Valves - Materials for bodies, bonnets and covers; Part 1: Steels specified in European Standards;
EN 1503-2	Part 2: Steels other than those specified in European Standards.
EN 10204	Metallic products - Types of inspection documents.
EN 10228-1	Non-destructive testing of steel forgings; Part 1: Magnetic particle inspection.
EN 13463-1	Non-electrical equipment for use in potentially explosive atmospheres; Part 1: Basic method and requirements.

EN 13942	Petroleum and natural gas industries - Pipeline transportation systems - Pipeline valves.
EN 14141	Valves for natural gas transportation in pipelines - Performance requirements and tests.
EN 60534-4	Industrial-process control valves; Part 4: Inspection and routine testing.
NEN-EN-IEC 60079-0	Explosive atmospheres; Part 0: Equipment - General requirements.
NEN-EN-IEC 60079-11	Explosive atmospheres; Part 11: Equipment protection by intrinsic safety "i".
EN ISO 898	Mechanical properties of fasteners made of carbon steel and alloy steel;
Part 1	Part 1: Bolts, screws and studs with specified property classes – Coarse thread and fine pitch thread.
Part 2	Part 2: Nuts with specified property classes - Coarse thread and fine pitch thread
EN ISO 3834-2	Quality requirements for fusion welding of metallic materials; Part 2: Comprehensive quality requirements.
EN ISO 9606-1	Qualification testing of welders - Fusion welding - Part 1: Steels.
EN ISO 9712	Non-destructive testing - Qualification and certification of NDT personnel.
EN ISO 14731	Welding coordination - Tasks and responsibilities.
EN ISO 14732	Welding personnel - Qualification testing of welding operators and weld setters for mechanized and automatic welding of metallic materials.
EN ISO 15609-1	Specification and qualification of welding procedures for metallic materials - Welding procedure specification; Part 1: Arc welding.
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.
EN ISO/IEC 17020	Conformity assessment - Requirements for the operation of various types of bodies performing inspection.
EN ISO/IEC 17025	General requirements for the competence of testing and calibration laboratories

EN ISO 148-1	Metallic materials – Charpy pendulum impact test; Part 1: Test method.
MSS SP-44	Steel pipeline flanges.

2.3 European Directives

In this specification reference is made to the European Directives mentioned in this subclause.

94/9/EC[2]	Directive 94/9/EC of the European Parliament and the Council of 23 March 1994 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres.
97/23/EC	Directive 97/23/EC of the European Parliament and of the Council of 29 May 1997 on the approximation of the laws of the Member States concerning pressure equipment ("Pressure Equipment Directive").
2014/34/EC[2]	Directive 2014/34/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres (recast).

[2] For this Directive a transition period is established until **April 20, 2016;** this applies for 94/9/EC (2014/34/EC).

3. DEFINITIONS, ABBREVIATIONS AND SYMBOLS

3.1 Definitions

In this specification the following definitions are applicable:

Pressure-containing part	A component which is exposed to and contains pressure.
Pressure-retaining part	A component which holds one or more pressure-containing members together but is not exposed to the pressure.

3.2 Abbreviations

In this specification the following abbreviations are applicable:

ATEX	Atmosphères explosives
DN	Nominal diameter
DT	Destructive testing
EWF	European welding federation
ID	Internal diameter
ND	Non-destructive
NDT	Non-destructive testing
NoBo	Notified body
NPS	Nominal pipe size
PED	Pressure equipment directive
QA	Quality Assurance
QC	Quality Control
WPAR	Welding procedure approval records
WPS	Welding procedure specification

3.3 Symbols

In this specification the following symbols are applicable:

Symbol	Description	Unit
A	Area of cross section of tensile test specimen	mm^2
B	Gasunie flange end diameter	mm
D	Valve flange bore	mm
d	Diameter of weld test specimen	mm
H_b	Height of identification plate	mm
L_b	Length of identification plate	mm
L_g	Gauge length	mm
ΔP	Differential pressure between the control valve inlet and outlet	bar
R_a	Surface roughness	µm
R_m	Tensile strength	MPa
T	Determining wall thickness	mm
T_b	Body base wall thickness	mm
T_w	Body weld wall thickness	mm

4. REQUIREMENTS

Valves shall comply with PED (97/23/EC) and as a minimum shall be supplied with:

- CE marking;
- EC declaration of conformity;
- operating manual.

Note:
CE marking is not applicable for Category 0.

To comply with the ATEX regulations (94/9/EC; will be replaced by 2014/34/EC, see also subclause 2.3) the design, construction, testing and marking of the valves shall be fully in accordance with EN 13463-1. The manufacturer shall remain responsible for the manufacturing procedures and the suitability of the equipment for its intended use.

The valves shall be suitable for aboveground or underground installation as specified in the control valve data sheet.

Before the start of production a quality inspection plan shall be submitted to Gasunie for approval (see also clause 10).

Provisions shall be made to avoid pressure build-up inside a hollow stem extension, due to leakage of the stem seal. The construction shall be such that the pressure can be vented into the annular space between the stem extension and the outer casing through a vent opening and from there into the atmosphere through a breather plug (**not** a check valve).

Vendor shall give the sound pressure level as stated in the data sheet "equipment noise limitation".

Flow and ΔP values at opening angles of 10°, 20°, 30°, 40°, 50°, 60°, 70°, 80° and 90° or the stroke percentage for piston type valves for the pressure data given in the data sheet have to be calculated and presented in one graph for each control valve.

The hysteresis + dead band for all valves (including the dead band of positioners and actuators) shall be $\leq$ 1,5 %.

Vendor shall inform Gasunie whether control valves are available which meet the general requirements given above and which have a rangeability that meets the process conditions as given in the data sheet. Vendor is asked to advise Gasunie about alternative solutions.

4.1 Documentation

The required documents will be specified in the purchase order.

The documents shall be legible, identifiable, retrievable and protected from damage, deterioration or loss.

The documents shall be prepared in English or Dutch.

4.2 Face-to-face and end-to-end dimensions

Unless otherwise agreed, face-to-face and end-to-end dimensions of valves shall be in accordance with EN 13942. Tolerances on these dimensions shall be ± 2 mm for valve sizes DN 250 and smaller and ± 3 mm for valve sizes DN 300 and larger.

4.3 Flanged ends

Flanges of nominal size DN 600 and smaller shall comply with ASME B16.5. Flanges larger than DN 600 shall comply with MSS SP-44. For all pressure classes, flanges shall be smooth finished (R_a = 3,2 μm - 6,3 μm) with a raised face. The flange bore shall be in accordance with annex A.

4.4 Lifting lugs

Valves of DN 300 and larger shall be provided with at least two lifting lugs. Lifting lugs shall be suitable for lifting the total weight of the valve including stem extension and actuator. Their design shall be in accordance with international code or the manufacturer's own design method and shall be subject to approval by Gasunie.

4.5 Actuators

Control valves shall be pneumatically actuated with instrument air, natural gas or nitrogen pressure. The actuator shall normally operate, for full valve stroke, at the following standard bench setting: 0,2 bar - 1,0 bar (20 kPa - 100 kPa).

Instrument air supply pressures shall be specified in the control valve data sheet.

Special attention shall be given to the instrument air connection(s) of the actuator to prevent stroking time limitations caused by errors in making up fittings and/or incorrect tubing sizes.

The material of the actuator housing shall be steel or cast steel. Aluminium is not permitted. Diaphragm cases shall be of pressed steel and of the multiple bolt type.

Actuators shall be equipped with a direct-coupled adjustable travel or position indicator for local status indication.

The valve action on instrument air supply failure shall be specified in the control valve data sheet to comply with operational and safety requirements. I.e. open, close and hold last position.

If a control valve requires accessories from another source, all the specific requirements of the particular make/type shall be stated in the control valve data sheet.

The actuator type shall be stated in the control valve data sheet.

4.6 Accessories

Depending on application, control valves may require one or more of the accessories described below. This shall be stated in the data sheet.

4.6.1 Positioners (pneumatic input)

Control valves for throttling applications shall be provided with a pneumatic positioner suitable for an input signal of 0,2 bar - 1,0 bar (20 kPa - 100 kPa).

Positioners which have a selectable characterizing cam shall be properly adjusted by the valve manufacturer.

The positioners shall be applied without bypass valves. They shall have a weatherproof enclosure in accordance with IP54 or IP55 as a minimum.

The positioners shall have sufficient capacity in both directions for pressurizing and venting the actuator to prevent response time limitations, caused, for example, by pilot capacity of the positioner. Insufficient exhaust capacity will cause the air, vented by the pilot, to leak via the positioner enclosure. The manufacturer shall specify the minimum orifice size and air filter requirements.

Instrument tubing and fittings which are part of the delivery shall be in accordance with Gasunie-specifications MSM-01-E and CSM-01-E.

4.6.2 Positioners (electrical input)

Electropneumatic positioners shall have a 4 mA to 20 mA input.

Ex-protection class shall be in accordance with NEN-EN-IEC 60079-0 and NEN-EN-IEC 60079-11 and shall be stated in the control valve data sheet.

The conditions, mentioned in subclause 4.6.1 (positioners (pneumatic input)) also are applicable for electropneumatic positioners.

4.6.3 Limit stops

Limit stops are intended to prevent the valve from fully closing or fully opening. The limit/travel stop setting(s) are specified in the requisition.

Limit stops shall be mechanical devices mounted on the actuator, but they shall not form part of the hand wheel mechanism (if provided).

Bolts screwed into the body shall not be used as limit stops. When so required, bolt-type limit stops, adjustable over the full length of the stroke, shall be applied. To prevent tampering they shall be fitted with a locking facility, e.g. a locking nut.

To prevent unauthorized adjustments, the limit stops shall be provided with a protective cap. The removal of the cap and (re-)adjustment of the limit stop shall require the use of a tool.

The manufacturer shall set the limit/travel stops at the required minimum and maximum valve opening.

4.6.4 Limit switches

Adjustable limit switches shall be provided for each end position. When the end position is reached "metal shall be detected" (failsafe execution).

Switch(es) and vane(s) shall be mounted in a junction box for mechanical protection, the flying leads of proximitor shall terminate in this junction box. External linkage between the actuator stem or the rotary spindle and vane shall not be applied.

Limit switches and construction (Ex-protection class) shall be in accordance with NEN-EN-IEC 60079-0 and NEN-EN-IEC 60079-11. Ex-protection class shall be stated in the control valve data sheet.

The mounting instructions supplied by the manufacturer of the limit switches shall be adhered to by the valve manufacturer.

The valve manufacturer shall submit a detailed drawing of the limit switch arrangement for approval by Gasunie. The limit switches shall be properly adjusted by the valve manufacturer.

4.6.5 Volume boosters

Volume boosters shall be provided for all services which require that the control valve or particular actuator will achieve the required time to open or to close as specified in the control valve data sheet.

Volume boosters shall be installed on the actuator.

5. MATERIAL

Materials for pressure-containing and pressure-retaining parts shall be certified with inspection document type 3.2 according EN 10204 and shall be clearly identifiable by the steel quality (grade), heat number and steel manufacturer's stamp or inspection authority stamp.

Valve body and closures shall be made of unalloyed carbon steel in accordance with EN 1503-1, EN 1503-2 or another international or national material standard approved by Gasunie. The selected materials may also be in accordance with the manufacturer's written specification, adapted from the above mentioned standards, to fulfil the requirements of this specification.

The manufacturer's written specifications shall contain the following information as a minimum:
- required mechanical properties;
- required chemical properties;
- testing requirements;
- certification requirements.

Valves shall not be made of cast iron, whether nodular or not. However the plunger or other type of closing element may be made from nodular cast iron, which material shall be approved by Gasunie before application.

5.1 Flanged ends

The carbon content (check analysis) shall not exceed 0,25 %.

5.2 Studs and bolts

Studs and bolts shall meet the requirements of ASTM A 193/A 193M, Grade B7 or equivalent, or EN ISO 898-1 grade 8.8. The nuts shall meet the requirements of ASTM A 194/A 194M, Grade 2H or equivalent, or grade 8 in accordance with EN ISO 898-2.

In order to avoid environmental hydrogen induced cracking, bolting materials having higher mechanical properties (yield and tensile strength) than of those mentioned above shall not be used.

The free length of studs and bolts above the nut shall be between one and three times the pitch of the thread.

5.3 Instrument tubing and fittings

Stainless steel tubing and fittings shall be manufactured and installed according to MSM-01-E and CSM-01-E.

6. MANUFACTURING PROCEDURES

6.1 Manufacturing report

A manufacturing report shall be compiled for each valve. The required documents will be specified in the purchase order.

The following information shall be stated on the front cover sheet of each manufacturing report:
- Gasunie purchase order number and item number(s);
- Gasunie article number(s);
- tag number(s);
- make, type and size of the valve;
- ANSI pressure class;
- Gasunie design pressure;
- date of manufacture;
- valve serial number(s).

6.2 Forged components

Forged components for pressure-containing parts shall be forged close to the finished size.

6.3 Welding

6.3.1 Welding organisation

The company that performs welding shall be certified in accordance with EN ISO 3834-2 by an authorised Notified Body. This Notified Body shall be recognised by the European Welding Federation (EWF) or International Institute of Welding (IIW).

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

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

6.3.2 Welding personnel

Welders of welds to and in pressure parts shall be qualified in accordance with EN ISO 9606-1 or EN ISO 14732. The welding procedure qualification (WPQ) shall be issued as required in 97/23/EC by a Notified Body or a recognised third party organisation for permanent joining.

6.3.3 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 Gasunie for approval:

- Welding Procedure Specification (WPS), in accordance with EN ISO 15609-1, within the limits of EN ISO 15614-1 and the applicable construction code if this is more restrictive than 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 technologist, but the welding engineer will remain responsible for the completeness and compliance of the documents.
- Welding Procedure Approval Record (WPAR), in accordance with EN ISO 15614-1. The WPAR shall be issued as required in 97/23/EC by a Notified Body or a recognised third party organisation for permanent joining.

6.3.4 Production welding

During welding, the applicable WPS as per subclause 6.3.3 shall be available to the welder at the location where welding is performed.

Welds to and in pressure-containing parts or subject to mechanical loading shall be made by welders qualified as per subclause 6.3.2.

6.3.5 Post-weld heat treatment

All welding shall be completed prior to post-weld heat treatment. The valve or parts of the valve to be heat-treated shall be supported such that deformation cannot occur. No welding, hammering or deformation is permitted after post-weld heat treatment.

6.3.6 Welding report

The welding report shall include at least the following information for each weld:

- weld identification number;
- location of the weld on general arrangement drawing;
- applicable WPS number;
- applicable NDT report.

7. INSPECTION AND TESTING

Valves DN 80 and smaller and valves for drain provisions shall be subjected to non-destructive testing (NDT) en destructive testing (DT) in accordance with the manufacturer's standard. The manufacturer's own standard procedures for NDT and DT shall be considered part of the quality inspection plan.

Valves DN 100 and larger shall be subjected to NDT and DT fully in accordance with EN 14141 and this specification.

7.1 Non-destructive testing

7.1.1 Organisation

The company that performs the NDT shall be EN ISO/IEC 17020 or EN ISO/IEC 17025 accredited with the relevant scope. The company shall have at least one NDT expert available. This expert shall be certified according to EN ISO 9712 level 3 in the methods employed by the manufacturer.

7.1.2 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 EN, ISO or ASME 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 manufacturing. A sketch or document showing the location of the NDT and the repairs shall be made for the manufacturing report.

7.1.3 Personnel

The NDT inspection personnel shall be certified according to EN ISO 9712 level 2 for the relevant testing method.

7.1.4 Pressure-containing parts

All welds joining pressure-containing parts, repair welds and welds attaching lifting lugs, nameplate and extension line supports to a pressure containing part shall be 100 % non-destructively tested using the best method applicable (subject to Gasunie's approval) for the particular configuration of the weld cross section.

Seat ring areas in castings shall be completely radiographed before final machining or, if this is not feasible, be US examined. After final machining these areas shall be MP or LP examined.

Flanges of flange ended valves shall be completely MP examined. This applies to flanges integrally cast or forged with the valve body, or welded to the valve body.

All pressure containing castings DN 100 and larger shall be examined by radiography (when possible). Radiography shall be applied in the following cases:

- welding ends intended for field welding;
- welds joining pressure containing parts (production welding);
- seat ring area's before final machining.

The body of the valve shall be inspected by at least 4 photographs of critical sections (for guidance see ASME B16.34) approved by Gasunie. For wall thickness over 60 mm radiography may be replaced by ultrasonic examination.

Flange facings shall be 100 % surface examined by magnetic particle technique in accordance with EN 1369 level 1 (castings) or EN 10228-1 class 4 (forgings).

7.1.5 Non-pressure containing parts

The welds of stem extensions and outer casings, shall be ND-tested using the best applicable method (see subclause 7.1.3). For this purpose one valve per nominal size shall be selected at random from a batch of ten valves or part thereof.

7.1.6 Testing procedures and acceptance criteria

Radiographic, ultrasonic, magnetic particle and liquid penetrant examinations shall be performed in accordance with EN 14141.

7.2 Destructive testing (DT)

The base material and weld material for pressure containing parts, which is not heat-treated after welding, requires no additional testing by the manufacturer.

In this case, the mechanical test results shall conform to the requirements of the applicable material specification and this specification. For this purpose, the material test certificates shall be identifiable with the relevant components of the valve, by heat number.

Impact tests for the base material and weld material are required at temperatures related to the design temperature of –20 °C. The test temperature and values shall be in accordance with annex B.

The base material values shall be guaranteed by the relevant base material specification. If these values are more stringent than the requirements of this specification, the former shall prevail.

The size, preparation and testing of impact test specimens shall be in accordance with EN ISO 148-1 (Charpy pendulum impact test).

8. PRESSURE TESTING

Hydrostatic testing of shell shall be in accordance with EN 14141 at pressures shown in table 1. The minimum durations are shown in table 2:

Table 1: Hydrostatic shell test pressures

ANSI class	Gasunie working pressure (bar)	Test pressure Hydrostatic Shell
150	19	29,3 bar
300	40	75,9 bar
600	66,2	150,0 bar
600	80	150,0 bar

Table 2: Minimum duration of pressure test

Valve size DN	Minimum test duration (minutes)		
	Hydrostatic shell	Hydrostatic seat	Pneumatic seat
≤ 150	5	5	5
200 u/i 450	15		
≥ 500	30		

During testing for strength (shell test) the valve shall be partially open.

During hydrostatic-seat and air-seat tests, the test pressure shall be applied successively to both sides of the closed valve. The unpressurised side shall be in open connection with the atmosphere. Leakage measurement shall be carried out in the body cavity.

Pressure versus time during hydrostatic shell testing shall be recorded with automatic recording devices. The chart with test results shall be clearly identifiable with the tested valve, type of test and date.

No leakage and deformation is permissible during hydrostatic shell testing.

The seat leakage test shall be done in accordance with EN 60534-4.

The percentage of the maximum seat leakage shall be stated in the control valve data sheet.

9. PAINTING, MARKING AND SHIPPING

9.1 Painting

If a valve is to be painted by the valve manufacturer, this shall be stated in the purchase order. The valve shall be painted in accordance with MSW-11-E. After painting, the location of the serial number on the valve housing (see subclause 9.2) shall be marked with a white painted frame.

If a valve is provided with a stem extension, the outer surface of the stem extension and the inner surface of the outer casing shall in all cases be painted by the valve manufacturer, irrespective of whether painting of the valve is required. The vent openings in the stem extension and the outer casing shall not be obstructed by the paint.

Before the identification plate is attached, the surface of the bracket under the plate shall be painted in accordance with MSW-11-E.

Bare metallic surfaces such as flange faces, stems, the inner surface of hollow stem extensions and the internals of the valve shall be protected as indicated in MSW-11-E.

9.2 Marking

Each valve and each extension (if applicable) shall have the following information clearly die stamped on a stainless steel or aluminium identification plate which shall be attached to a bracket as shown in annex C:

- manufacturer's marking;
- type;
- nominal size;
- ANSI pressure rating and Gasunie design pressure;
- serial number of valve;
- Gasunie's purchase order number, item number and article number;
- Date of manufacturer;
- CE marking;
- ATEX marking.

Additionally the valve serial number shall be die-stamped on the valve housing by means of low-stress die-stamps. After grit blasting and coating, the location of this number shall be marked within a white painted frame by the painting contractor (by Gasunie), or by valve manufacturer if painting is required in the purchase order.

Apart from the information required above, the flow direction of control valves (if applicable) shall be clearly marked by means of an arrow on the valve housing.

9.3 Shipping

The following criteria for shipping are applicable:

- Each valve shall be properly packed to prevent damage during transport in accordance with MSA-25-E.
- The valves shall be shipped in the fully closed position in order to protect the plunger.
- If a valve has a standard fail position, it shall be shipped in the standard fail position of the valve.
- The flanged ends shall be effectively closed to prevent the entry of water, dust or other foreign matter during transportation and storage.
- Valves provided with stem extensions without the gearbox or actuator installed, shall have the annular space closed and the stem extension secured against the outer casing.
- During shipment and storage the valve shall be positioned such that the nameplate is clearly visible, to permit easy identification.

10. QUALITY INSPECTION PLAN

The manufacturer shall draw up a quality inspection plan covering all verification activities and indicating all tests/inspections to be witnessed by Gasunie or an authorised inspection agency. The quality inspection plan shall be approved by Gasunie prior to commencement of manufacturing. In principle, manufacturers may use their own procedure and format for the quality inspection plan, 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).

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).

The following documents shall be included:
- manufacturer's written material specifications for pressure-containing parts, if different from EN 14141;
- 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.

A significant detail is the proof of origin of the materials. Merely providing a 3.1 or 3.2 inspection certificate will not be sufficient. The supplier will be requested to demonstrate that the QA/QC process contains an operational and adequate check on the authenticity of materials and the relation with the inspection certificate.

If Gasunie is of the opinion that the authenticity and traceability is not adequately assured, Gasunie reserves the right to require additional measures from supplier to assure this (at Gasunie's discretion). A typical example of such a measure is spot checking of the chemical composition via an OES measurement.

The permissible variation of the composition determined by OES, in comparison with the composition given on the inspection certificate, is specified in table 3.

All relevant information for performing the OES, interpretation, evaluation of results and reporting shall be included in a procedure. This procedure shall be submitted to Gasunie for approval.

Table 3: Permissible variation

Element	Permissible variation Mass % (absolute)	
C	-0,05	+0,02
Si	-0,02	+0,02
Mn	-0,05	+0,05
P	-0,02	+0,02
S	-0,02	+0,02
Ni	-0,02	+0,02
V	-0,02	+0,02
Cr	-0,02	+0,02
Cu	-0,02	+0,02
Al	-0,02	+0,02
Nb	-0,02	+0,02
Mo	-0,02	+0,02

Note:
The inspectors of Gasunie 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.

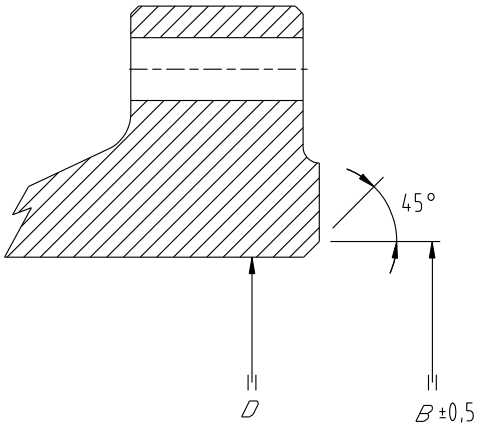
An update of the quality inspection plan and approval by Gasunie is required either every 3 years or by any change in the manufacturer's production procedures or a new revision of this specification.

11. FINAL INSPECTION

Each valve shall be visually inspected to assure conformity with the approved design drawing and the requirements of this specification. The inspection shall include the following items as a minimum:

- Dimensions: face-to-face or end-to-end dimension; dimensions of flanges and welding ends; inside diameter at welding end (tolerance ± 1 mm); out-of-roundness at welding end (true round) and Surfaces quality;
- Die-stamped heat numbers: correlation with relevant material certificates;
- Execution of appurtenances such as position indicators, identification plates and the like;
- Paint and coating quality (if applicable);
- Markings: in accordance with subclause 9.2;
- Shipping requirements: in accordance with subclause 9.3;
- Non-destructive testing reports if applicable;
- Destructive testing reports if applicable;
- Final testing report.

ANNEX A FLANGE END DIAMETERS OF VALVES DN 50 U/I DN 500 (NPS 2 U/I NPS 20) ANSI CLASS 150 AND 300 DN 50 U/I DN 1200 (NPS 2 U/I NPS 48) ANSI CLASS 600



GTS-FIG-174 version 1

D = Valve flange bore
B = Gasunie flange end diameter

Note: Dimensions in mm.

Figure 1: Flange end diameters of valves DN 50 u/i DN 500 (NPS 2 u/i NPS 20) ANSI class 150 and 300; DN 50 u/i DN 1200 (NPS 2 u/i NPS 48) ANSI class 600

Table 4: Dimensions

DN	(NPS)	*B* (mm)			
		ANSI 150	ANSI 300	ANSI 600	
		19 bar	40 bar	66,2 bar	80 bar
50	(2)	49,3	49,3	49,3	49,3
80	(3)	77,9	77,9	77,9	77,9
100	(4)	102,3	102,3	102,3	102,3
150	(6)	155,7	155,7	155,7	155,7
200	(8)	206,5	206,5	203,3	203,3
250	(10)	260,5	260,5	254,5	254,5
300	(12)	309,7	309,7	301,9	301,9
400	(16)	389,0	389,0	378,0	378,0
450	(18)	444,4	444,4	437,2	433,6
500	(20)	492,4	492,4	486,0	482,0
600	(24)	-	-	583,7	578,8
750	(30)	-	-	738,8	734,4
900	(36)	-	-	886,2	881,2
1050	(42)	-	-	1034,8	1028,8
1200	(48)	-	-	1182,4	1175,6

Notes:
1) If $D < B$: Bevelling to dimension "*B*" is required;
2) If $D \geq B$: Bevelling is not required.

B IMPACT TEST REQUIREMENTS

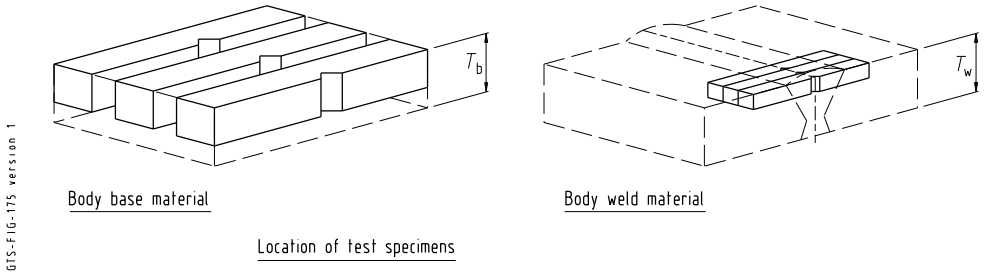


Figure 2: Test specimens for impact test

Notes:

1. Control valves with flanged ends, having heat-treated body welds or no body welds, shall be impact tested in accordance with table 5, T is equal to T_b.
2. Control valves with flanged ends, having body welds without heat treatment, shall be impact tested in accordance with table 5 where T is equal to the body weld thickness T_w.

Table 5: Impact test temperatures versus wall thickness for base and weld material

T (mm)	Impact test temperature (°C)	Re < 360 N/mm² Charpy-V impact values (J)		Re ≥ 360 N/mm² Charpy-V impact values (J)	
		average of three specimens	minimum of one specimen	average of three specimens	minimum of one specimen
$T \leq 13$	0	27	20	40	30
$13 < T \leq 18$	-10				
$18 < T \leq 22$	-20				
$22 < T \leq 25$	-30				
$25 < T \leq 28$	-40				
$T > 28$	-50				

C BRACKET AND IDENTIFICATION PLATE FOR CONTROL VALVES AND OUTER CASINGS

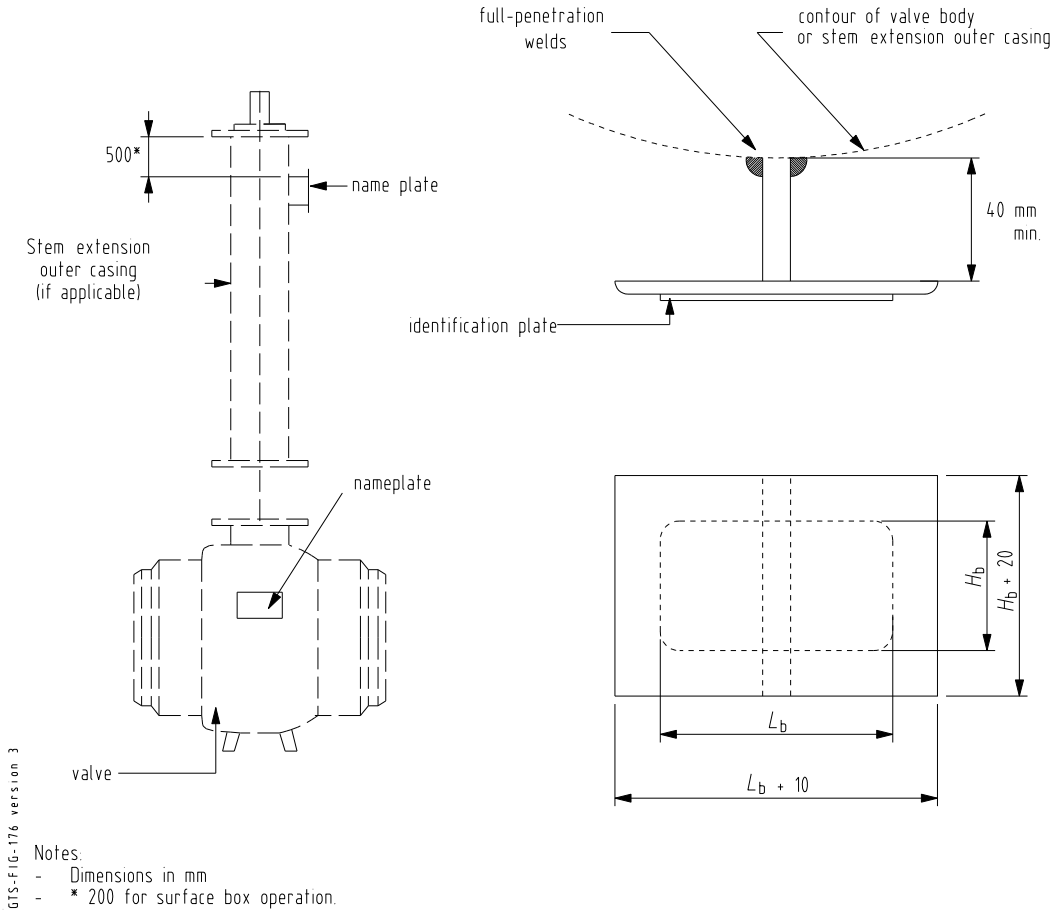


Figure 3: Bracket and identification plate for control valves and outer casings

Notes:

1) The identification plate and bracket for valves DN 80 and smaller shall be in accordance with manufacturer's standard
2) For larger valves, the shape of the bracket may be manufacturer's standard and is subject to Gasunie's approval.
3) Material of bracket plate: carbon steel.
4) Material of identification plate: AISI 316.
5) Bracket to be positioned on upper half of valve body and on the outer casing parallel to flow direction.
6) Bracket to be welded by a qualified welder before any post weld heat treatment of the valve body.
7) The identification plate shall be durable fixed to the bracket in accordance with MSW-11-E.