Gasunie Technical Standard

Material Specification Mechanical

MSW-03-E/1

Ball, plug and check valves

External

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N.V. Nederlandse Gasunie

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MSW-03-E/1

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This specification is drawn up by the Gasunie department
"Operations & Projects; Techniek - Werktuigbouw Installaties"
(Operations; Technology - Mechanical engineering Installations)

The specification may be distributed to external service providers.

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FOREWORD

This specification supersedes the ninth version of MSW-03-E/1.

MSW-03-E/4 "check valves of DN 50 and larger" is incorporated in this specification, therefore MSW-03-E/4 (version 6 d.d. 11-07-2014) will expire upon publication of this specification (MSW-03-E/1).

This specification is to be read in conjunction with NEN-EN 14141 (2013).

Note:
This specification (read in conjunction with NEN-EN 14141) shall be used in cases where Gasunie's requirements extend beyond NEN-EN 13942, NEN-ISO 14313 and API 6D.

With respect to the former version the following has been changed:
- MSW-03-E/4 is incorporated in this version;
- NDT requirements are modified;
- Various improvements.

Alterations are marked with a left margin line.

CONTENTS

1. SCOPE AND APPLICATION

This specification contains the requirements for carbon steel ball, plug and check valves, ANSI class 150, 300 and 600. These valves shall be used in natural gas piping systems under the following conditions:

- medium: non-corrosive natural gas, nitrogen and gas condensate;
- operating pressure: 80 bar (e) or less;
- design temperature: -20 °C to +80 °C.

2. REFERENCES

This specification is subject to the requirements of 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 specifications

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

MSA-25-E	Transport, packing and marking.
MSA-32-E	Requirements for inspection certificates of pressure parts.
MSM-08-E	Valve actuators.
MSW-11-E	Shop coating of steel structures and pipeline elements.

2.2 Standards

In this specification reference is made to the standards[1] mentioned in this subclause. Any supplements and errata notices that are also applicable.

ASME/ANSI B 16.25	Buttwelding ends.
ASME B 16.34	Valves - flanged, threaded and welding end.
ASME B 16.47	Large diameter steel flanges.
ASME B 16.5:2017	Pipe flanges and flanged fittings: NPS ½ through NPS 24 metric/inch standard.
ASME B 16.5	Pipe flanges and flanged fittings: NPS ½ through NPS 24 metric/inch standard.
ASME B 36.10M	Welded and seamless wrought steel pipe.
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 194Ma	Carbon steel, alloy steel and stainless steel nuts for bolts for high pressure or high temperature service or both.
ASTM A 320/A 320M	Alloy-steel and stainless steel bolting for low-temperature service.
DIN 28086	Lugs on vessels for use in process engineering – Dimensions and maximum safe working load.
NEN-EN-ISO 6892-1	Metallic materials – Tensile testing – Part 1: Method of test at room temperature.

[1] Applicable for all NEN-EN standards: Depending on the country where the standard will be applied, shall be chosen for example DIN-EN or BS-EN.

MSS SP-44	Steel pipeline flanges.
NEN-EN 10216-5	Seamless steel tubes for pressure purposes Technical delivery conditions - Part 5: Stainless steel tubes.
NEN-EN 10228-1	Non-destructive testing of steel forgings; Part 1: Magnetic particle inspection.
NEN-EN 10228-2	Non-destructive testing of steel forgings; Part 2: Penetrant testing.
NEN-EN 12266-1	Industrial valves - Testing of metallic valves; Part 1: Pressure tests, test procedures and acceptance criteria - Mandatory requirements.
NEN-EN 13942:2009	Petroleum and natural gas industries - Pipeline transportation systems - Pipeline valves.
NEN-EN 13942	Petroleum and natural gas industries - Pipeline transportation systems - Pipeline valves.
NEN-EN 14141:2013	Valves for natural gas transportation in pipelines – Performance requirements and tests.
NEN-EN-IEC 60529	Degrees of protection provided by enclosures (IP code).
NEN-EN-ISO 898-1	Mechanical properties of fasteners made of carbon steel and alloy steel; Part 1: Bolts, screws and studs with specified property classes - Coarse thread and fine pitch thread.
NEN-EN-ISO 898-2	Mechanical properties of fasteners made of carbon steel and alloy steel; Part 2: Nuts with specified property classes - Coarse thread and fine pitch thread.
NEN-EN-ISO 3452-1	Non-destructive testing - Penetrant testing - Part 1: General principles
NEN-EN-ISO 3834-2	Quality requirements for fusion welding of metallic materials; Part 2: Comprehensive quality requirements.
NEN-EN-ISO 5211	Industrial valves - Part-turn actuator attachments.
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 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 10675-1	Non-destructive testing of welds - Acceptance levels for radiographic testing - Part 1: Steel, nickel, titanium and their alloys
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 15848-1	Industrial valves - Measurement, test and qualification procedures for fugitive emissions; Part 1: Classification system and qualification procedures for type testing of valves.
NEN-EN-ISO 17636-1	Non-destructive testing of welds - Radiographic testing - Part 1: X- and gamma-ray techniques with film.

2.3 European Directives

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

2014/34/EU	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) (ATEX 114).
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.

3. DEFINITIONS, ABBREVIATIONS AND SYMBOLS

3.1 Definitions

In this specification the following definitions will be applicable:

Anti-blowout design	A design feature to ensure that removal of the stem seal retainer bolting while the valve is under pressure cannot result in the stem being fully ejected from the valve. This feature shall permit the replacement of the stem seals, or at least the upper stem seal, when the valve is under pressure and after bleeding/draining of the body cavity.
Anti-static design	A design feature which ensures electrical conductivity between all components of the valve.
Breakaway torque	The maximum torque measured during the acceptance test in shop, based on new valve conditions.
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.
Flow coefficient	The flow capacity of a (plug) valve, commonly expressed by the K_v-factor.
K_v of a (plug) valve	The quantity of water in m^3/h, at a temperature between 5 °C and 40 °C that will flow through the valve with a pressure drop of 1 bar.
Pressure-containing parts	A component which is exposed to and contains pressure. The principal pressure-containing parts of the valves are all parts of the housing including bonnets, end connections, drain and sealant provisions. Balls, stems and plugs are not considered to be pressure-containing parts.
Pressure-retaining parts	A component which holds one or more pressure-containing members together but is not exposed to the pressure. The principal pressure-retaining parts of the valves are bolts and nuts connecting pressure-containing parts.

3.2 Abbreviations

In this specification the following abbreviations will be applicable:

ATEX	Atmosphères Explosives
BAT	Break Away Torque
CE	Conformité Européenne
ITP	Inspection and Test Plan
LP	Liquid Penetrant
MAST	Maximum Allowable Stem Torque
MP	Magnetic Particle
NDT	Non-Destructive Testing
NPT	National (American) Standard Taper Pipe Thread
PED	Pressure Equipment Directive
US	Ultrasonic
WPAR	Welding Procedure Approval Records
WPS	Welding Procedure Specification

3.3 Symbols

In this specification the following symbols will be applicable:

Symbol	Description	Unit
B	Flange end diameter	mm
D	Valve flange bore	mm
D_b	Diameter of bolt holes	mm
D_h	Diameter hand wheel	mm
d_c	Diameter of close-fitting bolts	mm
d_d	Diameter of dowel pins	mm
F	Actuating force	N
H_s	Stem extension height	mm
H_w	Dimension of the welding end	mm
$H_{w,max}$	Maximal dimension of the welding end	mm
$H_{w,min}$	Minimal dimension of the welding end	mm
ID	Inside diameter	mm
K_v	Flow coefficient	m^3/h
L_w	Length of wrench	mm
OD	Outside diameter of the matching pipe	mm
R_a	Roughness	μm
R_{ep}	Specified minimum yield strength of Gasunie matching pipe	N/mm^2
R_{ev}	Specified minimum yield strength of valve welding-end material at room temperature	N/mm^2
S_t	Allowable material stress in tension	N/mm^2
T	Determining wall thickness	mm
T_b	Body base thickness	mm
T_w	Body weld thickness	mm
t_{nom}	Nominal wall thickness	mm

4. GENERAL REQUIREMENTS

Valves shall comply with PED (2014/68/EU).

Valves shall comply with the ATEX 114 regulations (2014/34/EU).

The manufacturer shall remain responsible for the manufacturing procedures and the suitability of the equipment for its intended use.

In addition, for capacity calculation purposes, the manufacturer shall supply documentation about pressure drop characteristics.

4.1 Welding

4.1.1 Organisation

The company that performs welding shall be certified in accordance with NEN-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 NEN-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 NEN-EN-ISO 14731.

4.1.2 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.

4.1.3 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 technologist, but the welding engineer will remain responsible for the completeness and compliance of the documents.
- 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.

4.1.4 Production welding

During welding, the applicable WPS as per subclause 4.1.3 of this specification (MSW-03-E/1) 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 4.1.2 of this specification (MSW-03-E/1).

4.1.5 Post-weld heat treatment

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

4.1.6 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.

4.1.7 Supports

The construction of temporary or permanent supports attached to the valve requires approval of client. The integrity of the coating of the supports and attachment points of the supports shall be secured especially after installation on site.

4.2 Painting and shipping

4.2.1 Painting

The valve shall be coated in accordance with MSW-11-E.

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 as indicated in MSW-11-E, irrespective of whether painting of the valve is required.

The vent openings in the stem extension and the outer casing shall be fit for the environment conditions encountered after installation e.g. submerged. The construction and implementing form of the vent openings require client's approval.

The identification plates shall be attached on the body and if applicable on the stem extension conform 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.

A minimum distance between coated components shall be at least 50 mm. Coating shall be applied in accordance with MSW-11-E.

4.2.2 Shipping

The following criteria for shipping are applicable:

- In case of ball valves, all sealant extension lines and other connecting cavities shall be injected with a lubricant medium.
- In case of plug valves, all sealant extension lines and other connecting cavities shall be injected with a sealant medium.
- Each valve shall be packed in accordance with MSA-25-E.
- The ball and plug valves shall be shipped in the fully open position in order to protect the sealing surfaces of the ball or plug.
- In case of valves with stem extensions on which the gearbox or actuator is not fitted, the annular space shall be sealed and the stem extension secured against the outer casing.
- Valve end-flanges and welding ends shall be covered to protect the gasket surfaces or welding ends and internals during shipment and storage.
- During shipment and storage the valve shall be positioned such that the name plate is clearly visible, to permit easy identification.

4.3 Pressure drop (check valves only)

The behaviour of the check valve shall be stable over the entire flow range, i.e. between minimum flow and maximum flow.

4.4 Damping device (check valves only)

In case swing type check valves have to be provided with a damping device, the damping device shall allow a quick opening and closing of the valve with a slow-down at the end of the travels. This is to avoid forcefully striking of the disc against the seat or the valve body.

A hydraulic damping device is not allowed.

4.5 Destructive testing

This subclause is only applicable for the base material and weld material of the main housing of the valve, including bonnet and end closures. Destructive testing shall be performed after heat treatment (if applicable).

The mechanical properties determined by destructive testing shall comply with the requirements of the applicable material standard.

Test plates from each heat of steel, and for each wall thickness or dimension, shall be subjected to the tests listed below. Sufficient material shall be available for testing and retesting.

Each heat-treatment batch shall be tested unless the temperature variation between batches is less than 20 °C.

The test specimens shall be marked and the destructive testing shall be witnessed by client, by an authorised inspection agency or by one member of the manufacturer's quality control personnel who has been authorised by such an agency.

4.5.1 Tensile testing

4.5.1.1 Testing procedures

Tensile test specimens shall be tested for yield strength, ultimate tensile strength and elongation in accordance with NEN-EN-ISO 6892-1.

4.5.1.2 Acceptance criteria

The yield strength, ultimate tensile strength and elongation of the base material and weld material shall comply with the requirements of the applicable material specification.

4.6 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).

4.7 Final inspection

Each valve shall be inspected to assure conformity with the approved documents and the requirements of this specification. The inspection shall include the following items:

- Dimensions: face-to-face or end-to-end dimension; stem extension height and alignment, dimensions of flanges and welding ends; inside diameter at welding end (tolerance ± 1 mm); out-of-roundness at welding end (true round) and fit in standard Gasunie surface box opening;
- Surfaces quality;
- Die-stamped heat numbers: correlation with relevant material certificates;
- Execution of appurtenances such as drain and sealant provisions, dowel pins, identification plates and the like;
- Paint and coating quality (if applicable);
- Markings: in accordance with section 10 of NEN-EN 14141:2013 (including amendments of MSW-03-E/1);
- Shipping requirements: in accordance with subclause 4.2.2 of this specification (MSW-03-E/1);
- Non-destructive testing reports if applicable;
- Destructive testing reports if applicable;
- Final testing report.

5. AMENDMENTS/SUPPLEMENTS TO NEN-EN 14141 (2013)

5.1 General requirements

If not specifically stated otherwise, the amended sections are replacements of the appropriate section of NEN-EN 14141. Sections not mentioned remain unaltered.

Additional requirements, which are not stated in NEN-EN 14141 are indicated with "addition" in the left margin.

Sections of NEN-EN 14141 which are not valid, are indicated with "deletion" in the left margin.

Requirements which are stated in NEN-EN 14141 that need to be replaced are indicated with "substitution" in the left margin.

Section numbers in italics correspond with section numbers of NEN-EN 14141.

5.2 Modifications and supplements to NEN-EN 14141 (2013)

SECTION 1 SCOPE

Substitution

Substitute "This European Standard applies to all valves (plug, ball, gate and check valves)" by "This European Standard applies to ball, plug and check valves"

Substitution

Substitute "but with…special design" by "The standard temperature range shall be -20 °C till 80 °C unless specified otherwise on the data sheet"

SECTION 4 FUNCTIONAL REQUIREMENTS

4.1 Travel stops

Addition

The design of the stops shall prevent the ingress of foreign material and corrosion products which could impair the operation of the stops.

4.2. Position of the obturator

Addition

The position of the valve shall be indicated by means of a position indicator independent of the actuating device. If mechanical end-stops are provided on the top mounting of the valve or the top mounting of the stem extension, these shall also fulfil the function of a position indicator.

Addition

For requirements of the position indicator of check valves, reference is made to the data sheet "Check valves".

4.3 Protection of exposed stems and shafts

Addition

The outer casing shall be provided with two connections, namely:

- the bottom one shall be a solid plug and shall be located opposite the valve end-stop;
- the top one shall be an atmospheric vent with a check valve to prevent water ingress and other pollutions (see annexes B and C of this specification (MSW-03-E/1)).

4.5 Lifting lugs

Addition The design load shall be based on lifting the total weight of the valve including stem extension, actuator and/or gearbox. All lifting lugs not capable of lifting the total weight of the valve shall be removed (e.g. gearbox or actuator lifting lugs). This shall be done before application of the (paint) coating.

Addition The design of lifting lugs shall be in accordance with DIN 28086 and shall be subject to approval by client.

Addition Manufacturer shall add a lifting procedure for lifting the valve including stem extension and actuator to the maintenance manual.

4.6 Additional requirements

Addition K_v values of plug valves shall be in accordance with annex G of this specification (MSW-03-E/1).

Addition The plug valve shall be pressure balanced.

Addition Hollow balls are not accepted.

Addition Only trunnion mounted, full bore ball valves are accepted.

Addition Ball valves shall be double isolation and bleed, both seats bi-directional (DIB-1), in accordance with NEN-EN 13942.

Note:
In previous versions of this specification (MSW-03-E/1) this design was called "Double piston effect".

Addition Ball valves for liquid applications shall be at least designed with one self relieving seat to prevent a pressure lock, so called DIB-2.

Addition Unless otherwise specified on the data sheet, ball valves shall be primary metal, secondary soft seated.

Addition If a valve is supplied with an actuator (specified in purchase order), the actuator shall be in accordance with MSM-08-E. The supplier of the valve-actuator combination is responsible for mounting the actuator to the valve, in case the valve and actuator are delivered separately to site*.
* Note: Control systems are not part of the delivery.

Anti-static design

Addition Valves shall be designed in such a way that the build-up of static electricity between obturator and body, obturator and stem, and stem and body shall be prevented. Based on a d.c. power supply not exceeding 12 V, the resistance measured in each case on a dry valve shall not exceed 10 Ω.
A type-test certificate shall be submitted to client for approval.

Addition Flange facings shall have a resultant surface finish R_a = 3,2 µm – 6,3 µm conform section 6.4.5.3 of ASME B16.5:2017.

SECTION 5 REQUIREMENTS AND TESTS

5.1 Design

5.1.2 End-to-end dimensions

Addition The end-to-end dimension of ANSI class 300 ball valves with welded ends shall be in accordance with NEN-EN 13942, ANSI class 600.

Addition Flanges of nominal size DN 600 and smaller shall comply with ASME B16.5. Flanges larger than DN 600 shall be compatible with ASME B 16.47, Series A as well as MSS SP-44. For all pressure classes, flanges shall have a raised face. Flange bore shall be in accordance with annex K.

5.1.3 Butt welding ends

Substitution Substitute "Weld end…and 5" by "welding ends shall be in accordance with annex A of this specification (MSW-03-E/1)"

5.1.6 Extended drain, vent and sealant lines

Addition Vent connections on valve's body are not required by client. If these are recommended by the manufacturer for testing purposes, these shall be in accordance with their own standard and shall be plugged-off with NPT solid plug, seal welded and coated before the shipment of the valve.

Addition For configuration of extended drain, vent and sealant lines reference is made to annex A, B and C of this specification (MSW-03-E/1). Drain connections and extension lines for drain and sealant injection shall be attached to the valve body or stem extension casing by means of welded steel supports or to a similar design. The spacing between the supports shall not exceed 1 000 mm. The top support shall be placed as close as possible to the drain valve and the sealant fitting.

Addition To avoid galvanic corrosion between sealant line and needle valve, these shall be of the same material. Therefore the last part of the sealant line shall be made of stainless steel according to NEN-EN 10216-5 (AISI 316L). This needs to be in the same wall thickness and diameter. For the location of the transition welds reference is made to annex D of this specification (MSW-03-E/1).

Substitution Substitute: "minimum pipe…DN ≥ 250 – DN 25 (1") drain" by "pipe size shall be as follows for valve size:

- ≤ DN 80; no drain line;
- > DN 80 - ≤ DN 200; DN 15;
- > DN 200 - ≤ DN 600; DN 25;
- > DN 600; DN 50."

Addition Auxiliaries for vent, drain and sealant provisions shall require the approval of client. If manufacturer's standards are not accepted by Gasunie these auxiliaries shall be in accordance with annex E of this specification (MSW-03-E/1).

Addition Pipe size for sealant lines shall be DN 15. The minimum wall thicknesses shall be schedule 160 in accordance with ASME B 36.10M. Ball valves DN 80 and smaller do not need to be provided with a sealant injection connection. Each sealant point shall have its own extended sealant line. The connection to the valve body shall be in accordance with annex L of this specification (MSW-03-E/1).

Addition The design pressure of sealant injection fittings shall be 10 000 psi (690 bar).

Addition The minimum wall thickness for drain lines shall be schedule 160 for DN 15 and schedule 80 for ≥ DN 25 in accordance with ASME B 36.10M.

Addition The design pressure of drain fittings shall be at least 3 000 psi.

Addition Drain connections shall be provided with a bleeder plug of an anti-blowout design.

Addition Valves for underground applications with extended stem seal injection provisions shall be marked with an identification plate. The text on the plate shall be "Stem seal injector". This plate shall be made of non-electrical conductive material and shall be fitted according to MSW-11-E.

5.1.7 Vent, drain and sealant valves

Addition The design pressure of sealant line valves shall be 10 000 psi (690 bar).

Addition The design pressure of drain valves shall be equal to the design pressure of the main valve with a minimum of Class 600. The body shall have a cylindrical form and shall be made of carbon steel material. The design options for the top-work shall be in accordance with section 5.2.1.

Addition Drain, vent and sealant valves shall be mounted according to annex B and C of this specification (MSW-03-E/1).

Addition Drain valves according to split body design and with threaded end connections, shall be mechanically blocked to prevent uncontrolled dismounting.

Addition Drain valves:
Instead of a wrench, a pressure rated protection cap shall be threaded to the top of the valve to protect the bare stem. This protection cap shall have an anti-blowout design. The protection caps shall be coated in the same manner as the rest of the valve.

5.1.8 Mechanical resistance against excessive actuating forces

Addition The design shall include the forces implied by the spring force and eccentric weight load of the actuator.

Addition Design criterion for Maximum Allowable Stem Torque (MAST):
The MAST of the valve shall be at least two times the Breakaway Torque (BAT) of the valve at a pressure difference over the valve which is equal to the operating pressure as specified by client. Design calculations shall be submitted to client for approval. The calculations shall state the used design code. The following stresses apply:

- a joint efficiency factor of 0,75 shall be used for fillet welds;
- allowable material stress in tension S_t = $^2/_3$ x yield strength;
- allowable bearing stress = 1,35 x S_t;
- allowable average shear stress = 0,7 x S_t;
- allowable maximum torsional stress = 0,58 x S_t.

Addition The maximum allowable torque shall be determined for at least the following load cases:
- torsional load on the stem shaft, stem extension and outer casing of stem extension (including adapter piece/mounting kit);
- bearing load on the key and keyway;
- shear load on the key;
- torsion or shear load on the connection between the stem and obturator;
- shear load on all fillet welds of the stem extension and outer casing of stem extension;
- loads on the flange connection.

Addition The lowest calculated torque for the mentioned load cases shall be considered as the maximum allowable stem torque of the valve.

5.1.10 Interface of valves to actuators of gears

Addition Close fitting bolts and dowel pins shall be in accordance with annex H of this specification (MSW-03-E/1).

Addition Top flanges of valve or stem extension shall be in accordance with NEN-EN-ISO 5211.

5.1.11 Stem extensions

Substitution Substitute "if not agreed in different way ... the lever" by "The length of the stem extension is defined to be the distance between the horizontal axis of the passage and the stem extension casing top flange (see annex F of this specification, MSW-03-E/1). The stem extension height (H_s) includes the adapter piece for an actuator if applicable."

Addition All connections between valve, stem extension outer casing and actuating device shall be water tight.

5.2 Operation

Addition All hand operated valves (gearbox and lever operated) for above and surface box operation shall be provided with a locking device for blocking in open or close position suitable for a Ø 12 mm padlock.

Addition Sizing of gearboxes shall be based on the following criteria:
- The maximum output torque of the gearbox shall be equal to at least 1,3 times the BAT of the valve at the specified design pressure, but shall not exceed the MAST of the valve.
- The actuating force (F) on the handwheel of the gearbox or Gasunie standard T-wrench (see annex J of this specification (MSW-03-E/1)) shall not exceed 360 N at 1,3 times the BAT of the valve.
- For valves of ANSI class 600, nominal size DN 400 and smaller, the BAT of the valve shall be based on a pressure difference over the valve of 80 bar.
- The operation time (number of turns) shall be kept as low as possible.

Addition For gearboxes the following information shall be submitted to client:
- make;
- type;
- gear ratio;
- efficiency;
- maximum output torque;
- maximum allowable input torque.

Addition Enclosure protection class:
All Gearboxes shall comply with protection class IP68 in accordance with NEN-EN-IEC 60529 against the effects of continuous immersion in water to a depth of 0,5 m above the top of the gearbox.

Addition The construction of the gearbox shall be such that all internal parts are greased for lubrication. Oil filled systems are not allowed.

Addition Gearboxes shall be installed aboveground or in a surface box. Underground installation is not permitted.

Addition Gearboxes for surface box application shall have the axis of the operating square (see annex F of this specification (MSW-03-E/1)) in a vertical orientation.

Addition If the gearbox is mounted directly on the valve, the gearbox shall be provided with an atmospheric air vent to prevent pressure build-up in the gearbox housing in the event of leakage through the valve stem seal.

Addition Gearboxes shall be provided with a position indicator to show the open/closed position of the valve. The position indicator shall be electrical isolated from the gearbox.

Addition Gearboxes shall be suitable for installation on a vertical or horizontal valve stem.

Addition Gearboxes shall be fitted with an identification plate in accordance with section 10 "Gearboxes" of this specification MSW-03-E/1.

5.2.1 Handwheels and wrenches - Levers

Addition Valves for underground installation:
Instead of a wrench, a pressure rated protection cap shall be threaded to the top of the valve to protect the bare stem. This protection cap shall have an anti-blowout. The protection caps shall be coated in the same manner as the rest of the valve.

Addition Levers and wrenches shall be designed and placed such that safe and unobstructed operation is possible.

5.2.4 Torque/thrust testing

Addition Torque/thrust testing shall be performed immediately after the seat test by reducing the seat test pressure to the operating pressure and measure the BAT (see table 1). Reducing the pressure to zero and/or operating the valve between the seat test and the torque test is not permitted.

Table 1: Test pressures

ANSI class	Gasunie operating pressure	Test pressures (bar (e))			
		Hydrostatic			Air
	bar (e)	Shell	Seat	In-shop BAT	Seat
300	40	75,9	55,2	40	5,5
600	66,2	150,0	110,3	66,2	5,5
600	80	150,0	110,3	80,0	5,5

The test shall be performed according NEN-EN 13942:2009, annex B.6

5.3 Materials

5.3.2 Shell materials

5.3.2.1 General

Addition Valves body and closures shall be made of unalloyed carbon steel. Valves shall not be made of cast iron, nodular or otherwise.

Addition The minimum elongation of the base and weld materials shall be at least 18 %.

Addition The ratio of yield strength to ultimate tensile strength shall not exceed 0,90 for the base material and weld material.

5.3.2.2 Impact values

Substitution Substitute "All ferritic … lower" by "Impact testing shall be performed in accordance with annex I of this specification (MSW-03-E/1)".

5.3.2.3 Welding ends for on-site welding

Addition The manufacturer shall verify that the welding ends are in accordance with the internal pressure.

Addition The following applies for wall thickness of the welding ends (H_w) (see also Annex A):

$$H_w \geq \frac{R_{ep}}{R_{ev}} \times t_{nom}, \quad \text{where: } H_{w,min} = t_{nom};\ H_{w,max} = 1{,}5\ t_{nom}$$

- R_{ep}: specified minimum yield strength of Gasunie matching pipe (383 N/mm^2 at design temperature of 80 °C);
- R_{ev}: specified minimum yield strength of valve welding-end material at design temperature of 80 °C;
- t_{nom}: nominal: wall thickness of Gasunie matching pipe.

For DN 50 ≤ DN 400: H_w max = 1,2 t_{nom}, see annex A, figure 1.
For DN 450 ≤ DN 1200: H_w max = 1,5 t_{nom}, see annex A, figure 2.

Tolerance on dimension H_w:
- ± 0,35 mm where $t_{nom} \leq 10$ mm;
- ± 0,5 mm where $t_{nom} > 10$ mm;
- t_{nom} is nominal wall thickness of Gasunie matching pipe;
- Inside diameter at welding end: tolerance ± 1 mm;
- Out-of-roundness at welding end: true round.

Addition The welding ends of the connecting pipe for field welding shall be made of a steel with a specified minimum yield strength of at least 245 N/mm^2 for connecting pipes of DN 50 u/i DN 400, and at least 420 N/mm^2 for connecting pipes of DN 450 u/i DN 1200.

5.3.3 Obturator

Addition The plug may be made of nodular cast iron provided the steel quality and material specification are approved by client.

Addition The obturator shall be a one piece casting or a forging.

5.3.4 Body/bonnet connection, bolting materials

Substitution

Substitute "Materials for…service temperature" by "Studs and bolts of M39 (1½") diameter and smaller shall comply with ASTM A 193M, Grade B7 or NEN-EN-ISO 898-1 Grade 8.8. Nuts shall comply with ASTM A 194Ma, Grade 2 H or NEN-EN-ISO 898-2, Grade 8.

Studs and bolts larger than M39 (1½") in diameter shall comply with ASTM A 320M Grade L7. Nuts shall comply with ASTM A 194Ma Grade 4 or Grade 7.

To avoid environmental hydrogen-induced cracking, bolting materials having higher mechanical properties (yield and tensile strength) than those mentioned in this clause 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."

5.5 Non-destructive testing

Addition

Organisation

The company that performs the NDT shall be accredited according to a Gasunie recognised accreditation standard.

The manufacturer shall have at least one NDT expert available for the NDT methods employed. This NDT expert 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 used technique.

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. The written procedures for each method employed in production shall be submitted to client 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.

NDT reports shall be verified by client's inspector at the manufacturer's workshop and shall be retained by the manufacturer.

5.5.2 Welding

Addition

Acceptance criteria visual inspection: NEN-EN-ISO 5817 quality level B.

Substitution

Substitute "EN 571-1" by "NEN-EN-ISO 3452-1".

Substitution

Substitute "radiographic testing in accordance with EN 1435:1997... or to EN 13942:2009, A.11" by "Radiographic testing in accordance with NEN-EN-ISO 17636-1, class B. Acceptance criteria according NEN-EN-ISO 10675-1 acceptance level 1".

5.5.3 Castings

Substitution Substitute "critical areas shall be examined by ... with EN 13942:2009, A.3" by "The critical areas of the body of the valve (for guidance location critical areas see ASME B16.34) shall be radiographic inspected in accordance with NEN-EN 13942:2009, A.2".

Addition For wall thickness over 40 mm radiographic examination may be replaced by ultrasonic examination according NEN-EN 13942:2009, A.4.

5.5.4 Forgings

Addition Flanges of flange-ended valves shall be surface examined:
- by magnetic particle technique in accordance with NEN-EN 10228-1, acceptance criteria quality Class 4, or
- by penetrant testing in accordance with NEN-EN 10228-2, acceptance criteria quality Class 4.

Addition "Magnetic particle testing or penetrant testing of forgings on 100 % of surface area" shall apply.

5.6 Shell test

Deletion "At the…with EN 12266-1:2012, Test P11"

Addition Test duration shall be in accordance with table 2.

Addition Table 2: Test durations

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

Note:
A sufficient stabilisation period shall be allowed for all pressure tests.

Addition For valves with one or two drain valves; these valves shall be in half open position during the hydrostatic shell test.

Addition Pressure versus time shall be recorded during all tests by an automatic recording device.

Addition After pressure testing, valves shall be fully drained of test fluid and dried.

5.7 External tightness

5.7.3 Fire test

Addition Fire test is mandatory

5.8 Internal tightness

5.8.1 Seat tightness

Addition Test durations for seat test shall be in accordance with table 2.

Substitution Substitute "metal seated … EN 12266-1" by "metal-seated valves shall meet leakage rate A in accordance with NEN-EN 12266-1"

5.8.2 Functional test on clean service

Addition The type test is mandatory (not applicable for plug valves).

5.8.3 Abrasion resistance test on dirty service

Addition The type test is mandatory (not applicable for plug and check valves).

Addition A fugitive emission test shall be performed in accordance with NEN-EN-ISO 15848-1, tightness class BH, endurance class C01.

SECTION 6 INSPECTION

Substitution Substitute entire section by:
"Materials for pressure-containing and pressure-retaining parts shall be certified in accordance with MSA-32-E.

For pressure-bearing parts in valves in cat I or II route 1 shall be taken. For pressure-bearing parts in valves in cat III route 2, 3 or 4 shall be taken depending on the nominal diameter."

SECTION 7 QUALITY

Substitution Substitute entire section by:

INSPECTION AND TEST PLAN (ITP)

The manufacturer shall draw up an ITP covering all verification activities and indicating all tests/inspections to be witnessed by client or an authorised inspection agency. The ITP shall be approved by client prior to commencement 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, client).

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 NEN-EN 14141:2013;
- 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.

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

An update of the ITP and approval by client is required either every 3 years or by any change in the manufacturer's production procedures or a new revision of this specification (MSW-03-E/1).

SECTION 10 Marking

Addition

Valves

In addition the following marking shall be applied:
- type;
- Gasunie design pressure;
- serial number;
- Gasunie's purchase order number, item number;
- Gasunie article number;
- manufacturer specific number;
- the maximum allowable temperature at the seat ring area during field welding;
- date of manufacture;
- CE marking;
- ATEX marking.

The valve serial number shall also be die-stamped on the valve housing with low-stress die stamps.

When a tag number is specified, the tag number shall be on a separate AISI 316 tag plate.

Gearboxes
The following information shall be clearly die-stamped on the identification plate of gearboxes:
- manufacturer's marking;
- serial number;
- type;
- gear ratio;
- efficiency;
- maximum allowable input torque;
- maximum output torque;
- CE marking (not applicable for category 0);
- ATEX marking (if applicable).

Addition

Material of identification plate shall be AISI 316.
The identification plate shall be durable fixed in accordance with MSW-11-E.

ANNEXES

A WELDING END DETAILS

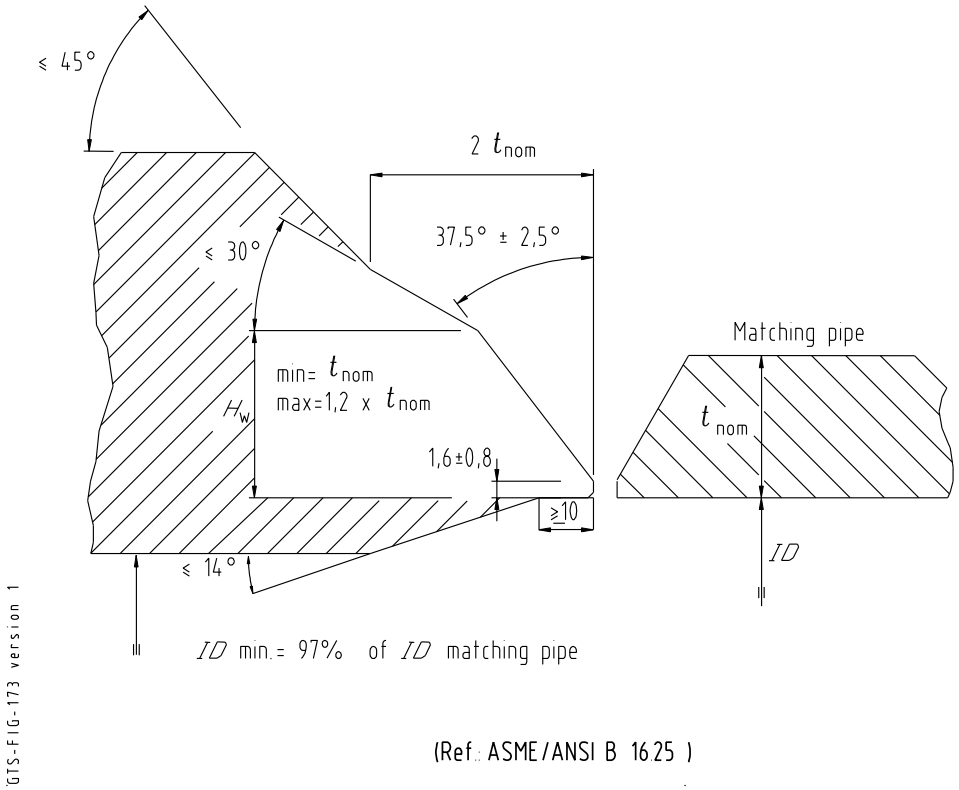


Figure 1: Valves of DN 50 ≤ DN 400
(Ref.: ASME/ANSI B 16.25)

Table 3: Dimensions of matching Gasunie pipe

VALVE SIZE DN	INTERNAL DIAMETER *ID* in mm			WALL THICKNESS t_{nom} in mm		
	DESIGN PRESSURE (bar (e))					
	19	40	66,2 and 80	19	40	66,2 and 80
50	49,3	49,3	49,3	5,5	5,5	5,5
80	77,9	77,9	77,9	5,5	5,5	5,5
100	102,3	102,3	102,3	6,0	6,0	6,0
150	155,7	155,7	155,7	6,3	6,3	6,3
200	206,5	206,5	203,3	6,3	6,3	7,9
250	260,5	260,5	254,5	6,3	6,3	9,3
300	309,7	309,7	301,9	7,1	7,1	11,0
400	389,0	389,0	378,0	8,7	8,7	14,2
ANSI class	150	300	600	150	300	600

Notes:
1 Inside diameter at welding end: tolerance ± 1 mm.
2 Out-of-roundness at welding end: true round.

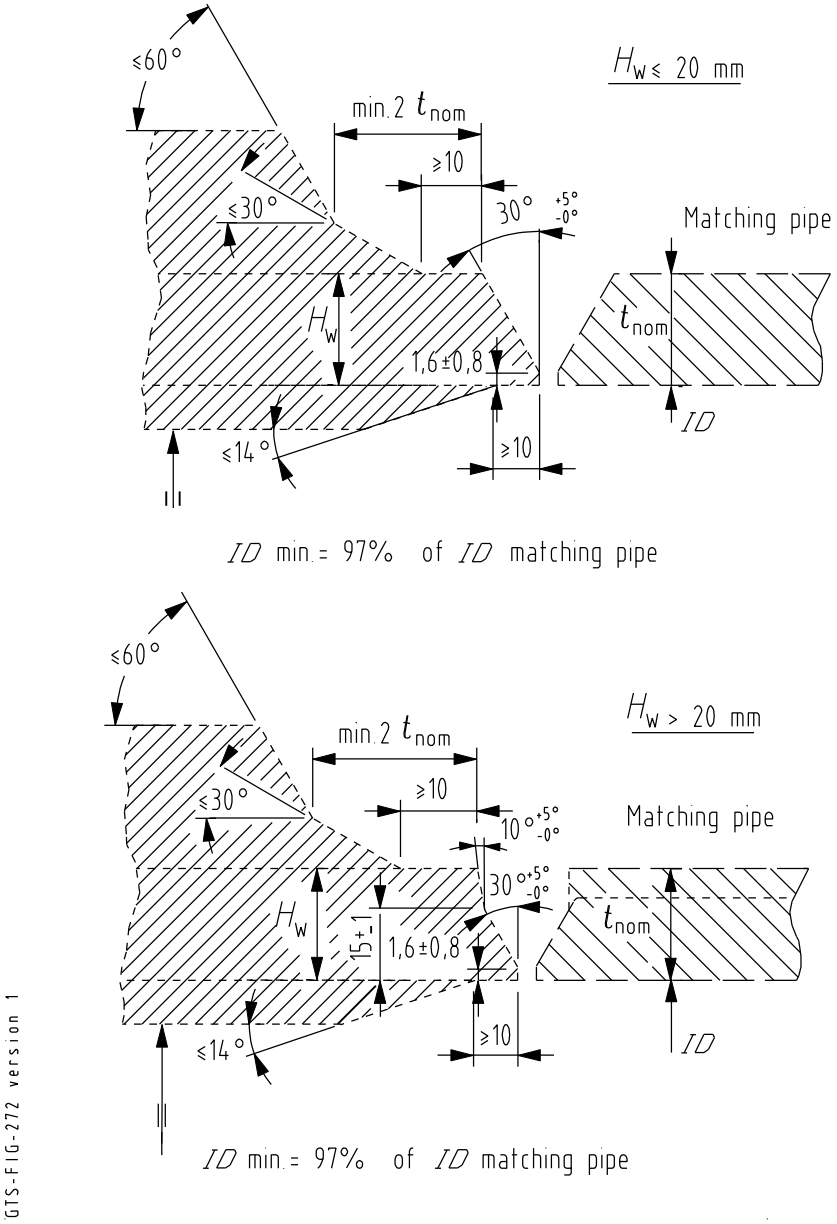


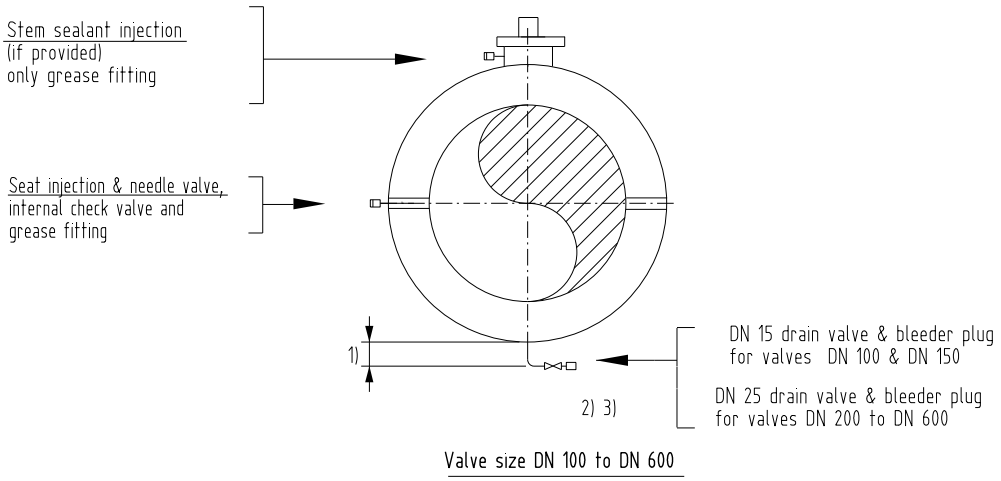
Figure 2: Valves of DN 450 to DN 1 200

Note: For sizing for H_w: see section *5.3.2.3*.

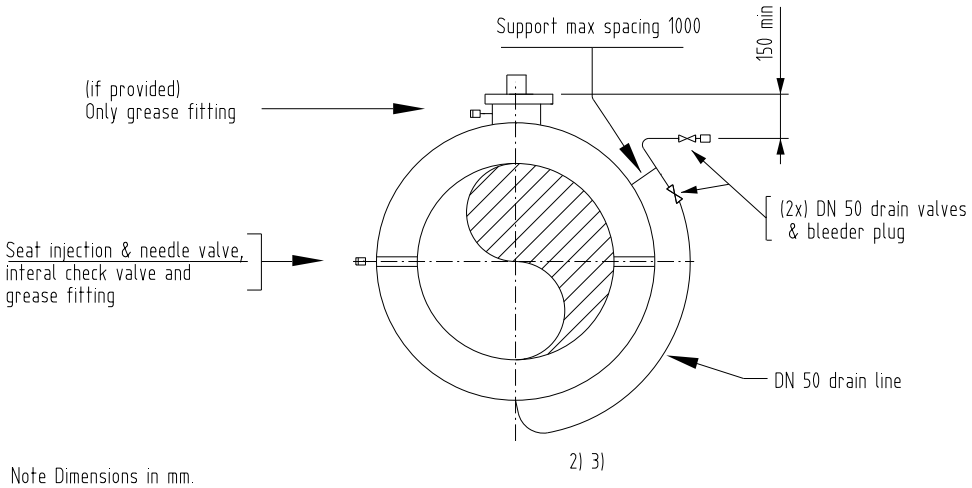
Table 4: Dimensions of matching Gasunie pipe

VALVE SIZE DN	INTERNAL DIAMETER *ID* in mm		WALL THICKNESS t_{nom} in mm	
	DESIGN PRESSURE (bar (e))			
	66,2	80	66,2	80
450	443,0	440,4	7,0	8,3
500	492,4	489,6	7,8	9,2
600	591,4	587,8	9,3	11,1
750	738,8	734,4	11,6	13,8
900	886,2	881,2	13,9	16,4
1 050	1 034,8	1 028,8	16,1	19,1
1 200	1 182,4	1 175,6	18,3	21,7

B DRAIN AND SEALANT PROVISIONS FOR BALL VALVES



Valve size DN 100 to DN 600



Note Dimensions in mm.

Valve size DN 750 to DN 1 200

Notes:

1) This dimension to be as small as possible.
2) The bleeding medium shall be discharged horizontally or at an upward angle.
3) The drain valve shall be welded to the drain line. In case of a second drain valve (for valve size DN 750 to DN 1200), this valve shall be mounted by a thread connection.

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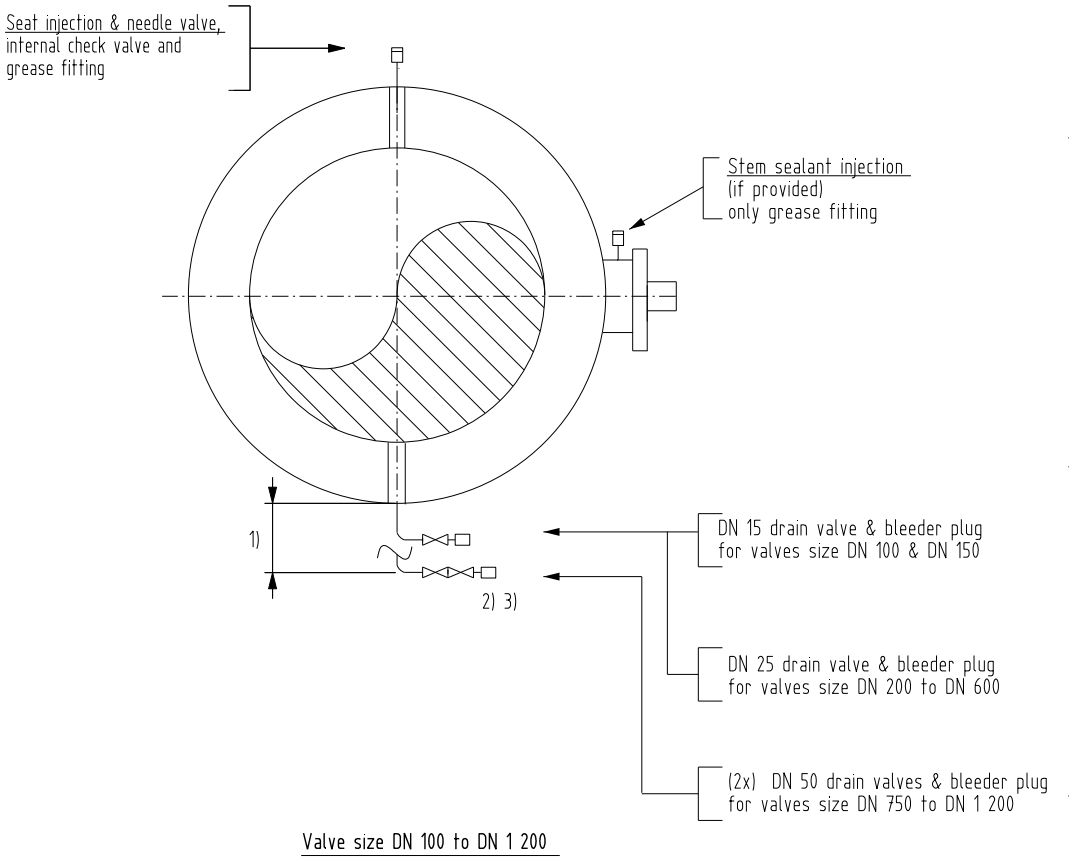
Figure 3: Aboveground installation, vertical stem



GTS-FIG-169 version 6

Notes:

1) This dimension to be as small as possible.
2) The bleeding medium shall be discharged horizontally or at an upward angle.
3) The drain valve shall be welded to the drain line. In case of a second drain valve (for valve size DN 750 to DN 1200), this valve shall be mounted by a thread connection.

Figure 4: Aboveground installation, horizontal stem

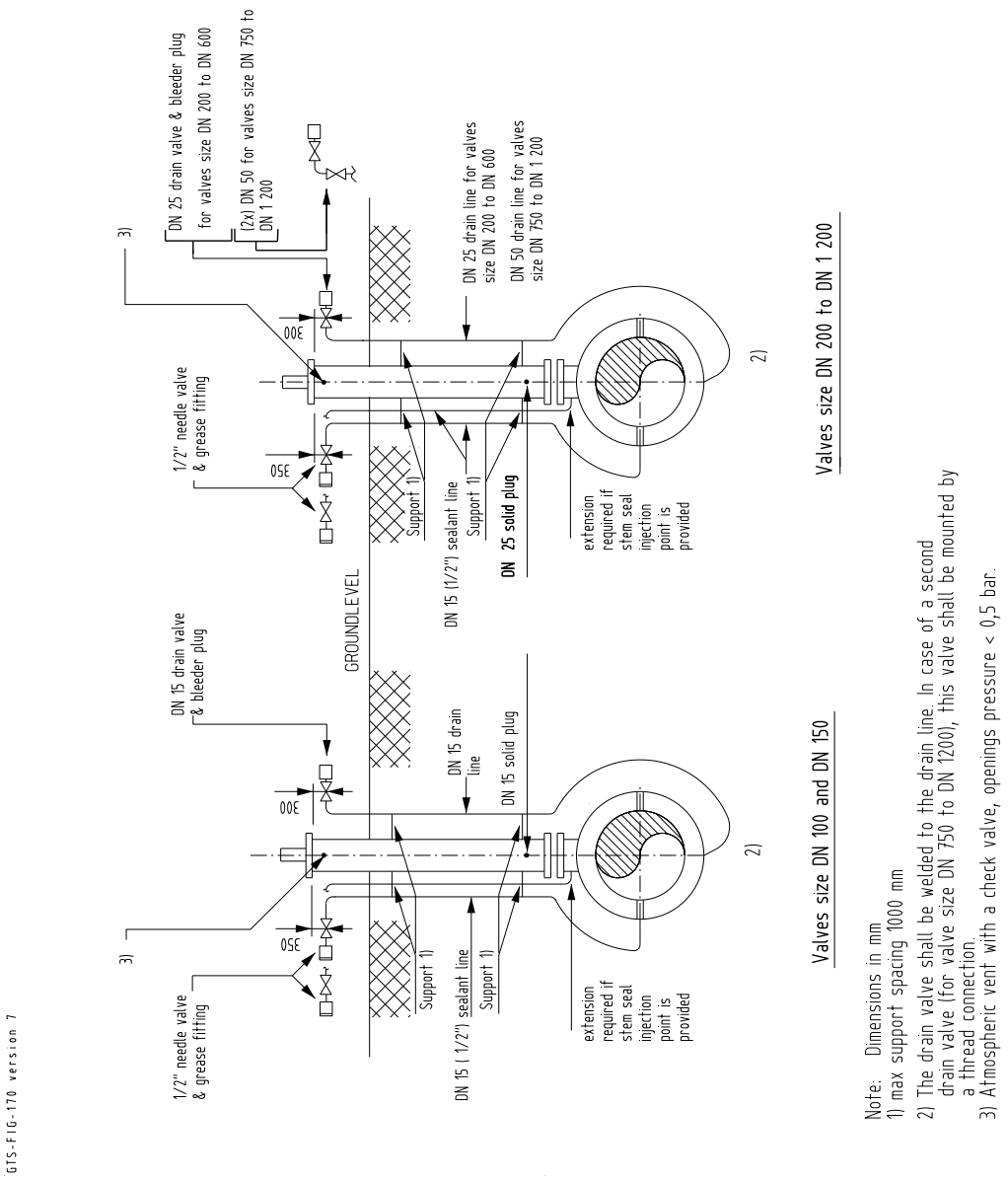


Figure 5: Underground installation, aboveground operation

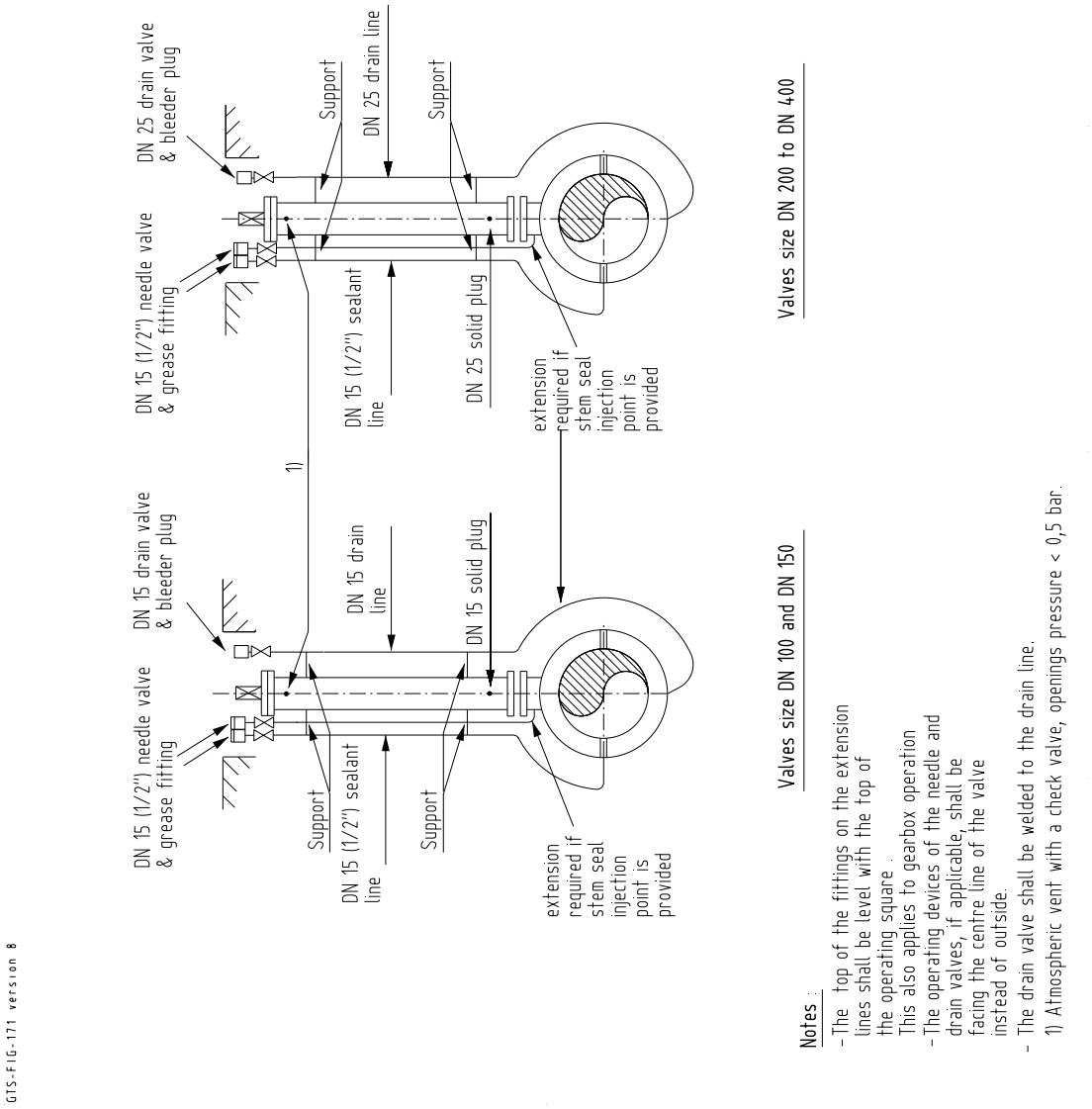


Figure 6: Underground installation, surface box operation

C VENT AND SEALANT PROVISIONS FOR PLUG VALVES

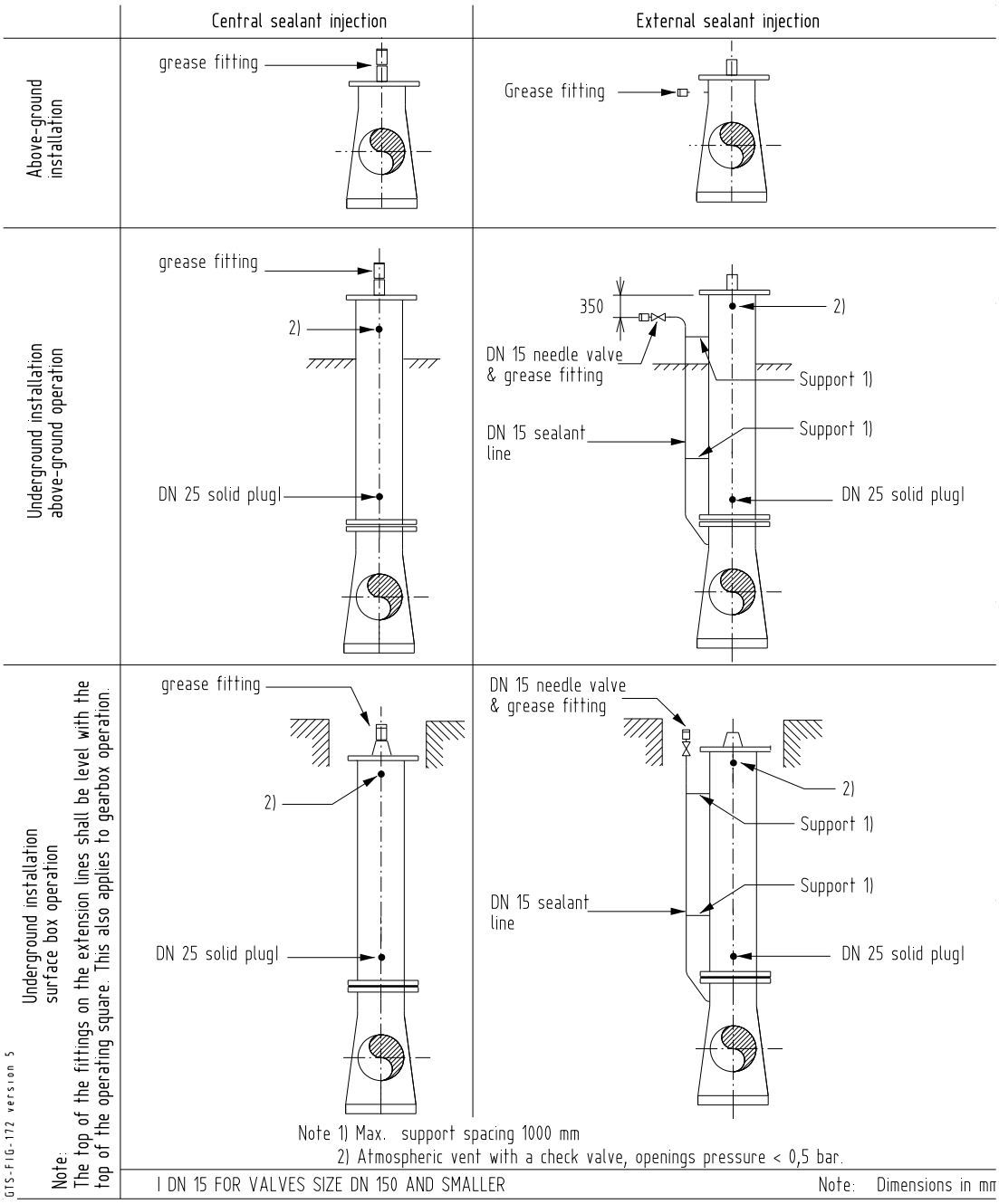


Figure 7: Vent and sealant provisions for plug valves

D TRANSITION WELDS SEALANT LINES

(Only applicable for ball and plug valves)

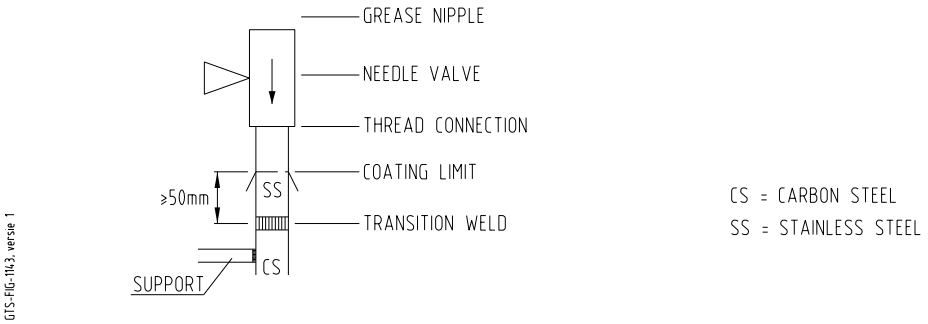


Figure 8: Surface box configuration

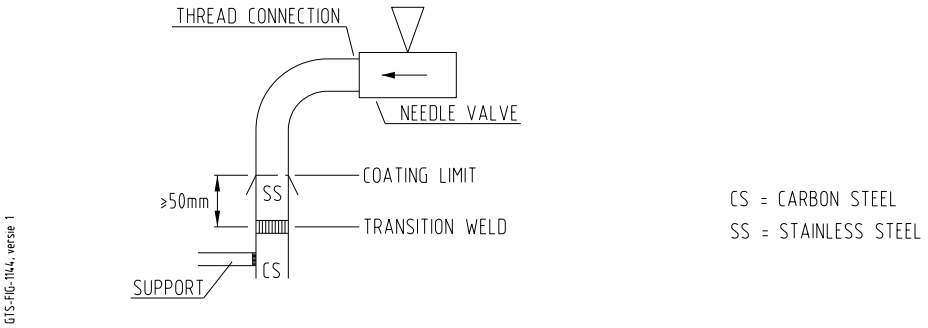


Figure 9: Aboveground configuration

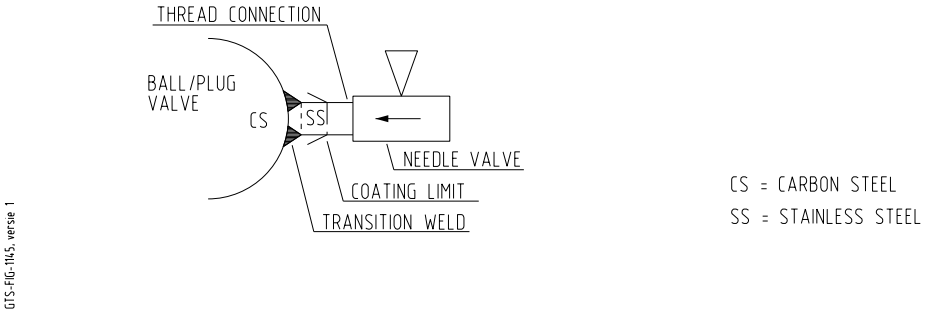


Figure 10: Aboveground configuration without sealant lines

E LIST OF STANDARDISED AUXILIARIES USED BY GASUNIE

Table 5: List of standardised auxiliaries by Gasunie if manufacturer's standards are not accepted by client

ITEM No.	DESCRIPTION	TYPE	MAKE	GASUNIE ARTICLE No.
1.0	**Valves for sealant provisions**			
1.1	Internal check valve, size ¼"-18 NPT, material AISI 316	Flow Wolf D-FW-IC 1/4-SS / D-FWT-IC-1/4-SS Threaded cage design	Sealweld/ Téchne	7650183 7650184
1.2	Needle valve, size ½", pressure rating 10 000 psi, NPT female ends, material AISI 316	S10NF88S	Imperial	1527062
1.3	Needle valve, size ½", pressure rating 10 000 psi, NPT female / male ends, material AISI 316	S10NFM88S	Imperial	1527063
2.0	**Valves for drain provision**			
2.1	DN 15 WE / ½" NPT female	HKSF-W	RMA Valves (D)	1306200
2.2	DN 25 WE / ¾" NPT female			1306201
2.3	DN 50 2" NPT female			1306602
2.4	DN 50 WE/WE			1306102
3.0	**Bleeder plugs**: material AISI 316			
3.1	Size DN 15, pressure rating 10 000 psi, NPT	5-2051	Merwede	1136634
3.2	Size DN 20, pressure rating 6 000 psi, NPT	5-2052		1136636
3.3	Size DN 25, pressure rating 6 000 psi, NPT	5-2053		1136638
3.4	Size DN 50, pressure rating 3 000 psi, NPT	5-2059		1136640
4.0	**Sealant injection fitting**			
4.1	Giant button head, with head diameter of 22 mm and ½" NPT male thread	Flow Wolf FW-1/2-BH-SS / FWT-1/2-BH-SS-CRN Threaded cage design	Sealweld / Téchne	7650182 7650181
5.0	**Lubricant medium**			
5.1	"ball valves"	Equa-lube eighty	Sealweld	
6.0	**Sealant medium**			
6.1	"plug valves"	VAL-TEX 80	VAL-TEX	

F STEM EXTENSION HEIGHT, SURFACE BOX OPENINGS AND OPERATING SQUARE

(Only applicable for ball and plug valves)

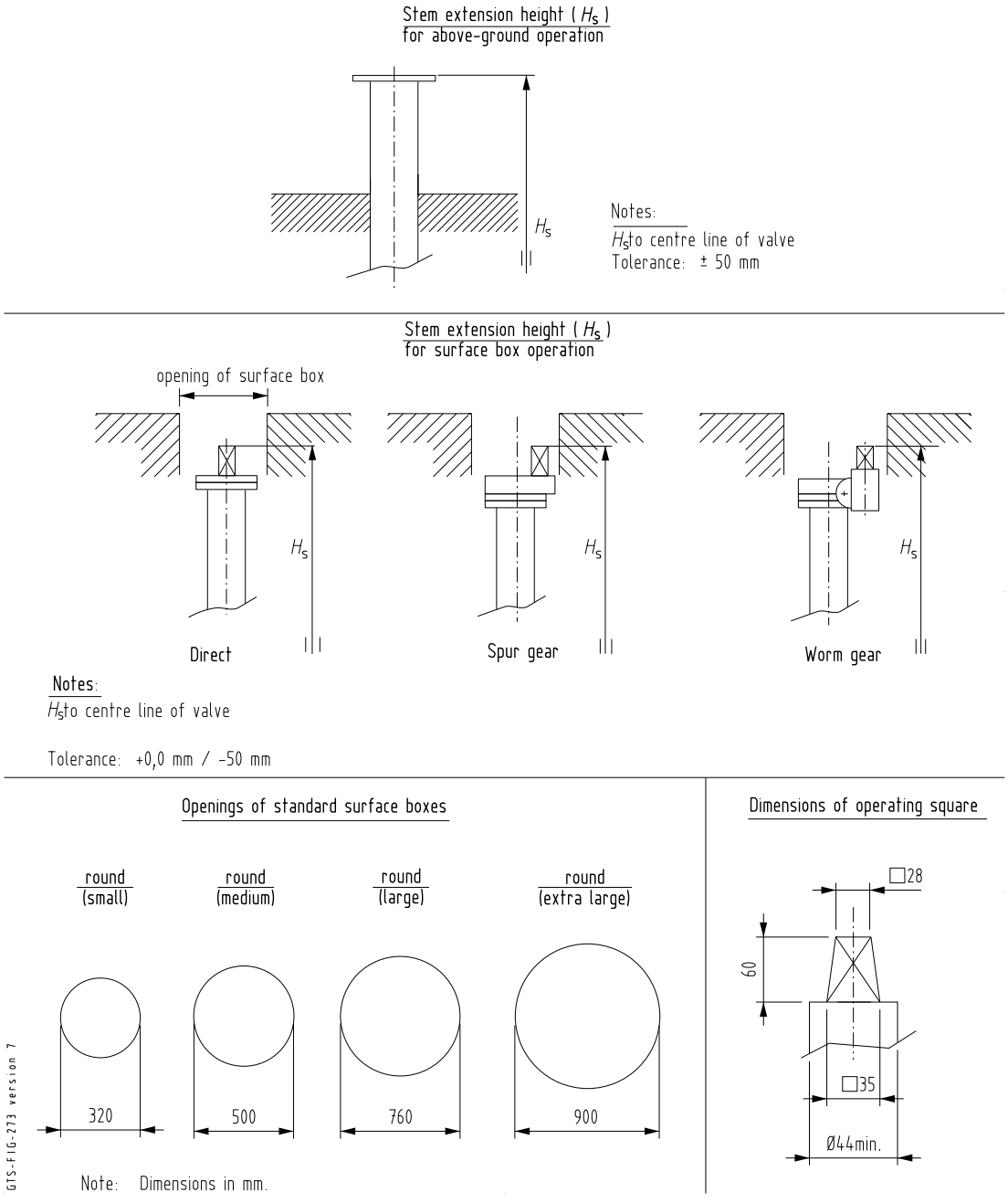


Figure 11: Stem extension height, surface box openings and operating square

G K_v VALUES FOR PLUG VALVES

The minimum K_v value of plug valves, expressed by the formula $K_v = 0{,}0318 \cdot OD^2$, shall be in accordance with table 6. In this equation *OD* equals the outside diameter of the matching pipe in mm.

Table 6: Minimum required K_v values for plug valves

Valve size DN	Minimum K_v value (m^3/h)
50	116
80	252
100	416
150	901
200	1 528
250	2 375
300	3 340
400	5 229

H CLOSE-FITTING BOLTS AND DOWEL PINS

- If manufacturer's standards are not accepted by client;
- Only applicable for ball and plug valves.

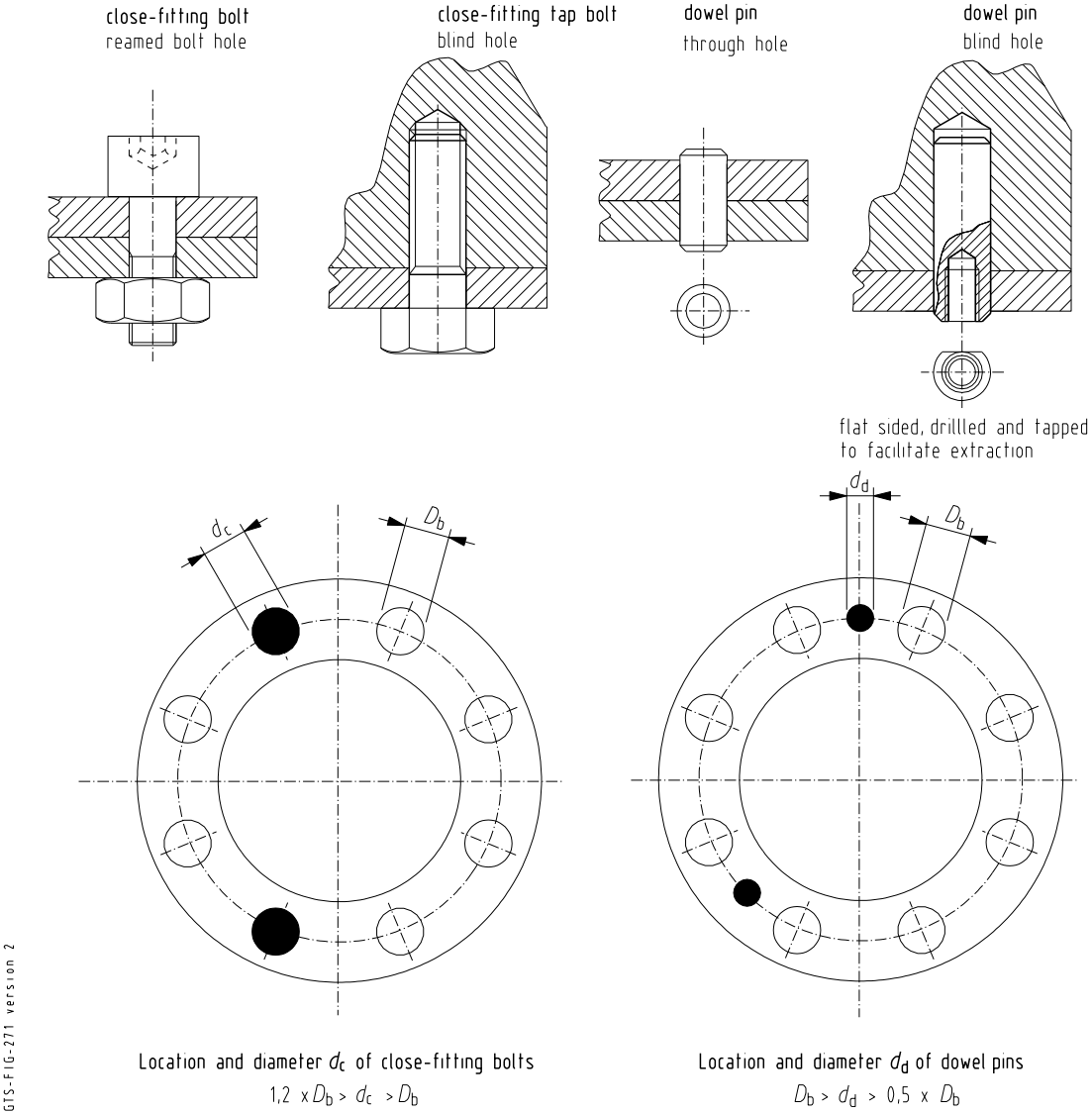


Figure 12: Close-fitting bolts and dowel pins

Notes:

1 Close-fitting bolts or dowel pins shall be used in the flange connections between:
   - valve and gearbox or actuator;
   - valve and stem extension casing;
   - stem extension casing and gearbox or actuator.

2 Two close-fitting bolts or dowel pins shall be required for each connection. They shall be made of mild steel, case-hardened, and accurately ground to a fit of H7k6.

I IMPACT TEST REQUIREMENTS

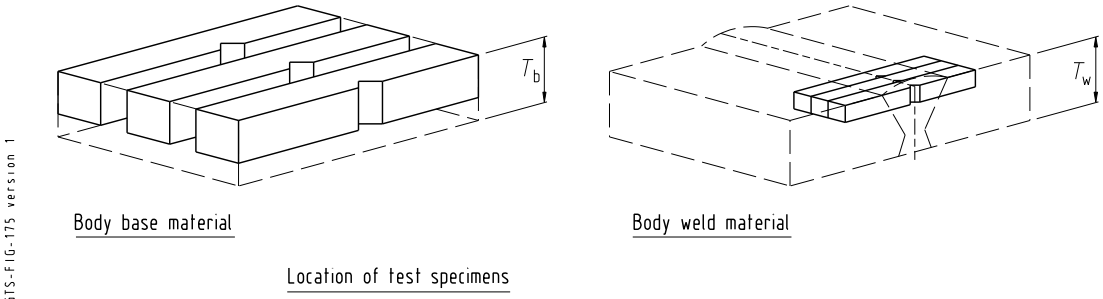


Figure 13: Test specimens for impact test

Impact testing shall be carried out as follows:

1 Valves with body welds which are not heat-treated shall be impact-tested in accordance with table 7.
The determining wall thickness *T* shall be derived as follows:
- Valves with welding ends or welding end/flanged end:
T is equal to the body weld thickness T_w or H_w whichever is the greater (see annex A of this specification MSW-03-E/1).
- Valves with flanged ends:
T is equal to the body weld thickness T_w.

2 Valves with heat-treated body welds or no body welds shall be impact-tested as follows:
- Valves with welding ends or welding end/flanged end:
Testing in accordance with table 7, *T* is equal to H_w (see annex A of this specification MSW-03-E/1).
- Valves with flanged ends:
Impact test in accordance with table 7, *T* is equal to T_b.

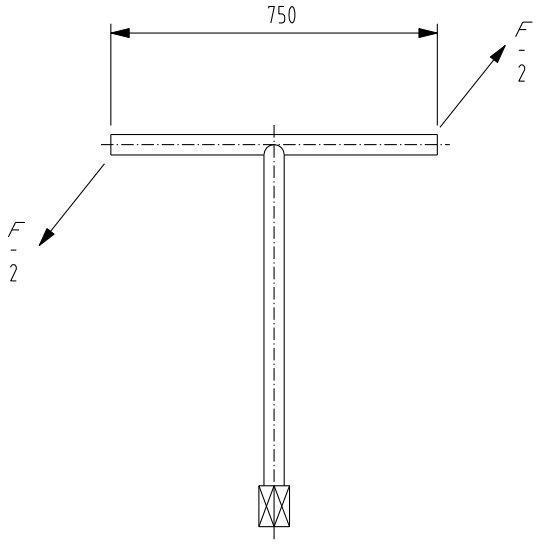
3 Central housing of split-body valves:
- No welds or heat-treated welds:
Impact test in accordance with table 7, *T* is equal to T_b.
- Welds without heat treatment:
Impact test in accordance with table 7, *T* is equal to T_w.

Table 7: Impact test temperatures versus wall thickness for base and weld material

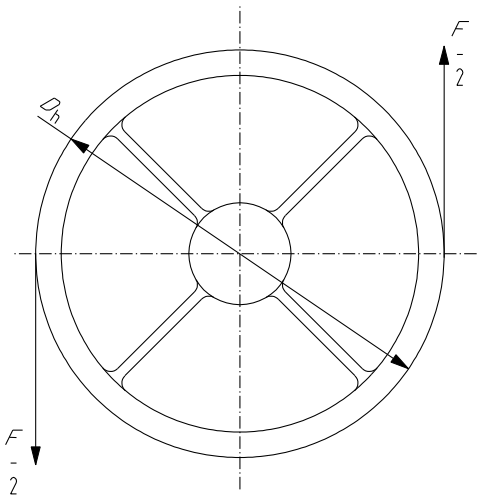
T (mm)	Impact test temperature (°C)	Re < 360 N/mm² Charpy-V impact values (J)		Re ≥ 360 N/mm² Charpy-V impact values (J)	
		average of three specimens	minimum of one specimen	average of three specimens	minimum of one specimen
$T \leq 13$	0	27	20	40	30
$13 < T \leq 18$	-10				
$18 < T \leq 22$	-20			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

J ACTUATING FORCE FOR HANDWHEEL-OPERATED AND WRENCH-OPERATED VALVES

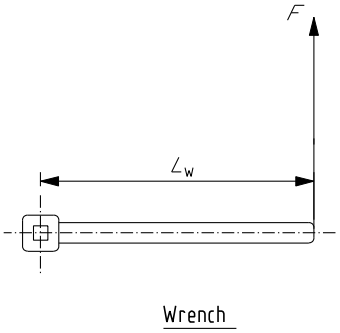
(not applicable for check valves)



Gasunie standard T-Wrench
for surface box operation



Handwheel



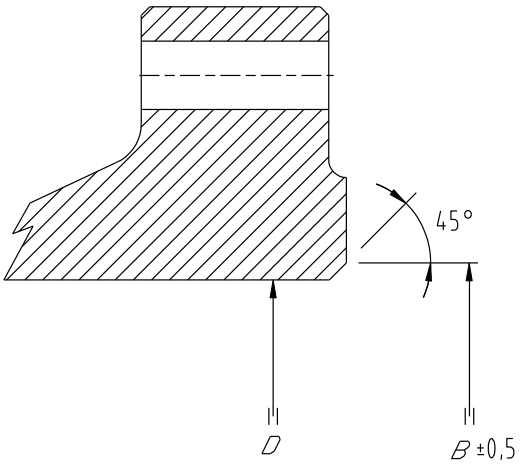
Wrench

Note: Dimensions in mm.

GTS-FIG-167 version 1

Figure 14: Actuating force for hand wheel-operated and wrench-operated valves

K FLANGE END BORE



GTS-FIG-174 version 1

D = Valve flange bore
B = Gasunie flange end diameter

Note: Dimensions in mm.

Figure 15: Flange end bore

Table 8: Bore dimensions

VALVE SIZE DN	DIMENSIONS *B* in mm			
	ANSI 150	ANSI 300	ANSI 600	
	19 bar (e)	40 bar (e)	66,2 bar (e)	80 bar (e)
50	49,3	49,3	49,3	49,3
80	77,9	77,9	77,9	77,9
100	102,3	102,3	102,3	102,3
150	155,7	155,7	155,7	155,7
200	206,5	206,5	203,3	203,3
250	260,5	260,5	254,5	254,5
300	309,7	309,7	301,9	301,9
400	389,0	389,0	378,0	378,0
450	-	-	437,2	433,6
500	-	-	486,0	482,0
600	-	-	583,7	578,8
750	-	-	738,8	734,4
900	-	-	886,2	881,2
1 050	-	-	1 034,8	1 028,8
1 200	-	-	1 182,4	1 175,6

Notes:
If $D < B$: Bevelling to dimension *B* is required.
If $D \geq B$: Bevelling is not required.

L DETAILS OF SEAT SEALANT INJECTION CONNECTION FOR UNDERGROUND VALVES

(not applicable for check valves)

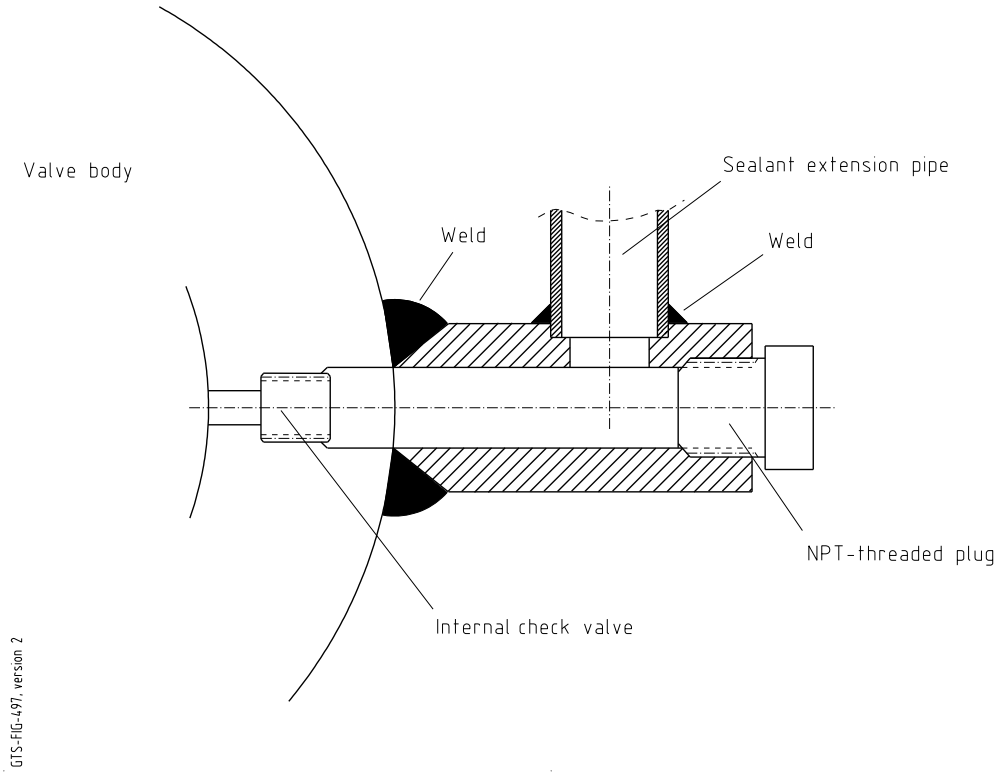


Figure 16: Details of seat sealant injection connection for underground valves