Material Specification Mechanical

Ball, axial piston, check valves UHS Zuidwending

Zuidwending H2

S.003843-LF-A435-013

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FOREWORD

This specification relates to project S.003843, UHS Zuidwending.

Within UHS Zuidwending, the primary medium is hydrogen, which is operated at pressures and temperatures, which deviate from the standard values in the OSW-01. Furthermore, within UHS Zuidwending, a different material has been selected as prime pipe material. The result is that the standard material specifications mechanical are not fully applicable and therefore, this specification is written. Within UHS Zuidwending, material specifications relate to norms and standards which are harmonized with Directive 2014/68/EU (PED), where possible.

This specification is to be read in conjunction with NEN-EN 1983 (for Ball Valves) NEN-EN 1349 (for Axial Control valves) and NEN-EN 16767 (for Check Valves)

CONTENTS

1 SCOPE AND APPLICATION

This specification contains the requirements for carbon steel ball, axial piston and check valves, ANSI class 600 and 1500 for use in the hydrogen gas systems with the following design criteria:

- nominal diameter : 25 ≤ DN ≤ 600;
- design pressure : 0 bar (e) < pd ≤ from 80 to 220 bar (e) (depending on the pipe class);
- design temperature : -20 °C < Td ≤ +80°C or +160 °C (depending on the pipe class);
- medium: hydrogen gas

This specification is applicable for valves specified in the following pipe classes:

Piping class	**Medium**	**Line Size DN**	**Design pressure [barg]**	**Design temperature [°C]**	**Flange rating**
80CS05	Hydrogen	25 - 700	-1 / +80	-20 / +80	600#
90CS01	Hydrogen	25 - 500	-1 / +90	-20 / +80	600#
140CS01	Hydrogen	25 - 300	-1 / +140	-20 / +160	1500#
220CS01	Hydrogen	25 - 500	-1 / +220	-20 / +80	1500#
220CS03	Hydrogen	25 - 300	-1 / +220	-20 / +160	1500#

As defined in the Piping material specification S.003843-LF-A435-001, related to UHS Zuidwending.

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2 REFERENCES

This specification is subject to the requirements of the documents mentioned in this section. If the documents in this specification are mentioned with a date, this specific edition is applicable.

2.1 Gasunie specifications

Reference is made in this specification to the following Gasunie documents:

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

Additionally, reference is made to the following project specific documentation:

S.003843-LF-A435-001	Piping material specification
S.003843-LF-A435-008	Welding and NDE of Shop and Field fabricated metallic piping
S.003843-LF-A435-011	Pipe material UHS Zuidwending
S.003843-LF-A435-014	Control valves UHS Zuidwending
S.003843-LF-A435-016	Fittings UHS Zuidwending
S.003843-LF-A435-017	Flanges UHS Zuidwending

2.2 Standards

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

NEN-EN 1759-1	Flanges and their joint - Circular flanges for pipes, valves, fitting s and accessories, Class designated - Part 1: Steel flanges, NPS 1/2 to 24
NEN-EN 10028-3	Flat products made of steels for pressure purposes – Part 3: Wieldable fine grain steels, normalized.
NEN-EN 12516-1	Industrial valves - Shell design strength - Part 1: Tabulation method for steel valve shells
NEN-EN-ISO 3834-2	Quality requirements for fusion welding of metallic materials; Part 2: Comprehensive quality requirements.
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 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 8501-3	Preparation of steel substrates before application of paints and related products - Visual assessment of surface cleanliness - Part 3: Preparation grades of welds, cut edges and other areas with surface imperfections.
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.
NEN-EN-ISO 6892-1	Metallic materials – Tensile testing – Part 1: Method of test at room temperature.
NEN-EN 12266-1	Industrial valves - Testing of metallic valves; Part 1: Pressure tests, test procedures and acceptance criteria - Mandatory requirements.
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 of welds – Penetrant testing – Part 1: General principles
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 558	Industrial valves - Face-to-face and centre-to-face dimensions of metal valves for use in flanged pipe systems - PN and Class designated valves
NEN-EN 1349	Industrial process control valves
NEN-EN 1369:2012	Founding - Magnetic particle testing
NEN-EN 1983	Industrial valves – steel ball valves
NEN-EN 10216	Seamless steel tubes for pressure purposes
NEN-EN 10228	Non-destructive testing of steel forgings
NEN-EN 12982	Industrial valves - End-to-end and centre-to-end dimensions for butt welding end valves
NEN-EN 13480	Metallic industrial piping
NEN-EN 16767	Industrial valves – steel check valves
NEN-EN 13942	Petroleum and natural gas industries - Pipeline transportation systems - Pipeline valves
NEN-EN-ISO 10497	Testing of valves - Fire type-testing requirements
NEN-EN-ISO 14731	Welding coordination - Tasks and responsibilities
NEN-EN-ISO 17663	Welding - Quality requirements for heat treatment in connection with welding and allied processes
NEN-EN-ISO 80079-36	Non-electrical equipment for explosive atmospheres - Basic method and requirements
NEN-EN-IEC 60529	Degrees of protection provided by enclosures (IP Code)

2.3 European Directive

Reference is made in this specification to the directive mentioned in this sub clause.

2014/68/EU Directive 2014/68/EU of the European Parliament and of the Council of 15 May 2014 on the harmonization of the laws of the Member States relating to the making available on the market of pressure equipment (PED).

2014/34/EU Directive 2014/34/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres (recast) (ATEX 114).

3 DEFINITIONS, ABBREVIATIONS AND SYMBOLS

3.1 Definitions

In this specification, the following definitions are 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 (axial piston) valve, commonly expressed by the Kv-factor. Kv of a (axial piston) valve The quantity of water in m3/h, at a temperature between 5 °C and 40 °C that will flow through the valve with a pressure drop of 1 bar.
Prescribed validation	Validation prescribed by the Client in accordance with which the Service provider can only continue the work, on the relevant subject, following formal "acceptance" by the Client.
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 lubrication provisions. Balls, stems and piston 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.
Rapid Gas Decompression or Explosive Decompression	Rapid pressure-drop in a high pressure gas-containing system which disrupts the equilibrium between external gas pressure and the concentration of gas dissolved inside any polymer, with the result that excess gas tries to escape from the solution at points throughout the material causing expansion.
Service provider	The party with whom the contract is or will be concluded.
Transport medium	A gaseous or liquefied substance that is transported by and/or stored in a Gasunie transport network; limited to: – natural gas; – hydrogen gas; – carbon dioxide; – nitrogen; – (hot) water; – ammonia.
Validation	The alignment of expectations demonstrating that the intended purpose will be achieved within the defined set of requirements with the process and/or product in question.

3.2 Abbreviations

In this specification, the following abbreviations are applicable:

ASME	American Society of Mechanical Engineers
BAT	Break Away Torque
EWF	European Welding Federation
FE	Flanged end
IIW	International Institute of Welding
ITP	Inspection and Test Plan
MAST	Maximum Allowable Stem Torque
MPI	Magnetic particle inspection
MT	Magnetic Testing
NDT	Non-destructive testing
RED	Required engineering documents
QT	Quenched and Tempered
RT	Radiographic testing
UI	User Inspectorate
UT	Ultrasonic Testing
VT	Visual Testing
WE	Welding End
WPQ	Welding Procedure Qualification
WPAR	Welding Procedure Approval Records
WPQR	Welder's Performance Qualification Records
WPS	Welding Procedure Specifications

3.3 Symbols

In this specification, the following symbols are applicable:

Symbol	Description	Unit
a	Round off radius	mm
A_f	Elongation	%
D_{max}	Maximum external diameter of matching pipe	mm
D_{min}	Minimum external diameter of matching pipe	mm
$H_{coupling}$	Wall thickness of coupling	mm
H_{max}	Maximum wall thickness of coupling	mm
H_{min}	Minimum wall thickness of coupling	mm
ID	Internal diameter of matching pipe ebonite coated flange	mm
$ID_{coupling}$	Internal diameter of matching pipe insulating coupling	mm
ID_{min}	Minimum internal diameter of matching pipe ebonite coated flange	mm
L	Length of coated flange	mm
$L_{coupling}$	Length of insulating coupling	mm
P_{calc}	Calculation pressure	MPa
$P_{d,IC}$	Design pressure of insulating coupling	MPa
P_d	Design pressure of system	MPa
P_{test}	Test pressure	MPa
r	Radius	mm
$R_{e(c)}$	Specified minimum yield strength of coupling welding-end material	N/mm^2
$R_{e(p)}$	Specified minimum yield strength of material of matching pipe	N/mm^2
R_m	Tensile strength	MPa
$R_{t0,5}$	Yield strength for 0,5 % total strain	MPa
t	Wall thickness of steel ring	mm
t_{nom}	Nominal wall thickness of matching pipe (t1)	mm
T_d	Design temperature	°C
U	Out of roundness	%

4 GENERAL REQUIREMENTS

4.1 Directive

Valves shall comply with the Pressure Equipment Directive (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.

4.2 Medium composition (Hydrogen)

The hydrogen gas quality applicable for this specification is given in the table below.

Components	Unit	Value
Hydrogen (H_2)	mol/mol	≥ 0,98
Total sum of hydrocarbons including CH_4 (C_XH_Y)	mol/mol	≤ 0,015
Oxygen (O_2)	µmol/mol (ppm)	≤ 10
Total sum of inert gasses (N_2, He, Ar)	mol/mol	≤ 0,02
Carbon dioxide (CO_2)	µmol/mol (ppm)	≤ 20
Carbon monoxide (CO)	µmol/mol (ppm)	≤ 20
Total Sulphur including H_2S (S)	µmol/mol (ppm)	≤ 3
Formic acid (CH_3OOH)	µmol/mol (ppm)	≤ 10
Formaldehyde (CH_2O)	µmol/mol (ppm)	≤ 10
Ammonia (NH_3)	µmol/mol (ppm)	≤ 10
Halogenated components	µmol/mol (ppm)	≤ 0,05
Water dew point (H_2O)	ºC @ 70 bara	≤ -8
Carbon dewpoint	°C @ 1-70 bara	≤ -2
Wobbe-index	$MJ/m^3(n)$	44,85 - 48,35
Other impurities	Shall not contain solid, liquid or gaseous material that might interfere with the integrity or operation of pipes or any gas appliance	

4.3 Materials

Valves body, closures and pup pieces shall be made of unalloyed carbon steel P355NH or P355NL1. Valves shall not be made of cast iron, nodular or otherwise. Other materials shall be susceptible to the approval of Gasunie. Materials shall comply with EN-10028-3 with maximum yield strength of 360 MPa. Steels with a hardness above 225HV10, applicable for base material, HAZ- and weld area are susceptible to fatigue crack growth in hydrogen gas applications. Post welding heat treatment shall be performed on all welds to lower the hardness to 225HV10, this shall be performed in accordance with 4.7.6.

The minimum elongation of the base and weld materials shall be at least 20%.

Flanges of nominal size DN 600 and smaller shall comply with S.003843-LF-A435-017.

For all flanges the following requirement is applicable:
The preparation grade of the complete part before coating shall be P3 in accordance with NEN-EN-ISO 8501-3. Bolt holes shall be prepared on both sides.

Flange bore shall be in accordance with annex L of this specification. For pressure class 600, flanges shall have a raised face. For pressure class 1500, flanges shall have a RTJ flange.

Raised face (RF) flange facings shall have a resultant surface finish Ra = 3,2 µm – 6,3 µm in accordance with ASME B16.5.
Ring joint (RTJ): the side wall surface of the gasket groove shall not exceed 1,6μm roughness. (as per requirement in ASME B16.5 section 6.4.5)

Non-metallic parts of valves shall be resistant to explosive decompression.

The valve manufacturer shall demonstrate to Client that the seal material is compatible with the mixture of natural gas with hydrogen up to 100 % hydrogen gas and the composition as defined in section 4.2 to which it is exposed according to the design conditions.

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 with diameter M39 (1½") until and including M65 (2 ½") shall comply with ASTM A320M Grade L7.Nuts shall comply with ASTM A 194Ma 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.

4.4 Fatigue

A fatigue assessment shall be performed on valves as per EN 13445-3 section 18 in which the vendor shall prove through a fatigue test or calculations that the valve is suitable for 260.000 cycles according to Table 1.

The allowed cycles per year per pressure fluctuation shall be calculated following the equations 18.10-17 till 18.10-20 of the EN 13445-3, and taking into account all correction factors of section 18. From the allowed pressure cycles, a "damage per pressure cycle" shall be stated by VENDOR. This "damage per cycle" is required to measure the accumulated damage over the operational life during operation (using the "reservoir cycle counting method" described in section 18.9.3).

Table 1: Cyclic Fatigue

Piping class/section	Design pressure (barg)	Design temperature (°C)	Pressure fluctuation (barg)	Number of cycles (per day)	Number of cycles (in 60 years)
80CS05 (Low pressure manifold)	-1 / +80	-20 / +80	36	12	262800
90CS01 (TEG Train)	-1 / +90	-20 / +80	5	12	262800
140CS01 (Compressors discharge stage 1)	-1 / +140	-20 / +160	125	1	21900
			95	5	109500
			50	6	131400
220CS01 (High pressure manifold)	-1 / +220	-20 / +80	10	1	21900
220CS03 (Compressors discharge stage 2)	-1 / +220	-20 / +160	200	1	21900
			170	5	109500
			110	6	131400

- In order to calculate the allowable number of years, full continuous operation shall be assumed (daily cycles at design temperature in the table below, shall hold for 365 days per year).
- For equipment, the "allowable years" shall be at least 30 years, assuming inspection (at 50% of the accumulated damage) is possible by design.

4.5 Failure mode analysis

A failure mode analysis according API579-1 or BS7910 is required on all pressure vessels and their components that are subjected to repeated fluctuations of stress.
Vendor shall perform both a limit state analysis and a crack growth analysis to determine the minimum required wall thickness.

4.5.1 Limit state

This analysis shall be carried out in accordance with API579-1 or BS7910. According to these standards, a fracture mechanical analysis can be carried out where the minimum required wall thickness should be determined based on the parameters below:

Kmat	Fracture toughness	50	$[\boldsymbol{MPa}\cdot\sqrt{\boldsymbol{m}}]$
a	Depth of crack	$^1/_4 t$	$[mm]$
2c	Lenght of crack	$6\cdot a$	$[mm]$
t	Wall thickness	Variable	$[mm]$

The following parameters shall be included in this calculation:
- Design pressure of the component
- Residual stresses if applicable
- Dimensional tolerances affecting the component under assessment.

4.5.2 Fatigue crack growth

Fatigue is a relevant failure mechanism and therefore hydrogen-induced crack growth should be assessed.
To ensure timely detection of defects, a crack growth life of at least 12 years is used whereby the vessel can be inspected every 4 years. 0-measurement in new constructions will serve as a reference for any small embedded weld defects.
The crack growth analysis should be performed using the curve from B31.12:

$$\frac{da}{dN} = C_1 \cdot \Delta K_I^{m_1} + C_2 \cdot \Delta K_I^{m_2} + C_3 \cdot \Delta K_I^{m_3}$$

The calculation should be performed with an assumed defect of a=3 mm and 2c=50 mm.

4.6 Certification

Materials for pressure-containing and pressure-retaining parts shall be certified in accordance with MSA-32-E.

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

4.7 Welding

4.7.1 Longitudinal welding

Longitudinal welds have the lowest preference and the use of it shall be avoided as far as possible, areas where longitudinal welds are used should be indicated and reasoning behind the need supplied to the customer.
Post welding heat treatment shall be performed on all welds to lower the hardness to 225HV10 as per 4.7.6.

4.7.2 Organization

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

4.7.3 Welding personnel

Welders of welds to and on 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 recognized third party organization for permanent joining.

4.7.4 Welding documentation

The following documents shall be prepared for welds to or joining pressure-containing parts and welds on parts which are subject to mechanical loading (for example supports and lifting lugs) and submitted to Client for validation:
– 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 recognized third party organization for permanent joining.

4.7.5 Production welding

During welding, the applicable WPS as per sub clause 4.7.4 of this specification shall be available to the welder at the location where welding is performed.

Welds to and on pressure-containing parts or subject to mechanical loading shall be made by welders qualified as per sub clause 4.7.3 of this specification.

4.7.6 Post-weld heat treatment

All welding shall be completed prior to post-weld heat treatment. No welding, hammering or deformation is permitted after post-weld heat treatment.

Post welding heat treatment shall be performed on all welds to lower the hardness to 225HV10.

PWHT shall be in accordance with the requirements of the selected pressure piping design code and the applicable material specification(s) and standards EN ISO 17663.

Post weld heat treatment of the body weld is required when possible. In case post weld heat treatment on the body weld is not possible, the pup pieces or flanges shall be welded to the valve body on a disassembled valve body and the welding joints will be post-weld heat treated before assembly of the body.

4.7.7 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.

4.7.8 Supports

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

4.7.9 Weld repair

Weld repair of forgings is only permitted after approval from Client.

4.8 Pup joints

For welds of fittings, appendages and piping equal to or above DN100, Post Weld Heat Treatment (PWHT) shall be applied. This would introduce a lot of heat to the body and the seat of the valve. To prevent damage to the valve trim, valves with welded ends and a diameter equal to or larger than DN100 shall be provided with an additional pup joint.

The size of the pup joint / pup piece on either end of the valve shall be[1]:
DN100 to DN250: 300mm
DN300 and above: 500mm

The pup pieces shall be made of the same material as the matching pipe i.e. P355NH.
Pup joints shall not be applied for valves with flanged ends.

Detailed valve end dimensions can be found in annex C Valve FTF/ETE and WFE dimensions of this specification.

Materials and fabrication of pup joints shall comply with the pipe material specification S.003843-LF-A435-011.

Valves with welding ends – regardless of the application of pup joints – shall comply with the butt weld end specification as per Annex D Welding end detail of this specification.

Refer to chapter 4.7 for the welding procedure to follow for joining pup pieces to the valve body.

4.9 Welding ends

The manufacturer shall verify that the welding ends are in accordance with the internal pressure. The following applies for wall thickness of the welding ends (*H*w).
(see also Annex D Welding end detail of this specification).

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

R_{ep}: specified minimum yield strength of Gasunie matching pipe (P355NH or P355NL1);
R_{ev}: specified minimum yield strength of valve welding-end material at design temperature of 80 °C or 160°C (depending on the used pipe class) ;
t_{nom}: nominal: wall thickness of Gasunie matching pipe.

If equal materials are selected as specified in section 4.3. The minimum wall thickness shall be equal to the adjoining pipe wall thickness as per

For DN 50 ≤ DN 400: $H_{w,max}$ = 1,2 t_{nom}, see annex D Welding end detail
For DN 450 ≤ DN 1200: $H_{w,max}$ = 1,5 t_{nom}, see annex D Welding end detail.

Tolerance on dimension *H*w:
- ± 0,35 mm where *t*nom ≤ 10 mm;
- ± 0,5 mm where *t*nom > 10 mm;
- t_{nom} is nominal wall thickness of Gasunie matching pipe;
- Insidediameter at welding end: tolerance ± 1 mm;

[1] The governing formula used is 2,5 * sqrt(r*T) as per EN 13480-4

4.10 Out-of-roundness at welding end: true round. Drain, vent and lubrication lines

Drain, vent and lubrication lines shall be provided if specified and shall be extended by means of rigid pipework, if necessary. The lines shall be fastened to the valve and/
or extensions and terminate close to the stem extension top works, by agreement.

The sealing injection system is mandatory for seats and stem sealing for diameters ≥ DN 100.

Drain and vent lines shall:
1) have a design pressure not less than the rated pressure of the valve on which they are installed;
2) be capable of withstanding the hydrostatic shell test pressure of the valve;
3) be designed in accordance with a recognized design code;
4) be suitable for blow-down operation, where applicable.

Note:
The seal lines are for emergency use only. In normal use the valve is not lubricated by the seal lines.
Drain and vent connections on valves:
1) Shall be fitted with at least one isolating valve;
2) Connection to the valve body shall be welded;
3) Connection to the first valve shall be welded;
4) 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.

Instead of a wrench, a pressure rated protection cap shall be threaded to the top of the drain 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.

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.

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.

For configuration of extended drain, vent and lubrication lines reference is made to annex E Drain and lubrication provisions for ball valves and F Transition welds lubrication lines of this specification. Drain connections and extension lines for drain and lubrication 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 lubrication fitting.

The design pressure of drain fittings must be at least equal to the design pressure of the valve. . The body shall have a cylindrical form and shall be made of carbon steel material. The design options for the top-work shall either include an integral design for the wrench or consist of a head which fits on the stem and is designed to take an extended handle. The head design shall allow permanent attachment of the extended section. The maximum force required at the hand wheel

or wrench to apply the breakaway torque or thrust shall not exceed 360N. Wrenches of integral design (not loose) shall not be longer than twice the face-to-face or end-to-end dimension.

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

The design pressure of lubrication injection fittings shall be 10 000 psi (690 bar). The minimum wall thickness for drain lines shall be schedule 160 for DN15 and schedule 80 for ≥ DN 25 in accordance with ASME B 36.10M. Prior to assembly, the internal bores of lubrication lines shall be clean and free from rust and any foreign particles.

Each lubrication injection line
- shall be welded to the valve body;
- shall incorporate a check valve at the point of connection to the valve body;
- shall incorporate an isolating valve;
- shall terminate in a giant button head fitting ø 22 mm.

Prior to assembly the internal bores of lubrication lines shall be chemically or mechanically cleaned.

To avoid galvanic corrosion between lubrication line and needle valve, these shall be of the same material. Therefore the last part of the lubrication 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 F Transition welds lubrication lines of this specification.

Pipe size for lubrication 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 lubrication injection connection. Each lubrication point shall have its own extended lubrication line. The connection to the valve body shall be in accordance with annex E Drain and lubrication provisions for ball valves of this specification.

Auxiliaries for vent, drain and lubrication provisions shall require the approval of client. If manufacturer's standards are not accepted by Gasunie these auxiliaries shall be in accordance with annex G List of standardised auxiliaries used by Gasunie of this specification.

4.11 Other requirements

The valve stem sealing shall at least be a double barrier type design.

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, incase the valve and actuator are delivered separately to site. Note: Control systems are not part of the delivery.

Close fitting bolts and dowel pins shall be in accordance with annex I Close-fitting bolts and dowel pins, of this specification.

All connections between the valve, stem extension outer casing and actuatingdevice shall be water tight.

Double isolation and bleed

Ball valves for gas applications shall be double isolation and bleed, both seats bi-directional (DIB-1)

Each seat shall be tested in both directions as specified in section 4.20.

Abrasion test certificate

All ball valves shall be provided with an abrasion test certificate at quotation according the test requirements of Annex O Functional test for abrasion resistance to dirty service of ball valves.

4.12 Painting and shipping

4.12.1 Painting

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

Coating shall fulfill the anti-static requirements according to ISO 80079-36 for equipment group IIC and ATEX zone 2 that is sufficient for the application of the valve.

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

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

Factory coatings shall cover the weld joining the pup piece to the valve body, the rest of the pup piece shall not be coated but primed according to MSW-11

As indicated in MSW-11-E vent openings, gasket surfaces, greasing points, planes of moving parts, vent plugs, spindle squares, stainless steel parts, identification plates shall remain uncoated, shall not be blast cleaned.

4.12.2 Shipping

The following criteria for shipping are applicable:

- In case of ball valves, all lubrication extension lines and other connecting cavities shall be injected with a lubricant medium.
- Each valve shall be packed in accordance with MSA-25-E.
- The ball and axial piston valves shall be shipped in the fully open position in order to protect the sealing surfaces of the ball or piston.
- In case of valves with stem extensions on which the gearbox or actuators 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.

4.12.3 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) if applicable;
- make, type and size of the valve;
- ANSI pressure class;
- Gasunie operating pressure;
- date of manufacture;
- valve serial number(s);
- drawing number of the valve including revision number (validated by Client).
- A client approved drawing shall be included in the manufacturing report.

4.13 Lifting lugs

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 capableof 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.

The design of lifting lugs shall be in accordance with DIN 28086 or equivalentand shall be subject to validation by Client.

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

4.14 Inspection and Test plan (ITP)

The manufacturer shall draw up an ITP covering all verification activities andindicating all tests/inspections to be witnessed by Client or an authorised inspection agency. The ITP shall be validated 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 any standards referenced in this specification;
- 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 validation 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.

4.15 Tensile testing

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

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.

4.16 Destructive testing

This sub clause 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 the 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.

4.17 Non-destructive testing

Castings
All pressure containing castings shall be non-destructively tested.
All castings shall be 100 % visually inspected.
All valves shall be subject to 100 % surface examination on all accessible internal and external areas by magnetic particle technique in accordance with EN 1369:2012 or by penetrant testing in accordance with EN 3452-1.

For all cast valves DN ≥ 200 critical areas of the valve (for guidance location critical areas see NEN-EN 12516-1) shall be radiographic inspected in accordance with NEN-EN 12516-1, Annex D.

For wall thickness over 40 mm radiographic examination may be replaced by ultrasonic examination according NEN-EN 12516-1 Annex E.

Forgings

All forged valves shall be, before machining, subject to 100 % surface examination on all accessible internal and external areas 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.

Non-destructive testing personnel shall be qualified in accordance with EN ISO 9712:2012, level 2.

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 in accordance with 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.

All welds joining pressure containing parts shall be non-destructively tested according to the standards set in document S.003843-LZ-A435-008 sections 15 to 17.

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 NEN 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 validation 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'sworkshop and shall be retained by the manufacturer.

Pup piece weld testing

Non destructive testing of pup piece welds to valve bodies have to conform to the requirements of fabricated metallic pipe welding as set out in S.003843-LZ-A435-008 section 15 and annexure A.

4.18 Shell test

The valves shall be subjected to a shell tightness P10 and a shell strength test P11 in accordance with EN 12266-1:2012 section 4. The test applies also to the extended drain, vent and lubrication lines.

Minimum test duration shall be in accordance with Table 2 of this specification: Test Durations

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

Pressure versus time shall be recorded during all tests by an automaticrecording device.

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

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.

4.19 Impact testing

Impact testing on the shell material shall be performed in accordance with Annex J Impact test requirements.

4.20 Seat tightness

Seat tightness test P12 according EN 12266-1:2012 is mandatory for all valves.. Test duration shall be according to Table 2: Test Durations.

Cavity-relief valves shall be removed if fitted. The valve and cavity shall be filled with test liquid, with the valve half-open, until the test liquid overflows through the cavity relief connection.

To test for seat leakage in the direction of the cavity, the valve shall be closed. The test pressure shall be applied successively to each valve end to test each seat separately from the upstream side. Leakage shall be monitored via the valve cavity pressure relief connection.

Thereafter, each seat shall be tested as a downstream seat. Both ends of the valve shall be drained and the valve cavity filled with test liquid. Pressure shall then be applied whilst monitoring leakage through each seat at both ends of the valve. Some valve designs can require the balancing of the upstream and valve cavity pressure during the downstream seat test.
Acceptance criteria:
All valves shall meet the leakage rate A in accordance with EN-12266-1

A functional type test on clean service is mandatory for ball valves in accordance with Annex N Functional test on clean gas.

Impact testing shall be performed inaccordance with annex J of this specification.

4.21 External tightness/Fugitive emission

The used type of valves must be certified in accordance with NEN-EN-ISO 15848-1, tightness class BH, endurance class CO1

4.22 Final inspection

Each valve shall be inspected to assure conformity with the validated 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 lubrication provisions, dowel pins, identification plates and the like;
- Applicable approved drawing;
- Paint and coating quality (if applicable);
- Markings: in accordance with this specification;
- Shipping requirements: in accordance with this specification;
- Non-destructive testing reports if applicable;
- Destructive testing reports if applicable;
- Final testing report.

4.23 Documentation

VENDOR shall provide the documents as indicated in the RED in Annex A Requirements for Documents (RED). In addition, the VENDOR shall provide 3D models of the purchased items in accordance with Annex P 3D model requirement.

5 BALL VALVES: AMENDMENTS / SUPPLUMENTS TO NEN-EN 1983

5.1 General requirements ball valves

The following sections refers to the specific requirements for ball valves as per NEN-EN 1983. All ball valves will follow the requirements of this section 5. The requirements stated in section 4 of this specification are also applicable to the valves referred to in this section.

Additional requirements, which are not stated in NEN-EN 1983 are indicated with "addition" in the left margin.

Sections of NEN-EN 1983 which are not valid, are indicated with "deletion" in the left margin.

Requirements which are stated in NEN-EN 1983 that need to be replaced are indicated with "substitution" in the left margin.

Section numbers in italics correspond with section numbers of NEN-EN 1983.

Where contradicting statements are made between this document, and NEN-EN 1983, this document (S.003843-LF-A435-013) will be used as the correct statement.

5.2 Amendments/supplements to NEN-EN 1983

SECTION 4 REQUIREMENTS

Clause 4.1.1.1 Flow passage

Addition Only full bore ball valves are accepted.

Clause 4.1.1.2 size and pressure design

Addition Only trunnion mounted ball valves are accepted.

Addition Ball valves shall be a fully welded design.

Clause 4.1.1.4 Ball

Addition Hollow balls are not accepted.

Clause 4.1.1.6 Anti-static design requirements

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 DC 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 validation.

The valve shall include a double anti-static feature of varying designs to prevent a single cause of failure.

The supplier shall include an anti-static design according to ISO 80079-36 for equipment group IIC and ATEX zone 2 that is sufficient for the application of the valve.

Clause 4.1.1.7 Fire safe design requirements

Addition The valve shall be type tested in accordance with the requirements of EN-ISO 10497.

Clause 4.1.1.8 Drain tapings

Addition The outer casing shall be provided with two connections. The requirements for these connections are:

- ≤ DN 150: diameter ½"
- ≥ DN 200: diameter 1"

The bottom one shall be equipped with:
- An extended line upwards to the level of the injection and drain lines and located opposite the valve end-stop.

The top one shall be equipped with:
– for above ground operation: an atmospheric vent;

In both situations see Annex E Drain and lubrication provisions for ball valves.

Clause 4.1.2.4 Trim and sealing materials

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

Clause 4.1.3 Pressure / temperature ratings

Addition The pressure temperature rating shall meet the requirements of EN 12516-1 at the minimum design temperature of -20° C.

Clause 4.1.4 Dimensions

Substitution "Face-to-face dimensions for PN designated flanged valves shall be in accordance with EN 558" shall be replaced with "Face-to-face dimensions for flanged valves will be as per EN-558 series 5 and in accordance with Annex C Valve FTF/ETE and WFE dimensions in this document"

Substitution "Dimensions of body ends shall be in accordance with" shall be replaced with "End-to-end dimensions for butt weld valves will be in accordance with Annex C Valve FTF/ETE and WFE dimensions in this document which is based on EN 12982 and increased with pup pieces"

Clause 4.1.5.1 Operating device

Addition All hand operated valves (gearbox and lever operated) for above and surfacebox 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 hand wheel of the gearbox or Gasunie standard T-wrench (annex K Actuating force for handwheel-operated and wrench operated valves, of this specification) shall not exceed 360 N at 1.3 times the BAT of the valve.
– The operation time (number of turns) shall be kept as low as possible.

Addition For gearboxes the following information shall be submitted to the 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 aregreased for lubrication. Oil filled systems are not allowed.

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 thegearbox housing in the event of leakage through the valve stem seal.

Addition Gearboxes shall be designed to be mounted directly on the valve.

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 valvestem.

Addition Gearboxes shall be fitted with an identification plate.

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.

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

Add the following sub clause:

Clause 4.1.5.4 Actuating forces
The design shall include the forces implied by the spring force and eccentricweight load of the actuator.

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 the Client for validation. The calculations shall state the used designcode. The following stresses apply:

- a joint efficiency factor of 0,75 shall be used for fillet welds;
- allowable material stress in tension St = 2/3 x yield strength;
- allowable bearing stress = 1,35 x St;
- allowable average shear stress = 0,7 x St;
- allowable maximum torsional stress = 0,58 x St.

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 stemextension (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 ofstem extension;
- loads on the flange connection.

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

Add the following clause

Clause 4.2.4 Other functional design requirements

Addition Ball valves DN 80 and smaller do not need to be provided with a lubrication injection connection.

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

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 onthe top mounting of the valve or the top mounting of the stem extension, these shall also fulfil the function of a position indicator.

SECTION 5 *Test Procedures*

Addition If a fugitive emission (FE) production test is required in accordance with ISO 15848-2, (sniffing method) will this be separate mentioned in purchase order which include the FE procedure.

Addition Additional mandatory tests in accordance with S.003843-LF-A435-013.

SECTION 7 *Designation*

Addition Threaded valves and socket welding valves will not be accepted.

SECTION 8 *Marking and preparation for storage and transportation*

In addition the following marking shall be applied:
- type;
- Gasunie operating 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 fieldwelding;
- 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 identificationplate 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

6 AXIAL PISTON VALVES: AMENDMENTS / SUPPLUMENTS TO NEN-EN1349

6.1 General requirements axial piston valves

The following sections refers to the specific requirements for axial piston valves (formally characterized as axial control valve). Axial piston valves are sometimes categorized as axial control valves and refer to standard NEN-EN 1349, which is generally applicable for process control valves. All axial piston valves will follow the requirements of this section. The requirements stated in section 4 of this specification are also applicable to the valves referred to in this section.

NEN-EN 1349 does not specifically identify a axial piston or an axial control valve in the types listed in section 3.2 of NEN-EN 1349. The requirements of the axial piston valves are deemed to correspond with ball control valves.

The axial piston valves in this specification are hand operated valves. All sections within NEN-EN 1349 which refer to an actuator or any other automation device are not applicable. A different specification (S.003843-LF-A435-014 Control valves UHS Zuidwending) is written for the specification of control valves.

Additional requirements, which are not stated in NEN-EN 1349 are indicated with "addition" in the left margin.

Sections of NEN-EN 1349 which are not valid, are indicated with "deletion"in the left margin.

Requirements which are stated in NEN-EN 1349 that need to be replacedare indicated with "substitution" in the left margin.

Section numbers in italics correspond with section numbers of NEN-EN 1349.

Where contradicting statements are made between this document, and NEN-EN 1349, this document (S.003843-LF-A435-013) will be used as the correct statement.

6.2 Amendments/supplements to NEN-EN 1349

SECTION 5 REQUIREMENTS

Clause 5.1.1 General

Addition The axial piston valves shall be fully pressure balanced to avoid that pressure or flow changes have an effect on the position of the piston or the controllability. The axial piston valves shall be fully bi-directional, for the sealing actuator sizing and selection as well as for the flow (control) without compromising functionality.

Clause 5.1.2.1 Shell

Addition Axial piston valves shall not be made of cast iron.

Addition The minimum elongation of the base and weld materials shall be at least 20%. Reference is made to section 4.3 for shell material requirements.

Addition The axial piston valve shall be coated in accordance with MSW-11-E. The cutback of welded ends on valves as mentioned in the MSW-11-E (chapter 7.1) shall be altered for PWHT purposes as indicated in section 4.12 of this specification.

Addition Add the following subsection

Clause 5.1.2.6 Lifting lugs

The design load shall be based on lifting the total weight of the total configuration. All lifting lugs not capable of lifting the total weight of the valve shall be removed (e.g. actuator lifting lugs). This shall be done before application of the (paint) coating.

The design of lifting lugs shall be in accordance with DIN 28086 and shall be subject to validation by Gasunie.

Clause 5.1.3 Pressure/temperature ratings

Substitute — Substitute the entire section for:
The pressure temperature rating shall meet the requirements of EN 12516-1 at the minimum design temperature of -20° C.

Clause 5.1.4.1 Face to face

Substitution — Substitute entire section for:
Face-to-face dimensions for flanged valves will be as per EN-558 series 5 and in accordance with Annex C Valve FTF/ETE and WFE dimensions in this document

Clause 5.1.4.2 end to end

Substitution — Substitute the entire section with:
Dimensions of axial piston valves with welded ends shall be as per annex C Valve FTF/ETE and WFE dimensions of this document.

Clause 5.1.4.3 Body ends

Deletion — delete from table 5: EN 1092-1

Addition — In case the valve is to be provided with welded ends, an additional pup joint in conformance with section 4.8 shall be included. Welding end shall be as per section 4.9.

Requirements on flanges are as stated in specification S.003843-LF-A435-017 PED Flanges UHS Zuidwending.

Cast iron and copper alloys are not permitted

Clause 5.1.5 Operation

Addition — Axial piston valves shall be closed by turning the hand wheel clockwise when facing the hand wheel.

Addition — Axial piston valves shall be designed to be operated by a hand wheel.

Addition — Where actuator attachments are required, the design of the axial piston valve shall be such that either with or without intermediate parts, mounting of an actuator having interface dimensions according to EN ISO 5211 shall be possible. In case Vendor supplies both valve and actuator as one assembly, interface dimensions according manufacturing standard are allowed.

Addition — Actuators shall be provided with limit switches for both the fully open and closed positions of the valve.

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

Addition — add following sub clause:

Clause 5.1.6 Anti-static design requirements
Valves shall have an anti-static feature incorporating the requirements of Annex A of NEN-EN 1983.

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 validation.

The supplier shall include an anti-static design according to ISO 80079-36 for equipment group IIC and ATEX zone 2 that is sufficient for the application of the valve.

Clause 5.2.2 Flow Coefficients

Substitution substitute the entire section with:
The minimum flow coefficient K_v of the axial piston valve shall be as per Annex H of this document

SECTION 6 *Test procedures*

Clause 6.1 Shell design strength

Deletion "and to a shell tightness test P11"

Addition Additional mandatory test are stated in section 4.14 - 4.22 of this specification

SECTION 7 *Dead band test*

Deletion Delete the entire section (as this specification relates to manually operated valves)

SECTION 10 *Marking and preparation for transport*

In addition the following marking shall be applied:
- type;
- Gasunie operating 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 fieldwelding;
- date of manufacture;
- CE marking;
- ATEX marking.

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

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

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

7 CHECK VALVES: AMENDMENTS / SUPPLUMENTS TO NEN-EN 16767

7.1 General requirements check valves

The following sections refers to the specific requirements for check valves as per NEN-EN 16767. All check valves will follow the requirements of this section. The requirements stated in section 4 of this specification are also applicable to the valves referred to in this section.

Additional requirements, which are not stated in NEN-EN 16767 are indicated with "addition" in the left margin.

Sections of NEN-EN 16767 which are not valid, are indicated with "deletion"in the left margin.

Requirements which are stated in NEN-EN 16767 that need to be replacedare indicated with "substitution" in the left margin.

Section numbers in italics correspond with section numbers of NEN-EN 16767.

Where contradicting statements are made between this document and NEN-EN 16767, this document (S.003843-LF-A435-013) will be used as the correct statement.

The specification for check valves shall be accompanied with a datasheet.

7.2 Amendments/supplements to NEN-EN 16767

SECTION 4 *REQUIREMENTS*

Clause 4.2.4.1 Dimensions

Substitution "Face-to-face (FTF) … shall be in accordance with EN 558" shall be replaced with "Face-to-face dimensions for check valves will be as per EN-558 series 5 / 55 and in accordance with Annex C Valve FTF/ETE and WFE dimensions in this document"

Clause 4.2.4.2 Body Ends

Substitution Substitute section 4.2.4.2.2 with: "Wafer bodies, flangeless, lugged of single flanged bodies are not permitted"

Substitution Substitute section 4.2.4.2.3 with: "Butt welding end profiles are not permitted"

Substitution Substitute section 4.2.4.2.4 with: "Socket welding ends are not permitted"

Substitution Substitute section 4.2.4.2.5 with: "Threaded ends are not permitted"

Clause 4.2.5 Operation

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

Clause 4.3.2 Flow characteristics

Addition The design of the check valve shall be such that the behavior of the check valve shall be stable over the entire flow range, i.e. between minimum flow and maximum flow.

Add the following subclause
Clause 4.3.4 Dampening device
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.

Addition add following sub clause:

Clause 4.3.2 Anti-static design requirements

Addition Valves shall be designed in such a way that the build-up of static electricity between valve components are prevented. Based on a DC 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 validation.

The valve shall include a double anti-static feature of varying designs to prevent a single cause of failure.

The supplier shall include an anti-static design according to ISO 80079-36 for equipment group IIC and ATEX zone 2 that is sufficient for the application of the valve.

SECTION 5 Test Procedures

Addition Additional mandatory test are stated in section 4.14 - 4.22 of this specification

SECTION 7 Designation

Addition Welded, threaded valves and socket welding valves will not be accepted.

SECTION 8 Marking and preparation for storage and transportation

Addition In addition the following marking shall be applied:
- type;
- Gasunie operating 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 fieldwelding;
- date of manufacture;
- CE marking;
- ATEX marking.

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

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

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

Annex

A REQUIREMENTS FOR DOCUMENTS (RED)

Legend:
P = Number of prints
DF = Digital file in PDF format
W/O = Required number of weeks after purchase order issue[1)]
W/A = Required number of weeks after release by Gasunie Inspection[2)]

	REQUIRED							FOR NOTES, SEE PAGE 2
TYPE OF DOCUMENTS	Inquiry	For approval[3)]			Final			
	P	P	DF	W/O	P	DF	W/A	
A GENERAL DOCUMENTS								
A1 General arrangement drawings			X	2		X	0	
A2 Manufacturing Data Book						X	0	
B ENGINEERING DOCUMENTS (Mechanical)								
B1 Construction drawings*			X	2		X	0	
B2 Material parts list			X	2		X	0	
B3 Dimensional drawings and weight data for handling			X	2		X	0	
B4 Design calculations (including failure mode analysis)			X	2		X	0	
B5 Thermal design calculations			X			X		
B6 Completed data sheets**	1		X	2		X	0	
B7 Data/curves								
B8 Test data/curves***			X	2		X	0	
B9 Noise limitation data sheet****	1		X					
B10 Vibration analysis								
B11 Hazard analyses								
B12 Abrasion test certificate	1							
C ENGINEERING DOCUMENTS (E&I)								
C1 Logic diagram/functional diagram								
C2 Wiring diagrams								
C3 Loop diagrams								
C4 Connection diagrams								
C5 EMC test proposal								
C6 EMC test report								
C7 ATEX explosion-proof certificates								
D OPERATING DOCUMENTS								
D1 Installation instructions			X	2		X	0	
D2 Operating manual			X	2		X	0	
D3 Maintenance manual			X	2		X	0	
D4 Spare parts list			X	2		X	0	
E INSPECTION AND TEST DOCUMENTS								
E1 Inspection and Test Plan (ITP)[4)]			X	2		X	0	

* Cross sectional drawings from pressure regulators and SSDs in DWG, which can be used to make exploded views by Gasunie.
** Capacity of SSD and regulator shall be on the data sheets in Kg or Cg, including the internal diameter of the valve.
*** Test reports of the set value shall be included for SSDs. If the trip valve is temperature depending, graphs shall be included.
**** Only applicable for gas pressure regulators

	Specification no.:			
GENERAL NOTES TO REQUIREMENTS FOR DOCUMENTS (RED)				
	Page	of		Rev.:

General:

a. All documents required for inquiry shall be submitted with the quotation to Gasunie's Procurement Department.
b. All documents shall be submitted to Gasunie with a properly addressed transmittal form (GTS_REQ-003 and GTS_REQ-004) for the attention of the department as specified.
c. Any deviations from the timing for submission of documents shall be notified to Gasunie's Procurement Department by letter or e-mail.
d. Each document shall bear the item or tag number and the Gasunie purchase order number and shall be dispatched in time to meet the required dates as specified in the purchase order.
e. All documents should preferably be in Dutch. English may be used as an alternative.
f. Dimensions used on engineering documents shall be in SI units.
Nominal pipe sizes may also be indicated in imperial units between brackets.
g. The following standard sizes shall be used: A4, A3, A2 and A1.
h. Drawings consisting of five or more pages shall be treated as a package. A package shall include a front page, an index page and a revision page. The lay-out of these pages shall be submitted to the supplier by Gasunie's engineer.
i. Data sheets are to be completed if applicable.

Notes:

1) Lead time for Gasunie approval is 10 working days. Shop fabrication shall not be started before the required engineering documents have been released for construction (A- or B-approved) by Gasunie.
2) Release note will be submitted after Manufacturing Data Book has been uploaded on Qdocs.
3) Documents such as drawings, calculations and the like that already have been approved by Gasunie are not required for resubmission for approval in the case of the following Purchase Order(s).
4) Approval on major aspects. Final approval during Pre Inspection Meeting after engineering documents have been "released for construction".

Manufacturing Data Book:

Contents:

A. General documents
B. Engineering documents (Mechanical)
C. Engineering documents (E&I)
D. Operating documents
E. Inspection and test documents*
* E1 Approved ITP followed by documents as mentioned in the ITP.

B REQUIREMENTS FOR INFORMATION SUPPLIED TO MANUFACTURER

Annex B1 Requirements for Information to be supplied to manufacturer (Ball Valves)

As per NEN-EN 1983

The following list serves as a reference guideline as to what information is supplied to the vendor regarding the specifications of valves ordered. An indication is given as to where information regarding specific attributes can be found. Some specific attribute information will be provided to the vendor with the purchase order. Other attributes are predetermined in this specification document.

The following information should be provided in the enquiry and/order:
a) this European Standard, i.e. EN 1983; [stated in this specification]
b) body end connections, i.e. flanged, butt welding, socket welding or threaded (see Tables 1 to 3); [stated in the purchase order]
c) the nominal valve size (see Clause 1); [stated in the purchase order]
d) the pressure designation (see Clause 1); [stated in the purchase order]
e) the material of the body, bonnet and cover (see 4.1.2); [requirements stated in this specification]
f) specific ball construction (see 4.1.1.4); [requirements stated in this specification]
g) full bore or reduced bore (see 4.1.1.1); [requirements stated in this specification]
h) the requirement for anti-static design (see 4.1.1.6); [requirements stated in this specification]
i) the requirement for fire safe design (see 4.1.1.7); [requirements stated in this specification]
j) special drain tappings (see 4.1.1.8); [requirements stated in this specification]
k) special trim and seat materials (see 4.1.2.4); [requirements stated in this specification]
l) for flanged end valves, the basic series number of the face-to-face dimension (see 4.1.4); [requirements stated in this specification]
m) for threaded valves the thread type (see 4.1.4); [not allowed]
n) the differential pressure across the obturator if less than the allowable at 20 °C for the particular pressure designation (see 4.2.4). [not applicable]

Annex B2 Requirements for Information to be supplied to manufacturer (Axial piston Valves)

NEN-EN 1349 does not contain a section with information to be supplied by the purchaser. The following is developed based on 1983 requirements.

The following list serves as a reference guideline as to what information is supplied to the vendor regarding the specifications of valves ordered. An indication is given as to where information regarding specific attributes can be found. Some specific attribute information will be provided to the vendor with the purchase order. Other attributes are predetermined in this specification document.

The following information should be provided in the enquiry and/order:

a) this European Standard, i.e. EN 1949; [stated in this specification]

b) body end connections, i.e. flanged, butt welding, socket welding or threaded; [stated in the purchase order]

c) the nominal valve size [stated in the purchase order]

d) the pressure designation [stated in the purchase order]

e) the material of the valve components [requirements stated in this specification]

f) the requirement for anti-static design [requirements stated in this specification]

g) the requirement for fire safe design [requirements stated in this specification]

h) special drain tappings [requirements stated in this specification]

i) for flanged end valves, the basic series number of the face-to-face dimension [requirements stated in this specification]

j) for threaded valves the thread type [not allowed]

Annex B3 Requirements for Information to be supplied to manufacturer (Check Valves)

As per NEN-EN 16767

The following list serves as a reference guideline as to what information is supplied to the vendor regarding the specifications of valves ordered. An indication is given as to where information regarding specific attributes can be found. Some specific attribute information will be provided to the vendor with the purchase order. Other attributes are predetermined in this specification document.

a) a reference to this document, i.e. EN 16767; [stated in this specification]
b) check valve type (see EN 736-1); [stated in the purchase order]
c) body pattern, i.e. straight, angle, oblique; [stated on the datasheet]
d) body end type, i.e. flanged, wafer, butt welding, socket welding, or threaded (see 4.2.4.2); [stated in the purchase order]
e) body end declaration, i.e. flange type and form, or thread type; [stated in the purchase order]
f) maximum allowable temperature, in °C (see 4.2.3); [stated on the datasheet]
g) nominal size (see Clause 1); [stated in the purchase order]
h) pressure rating designation (see Clause 1); [stated in the purchase order]
i) the fluid to be transported and the flow velocity or the volume flow rate (see 4.2.2.3); [stated on the datasheet]
j) the material of the body and cover (if any) (see 4.2.2); [stated in the purchase order]
k) the face-to-face or center-to-face or end-to-end or center-to-end dimensions basic series (see 4.2.4.1); [stated in this specification]
l) if auxiliary connections are required, their size and type (see 4.2.6); [stated in this specification]
m) orientation of pipework (see 4.2.5). [stated on the datasheet]

C VALVE FTF/ETE AND WFE DIMENSIONS

Annex C1 Ball Valve FTF/ETE and WFE Dimensions

Ball Valve Dimension (mm)	
Class 600 (Flange End)	
Size	FTF
DN25	216
DN50	292
DN80	356
DN100	432
DN150	559
DN200	660
DN250	787
DN300	838
DN350	889
DN400	991
DN450	1092
DN500	1194
DN600	1397
ASME B16.10 T1.5-1 / EN-558 s5	

Ball Valve Dimension (mm)			
Class 600 (Welding End)			
Size	ETE	Pup Piece	ETE Final
DN25	216		216
DN50	292		292
DN80	356		356
DN100	432	300	1032
DN150	559	300	1159
DN200	660	300	1260
DN250	787	300	1687
DN300	838	500	1838
DN350	889	500	1889
DN400	991	500	1991
DN450	1092	500	2092
DN500	1194	500	2194
DN600	1397	500	2397
ASME B16.10 T1.5-1 / EN-12982 s5			

Ball Valve Dimension (mm)	
Class 1500 (Flange End)	
Size	FTF (RTJ)*
DN25	254
DN50	371,2
DN80	473,2
DN100	549,2
DN150	711,4
DN200	841,5
DN250	1000,5
DN300	1145,9
DN350	1276,1
DN400	1406,2
DN450	1559,2
DN500	1686,2
ASME B16.10 T1.5-3 / EN-558 s55	

Ball Valve Dimension (mm)			
Class 1500 (Welding End)			
Size	ETE	Pup Piece	ETE Final
DN25	254		254
DN50	368		368
DN80	470		470
DN100	546	300	1146
DN150	705	300	1305
DN200	832	300	1432
DN250	991	300	1591
DN300	1130	500	2130
DN350	1257	500	2257
DN400	1384	500	2384
DN450	1537	500	2537
DN500	1664	500	2664
ASME B16.10 T1.5-3 / EN-12982 s55			

Ball Valve Dimension (mm)			
Class 600 (Welding/Flange End)			
Size	WFE	Pup Piece	WFE Final
DN25	216	-	216
DN50	292	-	292
DN80	356	-	356
DN100	432	300	732
ASME B16.10 T1.5-1 / EN-558 s5 / EN-12982 s5			

Ball Valve Dimension (mm)			
Class 1500 (Welding/Flange End)			
Size	WFE (RTJ)*	Pup Piece	WFE Final
DN25	254	-	254
DN50	369,6	-	369,6
DN80	471,6	-	471,6
DN100	547,6	300	847,6
ASME B16.10 T1.5-1 / EN-558 s5 / EN-12982 s5			

*dimensions of valves with RTJ flanges is increased as per NEN-EN 558
**dimensions of welding-flanged-end (WFE) valves are based on 0.5x of the end-to-end dimension plus 0.5x the face-to-face dimension (excluding RTJ allowance) of the valve size. An additional 0.5x of the RTJ allowance is added in class 1500 valves. A pup-piece is added to the welding-end side, according to section 4.8

Annex C2 Axial piston Valve FTF and ETE Dimensions

Axial piston Dimension (mm)	
Class 600 (Flange End)	
Size	FTF
DN25	216
DN50	292
DN80	356
DN100	432
DN150	559
DN200	660
ASME B16.10 T1.5-1 / EN-558 s5	

Axial piston Valve Dimension (mm)			
Class 600 (Welding End)			
Size	ETE	Pup Piece	ETE Final
DN25	216		216
DN50	292		292
DN80	356		356
DN100	432	300	1032
DN150	559	300	1159
DN200	660	300	1260
ASME B16.10 T1.5-1 / EN-12982 s5			

Axial piston Valve Dimension (mm)	
Class 1500 (Flange End)	
Size	FTF (RTJ)*
DN25	254
DN50	371,2
DN80	473,2
DN100	549,2
DN150	711,4
DN200	841,5
ASME B16.10 T1.5-1 / EN-558 s5	

Axial piston Valve Dimension (mm)			
Class 1500 (Welding End)			
Size	ETE	Pup Piece	ETE Final
DN25	254		254
DN50	368		368
DN80	470		470
DN100	546	300	1146
DN150	705	300	1305
DN200	832	300	1432
ASME B16.10 T1.5-3 / EN-12982 s55			

*dimension of valves with RTJ flanges is increased as per NEN-EN 558

Annex C3 Check Valve FTF Dimensions

Check Valve Dimension (mm)	
Class 600 - Straight (Flange End)	
Size	FTF
DN25	216
DN50	292
DN80	356
DN100	432
DN150	559
DN200	660
DN250	787
DN300	838
DN350	889
DN400	991
DN450	1092
DN500	1194
DN600	1397
ASME B16.10 T1.5-1 / EN-558 s5	

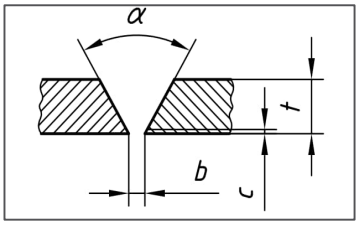
Check Valve Dimension (mm)	
Class 1500 - Straight (Flange End)	
Size	FTF (RTJ)*
DN25	254
DN50	374,4
DN80	476,4
DN100	552,4
DN150	717,8
DN200	851
DN250	1010
DN300	1161,8
DN350	1295,2
DN400	1428,4
DN450	1581,4
DN500	1708,4
DN600	2000,2
ASME B16.10 T1.5-3 / EN-558 s55	

*dimension of valves with RTJ flanges is increased as per NEN-EN 558

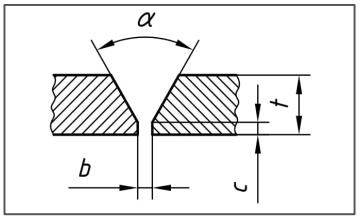
D WELDING END DETAIL

Notes:
1 Inside diameter at welding end: tolerance ± 1 mm.
2 Out-of-roundness at welding end: true round.
3 Dimension for matching Gasunie pipe found on Table 3
4 Welding end details stated in the figures below.
5 Bevel angle +5°/-0°, root face ±0,8mm.

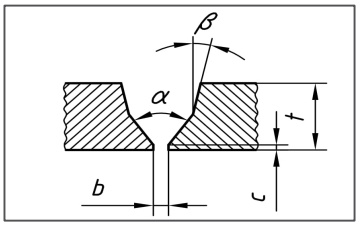
Joint preparations according to EN ISO 9692-1 Table 1



For WT 3<t<10mm, ref No 1.3, α= 55°, C=2mm



For WT 10 < t < 12mm, ref No. 1.5, α= 55°, C=2mm



F or WT >12mm, ref no 1.7, α= 60°, β=10°, C=2mm

Taper end details

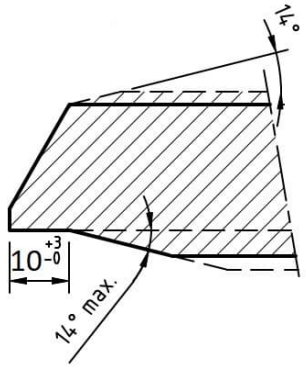


Table 3: Dimensions of matching Gasunie pipe

VALVE SIZE DN	External Diameter D (mm)					Wall Thickness T_{nom} (mm)				
	Operating Pressure (bar e)									
	80	90	140	220	220	80	90	140	220	220
	80CS01	90CS01	140CS01	220CS01	220CS02	80CS01	90CS01	140CS01	220CS01	220CS03
25	33,7	33,7	33,7	33,7	33,7	4,0	4,0	5,6	5,6	5,6
50	60,3	60,3	60,3	60,3	60,3	4,0	4,0	7,1	7,1	7,1
80	88,9	88,9	88,9	88,9	88,9	5,6	5,6	8,8	8,8	8,8
100	114,3	114,3	114,3	114,3	114,3	6,3	6,3	11,0	11,0	11,0
150	168,3	168,3	168,3	168,3	168,3	7,1	7,1	14,2	14,2	16,0
200	219,1	219,1	219,1	219,1	219,1	8,0	8,0	16,0	17,5	20,0
250	273	273	273	273	273	10,0	10,0	16,0	22,2	25,0
300	323,9	323,9	323,9	323,9	323,9	12,5	12,5	17,5	25,0	28,0
350	355,6	355,6	355,6	355,6	355,6	12,5	12,5	-	28,0	-
400	406,4	406,4	-	406,4	-	14,2	14,2	-	30,0	-
450	457	457	-	457	-	16,0	16,0	-	36,0	-
500	508	508	-	508	-	16,0	16,0	-	40,0	-
600	610	610	-	609	-	20,0	-	-	-	-
700	711	711	-	-	-	22,2	-	-	-	-
ANSI CLASS	*600*	*600*	*1500*	*1500*	*1500*	*600*	*600*	*1500*	*1500*	*1500*

E DRAIN AND LUBRICATION PROVISIONS FOR BALL VALVES

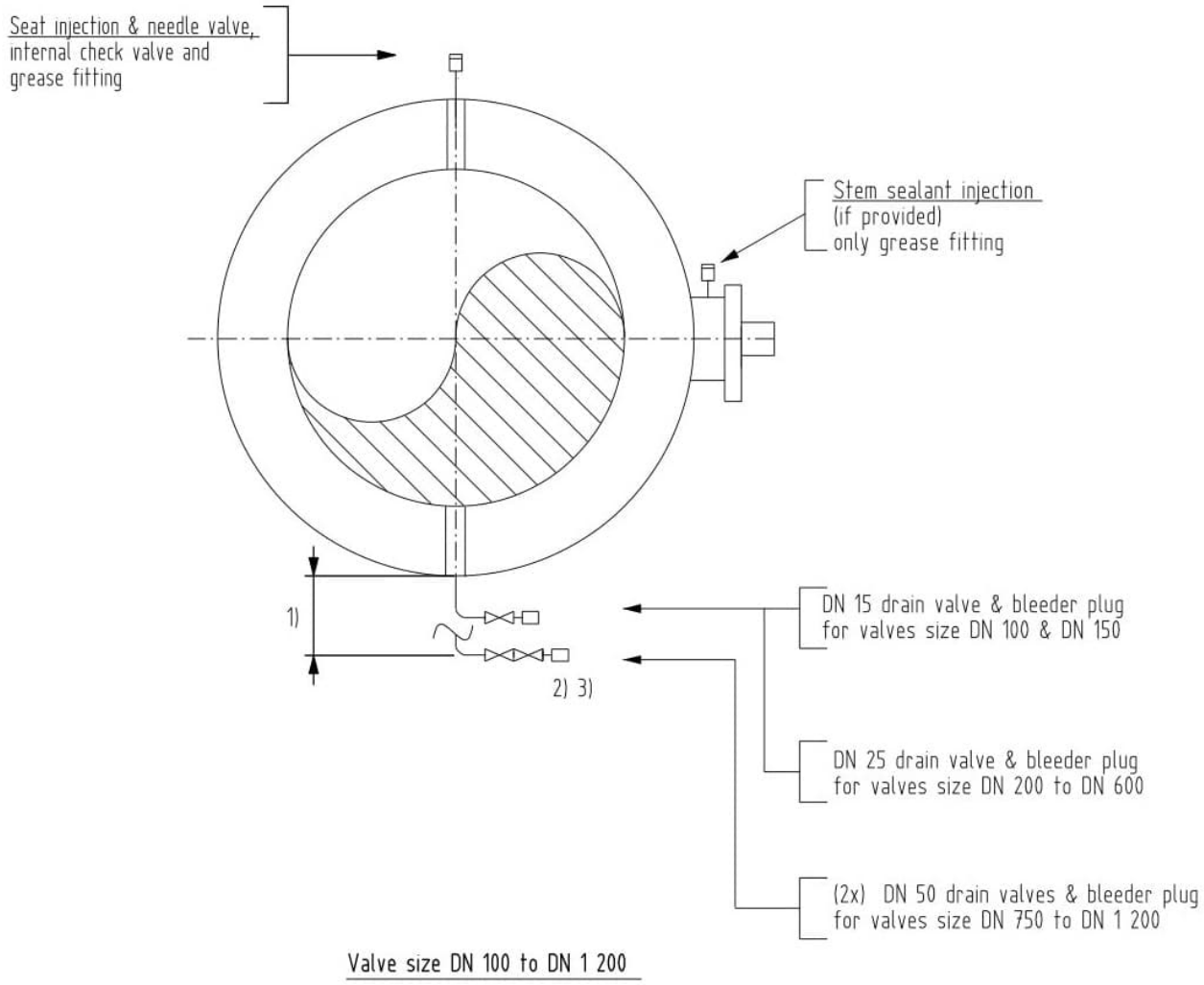
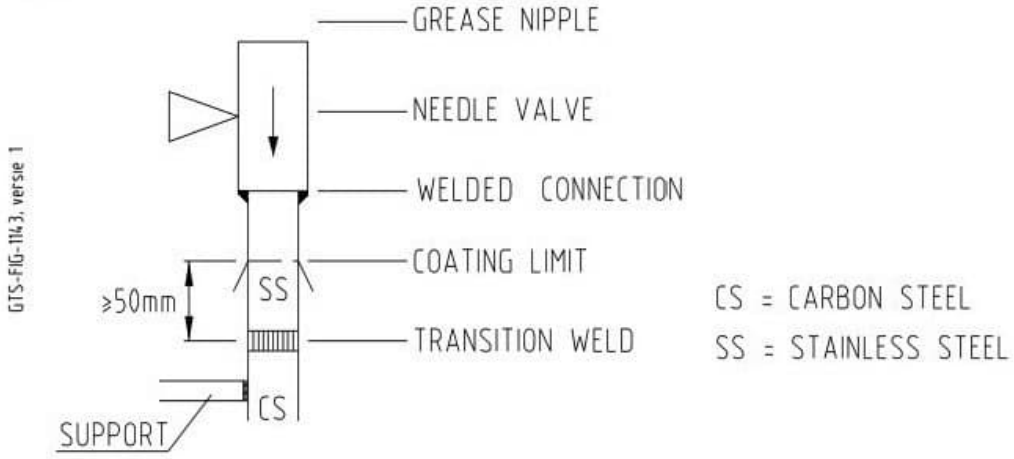


Figure 1: Above installation, horizontal stem

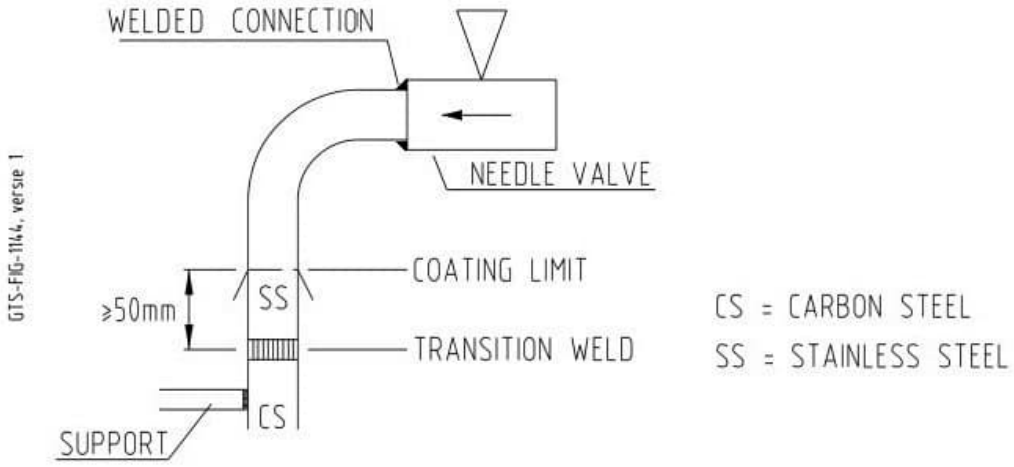
Notes:

1 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

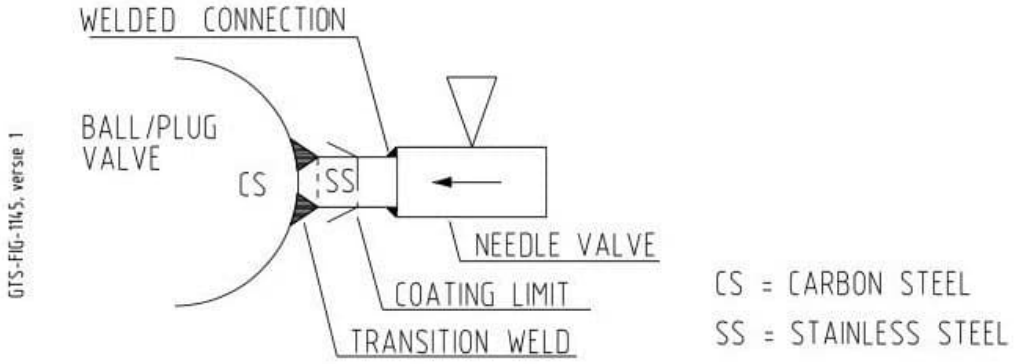
F TRANSITION WELDS LUBRICATION LINES



Surface box configuration



Aboveground configuration



Aboveground configuration without sealant lines

Figure 2: Aboveground configuration without lubrication lines

G LIST OF STANDARDISED AUXILIARIES USED BY GASUNIE

Table 4: List of standardized auxiliaries by Gasunie if manufacturer's standards are not accepted by Client

ITEM No.	DESCRIPTION	TYPE	MAKE	GASUNIE ARTICLE No.
1.0	Valves for lubrication 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 10000 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			1306200
2.2	DN 25 WE / ¾" NPT female	HKSF-W	RMA Valves (D)	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 10000 psi, NPT	5-2051		1136634
3.2	Size DN 20, pressure rating 6000 psi, NPT	5-2052	Merwede	1136636
3.3	Size DN 25, pressure rating 6000 psi, NPT	5-2053		1136638
3.4	Size DN 50, pressure rating 3000 psi, NPT	5-2059		1136640
4.0	lubricant injection fitting			
4.1	Giant button head, with head diameter of22 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	

H *KV* VALUES FOR AXIAL PISTON VALVES

The minimum K_V value of axial piston valves, shall be in accordance with Table 5: Minimum required Kv values for axial piston valves (welded)

Table 5: Minimum required Kv values for axial piston valves (welded)

Valve size	Minimum K_v value(m^3/h)	
DN	Valve with flange connection	Valve with weld connection
50	50	50
80	150	50
100	200	150
150	900	650
200	1650	1100
250	2700	1750
300	3900	2700
400	6300	4200

I CLOSE-FITTING BOLTS AND DOWEL PINS

If manufacturer's standards are not accepted by Client.

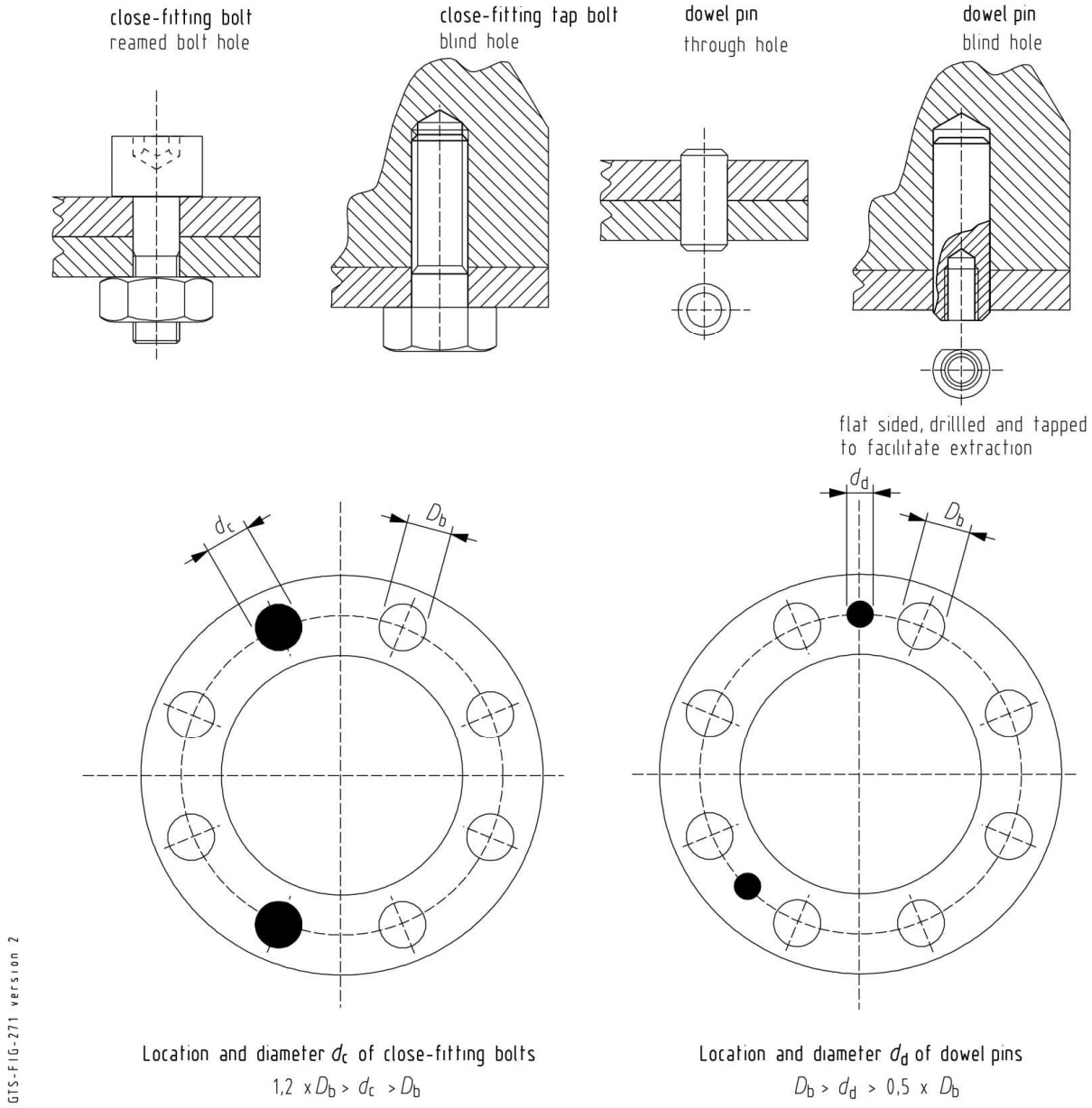


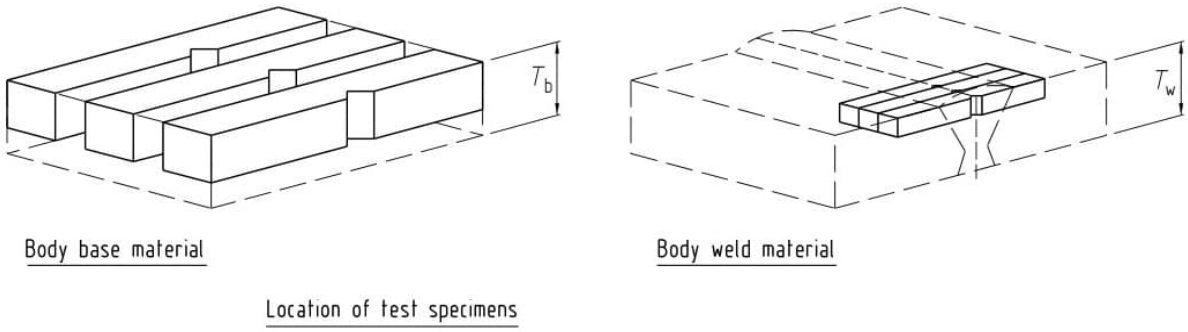
Figure 3: Close-fitting bolts and dowel pins

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. Theyshall be made of mild steel, case-hardened, and accurately ground to a fit of H7k6.

J IMPACT TEST REQUIREMENTS



GTS-FIG-175 version 1

Figure 4: 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 inaccordance with Table 6.

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 D).

– 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 asfollows:

– Valves with welding ends or welding end/flanged end:

Testing in accordance with Table 6, *T* is equal to H_w (see annex D).

– Valves with flanged ends:

Impact test in accordance with Table 6, *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 6: Impact test temperatures versus wall thickness for base and weld material, *T* is equal to T_b.

– Welds without heat treatment:

Impact test in accordance with Table 6, *T* is equal to T_w.

Table 6: 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)	
		average of three specimens	minimum of one specimen
$T \leq 13$	0	27	20
$13 < T \leq 18$	-10		
$18 < T \leq 22$	-20		
$22 < T \leq 25$	-30		
$25 < T \leq 28$	-40		
$T > 28$	-50		

K ACTUATING FORCE FOR HANDWHEEL-OPERATED AND WRENCH OPERATED VALVES

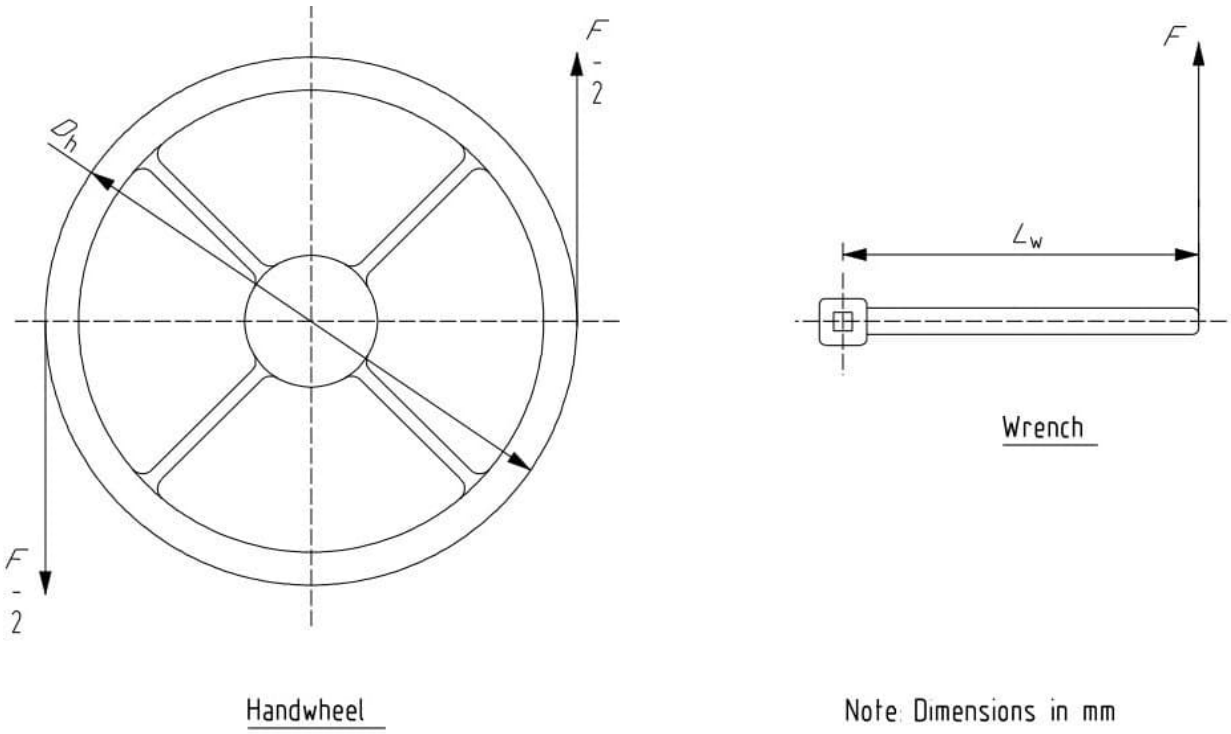
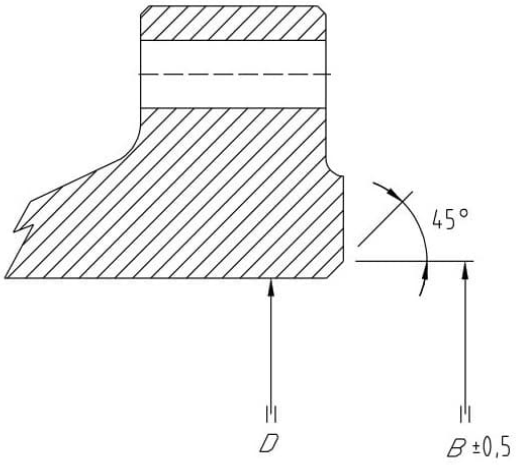


Figure 5: Actuating force for hand wheel-operated and wrench-operated valves

L FLANGE END BORE



D = Valve flange bore

B = Gasunie flange end diameter

Note: Dimensions in mm

Figure 6: Flange end bore

Table 7: Bore dimensions

VALVE SIZE DN	DIMENSIONS *B* in mm				
	ANSI 600 80 bar (e)	ANSI 600 90 bar (e)	ANSI 1500 140 bar (e)	ANSI 1500 220 bar (e)	ANSI 1500 220 bar (e)
	80CS05	90CS01	140CS01	220CS01	220CS03
25	25,7	25,7	22,5	22,5	22,5
40	40,3	40,3	35,7	35,7	35,7
50	52,3	52,3	46,1	46,1	46,1
80	77,7	77,7	71,3	71,3	71,3
100	101,7	101,7	92,3	92,3	92,3
150	154,1	154,1	139,9	133,3	133,3
200	203,1	203,1	187,1	184,1	174,7
250	253	253	241	228,6	213,0
300	298,9	298,9	288,9	273,9	259,9
350	330,6	330,6	-	299,6	-
400	378	378	-	346,4	-
450	425	425	-	393	-
500	476	476	-	436	-
600	570	-	-	-	-
700	666,6	-	-	-	-

Notes:

If *D* < *B*: Beveling to dimension *B* is required. If *D* ≥ *B*: Beveling is not required.

N FUNCTIONAL TEST ON CLEAN GAS

N.1 Purpose

The purpose of this test is to determine the ability to function under the influence of clean gas and appropriate operation. This means that the valve withstands several operation cycles under full differential pressure without damage.

N.2 Performance of test

The seat test shall be carried out in accordance with 5.8.1.

The test medium shall be air, nitrogen or natural gas.

The valve shall have been thoroughly dried before these tests are conducted.

In every duty cycle the valve shall open and close fully. The number of duty cycles shall be:

— < DN 100: 200 cycles;

— ≥ DN 100: 100 cycles at constant pressure (i.e. rated pressure); 50 cycles with differential pressure (i.e. MPD).

The test shall be performed at ambient temperature. The differential pressure shall be MPD. The manufacturer's instructions on admissible duty cycle speeds and frequencies shall be observed.

A storage vessel capacity of $VE = 4 \times (DN)^3$ in mm^3 shall be provided upstream the valve. There shall be no reduction of nominal size between the storage vessel and the valve. With regard to the dimensions of the test facility and the reduction of noise emissions, the outlet cross-section or the outlet volume can be restricted, so that at least 90 % of the initial pressure differential is effective.

The full pressure shall have built up upstream of the obturator before each opening motion.

With double sealing valves, the seat tightness test shall be repeated with reverse flow direction or the entire fatigue test shall be performed on another test specimen of the same nominal size, but with the reverse flow direction.

Before and after the test, the torque and the leakage tests in accordance with this European Standard shall be conducted.

N.3 Acceptance criteria

For external tightness, no visible leakage shall be allowed. All valves shall conform to leakage rate A in accordance with EN 12266-1:2012.; The increase in operating torque shall not exceed 15 %.

O FUNCTIONAL TEST FOR ABRASION RESISTANCE TO DIRTY SERVICE OF BALL VALVES

O.1 Purpose

The purpose of this test is to determine the abrasion resistance to solid substances entrained in the gaseous transport medium. The following pipeline operations shall be simulated.

— During by-pass operation with the main valve closed, e.g. after the pipeline has been closed down, solid contaminants settle upstream of the closed obturator. When the main valve is opened, the sealing elements are impacted with the dirt which has collected.

— During a pigging operation, the branch valves are closed. Solid contaminants which are pushed forward in front of the pig enter the branches and impact the sealing elements when the valve is opened.

O.2 Performance of test

This type test covers all sizes and pressure ratings. The test shall be performed on a single valve Class 600 with minimum diameter DN 300 and the largest diameter equal to the diameter of the test rig.

— 20 open-close cycles are carried out at a high transport rate in the presence of solid contaminants.

— A defined amount of contaminants[2] is introduced into the system upstream 0,2 m of the closed test valve. The composition of the test contaminant should be reproducible. It may, for example, be the result of a physical analysis of the material collected during a pigging operation. Table D.1 contains a representative example.

— A certain amount of gas is passed through the by-pass. The amount of gas corresponds to a transport flow in the test valve of approximately 10 m/s in open position.

— The test valve is opened in accordance with pipeline operation practice in a duration of about 60 s. The mere throttling of the test valve causes the contaminant to start to move and impact the exposed part of the sealing element. Whilst opening the test valve, the by-pass is synchronously closed.

— After the first, third, 10th and 20th cycle a seat tightness test is performed. Seat tightness shall be determined by measurement of leakage of the closed valve via overflow at the body cavity vent. Upstream and downstream pressure shall be monitored. The initial break-away torque, continuous torque and valve position shall be measured.

O.3 Acceptance criteria

The test result is representative of the wear resistance of the test valve. Permissible leakage shall be:

— Permissible leakage rate < 5 m3/h in each direction;

— Permissible leakage rate < 10 m3/h measured via overflow (drain or vent lines) at the cavity connection with pressure applied to both sides simultaneously.

[2] 1 kg for DN400; adaptation of quantity related to the squared diameter ratio in case of modified DN

Table O.1 —Composition of the contaminant mixture

Contaminant	Particle sizes s mm	Share %
Welding sinter	50% 0,1 < s ≤ 1,0 50% 0,1 < s ≤ 2,0	10
Welding pearls	1,5 < s ≤ 2,5	15
Coarse-grained sand	50% 0,1 < s ≤ 1,0 50% 0,1 < s ≤ 2,0	75
NOTE in addition, per liter of this mixture - 10cm^3 of glass splinters; - three welding rods residue diameter 3,25 mm/length 20mm.		

P 3D MODEL REQUIREMENT

The scope of this annexure is to specify the 3D model and data requirements for vendors of components or “small equipment”. This can be described as components, which may be used on multiple points in the project / design such as (but not limited to): valves, actuators, instrumentation, inline assets, supports, etc.

P.1 FILE TYPE, SIZE AND ORIGIN

The intention of the 3D model requirements is to allow the Client and EC to integrate data from the design into the overall plant data management system. All model files from VENDOR should meet the following requirements:

Whitelisted (3D) file types:	Native Files: RVT, DWG
Export Files:	STP (AP203), IFC, DWG
Blacklisted (3D) file types:	NWD, DWF and DWFx

Vendors are encouraged to keep file sizes to a minimal.

- details like bolts, nuts and labels can be excluded;
- external details like cooling ribs can be excluded;
- models can be segregated into multiple models.

P.2 UNITS

The project units of measure for the 3D models is millimeters.

P.3 ORIGIN AND ORIENTATION

The origin of a component shall be place in the center of the component, unless the component is included with footings, stands, a baseplate or mounting brackets for placement on a surface. In that case, the Z-origin shall flush with the mounting surface.

The orientation of the axes shall be such that the positive Z-axis points upwards. (It is kindly noted that not all 3D CAD software use this convention)

P.4 TAGS

TAG number shall be applied if so indicated in the specification.

P.5 NAMING CONVENTION

Vendor shall include the (equipment) tag number in the file name, as agreed with CLIENT. When no tag is provided (yet) or when the model relates to a component which is to be used multiple times (such as valves), vendor shall use a company standard definition of the component instead of <TagNr> in the 3D model file name (such as the component ordering number).

All single-equipment STP-models (or other file formats defined above) shall be named:
<TagNr>_<yyyy><mm><dd>_Rev<RevNr>

P.6 INCORPORATED DATA

A 3D model of a component shall incorporate following data in the attributes as an absolute minimum, for which the attributes are named exactly as in the table below.

Attribute name	Description
Tag	The tag number of equipment and inline assets (as per above).
Medium	-empty- (to be filled by the EC during engineering)
MaterialCode	-empty- (to be filled by the EC during engineering)
ItemCode	-empty- (to be filled by the EC during engineering)
DesignPressure	Design pressure of the line group or equipment.
DesignTemperature	Design temperature of the line group or equipment.
OperatingPressure	-empty- (to be filled by the EC during engineering)
OperatingTemperature	-empty- (to be filled by the EC during engineering)
BB_nr	“BestelBrief” nr, or PO number

P.7 GA-DRAWING

If discrepancies between 3D and 2D details are identified by CLIENT or EC at any point the VENDOR will be solely responsible for addressing at their own cost.

CHECK LIST FOR VENDORS

☐ File type ⇨Is any of STP, RVT, DWG and/or IFC

☐ X- and Y-axis ⇨ positive Z-axis upwards

☐ Scaling ⇨ 1 unit in model = 1 mm

☐ Colour ⇨ *To be defined*

☐ Equipment tag ⇨ No unapproved tags are applied

☐ Scope ⇨ Only objects from own scope:
- no dummy objects as reference allowed.

☐ Clash free ⇨ No internal clashes

☐ Conform GA ⇨ Model is conform component GA, no discernable deviations

☐ Revision ⇨ Revision number is same or tractable towards GA

☐ Correct file naming ⇨ <TagNr>_<yyyy><mm><dd>_rev<RevNr> or as above