


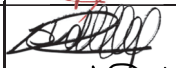
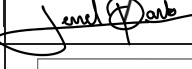
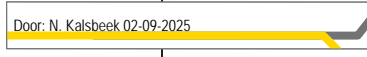
Material Specification Mechanical

## Flanges UHS Zuidwending

Zuidwending H2

S.003843-LF-A435-017

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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 harmonised with Directive 2014/68/EU (PED), where possible.

The flanges are Class designated flanges, therefore this specification is to be read in conjunction with NEN-EN 1759-1.

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## 1 SCOPE AND APPLICATION

This specification contains the requirements for flanges ANSI class 600 and 1500 for use in the hydrogen gas systems with the following design criteria:

- nominal diameter :  $25 \leq DN \leq 600$ ;
- design pressure :  $-1 \text{ bar (e)} < p_d \leq \text{from 80 to 220 bar (e)}$  (depending on the pipe class);
- design temperature :  $-20 \text{ }^{\circ}\text{C} < T_d \leq +80 \text{ to } +160 \text{ }^{\circ}\text{C}$  (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 [ $^{\circ}\text{C}$ ]	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#
140CS02	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. Note that the pipeclass 20CS01 is not referred to in this specification, as the flanges within this pipeclass are defined under the existing GTS standards.

This specification is based on NEN-EN 1759-1:2004 and serves as a supplement to that document. Therefore this specification shall be read in conjunction with NEN-EN 1759-1:2004.

All flanges specified to be in accordance with this specification shall comply with the requirements of NEN-EN 1759-1:2004, as amended and supplemented herein

## 2 REFERENCES

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

### 2.1. Gasunie specifications

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

### 2.2. Standards

In this specification, reference is made to the standards<sup>1</sup> mentioned in this sub clause. Any supplements and errata notices that are valid when the project specification was approved are also applicable.

ASME B 16.5	Pipe flanges and flanged fittings NPS ½ through NPS 24 metric/inch standard.
ASME BPVC Sec VIII, Div 1	ASME Boiler & Pressure Vessel Code - Section 8: Rules for construction of pressure vessels
NEN-EN 1759-1	Flanges and their joint – Circular flanges for pipes, valves, fittings and accessories, Class designated – Part 1: Steel flanges, NPS ½ to 24
NEN-EN 10204	Producten van metaal – Soorten keuringsdocument
NEN-EN 10028-3	Flat products made of steels for pressure purposes – Part 3: Weldable fine grain steels, normalized.
NEN-EN 10160	Ultrasonic testing of steel flat product of thickness equal or greater than 6 mm (reflection method).
NEN-EN 10228-1	Non-destructive testing of steel forgings - Part 1: Magnetic particle inspection.
NEN-EN 10228-3	Non-destructive testing of steel forgings; Part 3: Ultrasonic testing of ferritic or martensitic steel forgings.
NEN-EN-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 5817	Welding - Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) - Quality levels for imperfections.
NEN-EN-ISO 8501-3	Preparation of steel substrates before application of paints and related products - Visual assessment of surface cleanliness - Part 3: Preparation grades of welds, cut edges and other areas with surface imperfections.
NEN-EN-ISO 10893-4	Non-destructive testing of steel tubes - Part 4: Liquid penetrant inspection of seamless and welded steel tubes for the detection of surface imperfections.
NEN-EN-ISO 10893-5	Non-destructive testing of steel tubes - Part 5: Magnetic particle inspection of seamless and welded ferromagnetic steel tubes for the detection of surface imperfections.
NEN-EN-ISO 10893-8	Non-destructive testing of steel tubes - Part 8: Automated ultrasonic testing of seamless and welded steel tubes for the detection of laminar imperfections.
NEN-EN 10253-2	Butt-welding pipe fittings – Part 2: Non alloy and ferritic alloy steels with specific inspection requirements

### **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:

Equipment manufacturer	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.
Pressure-bearing part	Part, which is exposed to and contains pressure e.g.: pipe, flange, fitting, nozzle reinforcement plate, valve housing or shell.

#### **3.2. Abbreviations**

In this specification, the following abbreviations are applicable:

ASME	American Society of Mechanical Engineers
EWf	European Welding Federation
FE	Flanged end
HFW	High-Frequency Welded
IIW	International Institute of Welding
ITP	Inspection and Test Plan
MCN	Material Code Number (Gasunie article number)
MPI	Magnetic particle inspection
MT	Magnetic Testing
NDT	Non-destructive testing
RED	Required engineering documents
QT	Quenched and Tempered
RT	Radiographic testing
SAWH	Helical Submerged Arc Welding
SCN	Supplier Code Number (to be appointed by Gasunie)
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
Af	Elongation	%
Dmax	Maximum external diameter of matching pipe	mm
Dmin	Minimum external diameter of matching pipe	mm
Hcoupling	Wall thickness of coupling	mm
Hmax	Maximum wall thickness of coupling	mm
Hmin	Minimum wall thickness of coupling	mm
ID	Internal diameter of matching pipe ebonite coated flange	mm
IDcoupling	Internal diameter of matching pipe insulating coupling	mm
IDmin	Minimum internal diameter of matching pipe ebonite coated flange	mm
L	Length of coated flange	mm
Lcoupling	Length of insulating coupling	mm
Pcalc	Calculation pressure	MPa
Pd,IC	Design pressure of insulating coupling	MPa
Pd	Design pressure of system	MPa
Ptest	Test pressure	MPa
r	Radius	mm
Re(c)	Specified minimum yield strength of coupling welding-end material	N/mm <sup>2</sup>
Re(p)	Specified minimum yield strength of material of matching pipe	N/mm <sup>2</sup>
Rm	Tensile strength	MPa
Rt0,5	Yield strength for 0,5 % total strain	MPa
t	Wall thickness of steel ring	mm
tnom	Nominal wall thickness of matching pipe (t1)	mm
Td	Design temperature	°C
U	Out of roundness	%



## 4 AMENDMENTS / SUPPLEMENTS TO NEN-EN 1759-1:2004

This chapter is presented in the form of amendments and supplements to NEN-EN 1759-1:2004 and uses the same clause numbering.

If requirements of the mentioned codes and specifications conflict with this specification, this specification shall prevail.

### Section 4 Designation

#### 4.2 Information to be supplied by the equipment manufacturer

*Addition* Add to this sub clause the following:

- a) The designation shall be “flange”
- c) The flange type number shall be either:

**Type 11** (Welding neck flange), or

**Type 05** (blank flange, indicated in the purchase order as blind flange)

The type shall be indicated in the purchase order

- d) The facing type number shall be according to the following table:

Pipe class	80CS05/90CS01	140CS01/140CS02	220CS01	220CS03
<b>Pressure class</b>	Class 600	Class 1500	Class 1500	Class 1500
<b>Facing type</b>	<b>Type B</b> (figure 2) (raised face)	<b>Type J</b> (figure 2) (RTJ)	<b>Type J</b> (figure 2) (RTJ)	<b>Type J</b> (figure 2) (RTJ)

- e) f) and g) The wall thickness ( $t_{nom}$ ) and bore size (ID) of the matching pipe is stated in the table below.

Pipeclass		80CS05 / 90CS01		140CS01 / 140CS02		220CS01		220CS03	
Class		Class 600		Class 1500					
Pressure		80 and 90 bar		140 bar		220 bar		220 bar	
DN	NPS	t <sub>nom</sub>	ID	t <sub>nom</sub>	ID	t <sub>nom</sub>	ID	t <sub>nom</sub>	ID
25	1	4,0	25,7	5,6	22,5	5,6	22,5	5,6	22,5
40	1,5	4,0	40,3	6,3	35,7	6,3	35,7	6,3	35,7
50	2	4,0	52,3	7,1	46,1	7,1	46,1	7,1	46,1
80	3	5,6	77,7	8,8	22,5	8,8	71,3	8,8	71,3
100	4	6,3	101,7	11,0	92,3	11,0	92,3	11,0	92,3
150	6	7,1	154,1	14,2	139,9	14,2	139,9	16,0	136,3
200	8	8,0	203,1	16,0	187,1	17,5	184,1	20,0	179,1
250	10	10,0	253	16,0	241,0	22,2	228,6	25,0	223,0
300	12	12,5	298,9	17,5	288,9	25,0	273,9	28,0	267,9
350	14	12,5	330,6			28,0	299,6		
400	16	14,2	378			30,0	346,4		
450	18	16,0	425			36,0	385,0		
500	20	16,0	476			40,0	428,0		
600	24	20,0	570						

- h) Weld end preparation shall be according to Annex B.

- i) The material is stated in clause 5.1.1 of this specification.
- j) The material shall be fully killed.

Certification shall be in accordance with the requirements set out in section 5.1.1

## **Section 5 General requirements**

### **5.1.1 General**

*Addition Add to this sub clause the following:*

The material for flanges used shall be steel grade P355NH (1.0565, material group 8E3 in table 3b) or P355QH1 (1.0571, material No 380 from table D.2-1 in the NEN-EN 13480-2).

*Addition Add to this sub clause the following:*

Certification shall be in accordance with the requirements set out in MSA-32-E, route 6, 9 and 10 shall apply by default.

Inspection certificate type NEN-EN 10204 3.2 is applicable for route 6, 9 and 10 of MSA-32-E.

### **5.5 Pressure temperature (p/T) ratings**

*Addition Add to this sub clause the following:*

The flange shall meet the pressure temperature ratings requirements of steel grade P355NH (1.0565, material group 8E3) as per table 22 at the minimum design temperature of -20° C.

#### **5.7.3.1 Jointing face finish**

*Substitute Substitute this sub clause with the following:*

"Raised flange facing shall be raised face with a serrated surface finish from 3,2 $\mu$ m to 6,3 $\mu$ m.

Ring joint: the side wall surface of the gasket groove shall not exceed 1,6 $\mu$ m roughness." (as per requirement in ASME B16.5 section 6.4.5)

### **5.10.2 Stamping**

*Addition Add to this sub clause the following:*

Die stamp shall be located with a distance of 5mm from the weld bevel or at the rim of the flange.

### **5.10.3 Omissions of marking**

*Addition Add to this sub clause the following:*

- purchase order and item number

### **5.10.4 Declaration of compliance**

*Addition Add to this sub clause the following:*

The certifying authority shall be a Notified Body as defined in Directive 2014/68/EU. Gasunie reserves the right to impose additional requirements. Obtaining the (EU) declaration of conformity shall be the responsibility of and at the expense of the manufacturer.

## **5 ADDITIONAL REQUIREMENTS**

### **5.1. Welding ends**

Welding ends shall be bevelled to fit the matching pipe. Welding end requirements and dimension are according to Annex B.

### **5.2. Flange ends bore**

Flange end bore and bevelling shall be according to Annex C.

### **5.3. Heat treatment**

Heat treatment vocabulary shall be in accordance with EN ISO 4885.

Forged flanges shall be normalized after forming (as identical to those described in the corresponding EN-tube standards). The heat treatment shall be performed in accordance with a documented procedure. A record (heat treat chart) shall be maintained of each treatment and shall be included in the inspection document.

## 6 INSPECTION AND TESTING

The manufacturer shall draw up an Inspection and Test plan (ITP) covering all verification activities and indicating all tests/inspections to be witnessed by Gasunie or an authorised inspection agency. The ITP shall be approved by Gasunie, 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;
- frequency;
- controlling document;
- acceptance criteria;
- type of record or document to be provided;
- verification action (witness, hold-point or review of documents);
- party (manufacturer, Gasunie, Notified Body).

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;
- non-destructive testing (NDT) procedures;
- mechanical testing procedures;
- final testing procedures;
- painting procedures;
- marking procedures;
- shipping procedures.

The NDT procedures shall be submitted to Gasunie for approval.

Note:

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

An update of the ITP and approval by Gasunie is required either every 3 years or by any change in the manufacturer's production procedures or by a new revision of this specification (S.003843-LF-A435-017)."

### 6.1. Extent of testing and inspection

Mechanical testing samples shall consist of a prolongation, or sacrificial forging. A separately forged test bar of the same heat as for the final forgings shall be supplied. This test bar shall receive the same approximate working and shall be heat-treated with the flange forgings it represents.

The extent of testing and inspection to be performed shall be as stated in the table below for each heat.

Type of test	Number and frequency of testing
Chemical composition	One per heat after final heat treatment according clause 6.2
Tensile – base material	One per heat after final heat treatment
Impact – base material	One set per heat after final heat treatment
Surface hardness	One set per heat after final heat treatment

## 6.2. Chemical composition

The chemical composition of the starting material (product analysis) shall be taken after final heat treatment and shall be in accordance with MSA-32-E.

## 6.3. Physical testing

Physical testing shall consist of

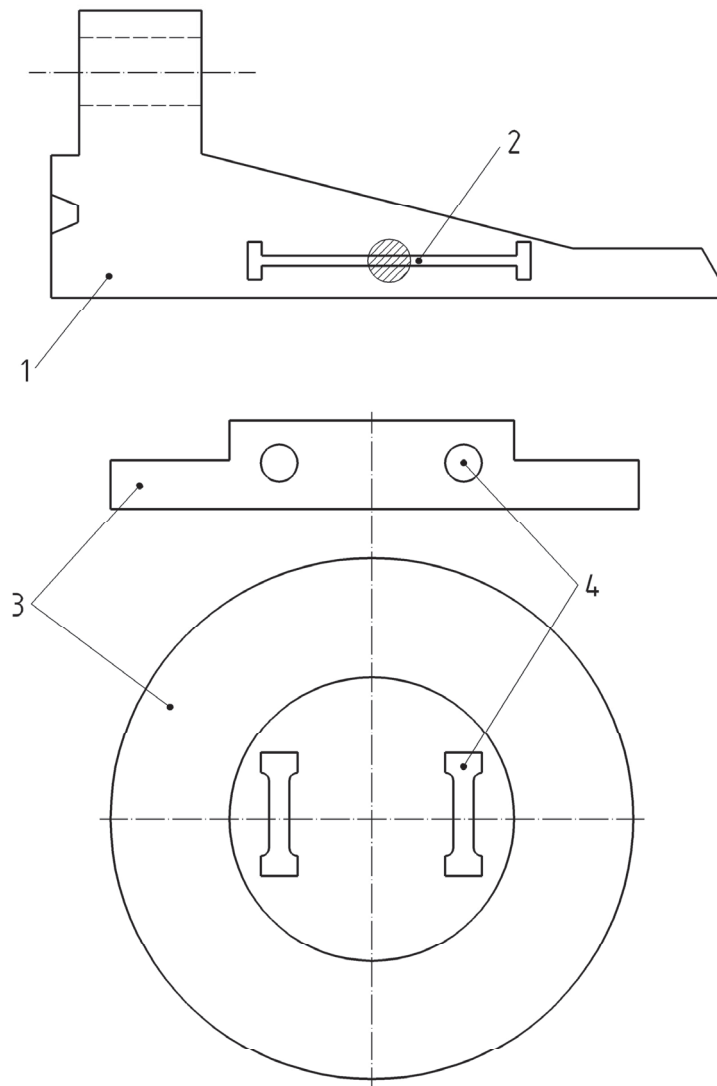
- Tensile testing
- Charpy V-notch impact test
- Vickers Through-thickness hardness testing.

### 6.3.1. Preparation of test pieces

Test pieces shall be prepared in accordance with EN ISO 377. If thermal cutting has been used to remove samples, the full extent of the heat-affected region shall be removed during the preparation of the test pieces.

### 6.3.2. Tensile testing

Orientation of the base-metal test pieces shall be longitudinal to the major axis of the flange in the weld neck hub. The largest possible round test specimen shall be obtained (see Figure below). Tensile testing representing blind or blank flanges may be taken from forged test bars that have received approximately the same amount of working as the blind or blank flanges they represent.



### Key

- 1 welding neck flange
- 2 longitudinal tensile specimens
- 3 blind flange
- 4 transverse tensile specimens

Tensile testing shall be carried out in accordance with EN ISO 6892.

The frequency of all testing shall meet the requirements of in section 6.1.

For tensile tests, percentage elongation after fracture shall be determined. The percentage elongation after fracture shall be reported with reference to a gauge length of  $5,65\sqrt{A_0}$ . If other gauge lengths are used, the elongation referred to a gauge length ( $Z_0$ ) of  $5,65\sqrt{A_0}$  shall be determined in accordance with EN ISO 2566-1.

### 6.3.3. Charpy V-Notch impact test

Charpy V-notch test pieces shall be prepared in accordance with ISO 148-1 with the axis of the notch perpendicular to the flange surface.

The orientation and size of the test pieces shall be as follows:

- transverse with the greatest possible width between 10 mm and 5 mm (see example in Figure 2);
- if transverse test pieces with a minimum width of 5 mm are not possible, longitudinal test pieces with the greatest possible width between 10 mm and 5 mm shall be used;
- Charpy V-notch impact testing shall be in accordance with ISO 148-1 with the additional requirement to report % shear area at the fracture surface;
- each set of impact tests shall consist of three adjacent test pieces.
- Charpy V-notch striker radius shall be 2mm.

The impact test temperature shall be a minimum of -50°C for all thicknesses.

Transverse Charpy specimens shall be notched through-thickness. The actual location shall be that nearest to the welded end from which 10 mm × 10 mm Charpy specimens can be taken.

Three tests shall be done, the mean value of the three test pieces shall meet the requirements given in 6.3.5. One individual value may be below the specified value, provided that it is not less than 70% of that value.

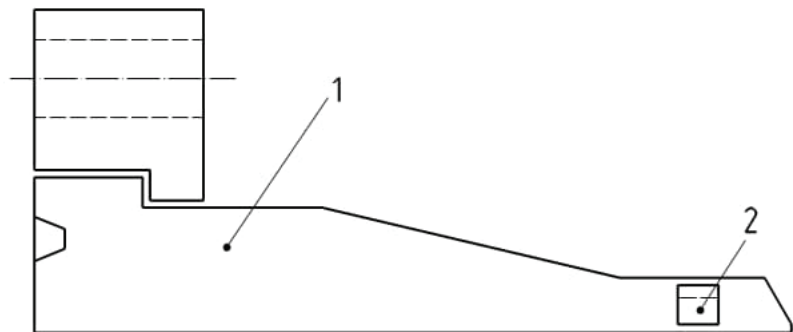
If the width (W) of the test piece is less than 10mm, the measured impact energy (KV<sub>p</sub>) shall be converted to impact energy (KV<sub>c</sub>) using the equation:

$$KV_c = 10mm * \frac{KV_p}{W}$$

Where

- KV<sub>c</sub> is the calculated impact energy in joules;  
 KV<sub>p</sub> is the measured impact energy in joules;  
 W is the width of the test piece in millimetre.

The measured energy values and the resulting average shall be reported.



#### Key

- swivel ring flange
- specimen location

#### 6.3.4. Hardness

Through-thickness hardness testing shall be performed using the Vickers method in accordance with EN ISO 6507-1, method HV10.

Hardness indent locations for flanges shall be stated in the ITP and be subject to approval.

#### 6.3.5. Acceptance

	Elongation Amin [%]		Tensile strength Rm at room temperature [MPa]	Charpy V-notch value (minimum average) [J]		Hardness maximum [HV10]
	Long.	Transv.		Long.	Transv.	
P355NH, P355QH1 $t_{nom} \leq 16\text{mm}$	22%	20%	490-650	40	27	225
P355NH, P355QH1 16mm $\leq t_{nom} \leq 60\text{mm}$	22%	20%	490-630	40	27	225

#### 6.3.6. Metallographic examination

Grain-size shall be determined in accordance with ASTM E 112

The photomicrographs shall demonstrate that the manufacturing process and any subsequent heat treatment have produced a consistent microstructure without separations in the base material.

Forged flanges shall have an average grain-size number of 7 or finer.

### 6.4. Non-destructive testing

Non-destructive testing shall meet the following requirements:

#### 6.4.1. NDT personnel and procedures

##### Organisation:

The manufacturer shall have NDT experts as a minimum available for the NDT methods employed. These NDT experts shall be certified according to NEN-EN-ISO 9712 level 3 in the method employed by the manufacturer. The personnel performing the examinations shall have at least NEN-EN-ISO 9712 level 2 for the technique they use.

##### Documentation:

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

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



#### **6.4.2. Forging preparation**

All NDT for acceptance of forgings in accordance with the requirements of this specification shall be performed after final heat treatment of forgings, except that the surfaces of forgings shall be finished so that surface imperfections can be detected by visual inspection.

The surface to be examined and all adjacent areas within 25mm shall be dry and free from all dirt, grease, lint, scale, welding flux and spatter, oil or other extraneous matter that could interfere with the non-destructive examination.

#### **6.4.3. Visual inspection**

Flanges shall be free from dents and/or gauges.

#### **6.4.4. MT/PT inspection**

The weld-end of flanges shall be inspected by MT in accordance with NEN-EN-ISO 10893-5 or by liquid for the presence of laminar imperfections.

All other areas of the flange shall be MT-inspected after all heat treatment has been completed. Each flange shall be inspected by magnetic particle testing in accordance with NEN-EN-ISO 10893-5 or by liquid penetrant testing in accordance with NEN-EN-ISO 10893-4.

By agreement in accordance with NEN-EN-ISO 10893-4 may be carried out instead of MT.

100% of the flanges shall be tested.

Laminar or linear imperfections equal to or greater than 2 mm in the circumferential direction and with an area exceeding 100 mm<sup>2</sup> shall not be permitted.

If any unacceptable imperfection is found on the test sample, then 100 % testing shall be carried out on the lot.

Imperfections not classified as defects are permitted to remain in the flange without repair. Localized grinding, however, is permitted.

All dressable surface defects shall be dressed out by grinding. Grinding shall be carried out in such a way that the dressed area blends in smoothly with the contour of the flange. Complete removal of defects shall be verified by local visual inspection aided, if necessary, by suitable NDT methods.

#### **6.4.5. UT inspection**

The final 50 mm of each end of the flange shall be UT-inspected for the detection of laminar imperfections in accordance with NEN-EN-ISO 10893-8. Ultrasonic inspection for the detection of longitudinal and/or transverse imperfections shall be performed after all heat treatment has been completed.

The reference standard shall contain notches for longitudinal imperfections and radially drilled holes for transverse imperfections.

For the purpose of determining the extent of suspect areas, adjacent suspect areas separated by less than twice the minor axis of the imperfection shall be considered as a single imperfection.

10% of the batch shall be tested. If any unacceptable imperfection is found on the test sample, the test shall be extended to 100% of the batch.

Laminar imperfections equal to or greater than 6 mm in the circumferential direction and with an area exceeding 100 mm<sup>2</sup> shall not be permitted.

**6.4.6. Hydrostatic pressure test**

A hydrostatic pressure test is not required.

**6.5. Repair welding**

Weld repair of flanges is not permitted.

**6.6. Visual inspection**

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

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

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

All surfaces shall be free from nicks, dents, gouges, laminations, arc burns and other detrimental surface defects.

The tolerances of the internal diameter at the welding ends of the pipe ends shall be  $\pm 1.0$  mm for all dimensions.

The out-of-roundness at the welding ends shall not exceed 0.5 % of the specified internal diameter for wall thicknesses up to and including 20 mm.

Fittings with wall thicknesses more than 20 mm shall be machined true round.

## **7 COATING, MARKING AND PACKING**

### **7.1 Coating**

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

### **7.2 Marking**

Each flange shall be identified with the marking requirements in accordance with ISO 7005-1:1992, 2.8.

In addition to the above-defined markings, the heat reference shall be die-stamped on the external surface, using low-stress 10 mm rounded or interrupted dot stamps. Smaller stamps may be required on small sized flanges due to space limitations. Die stamp position shall be located with a distance of 5 mm from the weld bevel or at the rim of the flange. Where the size of the flange does not permit complete marking, the following minimum information and order of precedence is applicable:

- manufacturer's name or trademark;
- heat number or manufacturer's heat identification;
- purchase order and item number.

Identification markings shall not be stencilled or painted on the weld preparation or the raised face or RTJ groove.

Each flange shall be marked as a minimum with the following information:

- purchase order and item number;
- applied International Standards
- specification and material grade of forging;
- heat number;
- DN and NPS;
- wall thickness, pipe schedule and bore;
- manufacturer's name or trade mark. The manufacturer's name or trademark shall be clearly made with a specific stamp or engraved and not a combination of standard characters;
- flange designation, as defined in Clause 5;
- design pressure and class;
- temperature of Charpy V-notch testing.

### **7.3 Packing**

For packing reference is made to MSA-25-E

## **8 DOCUMENTATION**

The following documents shall be supplied:

Applicable drawings and documents as mentioned in Annex A, finished product inspection certificates including results of dimensional check, destructive test, non-destructive test, heat treatment time and temperature.

### **8.1 Requirements for documents**

Drawings and other documents shall be submitted to Client for approval according to the requirements of Annex A.

Required information on documents:

All drawings and documents as mentioned shall contain at least the following information:

- Gasunie purchase order number, and
- item number.

And where relevant:

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

Additionally:

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

Manufacturing report:

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

### **8.2 Manufacturing data book**

The following documents shall be supplied:

- design calculation;
- applicable drawings as mentioned in this specification;
- concession requests if applicable;
- calculations;
- finished product inspection certificates including results of:
  - dimensional check
  - destructive tests;
  - non destructive tests
  - heat treatment time
  - temperature

## ANNEXURES

### A Requirements for Documents (RED)

<b>REQUIREMENTS FOR DOCUMENTS</b>	Specification no. : S.003843-LF-A435-017
<b>Fittings and flanges</b>	
<b>Legend:</b> P = Number of prints DF = Digital file in PDF format W/O = Required number of weeks after purchase order issue <sup>1)</sup> W/A = Required number of weeks after release by Gasunie Inspection <sup>2)</sup>	

TYPE OF DOCUMENTS		REQUIRED						FOR NOTES, SEE PAGE 2
		Inquiry	For approval <sup>3)</sup>			Final		
		P	P	DF	W/O	P	DF	W/A
A	<b>GENERAL DOCUMENTS</b>							
A1	General arrangement drawings							
A2	Manufacturing Data Book						X	0
B	<b>ENGINEERING DOCUMENTS (Mechanical)</b>							
B1	Construction drawings			X	3		X	2
B2	Material parts list			X	3		X	2
B3	Dimensional drawings and weight data for handling			X	3		X	3
B4	Design calculations			X	3		X	2
B5	Thermal design calculations							
B6	Completed data sheets							
B7	Data/curves							
B8	Test data/curves							
B9	Noise limitation data sheet							
B10	Vibration analysis							
B11	Hazard analyses							
C	<b>ENGINEERING DOCUMENTS (E&amp;I)</b>							
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	<b>OPERATING DOCUMENTS</b>							
D1	Installation instructions							
D2	Operating manual							
D3	Maintenance manual							
D4	Spare parts list							

E	<b>INSPECTION AND TEST DOCUMENTS</b>							
E1	Inspection and Test Plan (ITP) <sup>4)</sup>		X	3		X	0	

	Specification no.:			
<b>GENERAL NOTES TO REQUIREMENTS FOR DOCUMENTS (RED)</b>				
	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".

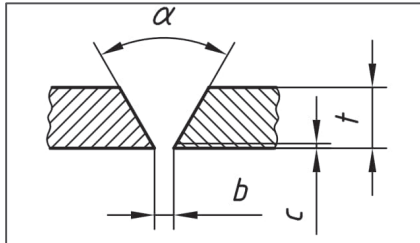
**Manufacturing Data Book:**

## 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 Welding end details

Joint preparations according to EN ISO 9692-1 Table 1 with the dimensions as specified in this appendix

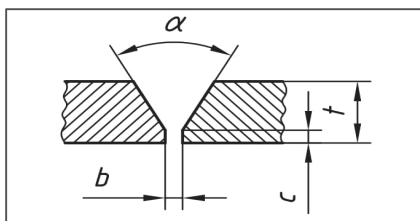


C=2mm

For WT  $3 < t < 10\text{mm}$

ref No 1.3

$\alpha = 55^\circ$ ,

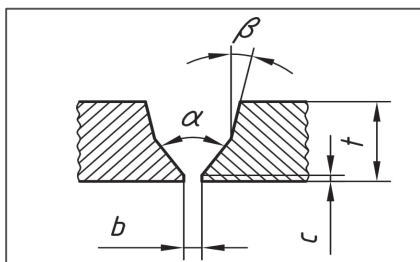


C=2mm

For WT  $10 < t < 12\text{mm}$

ref No. 1.5

$\alpha = 55^\circ$ ,



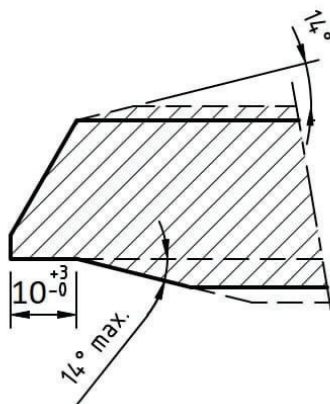
C=2mm

For WT  $> 12\text{mm}$

ref no 1.7

$\alpha = 60^\circ$ ,  $\beta = 10^\circ$ ,

## Taper end details



**80CS05/90CS01**

Nominal diameter DN	Outside diameter MM	W.T. MM
25	33,7	4,0
50	60,3	4,0
80	88,9	5,6
100	114,3	6,3
150	168,3	7,1
200	219,1	8,0
250	273,1	10,0
300	323,9	12,5
350	355,6	12,5
400	406,4	14,2
450	457	16,0
500	508	16,0
*600	610	20,0
*700	711	22,2

*\*80CS05 only*



**140CS01/140CS02**

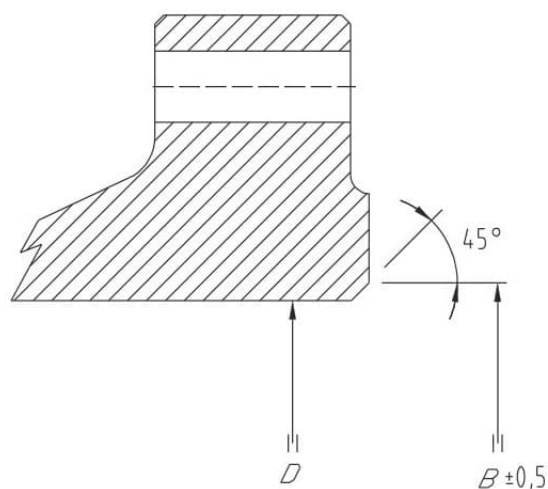
Nominal diameter DN	Outside diameter MM	W.T. MM
25	33,7	5,6
50	60,3	7,1
80	88,9	8,8
100	114,3	11,0
150	168,3	14,2
200	219,1	16,0
250	273,1	16,0
300	323,9	17,5

**220CS01**

Nominal Diameter DN	Outside diameter MM	W.T. MM
25	33,7	5,6
50	60,3	7,1
80	88,9	8,8
100	114,3	11,0
150	168,3	14,2
200	219,1	17,5
250	273,1	22,2
300	323,9	25,0
350	355,6	28,0
400	406,4	30,0
450	457	36,0
500	508	40,0

**220CS03**

Nominal Diameter DN	Outside diameter MM	W.T. MM
25	33,7	5,6
50	60,3	7,1
80	88,9	8,8
100	114,3	11,0
150	168,3	16
200	219,1	20
250	273,1	25
300	323,9	28

**C Flange end bore**

$D$  = Valve flange bore

$B$  = Gasunie flange end diameter

Note: Dimensions in mm

FLANGE 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 / 140CS02	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	136,3
200	203,1	203,1	187,1	184,1	179,7
250	253	253	241	228,6	223,0
300	298,9	298,9	288,9	273,9	267,9
350	330,6	330,6	-	299,6	
400	378	378	-	346,4	
450	425	425	-	385	
500	476	476	-	428	
600	570	-	-		
700	666,6	-	-	-	

**Notes:**

If  $D < B$ : Beveling to dimension  $B$  is required. If  $D \geq B$ :  
Beveling is not required.