

# Gasunie Technical Standard

Material Specification General

MSA-32-E

## **Requirements for inspection certificates of pressure parts**

Version 3 *20-11-2024*

## FOREWORD

This specification is a revised version of the second version of MSA-32-E.

Key changes:

- Added the transport medium table in clause 1;
- Added a new route in table 2 with different requirements;
- Improved clarification of the category of safety valves;
- Added a requirement to contents of the inspection certificate;
- Multiple changes in the lay-out.

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

An important aspect of pressure parts is the assurance that the pressure part manufacturer is in control of the traceability of the delivered pressure part to the inspection certificate ("material certificate"). In addition to quality assurance Gasunie requires also quality control, i.e. a physical check of that traceability. To this purpose Gasunie has developed this specification.

**CONTENTS**

1. SCOPE	4
1.1 Scope	4
1.2 Transport media	4
2. REFERENCES	5
2.1 Standards	5
2.2 European Directives	5
3. DEFINITIONS, ABBREVIATIONS AND SYMBOLS	6
3.1 Definitions	6
3.2 Abbreviations	7
3.3 Symbols	7
4. REQUIREMENTS TO INSPECTION CERTIFICATES	8
4.1 Pressure-bearing parts	8
4.2 Pressure-retaining parts	10
4.3 Other parts	10
4.4 Product analysis of pressure-bearing parts	10
4.5 Right to require additional measures	10
5. INSPECTION CERTIFICATE VERIFICATION	11
5.1 Procedure	11
5.2 Measurement method	11
5.3 Compliance	12
5.4 Reporting	13
6. POSITIVE MATERIAL IDENTIFICATION	14
6.1 Procedure	14
6.2 Measurement method	14
6.3 Compliance	15
6.4 Reporting	15
7. RATIONALE (EXPLANATIONS OF THE REQUIREMENTS)	16
8. DOCUMENTATION	17

1. SCOPE

1.1 Scope

This specification describes the requirements for inspection certificates of metallic pressure parts directly or assembled in a product.

Background information of this specification is given in documentation 1 u/i 5.

1.2 Transport media

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

Table 1: Transport media

Transport-medium <sup>1</sup>	Natural gas	Hydrogen	Carbon dioxide	Nitrogen	(Hot) water	Ammonia
	Transport medium independent					

1 The table is based on suitability of the transport medium concerned.  
The scope and media for which this specification is suitable are not automatically the same as the scope and media of underlying specifications. The scope and suitability for a medium are described for each specification.

## 2. REFERENCES

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

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

### 2.1 Standards

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

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

NEN-EN-ISO/IEC 17020	Conformity assessment – Requirements for the operation of various types of bodies performing inspection.
NEN-EN-ISO/IEC 17025	General requirements for the competence of testing and calibration laboratories.
NEN-EN 10204	Metallic products – Types of inspection documents.

### 2.2 European Directives

This specification refers to the following European Directives:

2014/68/EU	Directive 2014/68/EU of the European Parliament and the council of 15 May 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of pressure equipment.
------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

### 3. DEFINITIONS, ABBREVIATIONS AND SYMBOLS

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

#### 3.1 Definitions

Client	The person or persons who is/are responsible, on behalf of Gasunie, for supervising the fulfilment of the contract in general and the execution of the work in particular.
Heat analysis	Analysis of the chemical composition of the heat (or ladle, or cast) of a metal measured by the metal manufacturer.
Inspection certificate type 3.1	Statement of compliance with the order, with indication of results of specific inspection, validated by the manufacturer's authorized inspection representative independent of the manufacturing department.
Inspection certificate type 3.2	Statement of compliance with the order, with indication of results of specific inspection, validated by the manufacturer's authorized inspection representative independent of the manufacturing department and either the purchaser's authorized inspection representative or the inspector designated by the official regulations.
Inspection certificate verification (clause 5)	Determination of compliance of the pressure part with the inspection certificate.
Notified Body (NoBo)	An independent organization designated by an EU country to assess the conformity of products.
Positive Material Identification (clause 6)	Determination of compliance of the chemical composition according to the specification or standard of the pressure part.
Pressure part	Pressure-bearing part or pressure-retaining part.
Pressure-containing part	See pressure-bearing part.
Pressure-bearing part	Part which is exposed to and contains pressure e.g: pipe, flange, fitting, nozzle reinforcement plate, valve housing or shell.
Pressure-retaining part	Part which holds one or more pressure-bearing members together but is not exposed to the pressure e.g.: bolt and nut.
Product analysis	Analysis of the chemical composition of the product determined by the product manufacturer.
Service Provider (Supplier)	The party with whom the contract is or will be concluded.

Transport medium	<p>A gaseous or liquefied substance that is transported by and/or stored in a Gasunie transport network; limited to:</p> <ul style="list-style-type: none"> <li>– natural gas;</li> <li>– hydrogen;</li> <li>– carbon dioxide;</li> <li>– nitrogen;</li> <li>– (hot) water;</li> <li>– ammonia.</li> </ul> <p>Additives and other substances used in the medium or in the processes are therefore expressly outside the scope.</p>
------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

### 3.2 Abbreviations

GI	Gasunie Inspection (Gasunie department HSE; Verification & Inspection)
IPC	Insulating Pipe Connection
ITP	Inspection and Test Plan
NoBo	Notified Body
OES	Optical Emission Spectrometry
PED	Pressure Equipment Directive (2014/68/EU)
PMI	Positive Material Identification
XRF	X-ray fluorescence

### 3.3 Symbols

<u>Symbol</u>	<u>Description</u>	<u>Unit</u>
X	chemical element, e.g. C, Si, Mn	1
$\Delta x$	difference between the measured mass percentage X and the mass percentage X of the heat analysis	1
$m_{X, meas}$	the mass percentage of chemical element X determined by OES or XRF	1
$m_{X, heat}$	the mass percentage of element X of the heat analysis	1

## 4. REQUIREMENTS TO INSPECTION CERTIFICATES

Inspection certificates shall contain the test results as specified in the applicable Gasunie material specification or purchase order.

### 4.1 Pressure-bearing parts

The requirements for the inspection certificate of pressure-bearing parts are given in table 2. The requirements depend on the application and size of the pressure-bearing part. In the third column of this table, reference is made to a route number. This number is specified in the applicable Gasunie material specification or in the purchase order.

The test results as mentioned on the inspection certificate shall meet the requirements of the applicable Gasunie material specification. If required test results are missing, i.e. non-destructive test results, these tests have to be conducted also.

Valves, including safety valves, and insulating pipe connections shall be categorised in accordance with the tables of the PED for piping.

#### NOTE

According to PED safety valves are usually categorised as cat. IV. For the purpose of this specification safety valves shall be categorised in accordance with the tables of the PED for piping.

Table 2: Requirements to inspection certificate of pressure-bearing parts

pressure-bearing part assembled in:	nominal outside diameter of part (mm)	route specified in material specification	inspection certificate type NEN-EN 10204	approved ITP by	shop inspection by	additional requirements (see tables 3 and 4)
IPC in PED cat. I or II, valve in PED cat. I or II, vessel PED cat. I - III		1	Annex ZA			-
IPC in PED cat. III, valve in PED cat. III, vessel PED cat. IV	≤ 88,9	2	3.1			-
	> 88,9	3	3.1			C
		4	3.2		NoBo	A
piping & pipeline	≤ 88,9	5	3.1			-
		6	3.2	GI	GI	-
	> 88,9 ≤ 406,4	7	3.1			D
		8	3.2		NoBo	B
		9	3.2	GI	GI	-
	> 406,4	10	3.2	GI	GI	-
all		11	3.1 / 3.2			E

Additional requirements for the acceptance of inspection certificates depend on the type of metal. Table 3 specifies the additional requirements for pressure-bearing parts made of non-alloyed ferritic steels and table 4 for pressure-bearing parts of made of austenitic steels and copper and aluminium alloys.



The sample size in table 3 and 4 is defined as a percentage of all pressure parts, used for Client orders, of the same designation, starting material wall thickness, heat, manufacturing procedure specification, heat treatment condition, size and type. The minimum sample size is one pressure part. The pressure part of the first Client order shall be sampled.

Inspection certificate verification of non-alloyed ferritic steels is to be carried out in accordance with the procedure as described in clause 5 of this specification.

Positive material identification of austenitic steels and copper and aluminium alloys is to be carried out in accordance with the requirements of clause 6 of this specification.

Requirement E of route 11 in table 3 and table 4 consists of verification of tensile and impact properties of the material in addition to inspection certificate verification or positive material identification. The verification of these properties shall be conducted by the tensile and impact tests. The execution and the results of these tests shall be in accordance with the inspection certificate. Specifying route 11 means that one additional pressure part shall be ordered as the tensile and impact tests are destructive tests.

Table 3: Additional requirements for acceptance of inspection certificates for non-alloyed ferritic steels

additional requirement (table 2)	inspection certificate type	sample size for inspection certificate verification (clause 5) [%]	sample size for verification of tensile and impact properties	inspection by (clause 5)	
				witness	review
A	3.2	10	-	-	GI or NoBo
B	3.2	10	-	-	GI
C	3.1	100	-	-	GI or NoBo
D	3.1	100	-	GI	-
E	3.1	100	1 per 50	GI	-

Table 4: Additional requirements for acceptance of inspection certificates for austenitic steels and copper and aluminium alloys

additional requirement (table 2)	inspection certificate type	sample size for positive material identification (clause 6) [%]	sample size for verification of tensile and impact properties	inspection by (clause 6)	
				witness	review
A	3.2	10	-	-	GI or NoBo
B	3.2	10	-	-	GI
C	3.1	100	-	-	GI or NoBo
D	3.1	100	-	GI	-
E	3.1	100	1 per 50	GI	-

## 4.2 Pressure-retaining parts

The required inspection certificate type for pressure-retaining parts is given in table 5.

Table 5: Required inspection certificate type for pressure-retaining parts

outside diameter of screw thread (mm)	inspection certificate type NEN-EN 10204
< 51	3.1
≥ 51	3.2

## 4.3 Other parts

Parts that are not pressure bearing or pressure containing shall be delivered with an inspection certificate type 3.1. Examples of other parts are:

- measurement and impulse rings;
- internal components;
- flow conditioners;
- (restriction) orifices and spacer rings;
- (load carrying) attachments;
- guides for extruded tees;
- balls and seat rings, and plugs of valves.

## 4.4 Product analysis of pressure-bearing parts

If the Client specification of pressure-bearing parts requires a product (chemical) analysis, the product analysis shall not deviate from the heat analysis more than the first tolerance band given in table 6.

## 4.5 Right to require additional measures

If Gasunie Inspection (GI) is of the opinion that the traceability is not adequately assured, GI reserves the right to require additional measures from the supplier to assure this. A typical example of such a measure is the inspection certificate verification (see clause 5).

## **5. INSPECTION CERTIFICATE VERIFICATION**

The chemical composition of a pressure part shall be measured in a non-destructive way. The measured chemical composition shall be compared with the heat analysis as given on the inspection certificate of the incoming metallic material from which the pressure part is made.

Inspection certificate verification is applicable for pressure parts made of non-alloyed ferritic steels.

### **5.1 Procedure**

Measurements for the Inspection Certificate Verification (chapter 5) shall be carried out by personnel from an NEN-EN-ISO/IEC 17020/17025 certified company or the quality department of the supplier, using a procedure approved by GI or NoBo.

The procedure shall contain at least the following items:

- sampling location preparation;
- details of the measurement device;
- calibration procedure including correction of measurement results based on the measurements of certified reference materials;
- equipment operator qualification requirements;
- qualification requirements for personnel performing the verification;
- report content.

The activity inspection certificate verification shall be incorporated in the quality system of the manufacturer.

### **5.2 Measurement method**

The supplier can choose the method to measure the chemical composition. However the preferred method to measure the chemical composition is mobile spark OES. In all cases the supplier has to demonstrate that the applied measurement method is sufficiently accurate to meet the first tolerance intervals as given in table 6.

#### **5.2.1 Sampling location**

The sampling location of the measurement on the pressure part shall be such that the pressure part fulfils all requirements after the measurement. Preferred location is the pressure part outer surface.

#### **5.2.2 Area for performing the measurement**

The area where the measurement is performed shall be at the facilities of the supplier. This area shall be chosen in such a way that possible negative effects on the measurement shall be avoided, i.e. wind and rain.

#### **5.2.3 Time of measurement**

The measurements shall be carried out before the pressure part is assembled.

#### **5.2.4 Time of verification**

The inspection certificate verification (see subclause 5.3) shall be carried out preferably shortly after the measurements.

#### **5.2.5 Witnessing**

GI or NoBo can witness the measurements and review the verification in accordance with the inspection and test plan, see table 3.

### **5.3 Compliance**

#### **5.3.1 Calculation of deviations**

For each chemical element X the difference  $\Delta_X$  between the measurement and the heat analysis is defined as follows:

$$\Delta_X = m_{X,meas} - m_{X,heat} \quad (1)$$

where  $m_{X,meas}$  is the measured mass percentage of chemical element X and  $m_{X,heat}$  is the mass percentage of chemical element X of the heat analysis as given on the inspection certificate. The calculated differences are rounded to 2 decimal places and then compared to the allowable tolerances, see table 6.

#### **5.3.2 Acceptance**

The acceptance process is (see table 6 for the tolerances of each chemical element):

- first evaluation: if the calculated differences  $\Delta_X$  for all chemical elements are inside the first tolerance intervals the pressure part complies with the inspection certificate;
- second evaluation: if one or two calculated differences  $\Delta_X$  are outside the first tolerance intervals, additional evaluations are to be carried out as follows:
  - if one chemical element is outside the first tolerance interval but inside the second tolerance interval, the pressure part complies with inspection certificate;
  - if two chemical elements are outside the first tolerance intervals but inside the second tolerance interval, the pressure part complies with the inspection certificate provided that there is at least one pressure part (same type, size and heat) which is acceptable according the first evaluation.

If the pressure part does not comply according to the above evaluations the pressure part is not acceptable. The pressure part shall not be delivered to the Client but the test results shall be reported, see subclause 5.4.

Table 6: Chemical elements to be measured, and the allowable tolerance intervals on the calculated differences  $\Delta x$  (equation 1)

chemical element X	1 <sup>st</sup> tolerance intervals %	2 <sup>nd</sup> tolerance intervals %
C	-0,07/+0,02	-0,10/+0,04
Si	-0,05/+0,05	-0,10/+0,10
Mn	-0,05/+0,05	-0,10/+0,10
Cr	-0,03/+0,03	-0,05/+0,05
Mo	-0,02/+0,02	-0,04/+0,04
Ni	-0,03/+0,03	-0,05/+0,05
Cu	-0,02/+0,02	-0,04/+0,04
V	-0,02/+0,02	-0,04/+0,04
Nb	-0,02/+0,02	-0,04/+0,04
Ti	-0,02/+0,02	-0,04/+0,04
Al	-0,02/+0,02	-0,04/+0,04

## 5.4 Reporting

The supplier which performs the measurements shall report each evaluated pressure part. The reports shall include at least for each tested pressure part the heat analysis, the actual measured chemical composition and the result of the inspection certificate verification. The reports shall be included in the Manufacturing Data Book.

Pressure parts which are not acceptable, shall not be delivered but the test result shall be reported to GI or NoBo.

## **6. POSITIVE MATERIAL IDENTIFICATION**

The chemical composition of a pressure part shall be measured in a non-destructive way. The measured chemical composition shall be compared with the limits of the chemical composition as given on the corresponding specification or standard or material type.

PMI is applicable only for pressure parts made of austenitic steels, copper and aluminium alloys.

### **6.1 Procedure**

Measurements shall be carried out by personnel from an NEN-EN-ISO/IEC 17020/ NEN-EN-ISO/IEC 17025 certified company or the quality department of the supplier, using a procedure approved by GI or NoBo.

The procedure shall contain at least the following items:

- sampling location preparation;
- details of the measurement device;
- calibration procedure including correction of measurement results based on the measurement of certified reference materials;
- equipment operator qualification requirements;
- qualification requirements for personnel performing for the verification;
- report content.

The activity PMI shall be incorporated in the quality system of the manufacturer.

### **6.2 Measurement method**

The supplier can choose the method to measure the chemical composition. However the preferred method to measure the chemical composition is XRF or OES. In all cases the supplier has to demonstrate that the applied measurement method is sufficiently accurate to meet the requirements.

#### **6.2.1 Sampling location**

The sampling location of the measurement on the pressure part shall be such that the pressure part fulfils all requirements after the measurement. Preferred location is the pressure part outer surface.

#### **6.2.2 Area for performing the measurement**

The area where the measurement is performed shall be at the facilities of the supplier. This area shall be chosen in such a way that possible negative effects on the measurement shall be avoided, i.e. wind and rain.

#### **6.2.3 Time of measurement**

The measurements shall be carried out before the pressure part is assembled.

**6.2.4 Time of verification**

The positive material identification (see subclause 6.3) shall be carried out preferable shortly after the measurements.

**6.2.5 Witnessing**

GI or NoBo can witness the measurements and review the verification in accordance with the inspection and test plan, see table 4.

**6.3 Compliance**

The pressure part is acceptable if the measured chemical composition is within the limits as given in the specification or standard of pressure part material or material type.

**6.4 Reporting**

The supplier which performs the measurements shall report each evaluated pressure part. The reports shall include at least for each tested pressure part the specification of the pressure part material and the result of the positive material identification. The reports shall be included in the Manufacturing Data Book.

Pressure parts which are not acceptable shall not be delivered but the test result shall be reported to GI or NoBo.

## **7. RATIONALE (EXPLANATIONS OF THE REQUIREMENTS)**

This chapter contains substantiations of requirements and other additional information and is exclusively intended for the Client.

Gasunie standard practice is to purchase pressure bearing parts for the transmission network from a Gasunie qualified manufacturer with inspection from GI using an GI approved inspection and test plan. When this is not possible, for example when the amount of items ordered is too small, ordering from a stocklist is allowed using the procedure of Documentation 5.



## 8. DOCUMENTATION

This specification refers informatively to the following documentation:

Identification	Description
1	N.V. Nederlandse Gasunie, memorandum <a href="#">VS 13.0463</a> , "Keuringsdocumenten voor drukhoudende componenten", d.d. 01-10-2013 (not available for external parties).
2	N.V. Nederlandse Gasunie, memorandum <a href="#">VS 13.0139</a> , "Besluit keuringsdocumenten voor drukhoudende componenten $\leq 16$ ", d.d. 19-03-2013 (not available for external parties).
3	N.V. Nederlandse Gasunie, rapport <a href="#">VS 15.0335</a> , "Product Analysis with Mobile Optical Emission Spectrometry", d.d. 31-07-2015 (not available for external parties).
4	N.V. Nederlandse Gasunie, presentatie <a href="#">VS 16.0441</a> , "MSA-32-E Requirements for Inspection Certificates of Pressure Parts; Achtergronden en Gevolgen", d.d. 25-10-2016 (not available for external parties).
5	N.V. Nederlandse Gasunie, memorandum <a href="#">PEW 15.3773</a> , "Criteria voor het kopen van fittingen en flenzen bij handelaren", d.d. 04-10-2018 (not available for external parties).