



**SLOVENSKI STANDARD**  
**SIST EN 10222-4:2017+A1:2021**

**01-september-2021**

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**Jekleni izkovki za tlačne posode - 4. del: Variva drobnozrnata jekla z veliko dogovorno napetostjo tečenja**

Steel forgings for pressure purposes - Part 4: Weldable fine grain steels with high proof strength

Schmiedestücke aus Stahl für Druckbehälter - Teil 4: Schweißgeeignete Feinkornbaustähle mit hoher Dehngrenze

Pièces forgées en acier pour appareils à pression - Partie 4 : Aciers soudables à grains fins avec limite d'élasticité élevée

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**Ta slovenski standard je istoveten z: EN 10222-4:2017+A1:2021**

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**ICS:**

77.140.30	Jekla za uporabo pod tlakom	Steels for pressure purposes
77.140.85	Železni in jekleni kovani izdelki	Iron and steel forgings

**SIST EN 10222-4:2017+A1:2021**                      **en,fr,de**

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 10222-4:2017+A1**

June 2021

ICS 77.140.30; 77.140.85

Supersedes EN 10222-4:2017

English Version

## Steel forgings for pressure purposes - Part 4: Weldable fine grain steels with high proof strength

Pièces forgées en acier pour appareils à pression -  
Partie 4 : Aciers soudables à grains fins avec limite  
d'élasticité élevée

Schmiedestücke aus Stahl für Druckbehälter - Teil 4:  
Schweißgeeignete Feinkornbaustähle mit hoher  
Dehngrenze

This European Standard was approved by CEN on 25 December 2016 and includes Amendment 1 approved by CEN on 2 May 2021.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**

<b>Contents</b>	<b>Page</b>
European foreword.....	3
<b>1 Scope</b> .....	<b>4</b>
<b>2 Normative references</b> .....	<b>4</b>
<b>3 Terms and definitions</b> .....	<b>4</b>
<b>4 Classification and designation</b> .....	<b>4</b>
4.1 Classification.....	4
4.2 Designation.....	4
<b>5 Information to be supplied by the purchaser</b> .....	<b>5</b>
5.1 Mandatory information .....	5
5.2 Options.....	5
<b>6 Requirements</b> .....	<b>5</b>
6.1 Steelmaking process and manufacture of the product.....	5
6.2 Delivery condition .....	5
6.3 Chemical composition .....	5
6.3.1 Cast analysis.....	5
6.3.2 Product analysis .....	5
6.4 Mechanical properties.....	6
6.5 Surface condition .....	6
6.6 Internal soundness.....	6
6.7 Resistance to hydrogen induced cracking .....	6
<b>7 Inspection</b> .....	<b>6</b>
<b>8 Sampling</b> .....	<b>6</b>
<b>9 Test methods</b> .....	<b>6</b>
<b>10 Retests</b> .....	<b>6</b>
<b>11 Marking</b> .....	<b>7</b>
<b>Annex A (informative) Significant technical changes to the version EN 10222-4:1998</b> .....	<b>13</b>
<b>Annex ZA (informative) Relationship between this European Standard and the Essential Requirements of EU Directive 2014/68/EU</b> .....	<b>14</b>
<b>Bibliography</b> .....	<b>15</b>

## European foreword

This document (EN 10222-4:2017+A1:2021) has been prepared by Technical Committee ECISS/TC 459/SC 11 “Steel castings and forgings”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2021, and conflicting national standards shall be withdrawn at the latest by December 2021.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes A1 EN 10222-4:2017 A1.

This document includes Amendment 1 approved by CEN on 11 April 2021.

The start and finish of text introduced or altered by amendment is indicated in the text by tags A1 A1.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive 2014/68/EU.

For relationship with EU Directive 2014/68/EU, see informative Annex ZA, which is an integral part of this document.

EN 10222 consists of the following parts under the general title “Steel forgings for pressure purposes”:

- *Part 1: General requirements for open die forgings*
- *Part 2: Ferritic and martensitic steels with specified elevated temperature properties*
- *Part 3: Nickel steels with specified low temperature properties*
- *Part 4: Weldable fine grain steels with high proof strength*
- *Part 5: Martensitic, austenitic and austenitic-ferritic stainless steels.*

A1 *deleted sentence* A1.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

**EN 10222-4:2017+A1:2021 (E)****1 Scope**

This European Standard specifies the technical delivery conditions for forgings for pressure purposes, made of weldable fine grain steels with high proof strength.

NOTE Once this standard is published in the EU Official Journal (OJEU) under Directive 2014/68/EU, presumption of conformity to the Essential Safety Requirements (ESRs) of Directive 2014/68/EU is limited to technical data of materials in this standard and does not presume adequacy of the material to a specific item of equipment. Consequently, the assessment of the technical data stated in this material standard against the design requirements of this specific item of equipment to verify that the ESRs of Directive 2014/68/EU are satisfied, needs to be done. The series EN 10222-1 to EN 10222-5 is structured so that the data related to different materials is in the part allocated for that material. The presumption of conformity to the Essential Safety Requirements of Directive 2014/68/EU depends on both the text in part 1 and the data in part 2, 3, 4 or 5.

General information on technical delivery conditions is given in EN 10021.

**2 Normative references**

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 10222-1:2017, *Steel forgings for pressure purposes — Part 1: General requirements*

**ITeH STANDARD PREVIEW**

**3 Terms and definitions** (standards.iteh.ai)

For the purpose of this document, the terms and definitions given in EN 10222-1:2017 apply.

<https://standards.iteh.ai/catalog/standards/sist/42e15d6c-2015-402f-9af2-9711de5c6544/sist-en-10222-4-2017a1-2021>

**4 Classification and designation****4.1 Classification**

**A1** In accordance with the classification system in EN 10020, the steel grades specified in this document are non-alloy quality steels (P285NH, P285QH, P355NH, P355NL1), non-alloy special steel (P355NL2) and alloy special steels (P355QH1, P355QL1, P355QL2, P420NH, P420QH, P460QH, P460QL1, P460QL2). **A1**

**4.2 Designation**

See EN 10222-1:2017.

## 5 Information to be supplied by the purchaser

### 5.1 Mandatory information

Shall be in accordance with EN 10222-1:2017.

### 5.2 Options

A number of options are specified in this document and listed below. Additionally, the relevant options of EN 10222-1:2017 apply.

- 1) test temperature for the tensile test at elevated temperature, if applicable (see 6.4);
- 2) carbon equivalent for non-alloy steels (see Table 2, footnote b);
- 3) higher Al content (see Table 2, footnote c);
- 4) higher sulphur content (see Table 2, footnote f);
- 5)  $\square_{A1}$  delivery of steel grade P460N in normalized condition and determination of mechanical properties (see Table 4, footnote e, Table 5, footnote e, and Table 6, footnote a)  $\square_{A1}$ ;
- 6) different test temperature for the min. impact energy (see Table 5, footnote c);
- 7) minimum impact energy values (see Table 5 footnote d);
- 8) test to evaluate the resistance to hydrogen induced cracking (see 6.7).

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## 6 Requirements

### 6.1 Steelmaking process and manufacture of the product

Shall be in accordance with EN 10222-1:2017.

### 6.2 Delivery condition

$\square_{A1}$  The products shall be delivered in the heat treatment condition specified in Table 1. Delivery of steel grades P460QH, P460QL1 and P460QL2 in normalized condition (P460N) may be agreed at the time of enquiry and order.  $\square_{A1}$

### 6.3 Chemical composition

#### 6.3.1 Cast analysis

The chemical composition (cast analysis), determined in accordance with EN 10222-1:2017 shall conform to the requirements of Table 2.

#### 6.3.2 Product analysis

The product analysis shall not deviate from the specified cast analysis (see Table 2) by more than the values specified in Table 3.

**EN 10222-4:2017+A1:2021 (E)****6.4 Mechanical properties**

When heat treated in accordance with Table 1, the mechanical properties shall conform to the requirements of Tables 4 and 5.

Elevated temperature proof strength ( $R_{p0,2}$ ) values shall conform to the requirements of Table 6.

If verification of specified proof strength at elevated temperature is requested (see option in EN 10222-1:2017), the testing temperature should be agreed at the time of enquiry and order. Otherwise, the test shall be carried out at 300 °C.

**6.5 Surface condition**

See EN 10222-1:2017.

**6.6 Internal soundness**

See EN 10222-1:2017.

**6.7 Resistance to hydrogen induced cracking**

Steels covered by this standard may be susceptible to cracking when exposed to corrosive H<sub>2</sub>S containing environments, usually referred to as „sour service“.

A test to evaluate the resistance to hydrogen induced cracking in accordance with EN 10229 may be agreed at the time of enquiry and order.

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**7 Inspection**

See EN 10222-1:2017.

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**8 Sampling**

See EN 10222-1:2017.

**9 Test methods**

See EN 10222-1:2017.

**10 Retests**

See EN 10222-1:2017.



## 11 Marking

See EN 10222-1:2017.

**Table 1 — Heat treatment**

Steel grade		Heat treatment <sup>a</sup>	Austenitizing or normalizing		Tempering
Steel name	Steel number		Temperature °C	Cooling in <sup>b</sup>	Temperature °C
P285NH	1.0477	+N	880 to 960	a	–
P285QH	1.0478	+QT	860 to 940	o, p, w	600 to 700
P355NH <sup>c</sup>	1.0565	+N	880 to 960	a	–
P355NL1 <sup>c</sup>	1.0566	+N	880 to 960	a	–
P355NL2 <sup>c</sup>	1.1106	+N	880 to 960	a	–
P355QH1	1.0571	+QT	860 to 940	o, p, w	600 to 700
P355QL1	1.8868	+QT	860 to 940	o, p, w	600 to 700
P355QL2	1.8869	+QT	860 to 940	o, p, w	600 to 700
P420NH <sup>c</sup>	1.8932	+N	880 to 960	a	–
P420QH	1.8936	+QT	860 to 940	o, p, w	600 to 700
P460QH	1.8871	+QT	860 to 940	o, p, w	600 to 700
P460QL1	1.8872	+QT	860 to 940	o, p, w	600 to 700
P460 QL2	1.8864	+QT	860 to 940	o, p, w	600 to 700

<sup>a</sup> +N = normalized, +QT = quenched and tempered.

<sup>b</sup> a = air; o = oil; p = polymer; w = water.

<sup>c</sup> Limited to teq < 40 mm (see EN 10222-1:2017, Table A.1)

Table 2 — Chemical composition (cast analysis)

Steel designation		% by mass <sup>a</sup>														Carbon equivalent value <sup>b</sup> % by mass max.
Steel name	Steel number	C max.	Si max.	Mn	P max.	S <sup>f</sup> max.	Al <sub>total</sub>	N max.	Cr max.	Cu max.	Mo max.	Nb max.	Ni max.	V max.	Nb + V max.	
P285NH	1.0477	0,18	0,40	0,80 to 1,50	0,025	0,010	≥ 0,020 <sup>c</sup>	0,020	0,30	0,20	0,08	0,03	0,30	0,05	0,05	0,41
P285QH	1.0478															
P355NH	1.0565	0,18	0,50	1,10 to 1,70	0,025	0,010	≥ 0,020 <sup>c</sup>	0,015	0,30 <sup>d</sup>	0,30 <sup>d</sup>	0,08 <sup>d</sup>	0,05	0,50	0,10	0,12	0,47
P355NL1	1.0566					0,008										
P355NL2	1.1106					0,020										
P355QH1	1.0571	0,18	0,40	0,90 to 1,50	0,025	0,010	≥ 0,020 <sup>c</sup>	0,015	0,30	0,30	0,25	0,05 <sup>e</sup>	0,50	0,10 <sup>e</sup>	0,12	0,47
P355QL1	1.8868					0,008										
P355QL2	1.8869					0,020										
P420NH	1.8932	0,20	0,60	1,10 to 1,70	0,025	0,010	≥ 0,020 <sup>c</sup>	0,020	0,30	0,20	0,10	0,05	1,00	0,20	0,22	0,51
P420QH	1.8936				0,020	0,008								0,15	- e	
P460QH	1.8871	0,18	0,50	1,10 to 1,70	0,025	0,010	≥ 0,020 <sup>c</sup>	0,015	0,50	0,30	0,50	0,05	1,00	0,15	- e	0,51
P460QL1	1.8872					0,008										
P460QL2	1.8864					0,020										

<sup>a</sup> Elements not listed in this Table shall not be intentionally added to the steel without the approval of the purchase except for finishing the cast. All appropriate measures shall be taken to prevent the addition from scrap or other materials used in steelmaking of these elements which may adversely affect the mechanical properties and usability.

<sup>b</sup> If agreed at the time of enquiry and order (see also EN 10222-1:2017, 6.4.1.5).

<sup>c</sup> A maximum value of 0,050 should be agreed at time of enquiry and order. If only aluminium is used for nitrogen binding, a ratio Al/N ≥ 2 shall apply.

<sup>d</sup> The sum of the percentages by mass of the three elements chromium, copper and molybdenum shall not exceed 0,45 %.

<sup>e</sup> Ti and Zr may also be added: Ti ≤ 0,03 %, Zr ≤ 0,05 % The percentage of grain refining elements shall be at least 0,15 %.

<sup>f</sup> A maximum sulphur content up to 0,015 % may be agreed at time of enquiry and order. In this case the mechanical properties stated in the according tables are also valid and shall be fulfilled.