# SVENSK STANDARD
# SS-EN 10028-6:2017

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## Platta produkter av stål för tryckändamål – Del 6: Svetsbara finkornstål i seghärdat tillstånd

## Flat products made of steels for pressure purposes – Part 6: Weldable fine grain steels, quenched and tempered

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Europastandarden EN 10028-6:2017 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av EN 10028-6:2017.

Denna standard ersätter SS-EN 10028-6:2009, utgåva 4.

The European Standard EN 10028-6:2017 has the status of a Swedish Standard. This document contains the official version of EN 10028-6:2017.

This standard supersedes the Swedish Standard SS-EN 10028-6:2009, edition 4.



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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

# EN 10028-6

July 2017

ICS 77.140.30; 77.140.50

Supersedes EN 10028-6:2009

English Version

# Flat products made of steels for pressure purposes - Part 6: Weldable fine grain steels, quenched and tempered

Produits plats en acier pour appareils à pression - Partie 6 : Aciers soudable à grains fins, trempés et revenus

Flacherzeugnisse aus Druckbehälterstählen - Teil 6: Schweißgeeignete Feinkornbaustähle, vergütet

This European Standard was approved by CEN on 7 May 2017.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

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: Avenue Marnix 17, B-1000 Brussels**



Ref. No. EN 10028-6:2017 E

# Contents

Page

## European foreword

This document (EN 10028-6:2017) has been prepared by Technical Committee ECISS/TC 107 “Steels for pressure purposes”, the secretariat of which is held by DIN.

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 January 2018 and conflicting national standards shall be withdrawn at the latest by January 2018.

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

This document supersedes EN 10028-6:2009.

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 Directive 2014/68/EU.

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

A list of changes between this document and the previous version can be found in Annex B.

According to the CEN-CENELEC Internal Regulations, the national standards organizations 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.

# 1 Scope

This European Standard specifies the requirements for flat products for pressure equipment made of weldable fine grain steels, quenched and tempered, as specified in Table 1.

The requirements in EN 10028-1:2017 also apply.

NOTE Once this European 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 European Standard (Part 1 and the other relevant part of the series) 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.

# 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 1011-1:2009, *Welding — Recommendations for welding of metallic materials — Part 1: General guidance for arc welding*

EN 1011-2:2001, *Welding — Recommendations for welding of metallic materials — Part 2: Arc welding of ferritic steels*

EN 10020:2000, *Definition and classification of grades of steel*

EN 10028-1:2017, *Flat products made of steels for pressure purposes — Part 1: General requirements*

EN 10204:2004, *Metallic products — Types of inspection documents*

# 3 Terms and definitions

For the purposes of this document the terms and definitions given in EN 10028-1:2017 apply.

# 4 Tolerances on dimensions

See EN 10028-1:2017.

# 5 Calculation of mass

See EN 10028-1:2017.

# 6 Classification and designation

## 6.1 Classification

**6.1.1** This document covers the steel grades given in Table 1 in four qualities:

a) the basic series (P...Q);

b) series with elevated temperature properties (P...QH);

c) series with low temperature properties down to −40 °C (P...QL1);

d) series with low temperature properties down to −60 °C (P...QL2).

**6.1.2** In accordance with EN 10020:2000 all the steels specified in this document are alloy special steels.

### 6.2 Designation

See EN 10028-1:2017.

## 7 Information to be supplied by the purchaser

### 7.1 Mandatory information

See EN 10028-1:2017.

### 7.2 Options

A number of options is specified in this document and listed below. Additionally the relevant options of EN 10028-1:2017 apply. If the purchaser does not indicate a wish to implement any of these options at the time of enquiry and order, the products shall be supplied in accordance with the basic specification (see also EN 10028-1:2017).

1) providing data on suitable welding conditions (see 8.2.2);

2) mid thickness test pieces for the impact test (see Clause 10);

3) limitation of copper and/or tin content (see Table 1, footnote c);

4) no option, intentionally left blank;

5) specification of a minimum impact energy of 40 J (see 8.4 and Table 4, footnote a);

6) applicability of elevated temperature values for QL grades (see Table 5, footnote a).

### 7.3 Example for ordering

10 plates with nominal dimensions, thickness = 50 mm, width = 2 000 mm, length = 10 000 mm, made of a steel grade with the name P355QL2 and the number 1.8869 as specified in EN 10028-6, inspection certificate 3.1 as specified in EN 10204:

**10 plates – 50 × 2 000 × 10 000 – EN 10028-6 – P355QL2 – Inspection certificate 3.1**

or

**10 plates – 50 × 2 000 × 10 000 – EN 10028-6 – 1.8869 – Inspection certificate 3.1.**

## 8 Requirements

### 8.1 Steelmaking process

See EN 10028-1:2017.

### 8.2 Delivery condition

**8.2.1** The products covered by this European Standard shall be supplied in the quenched and tempered condition.

**8.2.2** Information on weldability are given in Annex A of this standard.

### 8.3 Chemical composition

**8.3.1** The requirements of Table 1 apply for the chemical composition according to the cast analysis.

**8.3.2** The product analysis may deviate from the specified values of the cast analysis given in Table 1 by the values given in Table 2.

### 8.4 Mechanical properties

The values given in Tables 3 to 5 apply (see also EN 10028-1:2017 and Clause 10).

Optionally, a minimum impact energy value of 40 J may be specified for temperatures where lower minimum values are specified (see Table 4, footnote a).

### 8.5 Surface condition

See EN 10028-1:2017.

### 8.6 Internal soundness

See EN 10028-1:2017.

## 9 Inspection

### 9.1 Types of inspections and inspections documents

See EN 10028-1:2017.

### 9.2 Tests to be carried out

See EN 10028-1:2017.

### 9.3 Retests, sorting and reprocessing

See EN 10028-1:2017.

## 10 Sampling

See EN 10028-1:2017.

For the impact test, deviating from EN 10028-1:2017, Table 4, footnote g, the preparation of test pieces taken from the mid thickness may be agreed at the time of enquiry and order. In this case, test temperatures and minimum impact energy values shall also be agreed.

## 11 Test methods

See EN 10028-1:2017.

## 12 Marking

See EN 10028-1:2017.

**Table 1 — Chemical composition (cast analysis) [a] [b]**

| Steel grade | | Maximum contents, % by mass | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Steel name | Steel number | C | Si | Mn | P | S | N | B | Cr | Mo | Cu [c] | Nb [d] | Ni | Ti [d] | V [d] | Zr [d] |
| P355Q | 1.8866 | 0,16 | 0,40 | 1,50 | 0,025 | 0,010 | 0,015 | 0,005 | 0,30 | 0,25 | 0,30 | 0,05 | 0,50 | 0,03 | 0,06 | 0,05 |
| P355QH | 1.8867 | | | | | | | | | | | | | | | |
| P355QL1 | 1.8868 | | | | 0,020 | 0,008 | | | | | | | | | | |
| P355QL2 | 1.8869 | | | | | 0,005 | | | | | | | | | | |
| P460Q | 1.8870 | 0,18 | 0,50 | 1,70 | 0,025 | 0,010 | 0,015 | 0,005 | 0,50 | 0,50 | 0,30 | 0,05 | 1,00 | 0,03 | 0,08 | 0,05 |
| P460QH | 1.8871 | | | | | | | | | | | | | | | |
| P460QL1 | 1.8872 | | | | 0,020 | 0,008 | | | | | | | | | | |
| P460QL2 | 1.8864 | | | | | 0,005 | | | | | | | | | | |
| P500Q | 1.8873 | 0,18 | 0,60 | 1,70 | 0,025 | 0,010 | 0,015 | 0,005 | 1,00 | 0,70 | 0,30 | 0,05 | 1,50 | 0,05 | 0,08 | 0,15 |
| P500QH | 1.8874 | | | | | | | | | | | | | | | |
| P500QL1 | 1.8875 | | | | 0,020 | 0,008 | | | | | | | | | | |
| P500QL2 | 1.8865 | | | | | 0,005 | | | | | | | | | | |
| P690Q | 1.8879 | 0,20 | 0,80 | 1,70 | 0,025 | 0,010 | 0,015 | 0,005 | 1,50 | 0,70 | 0,30 | 0,06 | 2,50 | 0,05 | 0,12 | 0,15 |
| P690QH | 1.8880 | | | | | | | | | | | | | | | |
| P690QL1 | 1.8881 | | | | 0,020 | 0,008 | | | | | | | | | | |
| P690QL2 | 1.8888 | | | | | 0,005 | | | | | | | | | | |

[a] Elements not listed in this table shall not be intentionally added to the steel without the agreement of the purchaser except for finishing the cast. All appropriate measures shall be taken to prevent the addition from scrap and other materials used in steelmaking of these elements which may adversely affect the mechanical properties and usability.

[b] The manufacturer may add one or several alloying element(s) up to the maximum values specified in the order as a function of the product thickness and the steelmaking conditions in order to attain the specified properties.

[c] A lower maximum copper content and/or a maximum sum of copper and tin content, e.g. Cu + 6 Sn ≤ 0,33 %, may be agreed upon at the time of enquiry and order, e.g. with regard to hot formability.

[d] The percentage of grain refining elements shall be at least 0,015 %. Aluminium is also included in these elements. The minimum content of 0,015 % applies here to dissolved aluminium. This value is regarded as attained if the total aluminium content is at least 0,018 %; in cases of dispute, the dissolved aluminium content is to be determined.