Manufacturer, Exporter, Stockiest, Supplier, Trader for Carbon Steel, Stainless Steel, Alloy Steel And High Nickel Alloy, Nickel Alloy Plate, Sheets And Coils.
Flat products made of steels for pressure purposes —

Part 3: Weldable fine grain steels, normalized

The European Standard EN 10028-3:2003 has the status of a British Standard

ICS 77.140.30; 77.140.50
National foreword

This British Standard is the official English language version of EN 10028-3:2003. It supersedes BS EN 10028-3:1993 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee ISE/73/2, Steel plates and bars for pressure purposes, which has the responsibility to:

— aid enquirers to understand the text;
— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
— monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 15 and a back cover.

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Amendments issued since publication

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Flat products made of steels for pressure purposes - Part 3:
Weldable fine grain steels, normalized

Produits plats en aciers pour appareils à pression - Partie
3: Aciers soudables à grains fins, normalisés

Flacherzeugnisse aus Druckbehälterstählen - Teil 3:
Schweißgeeignete Feinkornbaustähle, normalgeglüht

This European Standard was approved by CEN on 20 January 2003.

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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 Management Centre has the same status as the official versions.

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Foreword

This document (EN 10028-3:2003) has been prepared by Technical Committee ECISS /TC 22, "Steels for pressure purposes - Qualities", 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 December 2003, and conflicting national standards shall be withdrawn at the latest by December 2003.

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(s).

For relationship with EU Directive(s), see informative annex ZA, which is an integral part of this document.

This document supersedes EN 10028-3:1992.

EN 10028 consists of the following parts under the general title Flat products made of steels for pressure purposes:

Part 1: General requirements
Part 2: Non-alloy and alloy steels with specified elevated temperature properties
Part 3: Weldable fine grain steels, normalized
Part 4: Nickel alloy steels with specified low temperature properties
Part 5: Weldable fine grain steels, thermomechanically rolled
Part 6: Weldable fine grain steels, quenched and tempered
Part 7: Stainless steels

NOTE The clauses marked by two points ( ) contain information relating to agreements that may be made at the time of enquiry and order.

Annex A is normative.

This document includes a bibliography.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.
EN 10028-3:2003 (E)

1 Scope

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

NOTE Fine grain steels are understood as steels with a ferritic grain size of 6 or finer when tested in accordance with EURONORM 103.

The requirements and definitions of EN 10028-1 also apply.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).


EN 10204, Metallic products – Types of inspection documents.

EN 10229, Evaluation of resistance of steel products to hydrogen induced cracking (HIC).

3 Terms and definitions

For the purposes of this European Standard the terms and definitions given in EN 10028-1 apply.

4 Dimensions and tolerances on dimensions

See EN 10028-1.

5 Calculation of mass

See EN 10028-1.

6 Classification and designation

6.1 Classification

6.1.1 The steel grades covered by this European Standard are given in four qualities:

a) the room temperature quality (P ... N),

b) the elevated temperature quality (P...NH),

c) the low temperature quality (P...NL1) and

d) the special low temperature quality (P...NL2).

6.1.2 In accordance with EN 10020, the grades P275NH, P275NL1, P355N, P355NH and P355NL1 are non-alloy quality steels, the grades P275NL2 and P355NL2 are non-alloy special steels and the grades P460NH, P460NL1 and P460NL2 are alloy special steels.
6.2 Designation
See EN 10028-1.

7 Information to be supplied by the purchaser

7.1 Mandatory information
See EN 10028-1.

7.2 Options

A number of options are specified in this standard and listed below. Additionally the relevant options of EN 10028-1 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).

a) tests in the simulated normalized condition (see 8.2.2);

b) delivery of products in the untreated condition (see 8.2.3);

c) maximum carbon equivalent value (see 8.3.3);

d) application of the $R_{p0.2}$ values of Table 5 for the corresponding P…NL1 and P…NL2 grade (see 8.4.2);

e) HIC test in accordance with EN 10229 (see 8.7);

f) mid thickness test pieces for the impact test (see clause 10);

g) verification of impact energy for longitudinal test pieces (see clause 11);

h) tensile properties for increased product thicknesses (see Table 4, footnote c);

i) $R_{p0.2}$ values at elevated temperatures for increased product thicknesses (see Table 5, footnote b);

j) use of test solution B for the HIC test with agreed acceptance criteria (see annex A).

7.3 Example for ordering

10 plates with nominal dimensions, thickness = 50 mm, width = 2000 mm, length = 10 000 mm, made of a steel grade with the name P275NL2 and the number 1.1104 as specified in EN 10028-3, to be delivered with inspection certificate 3.1.B as specified in EN 10204:

10 plates – 50 x 2000 x 10000 – EN 10028-3 P275NL2 - Inspection certificate 3.1.B

or

10 plates – 50 x 2000 x 10000 – EN 10028-3 1.1104 – Inspection certificate 3.1.B.

8 Requirements

8.1 Steelmaking process
See EN 10028-1.
8.2 Delivery condition

8.2.1 Unless otherwise agreed at the time of enquiry and order (see 8.2.3), the products covered by this standard shall be supplied in the normalized condition.

For steels with a minimum yield strength 460 MPa, delayed cooling or additional tempering may be necessary for small product thicknesses and in special cases. If such a treatment is performed, this shall be noted in the inspection document.

8.2.2 Normalizing may, at the discretion of the manufacturer, be replaced with normalizing rolling for the steel grades P275NH, P275NL1, P275NL2, P355N, P355NH, P355NL1 and P355NL2 (see 3.1 in EN 10028-1:2000 + A1:2002). In this case, tests on simulated normalized samples with an agreed frequency of testing may be agreed at the time of enquiry and order to verify that the specified properties are complied with.

8.2.3 If so agreed at the time of enquiry and order, products covered by this standard may also be delivered in the untreated condition.

In these cases, testing shall be carried out in the simulated normalized condition (but see 8.2.1).

NOTE Testing in a simulated heat treated condition does not discharge the processor from the obligation of providing proof of the specified properties in the finished product.

8.2.4 Information on welding is given in EN 1011-1 and EN 1011-2.

NOTE Excessive post weld heat treatment (PWHT) conditions can decrease the mechanical properties. When in stress relieving the intended time temperature parameter

\[ P = T_s (20 + \log t) \times 10^{-3} \]

where

- \( T_s \) is the stress relieving temperature in K
- \( t \) is the holding time in hours,

is exceeding the critical \( P \) value of \( P_{\text{crit}} = 17.3 \), the purchaser should in his enquiry and order inform the manufacturer accordingly and, where appropriate, tests on simulated heat treated samples may be agreed to check whether after such a treatment the properties specified in this standard can still be regarded as valid.

8.3 Chemical composition

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

8.3.2 The product analysis shall not deviate from the specified values for the cast analysis as specified in Table 1 by more than the values given in Table 2.

8.3.3 A maximum value for the carbon equivalent in accordance with Table 3 may be agreed upon at the time of enquiry and order.
| Steel grade | number | C max. | Si max. | Mn max. | P max. | S max. | A
<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>P275NH</td>
<td>1.0487</td>
<td>0.16</td>
<td>0.40</td>
<td>0.80 b to 1.50</td>
<td>0.025</td>
<td>0.015</td>
<td>0.020 c,d</td>
<td>0.012</td>
<td>0.30 o</td>
<td>0.30 o</td>
<td>0.08 o</td>
<td>0.05</td>
<td>0.50</td>
<td>0.03</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>P275NL1</td>
<td>1.0488</td>
<td>0.18</td>
<td>0.50</td>
<td>1.10 to 1.70</td>
<td>0.025</td>
<td>0.015</td>
<td>0.020 c,d</td>
<td>0.012</td>
<td>0.30 o</td>
<td>0.30 o</td>
<td>0.08 o</td>
<td>0.05</td>
<td>0.50</td>
<td>0.03</td>
<td>0.10</td>
<td>0.12</td>
</tr>
<tr>
<td>P275NL2</td>
<td>1.1104</td>
<td>0.20</td>
<td>0.60</td>
<td>1.10 to 1.70</td>
<td>0.025</td>
<td>0.015</td>
<td>0.020 c,d</td>
<td>0.025</td>
<td>0.30</td>
<td>0.70 f</td>
<td>0.10</td>
<td>0.05</td>
<td>0.80</td>
<td>0.03</td>
<td>0.20</td>
<td>0.22</td>
</tr>
</tbody>
</table>

\begin{itemize}
  \item 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 or other materials used in steelmaking of these elements which may adversely affect the mechanical properties and usability.
  \item For product thicknesses < 6 mm, a minimum Mn content of 0.60 % is permitted.
  \item The A
\text{total} content may fall short this minimum if niobium, titanium or vanadium are additionally used for nitrogen binding.
  \item If only aluminium is used for nitrogen binding, a ratio \( \frac{\text{Al}}{\text{N}} \geq 2 \) shall apply.
  \item The sum of the percentages by mass of the three elements chromium, copper and molybdenum shall not exceed 0.45 %.
  \item If the percentage by mass of copper exceeds 0.30 %, the percentage by mass of nickel shall be at least half the percentage by mass of copper.
\end{itemize}
### Table 2 - Permissible deviations of the product analysis from the specified limits given in Table 1 for the cast analysis

<table>
<thead>
<tr>
<th>Element</th>
<th>Specified limit of the cast analysis according to Table 1 % by mass</th>
<th>Permissible deviation(^a) of the product analysis % by mass</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>(&lt;= 0.20)</td>
<td>+ 0.02</td>
</tr>
<tr>
<td>Si</td>
<td>(&lt;= 0.60)</td>
<td>+ 0.06</td>
</tr>
<tr>
<td>Mn</td>
<td>(&lt;= 1.00)</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>(&gt; 1.00 \text{ to } (&lt;= 1.70))</td>
<td>0.10</td>
</tr>
<tr>
<td>P</td>
<td>(&lt;= 0.025)</td>
<td>+ 0.005</td>
</tr>
<tr>
<td>S</td>
<td>(&lt;= 0.015)</td>
<td>+ 0.003</td>
</tr>
<tr>
<td>Al</td>
<td>(&gt; 0.020)</td>
<td>- 0.005</td>
</tr>
<tr>
<td>N</td>
<td>(&lt;= 0.025)</td>
<td>+ 0.002</td>
</tr>
<tr>
<td>Cr</td>
<td>0.30</td>
<td>+ 0.05</td>
</tr>
<tr>
<td>Mo</td>
<td>(&lt;= 0.10)</td>
<td>+ 0.03</td>
</tr>
<tr>
<td>Cu</td>
<td>(&lt;= 0.30)</td>
<td>+ 0.05</td>
</tr>
<tr>
<td></td>
<td>(&gt; 0.30 \text{ to } (&lt;= 0.70))</td>
<td>+ 0.10</td>
</tr>
<tr>
<td>Nb</td>
<td>(&lt;= 0.05)</td>
<td>+ 0.01</td>
</tr>
<tr>
<td>Ni</td>
<td>(&lt;= 0.80)</td>
<td>+ 0.05</td>
</tr>
<tr>
<td>Ti</td>
<td>(&lt;= 0.03)</td>
<td>+ 0.01</td>
</tr>
<tr>
<td>V</td>
<td>(&lt;= 0.20)</td>
<td>+ 0.01</td>
</tr>
</tbody>
</table>

\(^a\) If several product analyses are carried out on one cast, and the contents of an individual element determined lie outside the permissible range of the chemical composition specified for the cast analysis, then it is only allowed to exceed the permissible maximum value or fall short of the permissible minimum value, but not both for one cast.
Table 3 – Maximum carbon equivalent value (CEV) based on cast analysis
(if agreed at the time of enquiry and order) *

<table>
<thead>
<tr>
<th>Steel grade name</th>
<th>number</th>
<th>CEV&lt;sup&gt;b&lt;/sup&gt;&lt;br&gt;max. for product thicknesses t in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>60</td>
</tr>
<tr>
<td>P275NH</td>
<td>1.0487</td>
<td>0.40</td>
</tr>
<tr>
<td>P275NL1</td>
<td>1.0488</td>
<td></td>
</tr>
<tr>
<td>P275NL2</td>
<td>1.1104</td>
<td></td>
</tr>
<tr>
<td>P355N</td>
<td>1.0562</td>
<td></td>
</tr>
<tr>
<td>P355NH</td>
<td>1.0565</td>
<td>0.43</td>
</tr>
<tr>
<td>P355NL1</td>
<td>1.0566</td>
<td></td>
</tr>
<tr>
<td>P355NL2</td>
<td>1.1106</td>
<td></td>
</tr>
<tr>
<td>P460NH</td>
<td>1.8935</td>
<td></td>
</tr>
<tr>
<td>P460NL1</td>
<td>1.8915</td>
<td>0.53</td>
</tr>
<tr>
<td>P460NL2</td>
<td>1.8918</td>
<td></td>
</tr>
</tbody>
</table>

NOTE The values for the carbon equivalent are based on the percentage by mass and relate to the mechanical properties specified for the delivery condition.

* See 8.3.3.

<sup>b</sup> CEV = C<sup>6</sup> Mn<sup>5</sup> Cr<sup>4</sup> Mo<sup>6</sup> V<sup>6</sup> Ni<sup>9</sup> Cu<sup>15</sup>

8.4 Mechanical properties

8.4.1 The values given in Tables 4 to 6 (see also EN 10028-1 and clause 10) shall apply.

8.4.2 If agreed at the time of enquiry and order, the minimum proof strength $R_{p0,2}$ values at elevated temperature specified in Table 5 for the P...NH grades may also apply to the P...NL1 and P...NL2 grades.

8.5 Surface condition

See EN 10028-1.

8.6 Internal soundness

See EN 10028-1.

For possible verification of internal soundness, see also EN 10028-1.
8.7 Resistance to hydrogen induced cracking

Carbon and low alloy steels may be susceptible to cracking when exposed to corrosive $H_2S$ containing environments, usually referred to as 'sour service'.

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

9 Inspection

9.1 Types of inspection and inspection documents

See EN 10028-1.

9.2 Tests to be carried out

See EN 10028-1 and 8.7.

9.3 Retests

See EN 10028-1.

10 Sampling

See EN 10028-1.

For the impact test, deviating from EN 10028-1:2000 + A1:2002, Figure 2, footnote f, 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 and EN 10229.

For the impact test, verification of impact energy for longitudinal test pieces may be agreed at the time of enquiry and order in accordance with 10.2.2.3 and 11.4 in EN 10028-1:2000 + A1:2002.

12 Marking

See EN 10028-1.
Table 4 – Tensile properties at room temperature

<table>
<thead>
<tr>
<th>Steel grade</th>
<th>Usual delivery condition</th>
<th>Product thickness t mm</th>
<th>Yield strength $R_{eH}$ MPa min.</th>
<th>Tensile strength MPa</th>
<th>Elongation after fracture $A%$ min.</th>
</tr>
</thead>
<tbody>
<tr>
<td>P275NH, P275NL1, P275NL2</td>
<td>+N&lt;sup&gt;a&lt;/sup&gt;</td>
<td>16</td>
<td>275</td>
<td>390 to 510</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16 &lt; t 40</td>
<td>265</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>40 &lt; t 60</td>
<td>255</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>60 &lt; t 100</td>
<td>235</td>
<td>370 to 490</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100 &lt; t 150</td>
<td>225</td>
<td>360 to 480</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>150 &lt; t 250</td>
<td>215</td>
<td>350 to 470</td>
<td></td>
</tr>
<tr>
<td>P355N, P355NH, P355NL1, P355NL2</td>
<td>+N&lt;sup&gt;a&lt;/sup&gt;</td>
<td>16</td>
<td>355</td>
<td>490 to 630</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16 &lt; t 40</td>
<td>345</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>40 &lt; t 60</td>
<td>335</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>60 &lt; t 100</td>
<td>315</td>
<td>470 to 610</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100 &lt; t 150</td>
<td>305</td>
<td>460 to 600</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>150 &lt; t 250</td>
<td>295</td>
<td>450 to 590</td>
<td></td>
</tr>
<tr>
<td>P460NH, P460NL1, P460NL2</td>
<td>+N&lt;sup&gt;b&lt;/sup&gt;</td>
<td>16</td>
<td>460</td>
<td>570 to 720&lt;sup&gt;d&lt;/sup&gt;</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16 &lt; t 40</td>
<td>445</td>
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<tr>
<td></td>
<td></td>
<td>40 &lt; t 60</td>
<td>430</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>60 &lt; t 100</td>
<td>400</td>
<td>540 to 710</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>100 &lt; t 250</td>
<td>c</td>
<td>c</td>
<td>c</td>
</tr>
</tbody>
</table>

<sup>a</sup> See 8.2.2.

<sup>b</sup> See 8.2.1.

<sup>c</sup> Values may be agreed at the time of enquiry and order.

<sup>d</sup> For product thicknesses up to 16 mm, a maximum value of 730 MPa is permitted.
### Table 5 — Minimum values for the proof strength \( R_{p0.2} \) at elevated temperatures

<table>
<thead>
<tr>
<th>Steel grade</th>
<th>Minimum proof strength ( R_{p0.2} ) MPa at a temperature in °C of</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>name</td>
</tr>
<tr>
<td>P275NH</td>
<td>1.0487</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>P355NH</td>
<td>1.0565</td>
</tr>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>P460NH</td>
<td>1.8935</td>
</tr>
<tr>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

* The values are reflecting the minimum values for furnace normalized test pieces (i.e. they correspond to the lower band of the relevant trend curve determined in accordance with EN 10314) with a confidence limit of about 98 % (2s).

b Values may be agreed at the time of enquiry and order.

### Table 6 — Minimum impact energy values for the normalized condition

<table>
<thead>
<tr>
<th>Steel grade</th>
<th>Product thickness</th>
<th>Impact energy KV J min.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mm</td>
<td>transverse</td>
</tr>
<tr>
<td></td>
<td>- 50</td>
<td>- 40</td>
</tr>
<tr>
<td>P...N, P...NL1</td>
<td>5° to 250°</td>
<td>-</td>
</tr>
<tr>
<td>P...NL2</td>
<td>27</td>
<td>30</td>
</tr>
</tbody>
</table>

a See 8.2.1 and 8.2.2.

b The values apply for product thicknesses up to 40 mm.


d For the grades P460NH, P460NL1 and P460NL2 up to product thicknesses of 100 mm.
Annex A  
(normative)

Evaluation of resistance to hydrogen induced cracking

The tests to evaluate the resistance of steel products to hydrogen induced cracking shall be performed in accordance with EN 10229. The acceptance criteria for the test solution A (with pH 3) apply for the classes indicated in Table A.1 where the given values are mean values from three individual test results.

Test solution B (with pH 5) and corresponding acceptance criteria may be agreed at the time of enquiry and order.

Table A.1 – Acceptance classes for the HIC test (test solution A)

<table>
<thead>
<tr>
<th>Acceptance class</th>
<th>CLR&lt;sup&gt;a&lt;/sup&gt;</th>
<th>CTR&lt;sup&gt;a&lt;/sup&gt;</th>
<th>CSR&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>I</td>
<td>5</td>
<td>1,5</td>
<td>0,5</td>
</tr>
<tr>
<td>II</td>
<td>10</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>III</td>
<td>15</td>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>

<sup>a</sup> CLR: crack length ratio, CTR: crack thickness ratio, CSR: crack sensitivity ratio.
Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 97/23/EC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive 97/23/EC.

Once this standard is cited in the Official Journal of the European Communities under that Directive and has been implemented as a national standard in at least one Member State, compliance with the clauses of this standard given in Table ZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding Essential Requirements of that Directive and associated EFTA regulations.

Table ZA.1 – Correspondence between this European Standard and Directive 97/23/EC

<table>
<thead>
<tr>
<th>Clause(s)/sub-clause(s) of this EN</th>
<th>Essential Requirements (ERs) of Directive 97/23/EC</th>
</tr>
</thead>
<tbody>
<tr>
<td>All normative clauses</td>
<td>Annex 1, section 4</td>
</tr>
</tbody>
</table>

**WARNING:** Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.
Bibliography


EN 10020, Definition and classification of grades of steel.

EN 10314, Method for the derivation of minimum values of proof strength of steel at elevated temperatures.

EURONORM 103\(^1\), Microscopic determination of the ferrite or austenitic grain size of steels.

\(^1\) Until this EURONORM is transformed into a European Standard, it can be implemented or the corresponding national standard should be agreed at the time of enquiry and order.
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