TECHNICAL INFORMATION FOR STAINLESS STEEL FASTENERS
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## V. Labelling stainless screws and nuts
I. DIN and ISO standards and what they mean

a) The term standardisation

When components are standardised they are easier to work with because such components are interchangeable. For this to be possible the fundamental characteristics of standard parts must be defined by a central body and used by manufacturers and retailers.

b) The organisation and issuers of standards

Tab. 1: The diversity of standards

<table>
<thead>
<tr>
<th>Standard</th>
<th>Information</th>
</tr>
</thead>
</table>
| DIN standard| Issuer: Deutsches Institut für Normung (German Institute for Standardisation)  
= national, German standard  
DIN standards are issued for electric components and organisational methods as well as fasteners. DIN standards remain common in Germany even though the changeover to ISO standards is gaining pace. DIN standards will remain in place for parts which do not have ISO/EN standards or for which there is no need for standardisation. |
= international standard  
The term "ISO" comes from the Greek for "equal". ISO standards apply around the world and are therefore suited for world trade. Even though ISO standardisation is gaining in importance, the German DIN standard was a world leader in standardisation for a long time. |
| EN standard  | Issuer: European Committee for Standardization (CEN)  
= europäische Norm (European standard)  
The idea behind the EN standard was to establish "equal" preconditions for trade within Europe. Unlike ISO standards, EN standards only apply within the European Union. The CEN endeavours to make EN and ISO standards the same. In principle existing ISO standards should be adopted unchanged as EN standards, retaining the same ISO standard number but starting with EN ISO. If this is not possible at European standardisation level, separate EN standards are produced with EN standard numbers different from the ISO numbers. |
Continuation of Tab. 1: The diversity of standards

<table>
<thead>
<tr>
<th>Standard</th>
<th>Information</th>
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<tbody>
<tr>
<td>DIN EN standard</td>
<td>= national German version of an EN standard adopted in unchanged form. This is a combination of standards which indicates that the standard number (e.g. 12345) identifies the same object both in the DIN standard and the EN standard.</td>
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<tr>
<td>DIN EN ISO standard</td>
<td>= national German version of an EN standard adopted in unchanged form. This is a combination of standards which indicates that the standard number (e.g. 12345) identifies the same object in the DIN standard, EN standard and ISO standard.</td>
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<tr>
<td>DIN ISO EN</td>
<td>= national German version of an ISO standard adopted in unchanged form.</td>
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</table>

c) What does a DIN standard reveal?

Just like any other standard, the DIN standard delivers standardisation and simplicity. For example, for a query it would suffice to say "DIN 933, M12 x 40, A4-70" to define a multitude of features. This means that you don’t always have to cross-check the requirements of a product and the customer can be sure that he or she receives precisely the goods they ordered.

Standards define at least one of the following features:

- Head shape (e.g. hexagon head, hexagonal socket, raised countersunk head)
- Type of thread (e.g. standard metric ISO thread M, sheet metal thread)
- Thread length
- Thread pitch
- Material and strength class
- Possible coatings or strength characteristics

\[
\begin{align*}
    b &= \text{thread length for screws whose thread does not extend to the head (partial thread screws)} \\
    d &= \text{thread diameter in mm} \\
    e &= \text{corner measurement on head} \\
    k &= \text{height of head} \\
    I &= \text{nominal length of screw – this also indicates how the length of a screw is measured.} \\
    S &= \text{width across flats}
\end{align*}
\]
The example below should explain what the following details mean:

**DIN 931, M 12 x 40, A4-70**

DIN 931 = hexagonal screw with shoulder  
M = metric ISO thread  
12 = d... thread diameter of screw of 12 mm  
X 40 = l... nominal length in mm  
A4 = material class, stainless steel A4  
- 70 = strength class 70

P = the thread pitch is stated by a number. If this number is not provided, it is a standard thread. (M 12 x 40). The pitch is only stated for screws with a thread other than a standard thread, e.g. M 12 x 1 x 40 designates a

**d) Change in standard (DIN > EN > ISO)**

While the earlier DIN standards applied as standard specifications for Germany alone, the EN and ISO standards apply throughout Europe and the world. Many ISO standards were based on DIN standards; but many standards were only introduced when a relevant ISO standard was written (e.g. ISO 7380). Retailers are making a smooth changeover to ISO standards and DIN and ISO articles are manufactured side by side.
Tab. 2: An overview of changes to standards:

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<th>ISO</th>
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<td>16 mm</td>
</tr>
<tr>
<td>M 12</td>
<td>19 mm</td>
<td>18 mm</td>
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<tr>
<td>M 14</td>
<td>22 mm</td>
<td>21 mm</td>
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<tr>
<td>M 22</td>
<td>32 mm</td>
<td>34 mm</td>
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Tab. 3: Changes to hexagonal screws and nuts

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<th>ISO  (DIN ISO)</th>
<th>EN  (DIN EN)</th>
<th>Range of dimensions¹</th>
<th>Changes²</th>
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<td>558</td>
<td>4018</td>
<td>24018</td>
<td>φ M 10, 12, 14, 22</td>
<td>New ISO widths across flats</td>
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<td>φ M 10, 12, 14, 22</td>
<td>New ISO widths across flats</td>
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<td>24017</td>
<td>All other ø</td>
<td>None = DIN and ISO are identical</td>
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<td>28765</td>
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<td>601</td>
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<td>24016</td>
<td>φ M 10, 12, 14, 22</td>
<td>Screws: new ISO widths across flats</td>
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<td>with 4034 nuts</td>
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<td>Nuts: new ISO WAF + ISO heights</td>
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<td>Other ø up to M 39</td>
<td>Screws: none = DIN and ISO are identical</td>
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<td>with 4032 nuts</td>
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<td></td>
<td>Nuts: new ISO heights</td>
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<td>φ M 12, 16</td>
<td>New ISO widths across flats</td>
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<td>All other ø</td>
<td>None</td>
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<tr>
<td>609</td>
<td>-</td>
<td>-</td>
<td>φ M 10, 12, 14, 22</td>
<td>New ISO widths across flats</td>
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<td>610</td>
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<td>7968</td>
<td>-</td>
<td>24034</td>
<td>M 12, 22</td>
<td>Screws: new ISO widths across flats</td>
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<td>24034</td>
<td>All other ø</td>
<td>Nuts: new ISO WAF + ISO heights</td>
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<td>φ M 10, 12, 14, 22</td>
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<td>φ M 10, 12, 14, 22</td>
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<td>(A=out bevel)</td>
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<td>New ISO WAF + new ISO heights</td>
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<td>φ above M 39</td>
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### Tab. 4: Dimensional changes to hexagonal screws and nuts

### Continued from Tab. 3: Changes to hexagonal screws and nuts

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<th>EN (DIN EN)</th>
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<th>Changes</th>
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1 For comparison of WAFs and nut heights between DIN and ISO, see Table C
2 For assignment of standards, mechanical properties for nuts made of steel, see Table C

### Tab. 4: Dimensional changes to hexagonal screws and nuts

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<th>Nominal measurement d</th>
<th>Width across flat s</th>
<th>Nut height m min-max</th>
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<td>Sizes to be avoided</td>
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<td>ISO</td>
</tr>
<tr>
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<td>2.5</td>
<td>-</td>
</tr>
<tr>
<td>M 1.2</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>M 1.4</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>M 1.6</td>
<td>3.2</td>
<td>-</td>
</tr>
<tr>
<td>M 2</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>M 2.5</td>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>M 3</td>
<td>5.5</td>
<td>-</td>
</tr>
<tr>
<td>(M 3.5)</td>
<td>6</td>
<td>-</td>
</tr>
<tr>
<td>M 4</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>M 5</td>
<td>8</td>
<td>3.4-4.6</td>
</tr>
<tr>
<td>M 6</td>
<td>10</td>
<td>4.4-5.6</td>
</tr>
<tr>
<td>(M 7)</td>
<td>11</td>
<td>-</td>
</tr>
<tr>
<td>M 8</td>
<td>13</td>
<td>5.75-7.25</td>
</tr>
<tr>
<td>M 10</td>
<td>17</td>
<td>7.25-8.75</td>
</tr>
<tr>
<td>M 12</td>
<td>19</td>
<td>9.25-10.75</td>
</tr>
<tr>
<td>(M 14)</td>
<td>22</td>
<td>-</td>
</tr>
<tr>
<td>(M 18)</td>
<td>27</td>
<td>-</td>
</tr>
<tr>
<td>(M 22)</td>
<td>32</td>
<td>17.1-18.9</td>
</tr>
<tr>
<td>M 24</td>
<td>36</td>
<td>17.95-20.05</td>
</tr>
<tr>
<td>(M 27)</td>
<td>41</td>
<td>20.95-23.05</td>
</tr>
<tr>
<td>M 30</td>
<td>46</td>
<td>22.95-25.05</td>
</tr>
<tr>
<td>(M 33)</td>
<td>50</td>
<td>24.95-27.05</td>
</tr>
<tr>
<td>M 36</td>
<td>55</td>
<td>27.95-30.05</td>
</tr>
<tr>
<td>(M 39)</td>
<td>60</td>
<td>29.75-32.25</td>
</tr>
<tr>
<td>M 42</td>
<td>65</td>
<td>32.75-35.25</td>
</tr>
<tr>
<td>(M 45)</td>
<td>70</td>
<td>34.75-37.25</td>
</tr>
<tr>
<td>M 48</td>
<td>75</td>
<td>36.75-39.25</td>
</tr>
<tr>
<td>(M 52)</td>
<td>80</td>
<td>40.75-43.25</td>
</tr>
<tr>
<td>M 56</td>
<td>85</td>
<td>43.75-46.25</td>
</tr>
<tr>
<td>(M 60)</td>
<td>90</td>
<td>46.75-49.25</td>
</tr>
<tr>
<td>M 64</td>
<td>95</td>
<td>49.5-52.5</td>
</tr>
</tbody>
</table>

> M 64

Max. M 100 x 6

Max. M 160 x 6

-/-
Continuation of Tab. 4: Changes to the dimensions of hexagonal screws and nuts

<table>
<thead>
<tr>
<th>Nominal measurement d</th>
<th>Width across flat s</th>
<th>Nut height m min-max</th>
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</thead>
<tbody>
<tr>
<td>Sizes to be avoided</td>
<td>DIN ISO</td>
<td>DIN ISO DIN ISO</td>
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<tr>
<td></td>
<td></td>
<td>555 4034 934 4032</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ISO type 1 ISO type 1</td>
</tr>
<tr>
<td>Nut height factor</td>
<td>m d approx.</td>
<td>≤ M 4 - 0.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M 5-M 39 0.83-1.12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≥ M 42 ~ 0.8</td>
</tr>
<tr>
<td>Product class</td>
<td>C (rough)</td>
<td>≤ M 16 = A (average)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt; M 16 = B (average)</td>
</tr>
<tr>
<td>Thread tolerance</td>
<td>7 H</td>
<td>6 H</td>
</tr>
<tr>
<td>Strength class</td>
<td>Core range</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6, 8,10 (ISO 8673 = strength</td>
</tr>
<tr>
<td></td>
<td></td>
<td>class 10 ≤ M 16)</td>
</tr>
<tr>
<td>Steel</td>
<td>~ M 5-39</td>
<td>M 16 &lt; d ≤ M 39 = 4.5</td>
</tr>
<tr>
<td></td>
<td>&gt; M 39</td>
<td>Following agreement</td>
</tr>
<tr>
<td>Mechanical characteristics</td>
<td>according to standard</td>
<td>DIN 267 ISO 898</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Part 4 Part 2 Part 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ISO 898 Part 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Part 4 Part 6 (fine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>thread)</td>
</tr>
</tbody>
</table>

Tab. 5: Changes to small metric screws

<table>
<thead>
<tr>
<th>DIN (old)</th>
<th>ISO</th>
<th>DIN (new or DIN EN)</th>
<th>Title</th>
<th>Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>84</td>
<td>1207</td>
<td>DIN EN 21207</td>
<td>Socket cap screws with slot; product class A (ISO 1207: 1992)</td>
<td>Head height and diameter in places</td>
</tr>
<tr>
<td>85</td>
<td>1580</td>
<td>DIN EN 21580</td>
<td>Flat-headed screws with slot; product class A</td>
<td>Head height and diameter in places</td>
</tr>
<tr>
<td>963</td>
<td>2009</td>
<td>DIN EN 22009</td>
<td>Countersunk screws with slot, shape A</td>
<td>Head height and diameter in places</td>
</tr>
<tr>
<td>964</td>
<td>2010</td>
<td>DIN EN 22010</td>
<td>Countersunk oval head screws with slot, shape A</td>
<td>Head height and diameter in places</td>
</tr>
<tr>
<td>965</td>
<td>7046-1</td>
<td>DIN EN 27046-1</td>
<td>Countersunk screws with cross recess (common head): product class A, strength class 4.8</td>
<td>Head height and diameter in places</td>
</tr>
<tr>
<td>965</td>
<td>7046-2</td>
<td>DIN EN 27046-2</td>
<td>Countersunk screws with cross recess (common head): product class A, strength class 4.8</td>
<td>Head height and diameter in places</td>
</tr>
<tr>
<td>966</td>
<td>7047</td>
<td>DIN EN 27047</td>
<td>Countersunk oval head screws with cross recess (common head): product class A</td>
<td>Head height and diameter in places</td>
</tr>
<tr>
<td>7985</td>
<td>7045</td>
<td>DIN EN 27045</td>
<td>Flat-headed screws with cross recess; product class A</td>
<td>Head height and diameter in places</td>
</tr>
<tr>
<td>DIN (old)</td>
<td>ISO</td>
<td>DIN (new or DIN EN)</td>
<td>Title</td>
<td>Changes</td>
</tr>
<tr>
<td>----------</td>
<td>-------</td>
<td>---------------------</td>
<td>----------------------------------------------------------------------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>2339</td>
<td>DIN EN 22339</td>
<td>Tapered pins; unhardened (ISO 2339: 1986)</td>
<td>Length I incl. round ends</td>
</tr>
<tr>
<td>7</td>
<td>2338</td>
<td>DIN EN 22338</td>
<td>Cylindrical pins; unhardened (ISO 2338: 1986)</td>
<td>Length I incl. round ends</td>
</tr>
<tr>
<td>1440</td>
<td>8738</td>
<td>DIN EN 28738</td>
<td>Washers for bolts; product class A (ISO 8738: 1986)</td>
<td>Outer diameter in places</td>
</tr>
<tr>
<td>1443</td>
<td>2340</td>
<td>DIN EN 22340</td>
<td>Bolt without head (ISO 2340: 1986)</td>
<td>Nothing noteworthy</td>
</tr>
<tr>
<td>1444</td>
<td>2341</td>
<td>DIN EN 22341</td>
<td>Bolt with head (ISO 2341: 1986)</td>
<td>Nothing noteworthy</td>
</tr>
<tr>
<td>1470</td>
<td>8739</td>
<td>DIN EN 28739</td>
<td>Full length parallel grooved cylindrical pins with pilot (ISO 8739: 1986)</td>
<td>Increased shearing forces</td>
</tr>
<tr>
<td>1471</td>
<td>8744</td>
<td>DIN EN 28744</td>
<td>Full length taper grooved pins (ISO 8744: 1986)</td>
<td>Increased shearing forces</td>
</tr>
<tr>
<td>1472</td>
<td>8745</td>
<td>DIN EN 28745</td>
<td>Half length taper grooved pins</td>
<td>Increased shearing forces</td>
</tr>
<tr>
<td>1473</td>
<td>8740</td>
<td>DIN EN 28740</td>
<td>Full length parallel grooved cylindrical pins with bevel (ISO 8740: 1986)</td>
<td>Increased shearing forces</td>
</tr>
<tr>
<td>1474</td>
<td>8741</td>
<td>DIN EN 28741</td>
<td>Half length reverse grooved pins (ISO 8741: 1986)</td>
<td>Increased shearing forces</td>
</tr>
<tr>
<td>1475</td>
<td>8742</td>
<td>DIN EN 28742</td>
<td>Groove pins - 1/3 of length grooved (ISO 8742: 1986)</td>
<td>Increased shearing forces</td>
</tr>
<tr>
<td>1476</td>
<td>8746</td>
<td>DIN EN 28746</td>
<td>Semi round grooved pins (ISO 8746: 1986)</td>
<td>Nothing noteworthy</td>
</tr>
<tr>
<td>1477</td>
<td>8747</td>
<td>DIN EN 28747</td>
<td>Countersunk grooved pins (ISO 8747: 1986)</td>
<td>Nothing noteworthy</td>
</tr>
<tr>
<td>1481</td>
<td>8752</td>
<td>DIN EN 28752</td>
<td>Dowel pins; slotted (ISO 8752: 1987)</td>
<td>Nothing noteworthy</td>
</tr>
<tr>
<td>6325</td>
<td>8734</td>
<td>DIN EN 28734</td>
<td>Cylindrical pins; hardened (ISO 8734: 1987)</td>
<td>Nothing noteworthy</td>
</tr>
<tr>
<td>7977</td>
<td>8737</td>
<td>DIN EN 28737</td>
<td>Tapered pins with threaded peg; unhardened (ISO 8737: 1986)</td>
<td>Nothing noteworthy</td>
</tr>
<tr>
<td>7978</td>
<td>8736</td>
<td>DIN EN 28736</td>
<td>Tapered pins with female thread; unhardened (ISO 8736: 1986)</td>
<td>Nothing noteworthy</td>
</tr>
<tr>
<td>7979</td>
<td>8733</td>
<td>DIN EN 28733</td>
<td>Cylindrical pins with female thread; unhardened (ISO 8733: 1986)</td>
<td>Nothing noteworthy</td>
</tr>
<tr>
<td>7979</td>
<td>8735</td>
<td>DIN EN 28735</td>
<td>Cylindrical pins with female thread; hardened (ISO 8735: 1987)</td>
<td>Nothing noteworthy</td>
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</table>
Tab. 7: Changes to tapping screws

<table>
<thead>
<tr>
<th>DIN (old)</th>
<th>ISO</th>
<th>DIN (new or DIN EN)</th>
<th>Title</th>
<th>Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>7971</td>
<td>1481</td>
<td>DIN ISO 1481</td>
<td>Flat head tapping screws with slot (ISO 1481: 1983)</td>
<td>Head height and diameter in places</td>
</tr>
<tr>
<td>7972</td>
<td>1482</td>
<td>DIN ISO 1482</td>
<td>Tapping screws with slot, countersunk head</td>
<td>Head height and diameter in places</td>
</tr>
<tr>
<td>7973</td>
<td>1483</td>
<td>DIN ISO 1483</td>
<td>Tapping screws with slot, raised countersunk head</td>
<td>Head height and diameter in places</td>
</tr>
<tr>
<td>7976</td>
<td>1479</td>
<td>DIN ISO 1479</td>
<td>Tapping screws with hexagon head</td>
<td>Head height in places</td>
</tr>
<tr>
<td>7981</td>
<td>7049</td>
<td>DIN ISO 7049</td>
<td>Tapping screws with cross recess, fillister head</td>
<td>Head height and diameter in places</td>
</tr>
<tr>
<td>7982</td>
<td>7050</td>
<td>DIN ISO 7050</td>
<td>Tapping screws with cross recess, countersunk head</td>
<td>Head height and diameter in places</td>
</tr>
<tr>
<td>7983</td>
<td>7051</td>
<td>DIN ISO 7051</td>
<td>Tapping screws with cross recess, raised countersunk head</td>
<td>Head height and diameter in places</td>
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</table>

Tab. 8: Changes to threaded pins

<table>
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<th>DIN (old)</th>
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<th>DIN (new or DIN EN)</th>
<th>Title</th>
<th>Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>417</td>
<td>7435</td>
<td>DIN EN 27435</td>
<td>Threaded pins with slot and peg (ISO 7431: 1983)</td>
<td>Nothing noteworthy</td>
</tr>
<tr>
<td>438</td>
<td>7436</td>
<td>DIN EN 27436</td>
<td>Threaded pins with slot and cup point (ISO 7436: 1983)</td>
<td>Nothing noteworthy</td>
</tr>
<tr>
<td>551</td>
<td>4766</td>
<td>DIN EN 24766</td>
<td>Threaded pins with slot and flat point (ISO 4766: 1983)</td>
<td>Nothing noteworthy</td>
</tr>
<tr>
<td>553</td>
<td>7434</td>
<td>DIN EN 27434</td>
<td>Threaded pins with slot and tip (ISO 7431: 1983)</td>
<td>Nothing noteworthy</td>
</tr>
<tr>
<td>913</td>
<td>4026</td>
<td>DIN 913</td>
<td>Threaded pins with hexagonal socket and flat point</td>
<td>Nothing noteworthy</td>
</tr>
<tr>
<td>914</td>
<td>4027</td>
<td>DIN 914</td>
<td>Threaded pins with hexagonal socket and tip</td>
<td>Nothing noteworthy</td>
</tr>
<tr>
<td>915</td>
<td>4028</td>
<td>DIN 915</td>
<td>Threaded pins with hexagonal socket and peg</td>
<td>Nothing noteworthy</td>
</tr>
<tr>
<td>916</td>
<td>4029</td>
<td>DIN 916</td>
<td>Threaded pins with hexagonal socket and cup point</td>
<td>Nothing noteworthy</td>
</tr>
</tbody>
</table>
### Tab. 9: Technical terms of delivery and basic standards

<table>
<thead>
<tr>
<th>DIN (old)</th>
<th>ISO</th>
<th>DIN (new or DIN EN)</th>
<th>Title</th>
<th>Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>267 Part 20</td>
<td>-</td>
<td>DIN EN 493</td>
<td>Fasteners, surface defects, nuts</td>
<td>None</td>
</tr>
<tr>
<td>267 Part 21</td>
<td>-</td>
<td>DIN EN 493</td>
<td>Fasteners, surface defects, nuts</td>
<td>None</td>
</tr>
<tr>
<td>267 Part 19</td>
<td>6157-1</td>
<td>DIN EN 26157 Part 1</td>
<td>Fasteners, surface defects, screws for general requirements (ISO 6157-1:1988)</td>
<td>None</td>
</tr>
<tr>
<td>267 Part 19</td>
<td>6157-3</td>
<td>DIN EN 26157 Part 3</td>
<td>Fasteners, surface defects, screws for general requirements (ISO 6157-3:1988)</td>
<td>None</td>
</tr>
<tr>
<td>DIN ISO 7721</td>
<td>7721</td>
<td>DIN EN 27721</td>
<td>Countersunk screws; design and testing of countersunk heads (ISO 7721: 1983)</td>
<td>None</td>
</tr>
<tr>
<td>267 Part 9</td>
<td>-</td>
<td>DIN ISO 4042</td>
<td>Parts with threads - galvanic coatings</td>
<td>None</td>
</tr>
<tr>
<td>267 Part 1</td>
<td>-</td>
<td>DIN ISO 8992</td>
<td>General requirements for screws and nuts</td>
<td>None</td>
</tr>
<tr>
<td>267 Part 5</td>
<td>-</td>
<td>DIN ISO 3269</td>
<td>Mechanical fasteners - acceptance inspection</td>
<td>None</td>
</tr>
<tr>
<td>267 Part 11</td>
<td>-</td>
<td>DIN ISO 3506</td>
<td>Stainless steel fasteners - technical terms of delivery</td>
<td>None</td>
</tr>
<tr>
<td>267 Part 12</td>
<td>-</td>
<td>DIN EN ISO 2702</td>
<td>Heat-treated steel tapping screw - mechanical properties</td>
<td>None</td>
</tr>
<tr>
<td>267 Part 18</td>
<td>8839</td>
<td>DIN EN 28839</td>
<td>Mech. properties of fasteners, screws and nuts made from non-ferrous metals (ISO 8839: 1986)</td>
<td>None</td>
</tr>
</tbody>
</table>
II. Mechanical properties of special-grade stainless steel

Stainless steels divide into three groups of steel - austenitic, ferritic and martensitic. Austenitic steel is by far the commonest and offers the greatest scope for use. The steel groups and strength classes are designated by a four-digit sequence of letters and numbers as shown in the following example. DIN EN ISO 3506 governs screws and nuts made from stainless steel.

**Example:**
A2 - 80
A = austenitic steel
2 = type of alloy within group A
80 = tensile strength of at least 800 N/mm², cold work hardened

II. a) Labelling system for grades of stainless steels and their strength classes

*Fig. A:*

![Diagram](image-url)
Tab. 10: Common stainless steels and their chemical composition

<table>
<thead>
<tr>
<th>Material designation</th>
<th>Material no.</th>
<th>C %</th>
<th>Si ≤ %</th>
<th>Mn ≤ %</th>
<th>Cr %</th>
<th>Mo %</th>
<th>Ni %</th>
<th>Altri %</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 2</td>
<td>X 5Cr Ni 1810</td>
<td>1.4301</td>
<td>≤ 0.07</td>
<td>1.0</td>
<td>2.0</td>
<td>17.5 to 19.5</td>
<td>-</td>
<td>8.0 to 10.5</td>
</tr>
<tr>
<td></td>
<td>X 2 Cr Ni 1811</td>
<td>1.4306</td>
<td>≤ 0.03</td>
<td>1.0</td>
<td>2.0</td>
<td>18.0 to 20.0</td>
<td>-</td>
<td>10 to 12.0</td>
</tr>
<tr>
<td></td>
<td>X 8 Cr Ni 19/10</td>
<td>1.4303</td>
<td>≤ 0.07</td>
<td>1.0</td>
<td>2.0</td>
<td>17.0 to 19.0</td>
<td>-</td>
<td>11.0 to 13.0</td>
</tr>
<tr>
<td>A 3</td>
<td>X 6 Cr Ni Ti 1811</td>
<td>1.4541</td>
<td>≤ 0.10</td>
<td>1.0</td>
<td>2.0</td>
<td>17.0 to 19.0</td>
<td>-</td>
<td>9.0 to 12.0</td>
</tr>
<tr>
<td>A 4</td>
<td>X 5 Cr Ni Mo 1712</td>
<td>1.4401</td>
<td>≤ 0.07</td>
<td>1.0</td>
<td>2.0</td>
<td>16.5 to 18.5</td>
<td>2.0 to 2.5</td>
<td>10.0 to 13.0</td>
</tr>
<tr>
<td></td>
<td>X 2 Cr Ni Mo 1712</td>
<td>1.4404</td>
<td>≤ 0.03</td>
<td>1.0</td>
<td>2.0</td>
<td>16.5 to 18.5</td>
<td>2.0 to 2.5</td>
<td>10 to 13</td>
</tr>
<tr>
<td>A 5</td>
<td>X 6 Cr Ni Mo Ti 1712</td>
<td>1.4571</td>
<td>≤ 0.10</td>
<td>1.0</td>
<td>2.0</td>
<td>16.5 to 18.5</td>
<td>2.0 to 2.5</td>
<td>10.5 to 13.5</td>
</tr>
</tbody>
</table>

II. b) Subdivision of strengths of stainless steel screws

DIN ISO 3506 has summarised the recommended steel grades for fasteners. It is virtually only austenitic stainless steel A2 which is used here. On the other hand chrome nickel steels from steel group A4 tend to be used for very high corrosion requirements. Tab. 11 is based on screw connections made from austenitic steel in terms of mechanical strength values.
Mechanical properties of fasteners - austenitic steel grades

Tab. 11: Extract from DIN EN ISO 3506-1

<table>
<thead>
<tr>
<th>Steel group</th>
<th>Steel grade</th>
<th>Strength class</th>
<th>Screws</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Tensile strength $R_m^{(1)}$ N/mm$^2$ min.</td>
<td>$0.2%$ yield strength $R_p^{(0.2)}$ N/mm$^2$ min.</td>
</tr>
<tr>
<td>Austenitic</td>
<td>A1, A2, A3, A4 and A5</td>
<td>50</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td></td>
<td>70</td>
<td>700</td>
</tr>
<tr>
<td></td>
<td></td>
<td>80</td>
<td>800</td>
</tr>
</tbody>
</table>

1) The tensile stress is calculated with reference to the tensile stress area (see DIN EN ISO 3506-1).

2) The elongation at fracture should be calculated according to 7.2.4 at the corresponding screw length and not on the turned samples. $d$ is the nominal diameter.

II. c) Yield strength loads for shoulder studs

Since austenitic chrome nickel steels cannot be hardened, a higher yield strength is only achieved through cold work hardening resulting from cold working (e.g. using threaded rollers). The yield strength loads for shoulder studs according to DIN EN ISO 3506 can be taken from Table 12.

Tab. 12: Yield strength loads for shoulder studs

<table>
<thead>
<tr>
<th>Nominal diameter</th>
<th>Yield strength loads of austenitic steels according to DIN EN ISO 3506 A 2 and A 4 in N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strength class</td>
<td>50</td>
</tr>
<tr>
<td>M 5</td>
<td>2980</td>
</tr>
<tr>
<td>M 6</td>
<td>4220</td>
</tr>
<tr>
<td>M 8</td>
<td>7685</td>
</tr>
<tr>
<td>M 10</td>
<td>12180</td>
</tr>
<tr>
<td>M 12</td>
<td>17700</td>
</tr>
<tr>
<td>M 16</td>
<td>32970</td>
</tr>
<tr>
<td>M 20</td>
<td>51450</td>
</tr>
<tr>
<td>M 24</td>
<td>74130</td>
</tr>
<tr>
<td>M 27</td>
<td>96390</td>
</tr>
<tr>
<td>M 30</td>
<td>117810</td>
</tr>
</tbody>
</table>
II. d) Properties of stainless steel screws at increased temperatures

Tab. 13: Strength class 70

<table>
<thead>
<tr>
<th>Nominal diameter</th>
<th>Warm yield strengths in N</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+ 20 °C</td>
</tr>
<tr>
<td>M 5</td>
<td>6390</td>
</tr>
<tr>
<td>M 6</td>
<td>9045</td>
</tr>
<tr>
<td>M 8</td>
<td>16 740</td>
</tr>
<tr>
<td>M 10</td>
<td>26 100</td>
</tr>
<tr>
<td>M 12</td>
<td>37 935</td>
</tr>
<tr>
<td>M 16</td>
<td>70 650</td>
</tr>
<tr>
<td>M 20</td>
<td>110 250</td>
</tr>
<tr>
<td>M 24</td>
<td>88 250</td>
</tr>
<tr>
<td>M 27</td>
<td>114 750</td>
</tr>
<tr>
<td>M 30</td>
<td>140 250</td>
</tr>
</tbody>
</table>

The values in DIN 17440 apply for strength class 50

II. e) Reference values for tightening torques

The tightening torque required for an individual screw connection task can be taken from Table 6 as a reference value depending on nominal diameter and friction coefficient.

Tab. 14: Reference values for tightening torques for screws according to DIN EN ISO 3506

<table>
<thead>
<tr>
<th>Friction coefficient μ total 0.10</th>
<th>Pretensioning forces F vmax, [kN]</th>
<th>Tightening torque M A, [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50</td>
<td>70</td>
</tr>
<tr>
<td>M 3</td>
<td>0.9</td>
<td>1</td>
</tr>
<tr>
<td>M 4</td>
<td>1.08</td>
<td>2.97</td>
</tr>
<tr>
<td>M 5</td>
<td>2.26</td>
<td>4.85</td>
</tr>
<tr>
<td>M 6</td>
<td>3.2</td>
<td>6.85</td>
</tr>
<tr>
<td>M 8</td>
<td>5.86</td>
<td>12.6</td>
</tr>
<tr>
<td>M 10</td>
<td>9.32</td>
<td>20</td>
</tr>
<tr>
<td>M 12</td>
<td>13.6</td>
<td>29.1</td>
</tr>
<tr>
<td>M 14</td>
<td>18.7</td>
<td>40</td>
</tr>
<tr>
<td>M 16</td>
<td>25.7</td>
<td>55</td>
</tr>
<tr>
<td>M 18</td>
<td>32.2</td>
<td>69</td>
</tr>
<tr>
<td>M 20</td>
<td>41.3</td>
<td>88.6</td>
</tr>
<tr>
<td>M 22</td>
<td>50</td>
<td>107</td>
</tr>
<tr>
<td>M 24</td>
<td>58</td>
<td>142</td>
</tr>
<tr>
<td>M 27</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>M 30</td>
<td>91</td>
<td></td>
</tr>
<tr>
<td>M 33</td>
<td>114</td>
<td></td>
</tr>
<tr>
<td>M 36</td>
<td>135</td>
<td></td>
</tr>
<tr>
<td>M 39</td>
<td>162</td>
<td></td>
</tr>
<tr>
<td>Friction coefficient $\mu_{\text{total}}$ 0.20</td>
<td>Pretensioning forces $F_{\text{vmax}}$ [kN]</td>
<td>Tightening torque $M_A$ [Nm]</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>------------------------------------------</td>
<td>------------------------------</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>70</td>
</tr>
<tr>
<td>M 3</td>
<td>0.6</td>
<td>0.65</td>
</tr>
<tr>
<td>M 4</td>
<td>1.12</td>
<td>2.4</td>
</tr>
<tr>
<td>M 5</td>
<td>1.83</td>
<td>3.93</td>
</tr>
<tr>
<td>M 6</td>
<td>2.59</td>
<td>5.54</td>
</tr>
<tr>
<td>M 8</td>
<td>4.75</td>
<td>10.2</td>
</tr>
<tr>
<td>M 10</td>
<td>7.58</td>
<td>16.2</td>
</tr>
<tr>
<td>M 12</td>
<td>11.1</td>
<td>23.7</td>
</tr>
<tr>
<td>M 14</td>
<td>15.2</td>
<td>32.6</td>
</tr>
<tr>
<td>M 16</td>
<td>20.9</td>
<td>44.9</td>
</tr>
<tr>
<td>M 18</td>
<td>26.2</td>
<td>56.2</td>
</tr>
<tr>
<td>M 20</td>
<td>33.8</td>
<td>72.4</td>
</tr>
<tr>
<td>M 22</td>
<td>41</td>
<td>88</td>
</tr>
<tr>
<td>M 24</td>
<td>47</td>
<td>101</td>
</tr>
<tr>
<td>M 27</td>
<td>61</td>
<td></td>
</tr>
<tr>
<td>M 30</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>M 33</td>
<td>94</td>
<td></td>
</tr>
<tr>
<td>M 36</td>
<td>110</td>
<td></td>
</tr>
<tr>
<td>M 39</td>
<td>133</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Friction coefficient $\mu_{\text{total}}$ 0.30</th>
<th>Pretensioning forces $F_{\text{vmax}}$ [kN]</th>
<th>Tightening torque $M_A$ [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50</td>
<td>70</td>
</tr>
<tr>
<td>M 3</td>
<td>0.4</td>
<td>0.45</td>
</tr>
<tr>
<td>M 4</td>
<td>0.9</td>
<td>1.94</td>
</tr>
<tr>
<td>M 5</td>
<td>1.49</td>
<td>3.19</td>
</tr>
<tr>
<td>M 6</td>
<td>2.09</td>
<td>4.49</td>
</tr>
<tr>
<td>M 8</td>
<td>3.85</td>
<td>8.85</td>
</tr>
<tr>
<td>M 10</td>
<td>6.14</td>
<td>13.1</td>
</tr>
<tr>
<td>M 12</td>
<td>9</td>
<td>19.2</td>
</tr>
<tr>
<td>M 14</td>
<td>12.3</td>
<td>26.4</td>
</tr>
<tr>
<td>M 16</td>
<td>17</td>
<td>36.4</td>
</tr>
<tr>
<td>M 18</td>
<td>21.1</td>
<td>45.5</td>
</tr>
<tr>
<td>M 20</td>
<td>27.4</td>
<td>58.7</td>
</tr>
<tr>
<td>M 22</td>
<td>34</td>
<td>72</td>
</tr>
<tr>
<td>M 24</td>
<td>39</td>
<td>83</td>
</tr>
<tr>
<td>M 27</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>M 30</td>
<td>61</td>
<td></td>
</tr>
<tr>
<td>M 33</td>
<td>76</td>
<td></td>
</tr>
<tr>
<td>M 36</td>
<td>89</td>
<td></td>
</tr>
<tr>
<td>M 39</td>
<td>108</td>
<td></td>
</tr>
</tbody>
</table>
Friction coefficients $\mu_G$ and $\mu_K$ according to DIN 267 Part 11

Tab. 15: Friction coefficients $\mu_G$ and $\mu_K$ for screws made from stainless steel and anti-corrosion steel

<table>
<thead>
<tr>
<th>Screw made from</th>
<th>Nut made from</th>
<th>$\mu_{total}$ When lubricated</th>
<th>$\mu_{total}$ No lubrication</th>
<th>$\mu_{total}$ MoS$_2$ paste</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 2 or A 4</td>
<td>A 2 or A 4</td>
<td>0.23 - 0.5</td>
<td>0.10 - 0.20</td>
<td></td>
</tr>
<tr>
<td>A 2 or A 4</td>
<td>AIMgSi</td>
<td>0.28 - 0.35</td>
<td>0.08 - 0.16</td>
<td></td>
</tr>
</tbody>
</table>

Friction coefficients $\mu_{total}$ require the same friction value in the thread and under the head / nut support.
Tab. 16: Friction coefficients $\mu_G$ and $\mu_K$ for screws and nuts made from stainless steel and anti-corrosion steel

<table>
<thead>
<tr>
<th>Screw made from</th>
<th>Nut made from</th>
<th>Lubricant</th>
<th>Resilience of connection</th>
<th>Friction coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A 2</td>
<td>none</td>
<td>very high</td>
<td>$\mu_G$ in thread</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Special lubricant (chloroparaffin base)</td>
<td></td>
<td>0.26 to 0.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Anticorrosive grease</td>
<td></td>
<td>0.12 to 0.23</td>
</tr>
<tr>
<td></td>
<td></td>
<td>none</td>
<td>low</td>
<td>0.23 to 0.35</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Special lubricant (chloroparaffin base)</td>
<td></td>
<td>0.10 to 0.16</td>
</tr>
<tr>
<td></td>
<td>AIMgSi</td>
<td>none</td>
<td>very high</td>
<td>0.32 to 0.43</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Special lubricant (chloroparaffin base)</td>
<td></td>
<td>0.28 to 0.35</td>
</tr>
</tbody>
</table>

Hex nuts with a clamping part made from stainless steels tend to seize because of the high thread flank pressure as the thread moulds into the clamping part. Using a friction-reducing agent can remedy the situation. But this should be taken into account accordingly for friction values.

II. f) Magnetic properties of austenitic stainless steel

All fasteners made from austenitic stainless steels are generally non-magnetic; a certain magnetisability may occur after cold processing.

Each material, including stainless steel, is labelled by its ability to be magnetisable. In all probability only vacuums will be fully non-magnetic. The gauge for the material permeability in a magnetic field is the magnetic permeability value $\mu_r$ for this material in relation to a vacuum.

The material has a low magnetic permeability when $\mu_r$ near is equal to 1.

Examples:  
A2: $\mu_r \sim 1.8$  /  A4: $\mu_r \sim 1.015$  /  A4L: $\mu_r \sim 1.005$  /  AF1: $\mu_r \sim 5$
### International comparison of material

<table>
<thead>
<tr>
<th>Mat. no.</th>
<th>Short name</th>
<th>AISI¹</th>
<th>UNS²</th>
<th>SS³</th>
<th>AFNOR⁴</th>
<th>BS⁵</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.4006</td>
<td>X12Cr13</td>
<td>410</td>
<td></td>
<td>2302</td>
<td></td>
<td>Z 10 C 13</td>
</tr>
<tr>
<td>1.4016</td>
<td>X6Cr17</td>
<td>430</td>
<td></td>
<td>2320</td>
<td></td>
<td>Z 8 C 17</td>
</tr>
<tr>
<td>1.4301</td>
<td>X5CrNi18-10</td>
<td>304</td>
<td>S 30400</td>
<td>2332</td>
<td>Z 6 CN 18.09</td>
<td>304 S 15</td>
</tr>
<tr>
<td>1.4303</td>
<td>X10CrNiS18-9</td>
<td>305</td>
<td>S 30500</td>
<td>2352</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.4305</td>
<td>X 10 CrNiS 18-9</td>
<td>303</td>
<td>S 30300</td>
<td>2346</td>
<td>Z 8 CNF 18.09</td>
<td>304 S 31</td>
</tr>
<tr>
<td>1.4306</td>
<td>X 2 CrNi 19-11</td>
<td>304 L</td>
<td>S 30403</td>
<td>2352</td>
<td>Z 2 CN 18.10</td>
<td>304 S 11</td>
</tr>
<tr>
<td>1.4307</td>
<td>X2CrNi18-9</td>
<td>304L</td>
<td>S 30403</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.4310</td>
<td>X 12 CrNi 177</td>
<td>301</td>
<td>S 30100</td>
<td>2331</td>
<td>Z 12 CN 18.08</td>
<td>301 S 22</td>
</tr>
<tr>
<td>1.4567</td>
<td>X3CrNiCu19-9-4</td>
<td>304</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>1.4541</td>
<td>X6CrNiTi18-10</td>
<td>321</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.4401</td>
<td>X5CrNiMo17-12-2</td>
<td>316</td>
<td>S 31600</td>
<td>2347</td>
<td>Z 7 CND 17.02.02</td>
<td>316 S 31</td>
</tr>
<tr>
<td>1.4404</td>
<td>X2CrNiMo17-12-2</td>
<td>316 L</td>
<td>S 31603</td>
<td>2353</td>
<td>Z 3 CND 18.14.03</td>
<td>316 S 11</td>
</tr>
<tr>
<td>1.4578</td>
<td>X3CrNiCuMo17-11-3-2</td>
<td>x</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>1.4571</td>
<td>X6CrNiMoTi17-12-2</td>
<td>316Ti</td>
<td>S 31635</td>
<td>2350</td>
<td>Z 6 CNDT 17.12</td>
<td>320 S 31</td>
</tr>
<tr>
<td>1.4439</td>
<td>X2CrNiMoN17-13-5</td>
<td>317 LMN</td>
<td>S 31726</td>
<td>2562</td>
<td>Z 1 NCDU 25.20</td>
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</tr>
<tr>
<td>1.4541</td>
<td>X6CrNiTi 18-10</td>
<td>321</td>
<td></td>
<td>2337</td>
<td>Z 6 CNT 18-10</td>
<td>x</td>
</tr>
<tr>
<td>1.4362</td>
<td>X2CrNiN32-4</td>
<td>2304</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.4462</td>
<td>X2CrNiMoN22-5-3</td>
<td>2205</td>
<td>S 31600</td>
<td>2377</td>
<td>(Z 5 CNDU 21.08)</td>
<td></td>
</tr>
<tr>
<td>1.4539</td>
<td>X1NiCrMoCu25-20-5</td>
<td>904 L</td>
<td>N 08904</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1.4565</td>
<td>X2CrNiMnMoNbN25-18-5-4</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.4529</td>
<td>X1NiCrMoCuN25-20-7</td>
<td>x</td>
<td>N 08926</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹ AISI = American Iron and Steel Institute  
² UNS = Unified Numbering System  
³ SS = Swedish Standard  
⁴ AFNOR = Association Francaise de Normalisation (French National Standards Institute)  
⁵ BS = British Standard  
ASTM = American Society for Testing and Materials
III. Corrosion resistance of A2 and A4

Because of their constituent parts, austenitic stainless steels such as A2 and A4 fall under the category of "active" corrosion protection.

These high-grade stainless steels must contain at least 16 % chrome (Cr) and are resistant to oxidising corrosive agents. Increasing the Cr content and if necessary other alloy components such as nickel (Ni), molybdenum (Mo), titanium (Ti) and niobium (Nb) improves resistance to corrosion. These additives also affect the mechanical properties. Depending on use, this may have to be noted. Other alloy components are only added to improve the mechanical properties, e.g. nitrogen (N), or the chip-removing process, e.g. sulphur (S).

The fasteners may experience a certain degree of magnetisability during cold working. Austenitic stainless steels are not however generally magnetic. But the resistance to corrosion is not affected by this. The level of magnetisation produced by cold work hardening may even extend to the steel part sticking permanently to a magnet.

In practice it should be noted that a whole series of different types of corrosion may arise. The most common forms of corrosion for high-grade stainless steel are shown in the diagram below and detailed underneath:

*Diagram of the most common types of corrosion in screw connections*
III. a) Extraneous rust and how it forms

When particles of a carbon steel ("normal steel") adhere to a stainless steel surface, this produces extraneous rust on the surface of the stainless steel which turns into rust under the action of oxygen. If these areas are not cleaned or removed, this rust can cause electro-chemical localised corrosion in austenitic stainless steel.

Extraneous rust is produced for example by:

- using tools which have previously been used with carbon steel.
- sparks when working with an angle grinder or grinding dust or during welding.
- objects that rust coming into contact with a stainless steel surface.
- water containing rust dripping onto a stainless steel surface.

III. b) Stress corrosion

Internal stresses from welding may result in stress corrosion. However stress corrosion usually occurs in components used in an industrial atmosphere which are subject to high levels of mechanical tensile and bending stress.

Austenitic steels in an atmosphere containing chlorine are particularly sensitive to stress corrosion. The influence of temperature is a major factor. 50 °C is the critical temperature.

III. c) Surface-eroding corrosion

Uniform surface corrosion, also known as eroding corrosion, describes a condition where the surface is being eroded in a uniform manner. This type of corrosion can be prevented by selecting the right material in the first place.

Factories have published resistance tables based on lab tests, which provide information on how the steel grades behave at different temperatures and in different concentrations in the individual media (see Section III f Tab.17 & 18).
III. d) Localised corrosion

Localised corrosion appears as surface corrosion with the additional formation of hollows and holes.

The passive layer is penetrated locally. When high-grade stainless steel comes into contact with an active medium containing chlorine, localised corrosion also occurs alone with pinprick notches in the material. Deposits and rust may also trigger localised corrosion. All fasteners should therefore be regularly cleaned of residue and deposits.

Austenitic steels such as A2 and A4 are more resistant to localised corrosion than ferritic chrome steels.

III. e) Contact corrosion

When two components with different compositions make metallic contact and there is dampness present in the form of an electrolyte, contact corrosion will occur. The more base element is attacked and destroyed.

Please note the following to prevent contact corrosion:

- Prevent the connection from coming into contact with an electrolytic medium.
- For example, metals should be insulated using rubber, plastic or coatings such that contact current cannot flow to the point of contact.
- Avoid pairing up different materials wherever possible. For example, screws, nuts and washers should be adapted to the components being joined.

III. f) Corrosive media in the presence of A2 and A4

Tables 17 and 18 provide an overview of the resistance of A2 and A4 in the presence of various corrosive media. This provides an optimum means of comparison. Do however note that the values stated are simply rough indications.
Tab. 17: Overview of the chemical resistance of A2 and A4

<table>
<thead>
<tr>
<th>Corrosive agent</th>
<th>Concentration</th>
<th>Temperature in °C</th>
<th>Level of resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>A 2</td>
</tr>
<tr>
<td>Acetone</td>
<td>all</td>
<td>all</td>
<td>A</td>
</tr>
<tr>
<td>Ethyl ether</td>
<td>-</td>
<td>all</td>
<td>A</td>
</tr>
<tr>
<td>Ethyl alcohol</td>
<td>all</td>
<td>20</td>
<td>A</td>
</tr>
<tr>
<td>Formic acid</td>
<td>10%</td>
<td>20 boiling</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>boiling</td>
<td>B</td>
</tr>
<tr>
<td>Ammonia</td>
<td>all</td>
<td>20 boiling</td>
<td>A</td>
</tr>
<tr>
<td>Any kind of benzine</td>
<td>-</td>
<td>all</td>
<td>A</td>
</tr>
<tr>
<td>Benzoic acid</td>
<td>all</td>
<td>all</td>
<td>A</td>
</tr>
<tr>
<td>Benzol</td>
<td>-</td>
<td>all</td>
<td>A</td>
</tr>
<tr>
<td>Beer</td>
<td>-</td>
<td>all</td>
<td>A</td>
</tr>
<tr>
<td>Hydrocyanic acid</td>
<td>-</td>
<td>20</td>
<td>A</td>
</tr>
<tr>
<td>Blood</td>
<td>-</td>
<td>20</td>
<td>A</td>
</tr>
<tr>
<td>Binder solution</td>
<td>-</td>
<td>98</td>
<td>A</td>
</tr>
<tr>
<td>Chlorine: dry gas</td>
<td>-</td>
<td>20</td>
<td>A</td>
</tr>
<tr>
<td>Chlorine: damp gas</td>
<td>-</td>
<td>all</td>
<td>D</td>
</tr>
<tr>
<td>Chloroform</td>
<td>all</td>
<td>all</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>10%</td>
<td>20 boiling</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>boiling</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>50%</td>
<td>20 boiling</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td></td>
<td>boiling</td>
<td>D</td>
</tr>
<tr>
<td>Chromic acid</td>
<td>technical</td>
<td>150</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>180</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td></td>
<td>200-235</td>
<td>C</td>
</tr>
<tr>
<td>Developer (photogr.)</td>
<td>-</td>
<td>20</td>
<td>A</td>
</tr>
<tr>
<td>Acetic acid</td>
<td>10%</td>
<td>20 boiling</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>boiling</td>
<td>A</td>
</tr>
<tr>
<td>Fatty acid</td>
<td>technical</td>
<td>150</td>
<td>A</td>
</tr>
<tr>
<td>Fruit juices</td>
<td>-</td>
<td>all</td>
<td>A</td>
</tr>
<tr>
<td>Tannic acid</td>
<td>all</td>
<td>all</td>
<td>A</td>
</tr>
<tr>
<td>Glycerine</td>
<td>conc.</td>
<td>all</td>
<td>A</td>
</tr>
<tr>
<td>Industrial air</td>
<td>-</td>
<td>-</td>
<td>A</td>
</tr>
<tr>
<td>Potassium permanganate</td>
<td>10%</td>
<td>all</td>
<td>A</td>
</tr>
<tr>
<td>Lime milk</td>
<td>-</td>
<td>all</td>
<td>A</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>-</td>
<td>-</td>
<td>A</td>
</tr>
<tr>
<td>Cupric acetate</td>
<td>-</td>
<td>all</td>
<td>A</td>
</tr>
</tbody>
</table>
Continuation of Tab. 17: Overview of the chemical resistance of A2 and A4

<table>
<thead>
<tr>
<th>Corrosive agent</th>
<th>Concentration</th>
<th>Temperature in °C</th>
<th>Level of resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>A2</td>
</tr>
<tr>
<td>Copper nitrate</td>
<td>-</td>
<td>-</td>
<td>A</td>
</tr>
<tr>
<td>Copper sulphate</td>
<td>all</td>
<td>all</td>
<td>A</td>
</tr>
<tr>
<td>Magnesium sulphate</td>
<td>approx. 26%</td>
<td>all</td>
<td>A</td>
</tr>
<tr>
<td>Sea water</td>
<td>-</td>
<td>20</td>
<td>A</td>
</tr>
<tr>
<td>Methyl alcohol</td>
<td>all</td>
<td>all</td>
<td>A</td>
</tr>
<tr>
<td>Lactic acid</td>
<td>1.5%</td>
<td>all</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>10%</td>
<td>20</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>boiling</td>
<td>C</td>
</tr>
<tr>
<td>Sodium carbonate</td>
<td>cold saturated</td>
<td>all</td>
<td>A</td>
</tr>
<tr>
<td>Sodium hydroxide</td>
<td>20%</td>
<td>20</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>boiling</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td>50%</td>
<td>120</td>
<td>C</td>
</tr>
<tr>
<td>Sodium nitrate</td>
<td>-</td>
<td>all</td>
<td>A</td>
</tr>
<tr>
<td>Sodium perchlorate</td>
<td>10%</td>
<td>all</td>
<td>A</td>
</tr>
<tr>
<td>Sodium sulphate</td>
<td>cold saturated</td>
<td>all</td>
<td>A</td>
</tr>
<tr>
<td>Fruit</td>
<td>-</td>
<td>-</td>
<td>A</td>
</tr>
<tr>
<td>Oils (mineral and vegetable)</td>
<td>-</td>
<td>all</td>
<td>A</td>
</tr>
<tr>
<td>Oxalic acid</td>
<td>10%</td>
<td>20</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td></td>
<td>boiling</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>50%</td>
<td>boiling</td>
<td>D</td>
</tr>
<tr>
<td>Petroleum</td>
<td>-</td>
<td>all</td>
<td>A</td>
</tr>
<tr>
<td>Phenol</td>
<td>pure</td>
<td>boiling</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td>10%</td>
<td>boiling</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>50%</td>
<td>20</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>boiling</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>80%</td>
<td>20</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td></td>
<td>boiling</td>
<td>D</td>
</tr>
<tr>
<td>Phosphoric acid</td>
<td></td>
<td>conc.</td>
<td>D</td>
</tr>
<tr>
<td>Mercury</td>
<td>-</td>
<td>up to 50</td>
<td>A</td>
</tr>
<tr>
<td>Mercury nitrate</td>
<td>-</td>
<td>all</td>
<td>A</td>
</tr>
<tr>
<td>Salicylic acid</td>
<td>-</td>
<td>20</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>up to 40%</td>
<td>all</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>50%</td>
<td>20</td>
<td>A</td>
</tr>
</tbody>
</table>
Continuation of Tab. 17: Overview of the chemical resistance of A2 and A4

<table>
<thead>
<tr>
<th>Corrosive agent</th>
<th>Concentration</th>
<th>Temperature in °C</th>
<th>Level of resistance</th>
<th>A 2</th>
<th>A 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7% up to 70</td>
<td>B</td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>boiling</td>
<td></td>
<td>B</td>
<td></td>
<td>B</td>
</tr>
<tr>
<td></td>
<td>2.5% up to 70</td>
<td>B</td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>boiling</td>
<td></td>
<td>C</td>
<td></td>
<td>C</td>
</tr>
<tr>
<td>Sulphuric acid</td>
<td>5%</td>
<td>20</td>
<td>B</td>
<td></td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>&gt; 70</td>
<td></td>
<td>B</td>
<td></td>
<td>B</td>
</tr>
<tr>
<td></td>
<td>10%</td>
<td>20</td>
<td>C</td>
<td></td>
<td>B</td>
</tr>
<tr>
<td></td>
<td>70</td>
<td></td>
<td>C</td>
<td></td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>all</td>
<td></td>
<td>D</td>
<td></td>
<td>D</td>
</tr>
<tr>
<td>Sulphurous acid</td>
<td>watery solution</td>
<td>20</td>
<td>A</td>
<td></td>
<td>A</td>
</tr>
<tr>
<td>Sulphur dioxide</td>
<td>-</td>
<td>100-500</td>
<td>C</td>
<td></td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>900</td>
<td>D</td>
<td></td>
<td>C</td>
</tr>
<tr>
<td>Tar</td>
<td>-</td>
<td>hot</td>
<td>A</td>
<td></td>
<td>A</td>
</tr>
<tr>
<td>Wine</td>
<td>-</td>
<td>20 and hot</td>
<td>A</td>
<td></td>
<td>A</td>
</tr>
<tr>
<td>Tarteric acid</td>
<td>up to 10%</td>
<td>20</td>
<td>A</td>
<td></td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>boiling</td>
<td></td>
<td>B</td>
<td></td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td></td>
<td>A</td>
<td></td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>boiling</td>
<td></td>
<td>C</td>
<td></td>
<td>C</td>
</tr>
<tr>
<td>Lemon juice</td>
<td>-</td>
<td>20</td>
<td>A</td>
<td></td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>up to 10%</td>
<td></td>
<td>A</td>
<td></td>
<td>A</td>
</tr>
</tbody>
</table>

Tab. 18: Subdivision of level of resistance into various groups

<table>
<thead>
<tr>
<th>Level of resistance</th>
<th>Evaluation</th>
<th>Weight loss in g/m²h</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>totally resistant</td>
<td>&lt; 0.1</td>
</tr>
<tr>
<td>B</td>
<td>virtually resistant</td>
<td>0.1 - 1.0</td>
</tr>
<tr>
<td>C</td>
<td>less resistant</td>
<td>1.0 - 10</td>
</tr>
<tr>
<td>D</td>
<td>not resistant</td>
<td>&gt; 10</td>
</tr>
</tbody>
</table>
IV. Extract from building-authority approval Z-30.3-6 from 20 April 2009 "Products, fasteners and parts made from stainless steels"

Tab. 19: Subdivision of steel grades by strength class and corrosion resistance class

<table>
<thead>
<tr>
<th>Serial no.</th>
<th>Steel grade</th>
<th>Mat. no.</th>
<th>Structure</th>
<th>Strength classes and product shapes</th>
<th>Corrosion resistance class</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>X2CrNi12</td>
<td>1.4003</td>
<td>F</td>
<td>B, Ba, H, P, D, S, W, D, H, S, W</td>
<td>D, S</td>
</tr>
<tr>
<td>2</td>
<td>X6Cr17</td>
<td>1.4016</td>
<td>F</td>
<td>B, Ba, D, H, P, S, D, H, P, S</td>
<td>D, H, S</td>
</tr>
<tr>
<td>3</td>
<td>X5CrNi18-10</td>
<td>1.4301</td>
<td>A</td>
<td>B, Ba, D, H, P, S, B, Ba, D, H, P, S</td>
<td>D, H, S</td>
</tr>
<tr>
<td>4</td>
<td>X2CrNi18-9</td>
<td>1.4307</td>
<td>A</td>
<td>D, S</td>
<td>D, S</td>
</tr>
<tr>
<td>5</td>
<td>X3CrNiCu18-9-4</td>
<td>1.4567</td>
<td>A</td>
<td>D, S</td>
<td>D, S</td>
</tr>
<tr>
<td>6</td>
<td>X6CrNITi18-10</td>
<td>1.4514</td>
<td>A</td>
<td>B, Ba, D, H, P, S, D, S</td>
<td>D, S</td>
</tr>
<tr>
<td>7</td>
<td>X2CrNi18-7</td>
<td>1.4318</td>
<td>A</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>8</td>
<td>X5CrNiMo17-12-2</td>
<td>1.4401</td>
<td>A</td>
<td>B, Ba, D, H, P, S, B, Ba, D, H, P, S</td>
<td>D, H, S</td>
</tr>
<tr>
<td>9</td>
<td>X2CrNiMo17-12-2</td>
<td>1.4404</td>
<td>A</td>
<td>B, Ba, D, H, P, S, B, Ba, D, H, P, S</td>
<td>D, H, S</td>
</tr>
<tr>
<td>10</td>
<td>X3CrNiCuMo17-11-3-2</td>
<td>1.4578</td>
<td>A</td>
<td>D, S</td>
<td>D, S</td>
</tr>
<tr>
<td>11</td>
<td>X6CrNiMoTi17-12-2</td>
<td>1.4571</td>
<td>A</td>
<td>B, Ba, D, H, P, S, B, Ba, D, H, P, S</td>
<td>D, S</td>
</tr>
<tr>
<td>12</td>
<td>X2CrNHiMoN17-13-5</td>
<td>1.4439</td>
<td>A</td>
<td>B, Ba, D, H, S, W</td>
<td>--</td>
</tr>
<tr>
<td>13</td>
<td>X2CrNiN23-4</td>
<td>1.4362</td>
<td>FA</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>14</td>
<td>X2CrNiMN22-5-3</td>
<td>1.4462</td>
<td>FA</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>15</td>
<td>X1NiCrMoCu25-20-5</td>
<td>1.4539</td>
<td>A</td>
<td>B, Ba, D, H, P, S, B, Ba, D, H, P, S</td>
<td>D, P, S</td>
</tr>
<tr>
<td>16</td>
<td>X2CrNiMnMoNbN25-18-5-4</td>
<td>1.4565</td>
<td>A</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>17</td>
<td>X1NiCrMoCuN25-20-7</td>
<td>1.4529</td>
<td>A</td>
<td>B, D, S, W</td>
<td>D, P, S</td>
</tr>
<tr>
<td>18</td>
<td>X1CrNiMoCuN20-18-7</td>
<td>1.4547</td>
<td>A</td>
<td>B, Ba</td>
<td>B, Ba</td>
</tr>
</tbody>
</table>

1) According to DIN EN 10088-1:2005-09
2) A = austenite; F = ferrite; FA = ferrite-austenite (duplex)
3) The strength classes following the lowest strength in each case are achieved through cold work hardening by means of cold working.
4) B = sheet; Ba = strip and sheets produced from it; D = wire, drawn; H = hollow profile; P = profile; S = bars; W = wire rod
5) Applies to metallically bare surfaces only. The more base of the metals is at risk in the event of potential contact corrosion.
6) For the corrosion resistance classes required, see Table 11.
Tab. 20: Material selection for atmospheric exposure

<table>
<thead>
<tr>
<th>Impact</th>
<th>Exposure</th>
<th>Criteria and examples</th>
<th>Corrosion resistance class</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>I</td>
</tr>
<tr>
<td><strong>Dampness, annual average U of dampness</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SF0</td>
<td>dry</td>
<td>U &lt; 60%</td>
<td>X</td>
</tr>
<tr>
<td>SF1</td>
<td>rarely damp</td>
<td>60% ≤ U &lt; 80%</td>
<td>X</td>
</tr>
<tr>
<td>SF2</td>
<td>frequently damp</td>
<td>80% ≤ U &lt; 95%</td>
<td>X</td>
</tr>
<tr>
<td>SF3</td>
<td>permanently damp</td>
<td>95% &lt; U</td>
<td></td>
</tr>
<tr>
<td><strong>Chloride content of surroundings, distance M from the sea, distance S from busy streets where road salt is used</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SC0</td>
<td>low</td>
<td>Countryside, town, M &gt; 10 km, S &gt; 0.1 km</td>
<td>X</td>
</tr>
<tr>
<td>SC1</td>
<td>average</td>
<td>Industrial area, 10 km ≥ M &gt; 1 km, 0.1 km ≥ S &gt; 0.01 km</td>
<td>X</td>
</tr>
<tr>
<td>SC2</td>
<td>high</td>
<td>M ≤ 1 km S ≤ 0.01 km</td>
<td>X</td>
</tr>
<tr>
<td>SC3</td>
<td>very high</td>
<td>Indoor swimming pools, road tunnel</td>
<td>X</td>
</tr>
<tr>
<td><strong>Pollution from redox active substances (e.g. SO$_2$, HOCl, CI$_2$, H$_2$O$_2$)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SR0</td>
<td>low</td>
<td>Countryside, town</td>
<td>X</td>
</tr>
<tr>
<td>SR1</td>
<td>average</td>
<td>Industry</td>
<td>X</td>
</tr>
<tr>
<td>SR2</td>
<td>high</td>
<td>Indoor swimming pools, road tunnel</td>
<td>X</td>
</tr>
<tr>
<td><strong>pH values on the surface</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SH0</td>
<td>alkali (e.g. contact with concrete)</td>
<td>9 &lt; pH</td>
<td>X</td>
</tr>
<tr>
<td>SH1</td>
<td>neutral</td>
<td>5 &lt; pH ≤ 9</td>
<td>X</td>
</tr>
<tr>
<td>SH2</td>
<td>slightly acidic (e.g. contact with wood)</td>
<td>3 &lt; pH ≤ 5</td>
<td>X</td>
</tr>
<tr>
<td>SH3</td>
<td>acid (impact of acids)</td>
<td>pH ≤ 3</td>
<td>X</td>
</tr>
<tr>
<td><strong>Location of parts</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SL0</td>
<td>inside</td>
<td>heated and unheated indoor rooms</td>
<td>X</td>
</tr>
<tr>
<td>SL1</td>
<td>outside, exposed to the rain</td>
<td>freestanding constructions</td>
<td>X</td>
</tr>
<tr>
<td>SL2</td>
<td>outside, roofed</td>
<td>constructions with roofs</td>
<td>X</td>
</tr>
<tr>
<td>SL3</td>
<td>outside, inaccessible*, influx of ambient air</td>
<td>facades with ventilation at rear</td>
<td>X</td>
</tr>
</tbody>
</table>

The impact which produces the highest corrosion resistance class is definitive. Higher requirements do not result from a combination of different impacts.

1) Regular cleaning of accessible construction or direct surface irrigation will significantly reduce exposure to corrosion such that the result can be reduced by one corrosion resistance class. If it is possible that the concentration of materials on the surfaces may increase, one corrosion resistance class higher should be selected.
2) Regular cleaning of accessible construction can significantly reduce exposure to corrosion such that one corrosion resistance class lower is possible.
3) If service life is limited to 20 years, reduction to corrosion resistance class I is possible if localised corrosion of 100 µm is tolerated (no visual requirements).
4) Constructions are graded as inaccessible if their condition cannot be monitored or is very hard to monitor and if they can only be reconditioned at great cost in the event of fire.
Tab. 21: Steel grades for fasteners with assignment to steel groups following DIN EN ISO 3506 Parts 1 and 2 and labelling following Section 2.2.2 and maximum nominal diameter

<table>
<thead>
<tr>
<th>Serial no.</th>
<th>Steel grade</th>
<th>Mat. no.</th>
<th>Group</th>
<th>Corrosion resistance class</th>
<th>Labelling for screws with head based on DIN EN ISO 3506-1</th>
<th>Labelling for threaded rods, stud bolts, nuts and washers based on DIN EN ISO 3506-1+2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Short name</td>
<td></td>
<td></td>
<td></td>
<td>Strength class</td>
<td>Strength class</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>50</td>
<td>70</td>
</tr>
<tr>
<td>3</td>
<td>X5CrNi18-10</td>
<td>1.430</td>
<td>A2</td>
<td>II / moderate</td>
<td>≤ M 39</td>
<td>≤ M 24</td>
</tr>
<tr>
<td>4</td>
<td>X2CrNi18-9</td>
<td>1.430</td>
<td>A2L</td>
<td></td>
<td>≤ M 39</td>
<td>≤ M 24</td>
</tr>
<tr>
<td>5</td>
<td>X2CrNiCu18-9-4</td>
<td>1.456</td>
<td>A2L</td>
<td></td>
<td>≤ M 24</td>
<td>≤ M 16</td>
</tr>
<tr>
<td>6</td>
<td>X6CrNiTi18-10</td>
<td>1.454</td>
<td>A3</td>
<td></td>
<td>≤ M 39</td>
<td>≤ M 20</td>
</tr>
<tr>
<td>8</td>
<td>X5CrNiMo17-12-2</td>
<td>1.440</td>
<td>A4</td>
<td>III / average</td>
<td>≤ M 39</td>
<td>≤ M 24</td>
</tr>
<tr>
<td>9</td>
<td>X2CrNiMo17-12-2</td>
<td>1.440</td>
<td>A4L</td>
<td></td>
<td>≤ M 39</td>
<td>≤ M 24</td>
</tr>
<tr>
<td>10</td>
<td>X3CrNiCuMo17-11-3-2</td>
<td>1.457</td>
<td>A4L</td>
<td></td>
<td>≤ M 24</td>
<td>≤ M 16</td>
</tr>
<tr>
<td>11</td>
<td>X6CrNiMoTi17-12-2</td>
<td>1.457</td>
<td>A5</td>
<td></td>
<td>≤ M 39</td>
<td>≤ M 24</td>
</tr>
<tr>
<td>12</td>
<td>X2CrNiMo17-13-5</td>
<td>1.443</td>
<td>2)</td>
<td></td>
<td>≤ M 20</td>
<td>--</td>
</tr>
<tr>
<td>13</td>
<td>X2CrNiN32-4</td>
<td>1.436</td>
<td>2)</td>
<td></td>
<td>--</td>
<td>≤ M 24</td>
</tr>
<tr>
<td>14</td>
<td>X2CrNiMoN22-5-3</td>
<td>1.446</td>
<td>2)</td>
<td>IV / high</td>
<td>--</td>
<td>≤ M 24</td>
</tr>
<tr>
<td>15</td>
<td>X1NiCrMoCu25-20-5</td>
<td>1.453</td>
<td>2)</td>
<td></td>
<td>≤ M 39</td>
<td>≤ M 24</td>
</tr>
<tr>
<td>16</td>
<td>X2CrNiMnMoNbN25-18-5-4</td>
<td>1.456</td>
<td>2)</td>
<td></td>
<td>≤ M 24</td>
<td>≤ M 20</td>
</tr>
<tr>
<td>17</td>
<td>X1NiCrMoCuN25-20-7</td>
<td>1.452</td>
<td>2)</td>
<td></td>
<td>≤ M 30</td>
<td>≤ M 24</td>
</tr>
</tbody>
</table>

1) According to Table 10

2) Since there are no standard definitions at present, these steels should be labelled with the material number.

3) Appendix 7 of the general building-authority approval Z-30-3.6 from 20 April 2009 applies to fasteners in indoor swimming pool atmospheres. See Table 10.
V. Labelling stainless screws and nuts

The labelling for stainless screws and nuts must contain the steel group, strength class and manufacturer's label.

**Labelling screws according to DIN ISO 3506-1**

Hexagonal screws and socket cap screws with hexagonal socket as of an M5 nominal diameter should be clearly labelled following the labelling system. Where at all possible, the labelling should be placed on the screw head.

*Fig. C: Extract from DIN EN ISO 3506-1*

**Labelling nuts according to DIN EN ISO 3506-2**

Nuts with a thread nominal diameter as of 5 mm should be clearly labelled following the labelling system. Labelling on just one bearing surface is permitted and may only be used if recessed. Labelling on the spanner flats is also possible.

*Fig. D: Extract from DIN EN ISO 3506-2*

_Dated October 2009_