**UR™ 64: A non magnetic high strength stainless steel**

*UR™ 64* is a non magnetic stainless steel combining:

> excellent pitting corrosion resistance in marine environments
> high strength
> excellent ductility

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**STANDARDS**

> EURONORM: EN 1.3964 X2 CrNiMnMoNb 21-16-5-3 according to SEW 390/W1.3964

**CHEMICAL ANALYSIS - WEIGHT %**

Typical values

<table>
<thead>
<tr>
<th>C</th>
<th>S</th>
<th>P</th>
<th>Si</th>
<th>Mn</th>
<th>Cr</th>
<th>Mo</th>
<th>Ni</th>
<th>N</th>
<th>Nb</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;.030</td>
<td>&lt;.005</td>
<td>&lt;.025</td>
<td>&lt;1.0</td>
<td>4.0 - 6.0</td>
<td>20 - 21.5</td>
<td>3.0 - 3.5</td>
<td>15 - 17</td>
<td>.20 - .35</td>
<td>&lt;.25</td>
</tr>
</tbody>
</table>

**PHYSICAL PROPERTIES**

<table>
<thead>
<tr>
<th>Temperature interval (°C)</th>
<th>Thermal expansion (αx10⁻⁶ K⁻¹)</th>
<th>Thermal conductivity (W.m⁻¹.K⁻¹)</th>
<th>Relative permeability</th>
<th>Young modulus E (GPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-196 - +20</td>
<td>12.0</td>
<td>13.9</td>
<td>≤ 1.01</td>
<td>195</td>
</tr>
<tr>
<td>20 - +100</td>
<td>15.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 - +200</td>
<td>17.0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
MECHANICAL PROPERTIES

<table>
<thead>
<tr>
<th>Temperature °C</th>
<th>R_p0.2 (YS 0.2 MPa)</th>
<th>R_m (UTS MPa)</th>
<th>A % (Elongation %)</th>
<th>KCV T (1) J/cm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>&gt; 430</td>
<td>700 - 950</td>
<td>&gt; 35</td>
<td>&gt; 70</td>
</tr>
</tbody>
</table>

(1) th = 8 - 12 mm  
KCV > 55 J/cm²

Low temperature properties

<table>
<thead>
<tr>
<th>Temperature °C</th>
<th>R_p0.2 (YS 0.2 MPa)</th>
<th>R_m (UTS MPa)</th>
<th>A % (Elongation %)</th>
<th>Young Modulus GPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>-269 °C</td>
<td>1340</td>
<td>1750</td>
<td>20</td>
<td>213</td>
</tr>
<tr>
<td>-196 °C</td>
<td>900</td>
<td>1400</td>
<td>25</td>
<td>-</td>
</tr>
<tr>
<td>-78 °C</td>
<td>900</td>
<td>550</td>
<td>30</td>
<td>195</td>
</tr>
</tbody>
</table>

Fatigue strength

> in air : 250 - 300 N/mm²
> sea water (base metal) : 200-250 N/mm²
> sea water (welds) : 150 - 200 N/mm²

CORROSION RESISTANCE

Thanks to its high content in Cr, Mo, N, UR™ 64 has good resistance to :

> intergranular corrosion in the delivery and as weld condition
> pitting corrosion in chloride containing media
> crevice corrosion
Consult in case of doubt.

SIZES

| Thickness ≤ 100 mm | Width up to 3200 mm | Length up to 12000 mm | Weight up to 6 T |

Consult for dimensions as all values are not compatible.

HEAT TREATMENT

Heating between 1020 °C and 1100 °C followed by rapid quenching in water. Air cooling can be applied to the thinner products.

CUTTING

By plasma, or other techniques applicable to stainless steels.

WELDING

UR™ 64 is welded without preheating nor postheating. As for all fully austenitic steels, precautions should be taken to limit the risks of hot cracking: controlled heat input and travel speed, filler diameter...

Welding fillers

> Electrodes :
  - Thermanit 20/16 SM
  - Fox AM 400
> MIG wire :
  - Thermanit 20/16 SM
  - Fox AM 400 IG
> Submerged Arc :
  - Novonit 3954 + OP76S
  - Fox AM 500 UP + OP76S
Consult producers for details.
FORMING

UR™ 64 can be cold or hot formed using the usual precautions for stainless steels. The relative permeability of UR™ 64 remains low after cold deformations up to 80%. In the case of hot forming, care must be taken to maintain the mechanical properties: heating before forming and final heat treatment conditions must be studied.

Surface finishing

UR™ 64 should be cleaned and descaled after welding. Nitric/hydrofluoric acid mixtures (15% HNO₃, 1% HF) can be used between 20°C and 55°C. Rinse after pickling.

APPLICATIONS

Non magnetic steels

Industeel currently delivers non magnetic stainless steels for nuclear physics and military applications. Consult to determine the best available grades.

Submarine hulls

Industeel has qualified to deliver hull plates and other components according to the requirements of BWB/GL. UR™ 64 can also be used in mine sweeper construction. Industeel delivers a full range of high strength steels for submarine hulls.

Low temperatures

UR™ 64 is also used for the liquid oxygen and hydrogen tanks.

YOUR CONTACTS

Nathalie Mottu – Bellier
Tel. +33 3 85 80 53 02
nathalie.mottubellier@arcelormittal.com

Industeel France
Le Creusot Plant
56 rue Clemenceau
F – 71202 Le Creusot Cedex

http://industeel.arcelormittal.com

Technical data and information are to the best of our knowledge at the time of printing. However, they may be subject to some slight variations due to our ongoing research programme on steels. Therefore, we suggest that information be verified at time of enquiry or order. Furthermore, in service, real conditions are specific for each application. The data presented here are only for the purpose of description, and considered as guarantees when written formal approval has been delivered by our company. Further information may be obtained from the address opposite.