



**MATERIAL No.: ALLOY 800/ 1.4876 /N08800**

**DESCRIPTION**

|                                |                              |                                   |                                  |
|--------------------------------|------------------------------|-----------------------------------|----------------------------------|
| <b>EN symbol (short)</b>       | X10NiCrAlTi 32-21            | <b>Density lb//in<sup>3</sup></b> | 0,287                            |
| <b>Alloy</b>                   | 800                          | <b>Hardness HB30</b>              | <=192                            |
| <b>UNS</b>                     | N 08800                      | <b>Composition</b>                | Nickel Iron Chrome alloy         |
| <b>Registered work's label</b> | Nicrofer®3220<br>Incoloy 800 | <b>Category</b>                   | Heat resistant steels and alloys |
|                                |                              | <b>Structure</b>                  | austenitic                       |
|                                |                              | <b>Additional characteristics</b> | forge scale temperature 2012 °F  |

**Description** Version 1.4958(alloy 800H,UNS 08810) or 1.4959 (Alloy 800HT;UNS 08811) increasingly substitute this material, since they can be solution annealed. This procedure improves their creep-strength limit in high temperatures.

**CHEMICAL COMPOSITION**

|                     |              | C    | Mn   | P     | S     | Cr    | Ni    | Si   | Al   | Ti   | Fe   | Cu   |
|---------------------|--------------|------|------|-------|-------|-------|-------|------|------|------|------|------|
| <b>1.4876</b>       | <b>Min %</b> |      |      |       |       | 19,00 | 30,00 |      | 0,15 | 0,15 |      |      |
|                     | <b>Max %</b> | 0,12 | 2,0  | 0,030 | 0,015 | 23,00 | 34,00 | 1,00 | 0,60 | 0,60 |      |      |
| (Key to steel 2010) |              |      |      |       |       |       |       |      |      |      |      |      |
| <b>alloy 800</b>    | <b>Min %</b> |      |      |       |       |       |       |      |      |      |      |      |
|                     | <b>Max %</b> |      |      |       |       |       |       |      |      |      |      |      |
| <b>N 08800</b>      | <b>Min %</b> |      |      |       |       | 19,0  | 30,0  |      | 0,15 | 0,15 | 39,5 |      |
|                     | <b>Max %</b> | 0,10 | 1,50 |       | 0,015 | 23,0  | 35,0  | 1,0  | 0,60 | 0,60 |      | 0,75 |

ASTM B 407 (N 08800-Alloy 800)

**PHYSICAL PROPERTIES**

| Property                           | Value |
|------------------------------------|-------|
| <b>Density: lb//in<sup>3</sup></b> | 0,287 |
| <b>Hardness: HB30</b>              | <=192 |
| <b>permeability by 20°C</b>        | 1,01  |
| <b>magnetizable</b>                | no    |

|  |  |   |   |   |  |
|--|--|---|---|---|--|
| <b>elasticity modulus</b><br>(N/mm <sup>2</sup> ) /ksi |  | 194 / 28,1  |   |   |  |
| <b>Temperature</b><br><b>T</b><br>°C/F<br>(°C/F)       | <b>Specific heat</b><br>J / kgK<br>(Btu / lb °F) | <b>Thermal conductivity</b><br>W/mK<br>(Btu·in / ft <sup>2</sup> ·h·°F) | <b>Electric resistance</b><br>μΩ · cm<br>(Ω circ mill / ft) | <b>Modulus of elasticity</b><br>kN/mm <sup>2</sup><br>(10 <sup>3</sup> ksi) | <b>Expansion rate from 70°F bis T</b><br>10 <sup>-6</sup> / K<br>(10 <sup>-6</sup> / °F) |
| 20 / 68  | 472 (--)   | 11,5 (--)   | 101 (--)  | 194 (--)  | 12 (--)  |
| 100 / 212  | 501 (--)   | 13,1 (--)   | 104 (--)  | 189 (--)  | 15,1 (--)  |
| 200 / 392  | 525 (--)   | 14,8 (--)   | 108 (--)  | 183 (--)  | 15,7 (--)  |
| 300 / 572  | 532 (--)   | 16,4 (--)   | 112 (--)  | 177 (--)  | 16,2 (--)  |
| 400 / 752  | 555 (--)   | 18,1 (--)   | 115 (--)  | 170 (--)  | 16,6 (--)  |
| 500 / 932  | 582 (--)   | 19,6 (--)   | 118 (--)  | 163 (--)  | 17,0 (--)  |
| 600 / 1112   | 604 (--)   | 21,2 (--)   | 120 (--)  | 156 (--)  | 17,4 (--)  |
| 800 / 1472   | 609 (--)   | 24,3 (--)   | 124 (--)  | 141 (--)  | 18,0 (--)  |
| 1000 / 1832  | 641 (--)   | 27,3 (--)   | 127 (--)  | 127 (--)  | 18,6 (--)  |
| <b>Temp.</b>   | <b>Creep strain limit</b>                        | <b>Creep strain limit</b>   | <b>Creep rupture strength</b>                               | <b>Creep rupture strength</b>   | <b>Creep rupture strength</b>  |
|  |  |   | <b>1000 h</b>   |   |  |
| <b>°C/°F</b>   |  |   | <b>Mpa/ksi</b>  |   |  |
| 650 / 1202   |  |   | 165 / 23,9  |   |  |
| 705 / 1300   |  |   | 105 / 15,2  |   |  |
| 870 / 1600   |  |   | 32 / 4,7  |   |  |
| 980 / 1800   |  |   | 14 / 2,0  |   |  |
| <b>Temperature</b>                                     | <b>Yield strength in high temperatures</b>       |   | <b>Yield strength in high temperatures</b>                  |   | <b>Tensile strenght in high temperatures</b>   |
| <b>°C / °F</b>   | <b>Rp 1,0</b>                                    |   | <b>Rp 0,2</b>   |   | <b>Rm</b>  |
|  | <b>N/mm<sup>2</sup> / ksi</b>                    |   | <b>N/mm<sup>2</sup> / ksi</b>                               |   | <b>N/mm<sup>2</sup> / ksi</b>  |
| 20 / 68  | 200 / 29   |   | 170 / 24,6  |   | 450 / 65,2   |
| 100 / 212  | 160 / 23,2                                       |   | 140 / 20,3  |   | 400 / 58,0   |
| 300 / 572  | 115 / 16,6                                       |   | 95 / 13,7   |   | 390 / 56,5   |
| 500 / 932  | 100 / 15,4                                       |   | 80 / 11,6   |   | 360 / 52,2   |
| 600 / 1112   | 95 / 13,7  |   | 75 / 10,9   |   | 300 / 43,5   |

ksi value calculated

### MECHANICAL PROPERTIES (20°C / 68°F)

|  |               |       |
|--|---------------|-------|
| <b>1 %Yield strength Rp 1,0 Mpa(ksi)</b>     | 200 / 29      |       |
| <b>tensile elastic limit (Mpa) /ksi</b>      | >=170 />=24,6 |       |
| <b>Tensile strenght Rm (Mpa)</b>             | 450-680       |       |
| <b>Elongation A5 (%)</b>                     | >=30          | quer  |
|  | >=35          | längs |
| <b>impact work KV(ISO-V)/Jcm<sup>2</sup></b> | >=150         | längs |
|  | >=100         | quer  |

### TEMPERATURE INFORMATION

|                                |  |               |
|--------------------------------|--|---------------|
| <b>Application area</b>        |  |               |
| <b>Operation temperature</b>   | °F to 1112 °F  | air to 2012°F |
| <b>Explanation report</b>      | soft-annealed : resistant to scaling by air to 2012 °F |               |
| <b>Solution heat treatment</b> |  |               |
| <b>Working temperature</b>     | 1922 °F to 2102 °F                                     |               |
| <b>Explanation report</b>      | cooling down Water/air                                 |               |
| <b>soft-annealed</b>           |  |               |
| <b>Working temperature</b>     | 1688 °F to 2552 °F                                     |               |
| <b>Solution heat treatment</b> |  |               |
| <b>Working temperature</b>     | 1832 °F to 2282 °F                                     |               |

### STANDARDS / INFORMATION

| <b>Standards</b>                         | <b>Description</b>   |
|--|--|
| <a href="#">ASTM A 312</a>               | Standard Specification for Seamless and welded austenitic stainless steel pipes  |
| <a href="#">ASTM B 163</a>               | Standard Specifications for seamless nickel and nickel alloy condensers and heat-exchanger tubes                           |
| <a href="#">ASTM B 407</a>               | Standard Specification for Nickel-Iron-Chromium Alloy Seamless Pipe and Tube   |
| <a href="#">ASTM B 408</a>               | Standard Specification for Nickel-Iron-Chromium Alloy Rod and Bar  |
| <a href="#">ASTM B 409</a>               | Standard Specification for Nickel-Iron-Cromium Alloy metal sheets  |
| <a href="#">DIN EN 10088-1 (09/2005)</a> | Stainless steels Part 1: List of stainless steels  |
| <a href="#">DIN EN 10095 (05/1999)</a>   | heat resistant steel and nickel alloy  |
| <a href="#">DIN EN 10216-2(10/2007)</a>  | Stanless steel tubes for pressure purposes. Non-alloy and alloy steel tubes with specified elevated temperature properties |
| <a href="#">DIN EN 10297-2 (02/2006)</a> | seamless circular steel pipes for machine construction and general technical   |

|                   |   |
|-------------------|---|
|                   | applications, stainless steel           |
| SEW 310 (08/1992) | physical properties of steel            |
| SEW 470 (02/1976) | heat-resisting rolled and forged steels |

#### PROCESS INFORMATION

|  |  |
|--|--|
| <b>Chip removing process</b>                           | process in annealed state, due to cold work hardening<br>low cutting speed<br>keep constant cutting tool contact |
| <b>Welding</b>   |  |
| <b>- Material classification acc. CEN ISO/TR 15608</b> | <b>8,2</b>   |
| <b>- Type</b>  | well weldable<br>all methods of welding  |
| <b>- Add. material</b>                                 | 2.4806/2.4807  |

#### MAIN FIELDS OF APPLICATION

|                                       |   |
|---------------------------------------|---|
| <b>Details of application</b>         | scaling resistant in air up to 2012°F<br>corrosion and heat resistant |
| <b>Certifications</b>                 | Nace MR 01-75   |
| <b>Steam boiler construction</b>      |   |
| <b>industrial furnace engineering</b> |   |
| <b>Apparatus engineering</b>          |   |
| <b>crude oil</b>                      |   |

#### RANGE OF PRODUCTS

| <b>Product type</b>                  | <b>Product</b>   |
|--------------------------------------|--|
| Plates / Sheets                      | plates/sheets<br>plate/sheet cuts  |
| Fittings                             | welded elbows<br>welded reductions<br>Welded T-pieces<br>seamless elbows<br>seamless reductions<br>seamless T-pieces |
| Flanges / Collars / Flared tube ends | various flanges (weld neck flange, blind flange etc.)  |
| Pipes / Tubes                        | welded pipes/tubes   |

|           |                               |
|-----------|-------------------------------|
|           | seamless pipes/tubes          |
| Bar steel | flat steel<br>round bar steel |

[Pipe/Tube/Fitting/Flange/Valve/Plate](#)

Stainless Steel/Nickel Alloy/Duplex

