VDM® Nickel 200 and 201
Nickel 99.2 and LC-Nickel 99.2

VDM® Nickel 200 and VDM® Nickel 201 are unalloyed nickel with a nickel concentration of at least 99.2%. VDM® Nickel 201 is the low carbon version of VDM® Nickel 200. They are characterized by:

- excellent resistance in alkaline media,
- high ductility in a wide temperature range,
- ferromagnetism,
- high electrical and thermal conductivity.

The materials are offered under the name VDM® Nickel 205 with a higher guaranteed nickel concentration of 99.6%.

### Designations

<table>
<thead>
<tr>
<th>Standard</th>
<th>Material designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN</td>
<td>VDM Nickel 200: 2.4066</td>
</tr>
<tr>
<td>UNS</td>
<td>VDM Nickel 200: N02200</td>
</tr>
</tbody>
</table>

### Standards

<table>
<thead>
<tr>
<th>Product form</th>
<th>DIN</th>
<th>VdTÜV</th>
<th>ISO</th>
<th>ASTM</th>
<th>ASME</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bar</td>
<td>17752&lt;sup&gt;(1)&lt;/sup&gt; 17740&lt;sup&gt;(2)&lt;/sup&gt;</td>
<td>345&lt;sup&gt;(2)&lt;/sup&gt;</td>
<td></td>
<td>B 160</td>
<td>SB 160</td>
<td>EN 10029&lt;sup&gt;(2)&lt;/sup&gt;</td>
</tr>
<tr>
<td>Sheet</td>
<td>17740 17750</td>
<td>345&lt;sup&gt;(2)&lt;/sup&gt;</td>
<td></td>
<td>B 162</td>
<td>SB 162</td>
<td>SAE AMS 5553&lt;sup&gt;(2)&lt;/sup&gt;</td>
</tr>
<tr>
<td>Strip</td>
<td>17740</td>
<td>345&lt;sup&gt;(2)&lt;/sup&gt; 6208</td>
<td></td>
<td>B 162</td>
<td>SB 162&lt;sup&gt;(2)&lt;/sup&gt;</td>
<td>SAE AMS 5553&lt;sup&gt;(2)&lt;/sup&gt;</td>
</tr>
<tr>
<td>Wire</td>
<td>17740</td>
<td></td>
<td></td>
<td>B 730&lt;sup&gt;(2)&lt;/sup&gt;</td>
<td></td>
<td>SAE AMS 5555&lt;sup&gt;(2)&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>(1)</sup> only valid for VDM® Nickel 200
<sup>(2)</sup> only valid for VDM® Nickel 201

Table 1 – Designations and standards
Chemical composition

VDM® Nickel 200

<table>
<thead>
<tr>
<th></th>
<th>C</th>
<th>S</th>
<th>Ni</th>
<th>Mn</th>
<th>Si</th>
<th>Ti</th>
<th>Cu</th>
<th>Fe</th>
<th>Mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min.</td>
<td></td>
<td></td>
<td>99.2</td>
<td>0.35</td>
<td>0.15</td>
<td>0.1</td>
<td>0.25</td>
<td>0.4</td>
<td>0.15</td>
</tr>
<tr>
<td>Max.</td>
<td>0.1</td>
<td>0.005</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Due to technical reasons the alloy may contain more elements than listed

Table 2a – Chemical composition (%)

VDM® Nickel 201

<table>
<thead>
<tr>
<th></th>
<th>C</th>
<th>S</th>
<th>Ni</th>
<th>Mn</th>
<th>Si</th>
<th>Ti</th>
<th>Cu</th>
<th>Fe</th>
<th>Mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min.</td>
<td></td>
<td></td>
<td>99.2</td>
<td>0.35</td>
<td>0.15</td>
<td>0.1</td>
<td>0.25</td>
<td>0.4</td>
<td>0.15</td>
</tr>
<tr>
<td>Max.</td>
<td>0.02</td>
<td>0.005</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Due to technical reasons the alloy may contain more elements than listed

Table 2b – Chemical composition (%)

Physical properties

<table>
<thead>
<tr>
<th>Density</th>
<th>Melting range</th>
<th>Curie temperature</th>
<th>Saturation flux density</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.9 g/cm³ bei 20°C</td>
<td>1,435 – 1,445°C (2,610 – 2,630°F)</td>
<td>360°C (68 °F)</td>
<td>0.61 T</td>
</tr>
<tr>
<td>Temperature</td>
<td>Specific heat capacity&lt;sup&gt;1)&lt;/sup&gt;</td>
<td>Electrical resistivity</td>
<td>Modulus of elasticity</td>
</tr>
<tr>
<td>-------------</td>
<td>-----------------------------------</td>
<td>-----------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>°C</td>
<td>J kg⁻¹ K&lt;sup&gt;-1&lt;/sup&gt;</td>
<td>Btu lb⁻¹ °F</td>
<td>μΩ · cm</td>
</tr>
<tr>
<td>-200</td>
<td>-328</td>
<td>150</td>
<td>0.0358</td>
</tr>
<tr>
<td>-100</td>
<td>-148</td>
<td>355</td>
<td>0.0848</td>
</tr>
<tr>
<td>0</td>
<td>32</td>
<td>426</td>
<td>0.102</td>
</tr>
<tr>
<td>20</td>
<td>68</td>
<td>456</td>
<td>0.109</td>
</tr>
<tr>
<td>100</td>
<td>212</td>
<td>475</td>
<td>0.113</td>
</tr>
<tr>
<td>200</td>
<td>392</td>
<td>500</td>
<td>0.119</td>
</tr>
<tr>
<td>300</td>
<td>572</td>
<td>570</td>
<td>0.136</td>
</tr>
<tr>
<td>400</td>
<td>752</td>
<td>530</td>
<td>0.172</td>
</tr>
<tr>
<td>500</td>
<td>932</td>
<td>525</td>
<td>0.125</td>
</tr>
<tr>
<td>600</td>
<td>1,112</td>
<td>535</td>
<td>0.128</td>
</tr>
<tr>
<td>700</td>
<td>1,292</td>
<td>550</td>
<td>0.131</td>
</tr>
<tr>
<td>800</td>
<td>1,472</td>
<td>565</td>
<td>0.135</td>
</tr>
<tr>
<td>900</td>
<td>1,652</td>
<td>580</td>
<td>0.139</td>
</tr>
<tr>
<td>1,000</td>
<td>1,832</td>
<td>590</td>
<td>0.141</td>
</tr>
</tbody>
</table>

<sup>1</sup> The specific heat capacity has a distinct maximum at 358°C (676.4°F).

Table 3 a—Typical physical properties at low, room and elevated temperatures of VDM® Nickel 200 and VDM® Nickel 201

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Thermal conductivity of Nickel 200</th>
<th>Thermal conductivity of Nickel 201&lt;sup&gt;1)&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>°C</td>
<td>W m⁻¹ K⁻¹</td>
<td>Btu · in⁻¹ ft⁻¹ °F</td>
</tr>
<tr>
<td>-200</td>
<td>79</td>
<td>45.6</td>
</tr>
<tr>
<td>-100</td>
<td>75</td>
<td>43.3</td>
</tr>
<tr>
<td>0</td>
<td>72</td>
<td>41.6</td>
</tr>
<tr>
<td>20</td>
<td>71</td>
<td>41.0</td>
</tr>
<tr>
<td>100</td>
<td>67</td>
<td>38.7</td>
</tr>
<tr>
<td>200</td>
<td>62</td>
<td>35.8</td>
</tr>
<tr>
<td>300</td>
<td>57</td>
<td>32.9</td>
</tr>
<tr>
<td>400</td>
<td>56</td>
<td>32.4</td>
</tr>
<tr>
<td>500</td>
<td>58</td>
<td>33.5</td>
</tr>
<tr>
<td>600</td>
<td>60</td>
<td>34.7</td>
</tr>
<tr>
<td>700</td>
<td>62</td>
<td>35.8</td>
</tr>
<tr>
<td>800</td>
<td>64</td>
<td>37.0</td>
</tr>
<tr>
<td>900</td>
<td>67</td>
<td>38.7</td>
</tr>
<tr>
<td>1,000</td>
<td>69</td>
<td>39.9</td>
</tr>
</tbody>
</table>

<sup>1</sup> Thermal conductivity is lower in contaminated material. This effect is extremely strong in the very deep temperature range. Above the Curie point, the thermal conductivity indicates a change of direction.

Table 3b—Typical thermal conductivity at low, room and elevated temperatures of VDM® Nickel 200 and VDM® Nickel 201
Microstructural properties

VDM® Nickel 200 and VDM® Nickel 201 are austenitic from the absolute zero point up to melting temperature.

Mechanical properties

The following mechanical properties apply to VDM® Nickel 200 and VDM® Nickel 201 in annealed condition and in the specified semi-finished forms and dimensions. The properties for larger dimensions must be agreed separately.

### Mechanical properties of Nickel 200

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Yield strength $R_{p0.2}$</th>
<th>Yield strength $R_{p1.0}$</th>
<th>Tensile strength $R_m$</th>
<th>Elongation A</th>
</tr>
</thead>
<tbody>
<tr>
<td>°C</td>
<td>MPa</td>
<td>ksl</td>
<td>MPa</td>
<td>ksl</td>
</tr>
<tr>
<td>20</td>
<td>68</td>
<td>100</td>
<td>14.5</td>
<td>125</td>
</tr>
</tbody>
</table>

Table 4a – Mechanical short-term properties of soft-annealed VDM® Nickel 200 at room temperature according to DIN 17750

### Mechanical properties of Nickel 201

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Yield strength $R_{p0.2}$</th>
<th>Yield strength $R_{p1.0}$</th>
<th>Tensile strength $R_m$</th>
<th>Elongation A</th>
</tr>
</thead>
<tbody>
<tr>
<td>°C</td>
<td>MPa</td>
<td>ksl</td>
<td>MPa</td>
<td>ksl</td>
</tr>
<tr>
<td>20</td>
<td>68</td>
<td>80</td>
<td>11.6</td>
<td>105</td>
</tr>
<tr>
<td>100</td>
<td>212</td>
<td>70</td>
<td>10.2</td>
<td>90</td>
</tr>
<tr>
<td>200</td>
<td>392</td>
<td>65</td>
<td>9.43</td>
<td>85</td>
</tr>
<tr>
<td>300</td>
<td>572</td>
<td>60</td>
<td>8.7</td>
<td>80</td>
</tr>
<tr>
<td>400</td>
<td>752</td>
<td>55</td>
<td>7.98</td>
<td>75</td>
</tr>
<tr>
<td>500</td>
<td>932</td>
<td>50</td>
<td>7.25</td>
<td>65</td>
</tr>
<tr>
<td>600</td>
<td>1,112</td>
<td>40</td>
<td>5.8</td>
<td>52</td>
</tr>
</tbody>
</table>

2) These values are above the point of intersection with the long term creep limit

Table 4b – Mechanical short-term properties of soft-annealed VDM® Nickel 201 at room and elevated temperatures according to VdTÜV material data sheet 345

### Mechanical properties at room temperature of VDM® Nickel 201 in annealed condition according to DIN 17750 - 17753

<table>
<thead>
<tr>
<th>Product form</th>
<th>Dimensions</th>
<th>Yield stress $R_{p0.2}$</th>
<th>Yield stress $R_{p1.0}$</th>
<th>Tensile strength $R_m$</th>
<th>Elongation A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheet</td>
<td>50 mm/1.96 in</td>
<td>80 MPa</td>
<td>105 MPa</td>
<td>340 MPa</td>
<td>50 %</td>
</tr>
</tbody>
</table>

Table 4c – Mechanical properties at room temperature of VDM® Nickel 201 in annealed condition according to DIN 17750 - 17753
Corrosion resistance

VDM® Nickel 200 and VDM® Nickel 201 have excellent resistance against many corrosive media, in particular hydrofluoric acid and alkalis. The corrosion resistance is particularly good under reduced conditions; but as soon as a passivating oxide layer forms, this is also true in oxidizing media. An extraordinary characteristic is the resistance in alkali solutions up to salt baths.

The very much reduced carbon content of VDM® Nickel 201 ensures practically a complete absence of grain boundary attacks even above 315°C (599°F). In alkali solutions, the chlorate concentration must be kept low however, as it promotes corrosion attacks through chloride formation.

The resistance of VDM® Nickel 200 and VDM® Nickel 201 against mineral acids varies depending on temperature and concentration and on whether the solution is ventilated or not. The corrosion resistance in unventilated acids is better. In acids, alkalis and solutions of neutral salts, VDM® Nickel 200 and VDM® Nickel 201 prove good resistance, but in oxidizing salt solutions, strong corrosion can occur. Both materials are resistant to dry gases in room temperature.

VDM® Nickel 201 can be used in dry chlorine gas and hydrogen chloride in temperatures of up to 550°C (1,022°F).

The material is offered under the name VDM® Nickel 205 with a higher guaranteed nickel concentration of 99.6%.

<table>
<thead>
<tr>
<th>Temperature °C</th>
<th>Creep limit Rm / 10⁴ h MPa</th>
<th>Creep limit Rp / 10⁴ h kpsi</th>
</tr>
</thead>
<tbody>
<tr>
<td>380</td>
<td>65</td>
<td>12.3</td>
</tr>
<tr>
<td>400</td>
<td>75</td>
<td>10.9</td>
</tr>
<tr>
<td>420</td>
<td>67</td>
<td>9.72</td>
</tr>
<tr>
<td>440</td>
<td>59</td>
<td>8.56</td>
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<tr>
<td>460</td>
<td>51</td>
<td>7.4</td>
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<tr>
<td>480</td>
<td>43</td>
<td>6.24</td>
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<tr>
<td>500</td>
<td>35</td>
<td>5.08</td>
</tr>
<tr>
<td>520</td>
<td>28</td>
<td>4.06</td>
</tr>
<tr>
<td>540</td>
<td>22</td>
<td>3.19</td>
</tr>
<tr>
<td>560</td>
<td>17</td>
<td>2.47</td>
</tr>
<tr>
<td>580</td>
<td>13</td>
<td>1.89</td>
</tr>
<tr>
<td>600</td>
<td>10</td>
<td>1.45</td>
</tr>
</tbody>
</table>

Table 5 – Calculated characteristic values of VDM® Nickel 201 at elevated temperature according to VdTÜV data sheet 345. Notes of the VdTÜV sheets should be considered for interpretation.
Applications

Unalloyed nickel combines good mechanical properties with good corrosion resistance. In application temperatures above 300°C (572°F), VDM® Nickel 201, which stands out for a low C-concentration, is preferable over VDM® Nickel 200. The lowered C-concentration reduces strength and the work hardening rate, and it raises ductility.

Typical applications are:

- Food manufacturing such as handling of cooling brine, fatty acids and fruit juices due to the material’s resistance against acids,
- alkalis and neutral salt solutions and against organic acids
- Tanks in which fluorine is produced and where it reacts with hydrocarbon (CFC) due to the material’s resistance against fluorine
- Storage and transport of phenol
- Production and treatment of caustic soda
- Production of synthetic fibers and soaps
- Production of hydrogen chloride and chlorination of hydrocarbons such as benzene, methane and ethane
- Production of vinyl chloride monomer due to the material’s resistance against dry chlorine gas and hydrogen chloride in increased temperatures
- Electrical and electronic components
- Electrode contacts and current conductors in batteries
- Current conductors in alkali fuels
VDM® Nickel 200 and VDM® Nickel 201 are ideally suited for processing by means of common processing techniques customary in metalworking.

Heating
It is important that the workpieces are clean and free of any contaminations before and during heat treatment. Sulfur, phosphorus, lead and other low-melting point metals can result in material damage during the heat treatment. This type of contamination is also contained in marking and temperature-indicating paints or pens, and also in lubricating grease, oils, fuels and similar materials. The sulfur content of fuels must be as low as possible. Natural gas should contain less than 0.1 wt.% of sulfur. Heating oil with a maximum sulfur content of 0.5 wt.% is also suitable. Electric furnaces are preferable for their precise temperature control and a lack of contaminations from fuels. The furnace temperature should be set between neutral and slightly oxidizing and it should not change between oxidizing and reducing. The workpieces must not come in direct contact with flames.

Hot forming
VDM® Nickel 200 and VDM® Nickel 201 are well suited for hot forming in the temperature range between 1,200 and 800 °C (2,192 and 1,472 °F). For heating up, workpieces should be placed in a furnace that is already heated up. Rapid cooling down after the hot forming is not required. A heat treatment after the hot forming is recommended for achieving the optimal corrosion characteristics and controlled mechanical properties.

Cold forming
Cold forming should be conducted on the soft annealed material. The forming characteristics of VDM® Nickel 200 and 201 are comparable to those of carbon steels. In strong cold forming, intermediate annealing may be necessary to reinstate the formable soft condition.

Heat treatment
VDM® Nickel 200 and 201 are soft annealed in the temperature range between 700 and 850 °C (1,292 and 1,562 °F). To achieve a fine-grained microstructure, it is recommended to determine the parameters of the annealing temperature and retention time carefully prior to the heat treatment. Work-hardened VDM® Nickel is advantageous for some applications. Work-hardened material can be heat treated in temperatures between 550 and 650 °C (1,022 and 1,202 °F) to compensate forming tensions. In this temperature range, the material does not recrystallize and therefore largely retains the strength that was obtained through the forming process. The cooling down speed after heat treatment of VDM® Nickel 200 or 201 is generally unproblematic. For strips as the product form, the heat treatment can be performed in a continuous furnace at a speed and temperature that is adapted to the strip thickness. In each heat treatment, the aforementioned cleanliness requirements must be observed.

Descaling and pickling
Oxides on VDM® Nickel 200 and 201 and discolorations in the area of weld seams must be removed before use. Before the pickling in hot sulfuric acid, blasting of the surfaces is helpful to shorten the pickling times. Pickling in saltpeter hydrofluoric acid mixtures leads to the formation of nitric gases damaging to health and the environment it is therefore recommendable only with limitations.

Machining
VDM® Nickel 200 and 201 is preferably processed in annealed condition. Since the material has a propensity for work hardening, a low cutting speed should be selected and the cutting tool should stay engaged at all times. An adequate chip depth is important in order to cut below the previously formed work-hardened zone. An optimal heat dissipation by using large quantities of suitable, preferably aqueous, cold forming lubricants has considerable influence on a stable machining process.
Welding information

When welding nickel alloys and special stainless steels, the following information should be taken into account:

**Safety**
The generally applicable safety recommendations, especially for avoiding dust and smoke exposure must be observed.

**Workplace**
A separately located workplace, which is specifically separated from areas in which C steel is being processed, must be provided. Maximum cleanliness is required, and drafts should be avoided during gas-shielded welding.

**Auxiliary equipment and clothing**
Clean fine leather gloves and clean working clothes must be used.
Since nickel compared to nickel alloys has a greater propensity for forming pores, a particularly good shielding gas cover must be ensured during the welding.

**Tools and machines**
Tools that have been used for other materials may not be used for nickel alloys and stainless steels. Only stainless steel brushes may be used. Machines such as shears, punches or rollers must be fitted (e.g. with felt, cardboard, films) so that the workpiece surfaces cannot be damaged by such equipment due to pressed-in iron particles as this can lead to corrosion.

**Edge preparation**
Edge preparation should preferably be carried out using mechanical methods such as lathing, milling or planning. Abrasive waterjet cutting or plasma cutting is also possible. In case of the latter, however, the cut edge (seam flank) must be reworked cleanly. Careful grinding without overheating is also permissible.

**Striking the arc**
Striking the arc may only take place in the seam area, e.g. on the seam flanks or on an outlet piece, and not on the component surface. Scaling areas are places that may be more susceptible to corrosion.

**Included angle**
Compared to C-steels, nickel alloys and special stainless steels exhibit lower thermal conductivity and greater heat expansion. Larger root openings and web spacings (1 to 3 mm) are required to live up to these properties. Due to the viscosity of the welding material (compared to standard austenites) and the tendency to shrink, included angles of 60 to 70° – as shown in Figure 1 – have to be provided for butt welds.
Cleaning
Cleaning of the base material in the seam area (both sides) and the welding filler (e.g. welding rod) should be carried out using acetone.

Welding filler
The use of the following fillers is recommended for gas-shielded welding methods:

Welding rods and wire electrodes:
VDM® FM 61 (material no. 2.4155)
AWS 5.14 - ERNi-1
DIN EN ISO 18274 - S Ni 2061 (NiTi3)

The use of bar electrodes in sleeves is possible.
**Post-treatment**

If the work is performed optimally, brushing immediately after welding, i.e. while still warm, and without additional pickling, will result in the desired surface condition. In other words, heat tint can be removed completely. Pickling, if required or specified, should generally be the last operation in the welding process. The information contained in the section entitled "Descaling and pickling" must be observed.

Heat treatments are normally not required either before or after welding. If necessary, however, a low-tension annealing can be conducted with VDM® Nickel 201 after the welding at temperatures between 550 and 650°C (1,022 and 1,202°F) with a retention time between 30 min and up to 3 hours.
<table>
<thead>
<tr>
<th>Thickness (mm)</th>
<th>Welding process</th>
<th>Filler material</th>
<th>Rootpass ¹</th>
<th>Intermediate and final passes</th>
<th>Welding speed</th>
<th>Shielding glass</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Diameter (mm)</td>
<td>Speed (m/min.)</td>
<td>I (A)</td>
<td>U (V)</td>
<td>I (A)</td>
</tr>
<tr>
<td>3 (0.118)</td>
<td>Manual TIG</td>
<td>2.0 (0.079)</td>
<td>90</td>
<td>10</td>
<td>110-120</td>
<td>11</td>
</tr>
<tr>
<td>6 (0.236)</td>
<td>Manual TIG</td>
<td>2.0-2.4 (0.079-0.0945)</td>
<td>100-110</td>
<td>10</td>
<td>120-140</td>
<td>12</td>
</tr>
<tr>
<td>8 (0.315)</td>
<td>Manual TIG</td>
<td>2.4 (0.0945)</td>
<td>100-110</td>
<td>11</td>
<td>130-140</td>
<td>12</td>
</tr>
<tr>
<td>10 (0.394)</td>
<td>Manual TIG</td>
<td>2.4-4.0 (0.0945-0.16)</td>
<td>100-110</td>
<td>11</td>
<td>130-140</td>
<td>12</td>
</tr>
<tr>
<td>3 (0.118)</td>
<td>Autom.-TIG</td>
<td>1.0 (0.039)</td>
<td>1.2</td>
<td></td>
<td></td>
<td>150</td>
</tr>
<tr>
<td>5 (0.197)</td>
<td>Autom.-TIG</td>
<td>1.2 (0.0472)</td>
<td>1.4</td>
<td></td>
<td></td>
<td>180</td>
</tr>
<tr>
<td>2 (0.0787)</td>
<td>Autom. TIG HD</td>
<td>1.0 (0.039)</td>
<td></td>
<td></td>
<td></td>
<td>180</td>
</tr>
<tr>
<td>10 (0.394)</td>
<td>Autom. TIG HD</td>
<td>1.2 (0.0472)</td>
<td></td>
<td></td>
<td></td>
<td>220</td>
</tr>
<tr>
<td>4 (0.157)</td>
<td>Plasma</td>
<td>1.2 (0.0472)</td>
<td>1</td>
<td></td>
<td></td>
<td>180</td>
</tr>
<tr>
<td>6 (0.236)</td>
<td>Plasma</td>
<td>1.2 (0.047)</td>
<td>1</td>
<td></td>
<td></td>
<td>200-220</td>
</tr>
<tr>
<td>8 (0.315)</td>
<td>GMAW (MIG/MAG ³)</td>
<td>1.0 (0.039)</td>
<td>6-7</td>
<td></td>
<td></td>
<td>130-140</td>
</tr>
<tr>
<td>10 (0.394)</td>
<td>GMAW (MIG/MAG ³)</td>
<td>1.2-1.6 (0.047-0.063)</td>
<td>6-7</td>
<td></td>
<td></td>
<td>130-150</td>
</tr>
</tbody>
</table>

Information

¹ Root pass: it must be ensured that there is sufficient root protection, for example using Ar 4.6, for all inert gas welding processes.
² Autom. TIG: the root pass should be welded manually (see manual TIG parameters)
³ Plasma: recommended plasma gas Ar 4.6 / plasma quantity 3.0-3.5 l/min
⁴ GMAW (MIG/MAG): the use of multi-component shielding gases is recommended for MAG welding.

Section energy kJ/cm: autom. TIG-HD max. 6; TIG, GMAW (MIG/MAG) manual, mechanized max. 8; plasma max. 10
The values are intended as guidance to simplify the setting of welding machines.

Table 6 – Welding parameters
Availability

VDM® Nickel 200 and VDM® Nickel 201 are available in the following semi-finished forms:

**Sheet/Plate**
Delivery condition: hot or cold rolled, heat treated, descaled or pickled

<table>
<thead>
<tr>
<th>Condition</th>
<th>Thickness mm</th>
<th>Width mm</th>
<th>Length mm</th>
<th>Piece weight kg (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cold rolled</td>
<td>1.7 (0.039-0.275)</td>
<td>≤ 2.500 (98.42)</td>
<td>≤ 12.500 (492)</td>
<td></td>
</tr>
<tr>
<td>Hot rolled</td>
<td>3-20 (0.11811-0.787402)</td>
<td>≤ 2.500 (98.42)</td>
<td>≤ 12.500 (492)</td>
<td>≤ 2.450 (5.400)</td>
</tr>
</tbody>
</table>

**Strip**
Delivery condition: cold rolled, heat treated, pickled or bright annealed

<table>
<thead>
<tr>
<th>Thickness mm (in)</th>
<th>Width mm (in)</th>
<th>Coil inside diameter mm (in)</th>
<th>Piece weight kg (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.02-0.2 (0.000787-0.00787)</td>
<td>4-230 (0.157-9.06)</td>
<td>300 (11.8)</td>
<td>400 (15.7)</td>
</tr>
<tr>
<td>0.2-0.25 (0.00787-0.00984)</td>
<td>4-720 (0.157-28.3)</td>
<td>300 (11.8)</td>
<td>400 (15.7)</td>
</tr>
<tr>
<td>0.25-0.6 (0.00984-0.0236)</td>
<td>6-750 (0.236-29.5)</td>
<td>–</td>
<td>400 (15.7)</td>
</tr>
<tr>
<td>0.6-1 (0.0236 -0.0394)</td>
<td>8-750 (0.315-29.5)</td>
<td>–</td>
<td>400 (15.7)</td>
</tr>
<tr>
<td>1-2 (0.0394-0.0787)</td>
<td>15-750 (0.591-29.5)</td>
<td>–</td>
<td>400 (15.7)</td>
</tr>
<tr>
<td>3.5-10 (0.0787-0.1378)</td>
<td>25-750 (0.984-29.5)</td>
<td>–</td>
<td>400 (15.7)</td>
</tr>
</tbody>
</table>

*Rolled sheet – separated from the coil – are available in lengths from 250-4,000 mm (9.84 to 157.48 in).*

**Rod: available as VDM Nickel 201**
Delivery condition: forged, rolled, drawn, heat treated, oxidized, descaled or pickled, turned, peeled, ground or polished

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Outside diameter mm (inch)</th>
<th>Length mm (inch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>General dimensions</td>
<td>6-800 (0.236-31.5)</td>
<td>1,500-12,000 (59.1 – 472)</td>
</tr>
<tr>
<td>Material specific dimensions</td>
<td>13-340 (0.511811-13.3858)</td>
<td>1,500-12,000 (59.1 – 472)</td>
</tr>
</tbody>
</table>

*VDM® Nickel 200 is not manufactured in the rod product form*

**Wire**
Delivery condition: drawn bright, ¼ hard to hard, bright annealed in rings, containers, on spools and headstocks

<table>
<thead>
<tr>
<th>Drawn mm (in)</th>
<th>Hot rolled mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.16 – 10 (0.0063-0.393701)</td>
<td>5.5 – 19 (0.22-0.75)</td>
</tr>
</tbody>
</table>

*Other shapes and dimensions such as discs, rings, seamless or longitudinally welded pipes and forgings can be requested.*
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