SUPERPLAST® 300® (SP300®) is a plastic injection steel pre-hardened to 300 HB (32 HRC).

SUPERPLAST® 300® is designed to fit with needs of current plastic mold industry. Its original chemistry ensures specific properties: very high machinability, homogeneous through hardening (up to 910 mm - 35.82" thick), very good aptitude to weld repairs, high thermal conductivity.

SUPERPLAST® 300® can efficiently substitute for conventional grades such as P20/W1.2738.

Moreover it will provide significant advantages to moldmakers and molders and can therefore contributes to cost savings in mold manufacturing and mold operation as well.

Based on its outstanding aptitude to processing, SUPERPLAST® 300® can be used for small to big mold cavities and cores such as bumpers molds. It can be textured and polished providing lense quality is not requested.

**Standard**

Superplast® 300® - SP 300®

**Chemical analysis - % weight**

<table>
<thead>
<tr>
<th>C</th>
<th>Cr</th>
<th>Mn</th>
<th>Mo</th>
<th>Other element</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.25</td>
<td>1.30</td>
<td>1.30</td>
<td>0.4</td>
<td>B</td>
</tr>
</tbody>
</table>

Typical values for a plate 100 mm (4") thick.

**Mechanical properties**

<table>
<thead>
<tr>
<th>Guaranteed hardness</th>
<th>Hardness (HB)</th>
<th>Y.S. 0.2 MPa (KSI)</th>
<th>UTS MPa (KSI)</th>
<th>El 5.65 %</th>
<th>Young Modulus GPa</th>
</tr>
</thead>
<tbody>
<tr>
<td>290 / 320 HB</td>
<td>305</td>
<td>920 (134)</td>
<td>1020 (148)</td>
<td>13.5</td>
<td>205</td>
</tr>
</tbody>
</table>

Typical values for a 100 mm (4") SP300® plate thick.

° Industeel Trademark – ™ Patented Grade

*HRC hardness is only indicative value (translation from HB according to ISO 18265 : 2003 table B2)
Physical properties

Density = 7.85

<table>
<thead>
<tr>
<th>Thermal conductivity W.m⁻¹ °K⁻¹</th>
<th>Thermal expansion coefficient 10⁻⁶ °K⁻¹</th>
<th>Ind. Rem.</th>
</tr>
</thead>
<tbody>
<tr>
<td>at 20°C at 68°F</td>
<td>Ind.Rem. HC</td>
<td>40</td>
</tr>
<tr>
<td>20-100°C 68-212°F</td>
<td>11.9</td>
<td>12.4</td>
</tr>
<tr>
<td>20-200°C 68-392°F</td>
<td>12.8</td>
<td>13.1</td>
</tr>
<tr>
<td>20-300°C 68-572°F</td>
<td>- 15</td>
<td></td>
</tr>
<tr>
<td>20-400°C 68-752°F</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Thermal conductivity is 15 to 20% higher than that of a conventional 300 HB steel (P20/W1.2738). This property can contribute to injection cycle time reduction; the better heat exchange helps to reduce cooling time of the plastic part in the mold.

Metallurgical properties

■ Cleanliness

Industeel uses a combination of processes with electric arc furnace and VD refining. These facilities allow us to reach very low level of impurities (oxygen especially).

Guaranteed cleanliness per ISO 4967 : 1998

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 1.5</td>
<td>≤ 2</td>
<td>≤ 1.0</td>
<td>≤ 1.5</td>
</tr>
</tbody>
</table>

■ Microstructure

SP300 is delivered in pre-hardened condition. Its microstructure is basically made of a mix of bainite and martensite.

Optimized balance of alloying elements results in excellent hardenability. Consequently hardness is very consistent through the whole thickness even for very thick blocks up to 910 mm (35.82").

Low carbon content of SUPERPLAST® 300 ensures also a

Example for a 800mm (31.5") thick block.

Transformation points

Heating 150°C/h (270°F/h) up to 875°C (1671°F) and holding for 10 mn.

<table>
<thead>
<tr>
<th>AC₁</th>
<th>AC₂</th>
<th>Ms</th>
</tr>
</thead>
<tbody>
<tr>
<td>(°C-°F)</td>
<td>(°C-°F)</td>
<td>(°C-°F)</td>
</tr>
<tr>
<td>SP300 (°)</td>
<td>739 - 1362</td>
<td>815 - 1499</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>V₁</th>
<th>V₂</th>
<th>Mf</th>
</tr>
</thead>
<tbody>
<tr>
<td>(°C/h-°F/h)</td>
<td>(°C/h-°F/h)</td>
<td>(°C-°F)</td>
</tr>
<tr>
<td>SP300 (°)</td>
<td>9000 - 16200</td>
<td>150 - 270</td>
</tr>
</tbody>
</table>

CCT Diagram SP300°

strong reduction of hard spots punctually encountered on W1.2738 / P20 type of steels. It is helpful for machining (gun drilling), texturing and polishing (uniform aspects of cavities).
Heat Treatments

SP300® is delivered in pre-hardened condition and therefore should not need any further hardening. Moreover it is not recommended to harden it to hardness higher than 320 HB (in case of specific request please contact the mill).

If, for any reason, SUPERPLAST® 300® is exposed to a temperature higher than 550°C (1020°F) delivery mechanical properties can be affected. It will be then necessary to perform a complete heat treatment cycle, including quenching and tempering, to restore original properties.

Following heat treatments have to be performed:
- Austenitization at around 900°C (1652°F), holding time 1 hour/25 mm (1") of section,
- Quenching in water, oil, pressurized gas or air depending on piece thickness and shape,
- Tempering within a temperature range 500 to 600°C (932 to 1112°F) depending on required hardness.

Machining

SUPERPLAST® 300® is very well adapted to machining (drilling or milling). Its machinability is much better than the one of W1.2738 / P20. Significant cost and time savings can be achieve using more productive machining parameters (cutting speed and feed).

Rough milling with a 40mm diameter toric tool.

Polishing and Texturing

Thanks to improved structure homogeneity and high cleanliness, SUPERPLAST® 300® is fully suitable for polishing up to a mirror finish. A2 level (as defined by SPI standard) is achievable.

SUPERPLAST® 300® is adapted to texturing.

E.D.M.

SUPERPLAST® 300® is suitable, in delivery conditions for all EDM processes (electrod or wire cutting).

If the cavity is left with an EDM surface it is necessary to perform a stress relieving at 530°C (986°F) or to perform a polishing in order to remove completely the white layer created by EDM. When the cavity is textured, polishing is absolutely necessary.
Welding

Chemistry of SP300® is optimized to develop special aptitude to weld repair.

Compared to conventional 2738 / P20, it provides better cold cracking resistance and also better colour match on the plastic part.

- Welding out of mold cavities (no polishing nor etching) : Superplast®300® can be welded without pre-heating with same welding wires as W1.2738 / P20.
- Welding in mold cavities : SUPERPLAST®300® has to be welded using specific SP300® weld-E wires.

More details about welding procedure are given in the technical processing guide. For more information, please contact Industeel.

<table>
<thead>
<tr>
<th>Pre-heating and Post-heating</th>
<th>PWHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polished zone</td>
<td>325°C / 325°C - 2h 617°F / 617°F</td>
</tr>
<tr>
<td>Etched zone</td>
<td>150°C / 150°C - 2h 302°F / 302°F</td>
</tr>
</tbody>
</table>

Comparison of hardness uniformity throughout welded zone for SP300® and W1.2738-P20

Applications

- Plastic injection molds,
- Plastic extrusion dies,
- Applications where polishing and texturing are required.

Manufacturing program

<table>
<thead>
<tr>
<th>Thicknesses</th>
<th>Widths</th>
</tr>
</thead>
<tbody>
<tr>
<td>from 30 to 910 mm</td>
<td>up to 2000 mm</td>
</tr>
</tbody>
</table>

.80 to 35.82” 78.7”

For specific sizes, please consult us

Nota - 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 mold 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.

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Superplast®300 - 09/05/2012 issue - page 4