# Material data sheet
# SWG CRMHP VICTORY ESR

Schmiedewerke Gröditz
GMH GRUPPE

| material characteristics | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | material number / grade | SWG CRMHP VICTORY ESR | | | | | | |
| | short designation | X28CrNi13 | | | | | | |
| | comparable grade | 1.4021mod ESR, AISI 420mod ESR | | | | | | |
| | chemical composition - reference analysis [%] | C | Si | Mn | Cr | Ni | N | |
| | | 0.25 | 0.30 | 0.40 | 14.00 | 0.60 | alloyed | |
| | production technology | EAF/LF/VD/ESR, forging, annealing | | | | | | |
| | service hardness / strength | | HB | HRC | N/mm² | | | |
| | | | - | 50 - 54 | - | | | |
| | delivery condition | annealed | ≤ 250 | | | variation upon request | | |
| | maximum dimension | diameter | | thickness | | | | |
| | | - | | ≤ 500 mm | | | | |
| | US-specification | EN 10228-3 | | SEP 1921 | | | | |
| | | table 3 - type 1 - qual. class 4 | | group 3 - class E,e | | | | |
| | cleanliness | DIN 50602 | | ASTM E45 Methode A | | | | |
| | | K1 ≤ 10 | | A ≤ 0,5; B, C, D ≤ 1 | | | | |

| technological properties | | 0 | 1 | 2 | 3 | 4 | 5 | comment |
|---|---|---|---|---|---|---|---|---|
| | toughness | | ■ | ■ | | | | in relation to service hardness |
| | hot strength at working temp. | | ■ | ■ | ■ | | | |
| | wear resistance | | ■ | ■ | ■ | ■ | | |
| | corrosion resistance | | ■ | ■ | ■ | ■ | | polished surface for best corrosion resistance |
| | machinability | | ■ | ■ | | | | Q+T |
| | polishability | | ■ | ■ | ■ | ■ | ■ | ISO/SPI: N0/A-1 |
| | weldability | | ■ | | | | | CET = 1.00 % acc. DIN EN 1011-2 |
| | texturability | | ■ | ■ | ■ | ■ | | |
| | nitridability | | ■ | ■ | ■ | ■ | | nitriding hardness 900 - 1200 HV1 |
| | chrome-platability | | ■ | ■ | ■ | ■ | ■ | high cleanliness |

rating properties: 0 = not suitable; 1 = low; 2 = middle; 3 = good; 4 = very good; 5 = perfectly suitable

| physical properties | | | | | |
|---|---|---|---|---|---|
| | thermal conductivity [W · m$^{-1}$ · K$^{-1}$] | 20 °C | 200 °C | 300 °C | 500 °C |
| | | 20.0 | 21.0 | - | - |
| | coefficient of thermal expansion between 20 °C and ... [10$^{-6}$ · K$^{-1}$] | 100 °C | 200 °C | 300 °C | 500 °C |
| | | 10.5 | 11.0 | 11.0 | |
| | elastic modulus [kN/mm$^2$] | 20 °C | 200 °C | 300 °C | 500 °C |
| | | 218 | 206 | 198,0 | 180,0 |

| | | |
|---|---|---|
| application | technology | mold making, corrosion resistant |
| | tools | corrosion resistant plastic molds with high requirements on surface quality |
| | process temperature | < 300 °C |
| | tool size | small- and medium-sized molds |
| | final products | transparent plastic parts, high gloss parts, lenses, optical parts, electronic covers |
| | features | for very high surface quality |

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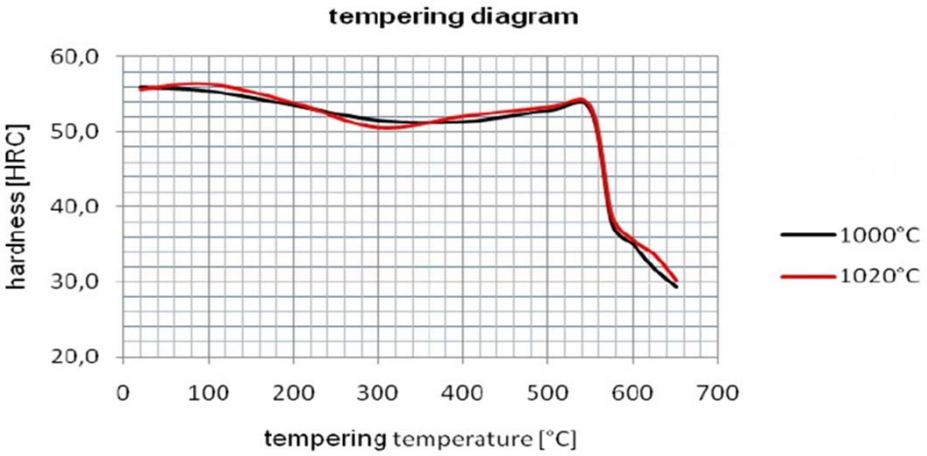
| SWG processing instructions | welding, texturing, polishing, vacuum hardening |

| | | T min [°C] | T max [°C] | medium / comment |
|---|---|---|---|---|
| heat treatment | annealing | 760 | 800 | furnace |
| | hardening | 1000 | 1030 | vacuum, oil |
| | tempering | 250 | 600 | furnace |
| | stress relieving | 450 | 500 | max. 30 °C below tempering temp. |
| | pre-heating before welding | 320 | 350 | |
| | nitriding | 400 | 500 | max. 30 °C below tempering temp. |
| | PVD-treating | 400 | 500 | |

| | | |
|---|---|---|
| diagrams/ structure | TTT-diagram | yes |
| | tempering diagram | yes |
| | advice on heat treatment | vacuum hardening after pre-machining |
| | microstructure | martensitic |

## Tempering diagram: Average values on samples dia 25 mm x length 50 mm; hardened at 1030°C in oil




## TTT-diagram (continuous)