

# TOOL STEELS

## HARDENABLE CORROSION RESISTANT STEEL

### Application Segments

Plastic Mould

### Available Product Variants

Long Products

### Product Description

BÖHLER N690 is a corrosion-resistant, martensitic chromium steel with a high carbon content and the addition of cobalt, molybdenum and vanadium. BÖHLER N690 is also approved for food and beverage contact.

### Properties

- > Toughness & Ductility : good
- > Wear Resistance : very high
- > English (United Kingdom) : good
- > Dimensional stability : good
- > Polishability : good
- > Corrosion resistance : high

### Applications

- > Components for food processing and animal feed
- > General Components for Mechanical Engineering
- > Electronic industry
- > Plastic Extrusion
- > Standard Parts (Molds, Plates, Pins, Punches)
- > Hotrunner systems
- > Glasfibre reinforced plastics
- > Screws and Barrels
- > Typical cutting instruments and knives
- > Injection Molding
- > Pill punching dies

### Technical data

| Material designation |     |
|----------------------|-----|
| 1.4528               | SEL |
| X105CrCoMo18-2       | EN  |

### Chemical composition (wt. %)

| C    | Si  | Mn  | Cr   | Mo  | V   | Co  |
|------|-----|-----|------|-----|-----|-----|
| 1.08 | 0.4 | 0.4 | 17.3 | 1.1 | 0.1 | 1.5 |

## Delivery condition

### Annealed

|               |          |
|---------------|----------|
| Hardness (HB) | max. 285 |
|---------------|----------|

## Heat treatment

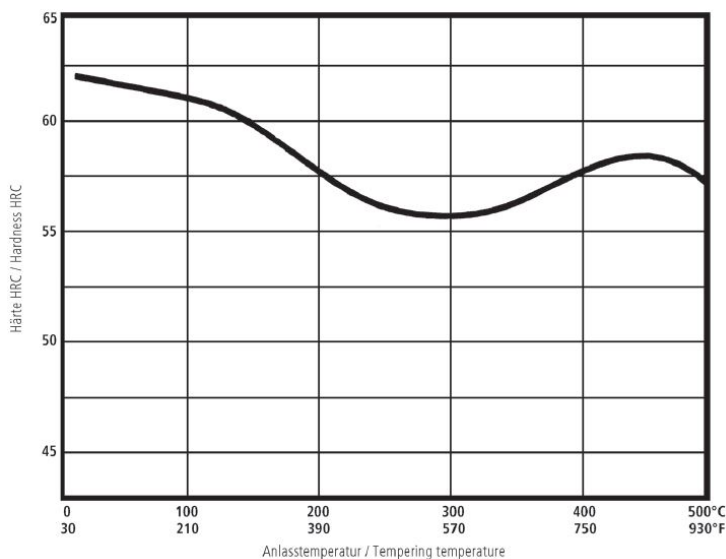
### Stress relieving

|             |             |  |
|-------------|-------------|--|
| Temperature | max. 650 °C | Soft annealed material: For stress relief annealing after mechanical processing, hold the material at temperature in a neutral atmosphere for 1-2 hours after complete heating, then slowly cool the furnace at 20°C [68 °F]/hour to 200°C [392 °F], then cool in air. |
| Temperature |             | Hardened and tempered material: The temperature for stress relief annealing should be approx. 50°C [122 °F] below the previously selected tempering temperature. Other procedure as for stress relief annealing of soft annealed material.                             |

### Hardening and Tempering

|             |                   |   |
|-------------|-------------------|---|
| Temperature | 1,030 to 1,080 °C | For hardening, hold the material at the specified temperature for 15-30 minutes after complete heating and quench quickly. Cool the material to approx. 30°C [86 °F]. Tempering should take place immediately.  |
| Temperature | 100 to 200 °C     | Tempering treatment to the desired working hardness after hardening - see tempering diagram. Heat the material slowly and temper once for 1 hour/20mm material thickness, but at least 2 hours. After the heat treatment step, the material must be cooled to approx. 30°C [86 °F]. |

## Tempering chart



Hardening temperature: 1030°C / 1886°F

Tempering: 2x2h

Sample cross-section: Square 20mm

Hardness up to 59-61 HRC

## Physical Properties

|  |      |
|--|------|
| Temperature (°C)   | 20   |
| Density (kg/dm <sup>3</sup> )                              | 7.7  |
| Thermal conductivity (W/(m.K))                             | 15   |
| Specific heat (kJ/kg K)                                    | 0.43 |
| Spec. electrical resistance (Ohm.mm <sup>2</sup> /m)       | 0.8  |
| Modulus of elasticity (10 <sup>3</sup> N/mm <sup>2</sup> ) | 223  |

## Thermal Expansions between 20°C | 68°F and ...

| Temperature (°C)                             | 100  | 200  | 300  | 400  | 500  |
|--|------|------|------|------|------|
| Thermal expansion (10 <sup>-6</sup> m/(m.K)) | 10.4 | 10.8 | 11.2 | 11.6 | 11.9 |

If other available product variants are listed in addition to long products, please note that these may differ in terms of melting process, technical data, delivery and surface condition as well as available product dimensions. For mandatory technical specifications, other requirements and dimensions, please contact our regional voestalpine BÖHLER sales companies. The data contained in this brochure is merely for general information and therefore shall not be binding on the company. We may be bound only through a contract explicitly stipulating such data as binding. Measurement data are laboratory values and can deviate from practical analyses. The manufacture of our products does not involve the use of substances detrimental to health or to the ozone layer.