

WARMWERKSTAAL

Beschikbare uitvoeringen

Stafstaal

Product omschrijving

BÖHLER W403 VMR - In vacuüm geproduceerd warmwerkstaal met zeer hoge hittebestendigheid – en daardoor maximale bestendigheid tegen brandscheuren.

Smeltroute

Airmelted + VAR

Eigenschappen

- > Taaiheid & Vervormbaarheid : hoog
- > Slijtageweerstand : hoog
- > Bewerkbaarheid : goed
- > Hete hardheid (rode hardheid) : hoog
- > Polijstbaarheid : zeer hoog
- > Warmtegeleidingsvermogen : zeer hoog
- > Microzuiverheid : zeer hoog

Toepassingen

- > Spuitgieten
- > Algemene componenten voor werktuigbouw
- > Dieptrekken / warmvormprocedé
- > Glasfibre reinforced plastics
- > Extrusie
- > Zwaartekrachtgieten / lagedruk gieten
- > Progressief smeedwerk (Hatebur)
- > Smeedwerk (warm / halfwarm)
- > Spuitgieten
- > Werktuigbouw / machinebouw Algemeen







Technische gegevens

| Materiaal aanduiding | | Normen | |
|----------------------|-------|--------|-------|
| ~1.2367 | SEL | #207 | NADCA |
| ~X38CrMoV5-3 | EN | | |
| C1885 | NADCA | | |

Chemische samenstelling

| C | Si | Mn | Cr | Mo | V |
|------|------|------|------|------|------|
| 0,38 | 0,20 | 0,25 | 5,00 | 2,80 | 0,65 |

Materiaaleigenschappen

| | Hete kracht | Hete taatheid | Weerstand tegen hete slijtage |
|---|-------------|---------------|-------------------------------|
|  | ★★★★ | ★★★★ | ★★★★ |
|  | ★★ | ★★★★ | ★★ |
|  | ★★ | ★★★ | ★★ |
|  | ★★★ | ★★★★ | ★★★ |
|  | ★★★ | ★★★ | ★★★ |
|  | ★★★★ | ★★★ | ★★★★ |
|  | ★★★ | ★★★★★ | ★★★ |
|  | ★★★★★ | ★★★★ | ★★★★★ |
|  | ★★ | ★★★★★ | ★★ |

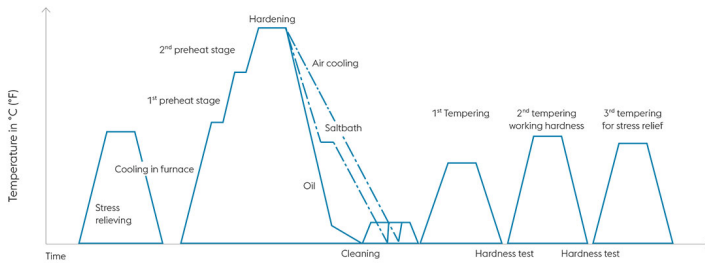
Leveringsconditie

| gegloeid | |
|---------------|----------|
| Hardheid (HB) | max. 205 |

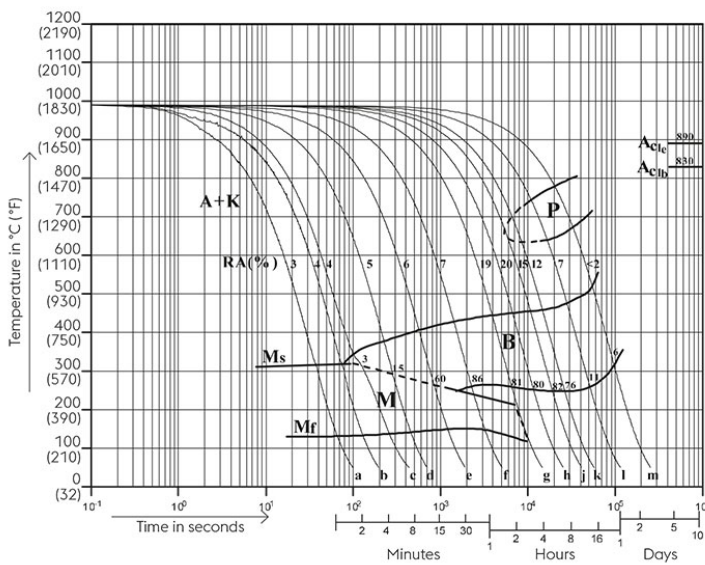
Warmtebehandeling

| Annealing | | |
|--------------------|---------------------|--|
| Temperatuur | 800 naar 850 °C | Holding time 6 to 8 hours. Slow, controlled furnace cooling at 10 to 20°C/h (50 to 68 °F/hr) to approx. 600°C (1112°F), further cooling in air. |
| Stress relieving | | |
| Temperatuur | 600 naar 670 °C | For stress relief after extensive machining or for complicated tools. Holding time depending on tool size after complete heating 2 - 6 hours in neutral atmosphere. Slow furnace cooling. |
| Harden en ontlaten | | |
| Temperatuur | 1.020 naar 1.030 °C | Holding time after temperature equalization: 15 to 30 minutes; In order to prevent coarsening of the grain, hardening must be carried out at the recommended temperature; Quenching: oil, salt bath (500 - 550°C [930 to 1020 °F]), air, inert gas in vacuum; After hardening, required tempering treatment to achieve desired working hardness (see tempering chart). |

Heat treatment sequence



Continuous cooling CCT curves

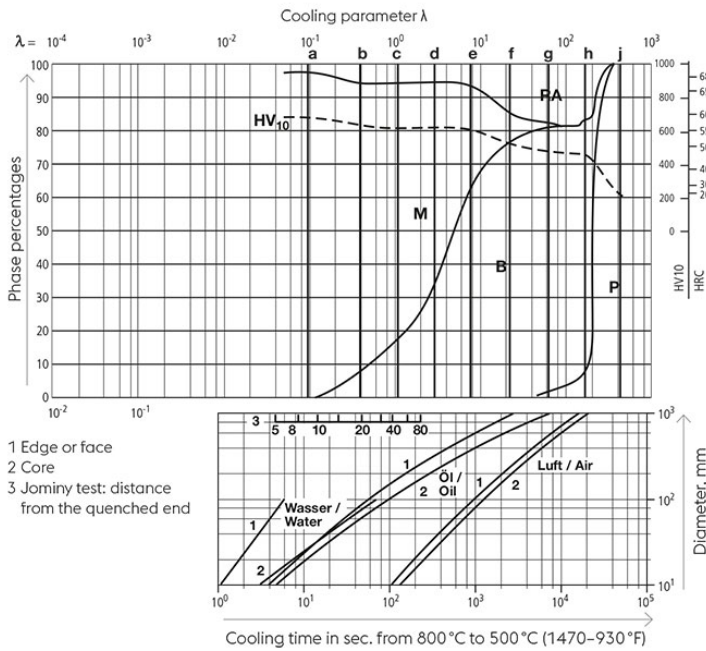


Austenitising temperature: 1025°C (1877°F)
 Holding time: 15 minutes
 5...100 phase percentages
 0.5...180 cooling parameter, i.e. duration of cooling from 800 - 500°C (1472-932°F) in $s \times 10^{-2}$

Table:
 Sample λ HV10

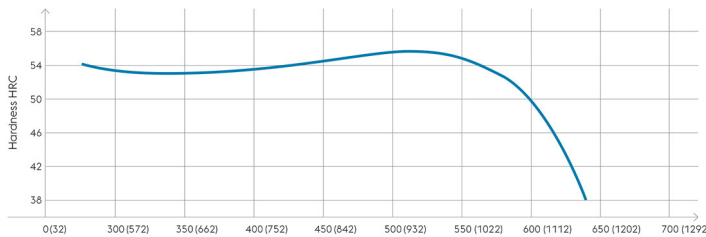
| | | |
|---|-----|-----|
| a | 0,1 | 686 |
| b | 0,4 | 643 |
| c | 1,1 | 619 |
| d | 3 | 624 |
| e | 8 | 615 |
| f | 23 | 529 |
| g | 65 | 494 |
| h | 180 | 465 |
| j | 400 | 234 |

Quantitative phase diagram



A... Austenite
B... Bainite
K... Carbide
M... Martensite
P... Pearlite
RA... Retained austenite

Tempering chart



Tempering:

Slow heating to tempering temperature immediately after hardening (time in furnace 1 hour for each 0,787 inch (20 mm) of workpiece thickness but at least 2 hours / cooling in air).

It is recommended to temper at least twice.

A third tempering cycle for the purpose of stress relieving may be advantageous.

1st tempering approx. 86°F (30°C) above maximum secondary hardness.

2nd tempering to desired working hardness. The tempering chart shows average tempered hardness values.

3rd for stress relieving at a temperature 86 to 122°F (30 to 50°C) below highest tempering temperature.

Hardening temperature: 1030°C (1886°F)
Specimen size: square 20 mm

Fysische eigenschappen

| | |
|---|------|
| Temperatuur (°C) | 20 |
| Soortelijk gewicht (kg/dm ³) | 7,85 |
| Thermische conductiviteit (W/(m.K)) | 29,8 |
| Soortelijke warmte (kJ/kg K) | 0,47 |
| Specifieke elektrische weerstand (Ohm.mm ² /m) | - |
| Elasticiteitsmodus (10 ³ N/mm ²) | 211 |

Thermische expansie

| Temperatuur (°C) | 100 | 200 | 300 | 400 | 500 | 600 |
|--|-------|-------|-----|-------|-------|-------|
| Thermische expansie (10 ⁻⁶ m/(m.K)) | 10,63 | 10,83 | 12 | 12,92 | 14,13 | 14,34 |

For additional specifications and technical requirements, please contact our regional voestalpine BÖHLER sales companies.

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