VR 300

Plastic mould steel

1 Main characteristics and applications

VR300 is a pre-hardened steel with excellent hardening penetration up to thickness 600mm. To be used for plastic dies with excellent surface finishing properties, compression moulding, plastic injection moulds, moulds for automotive industry with texturing.

VR300 is designed to provide improved performance and offers the following advantages:
- uniform hardness across the full thickness up to 600mm.
- high polishability.
- high machinability.
- excellent suitability for texturing.
- greatly increased thermal conductivity.
- good toughness.

2 Chemical composition (typical; in weight %)

C	Mn	Si	P	S	Cr	Mo	Ni
0.30	1.45	Max 0.30	0.010	0.003	1.6	0.4	0.65

3 Production technology

EAF – LF – VD - Forging – Rolling - Heat treatment QT

4 US specification

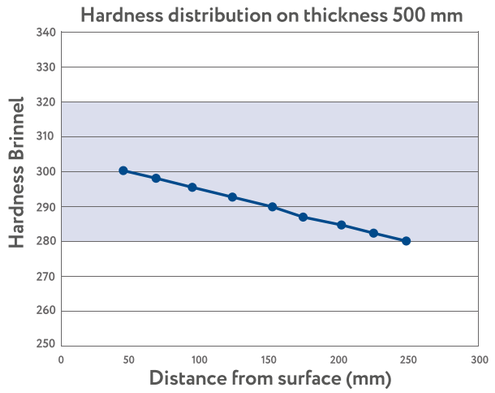
In according to standard EN10228-3 Class 4 and standard SEP 1921 Class E/e

5 Delivery condition

VR300 is delivered in quenched and tempered condition, with hardness range 280 - 325 HB (29 - 35 HRC).

6 Through hardenability

The high performance of hardenability for thickness 600 mm, is obtained by an optimized balance of chemical composition and a special manufacturing process.



7 Physical properties (reference values)

	20°C	100°C	250°C	500°C
Thermal expansion coefficient (10-6/K)	11	11.6	12.1	13.8
Thermal conductivity (W/mk)	40.0	39.3	38.4	35.2
Young modulus (Kn/mm2)	205	201	-	-

12 Polishing Range

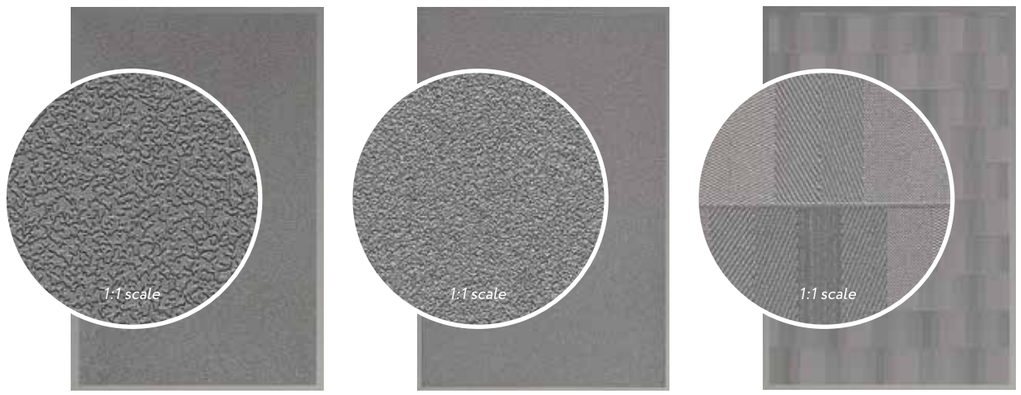
Code	*Type of polishing*	*Application*	*Roughness µm*
VR01	*Silicon Carbide Grinding Paper "100"*	*Technical polishing of internal parts or stamp*	*RA 0.69-RZ 4.62*
VR03	*Silicon Carbide Grinding Paper "150"*	*Technical polishing of extraction parts*	*RA 0.57-RZ 3.62*
VR05	*Silicon Carbide Grinding Paper "240"*	*Technical polishing of stamps and mold*	*RA 0.39-RZ 3.40*
VR07	*Silicon Carbide Grinding Paper "400"*	*Technical polishing of mold product to paint*	*RA 0.23-RZ 2.28*
VR09	*Silicon Carbide Grinding Paper "800"*	*Pre-Lapping*	*RA 0.21-RZ 1.22*
VR11	*Polishing Pads 320 Sisal*	*Polishing from pads 320 and Sisal*	*RA 0.06-RZ 0.34*
VR13	*Dry Diamond Polishing Pads 400 (3 µm)*	*Lapping of paint pieces (frompads 400)*	*RA 0.03-RZ 0.12*

Roughness tolerance: RA +/- 10% from VR01 to VR09 and +/- 15% from VR11 to VR13
RZ +/- 10% from VR01 to VR09 and +/- 15% from VR11 to VR13

1:1 scale

13 Texturing Samples

Texturing performed by Standex Mold-tech with patterns Standex MT 9086, MT 9055 and 9083

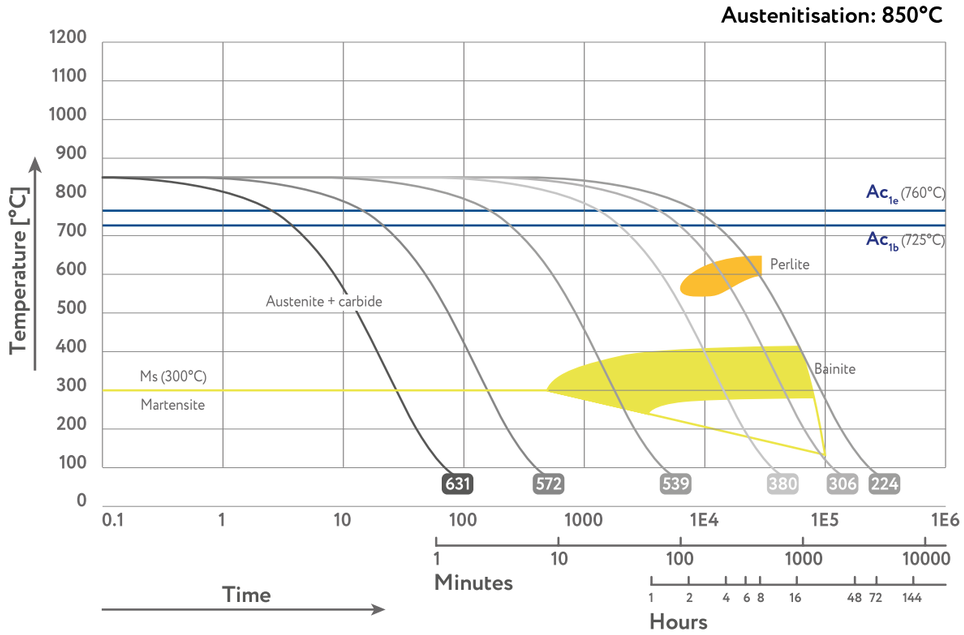


NLMK Verona S.p.A
Via Antonio Salieri, 22 - 37050 Vallese di Oppeano (VR) - Italy
Tel. : +39 045 69 97 900 - Fax : +39 045 69 97 915
toolsteel.verona@eu.nlmk.com - ⊕ toolsteels.nlmk.com

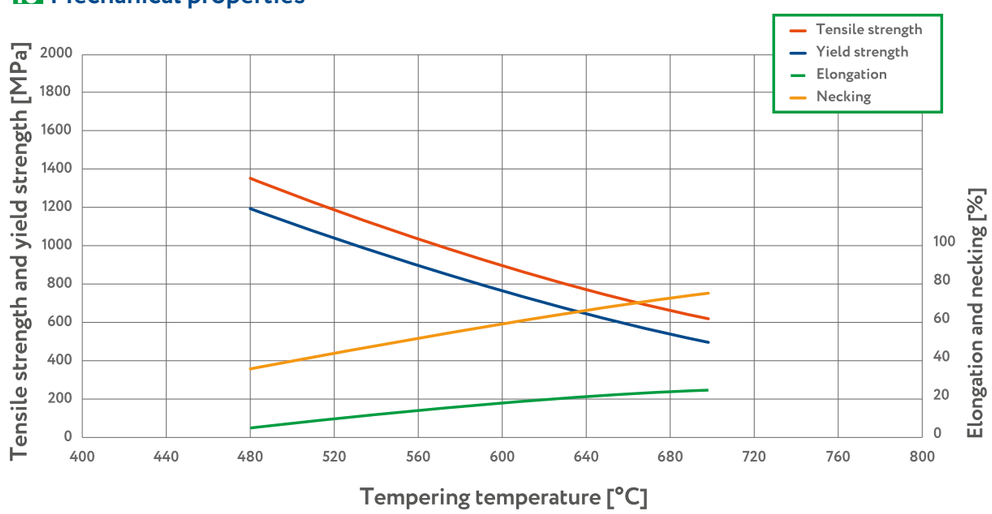
8 Heat treatment

TREATMENT	TEMPERATURE	HOLDING TIME (HT)	COOLING	COMMENTS
Annealing	Heat to 650 - 700 °C	Min. H.T. for 2 minute /mm	Air or furnace	In order to obtain hardness lower than 250 HB (24 HRC) to improve machinability
Stress relieving	Heat to 500 - 550 °C	Min. H.T. for 2 minute /mm	Air or furnace	To be carried out after machining, is recommended to eliminate the residual stresses induced by mechanical working
Hardening	Heat to 860 - 900 °C	Min. H.T. for 1 minute /mm	Polymer	-
Tempering	Heat to 530 - 610 °C	Min. H.T. for 3 minute /mm	Air or furnace	To be carried out after hardening. 2nd Tempering must be performed to max 30°C below tempering temperature

9 C.C.T. curve



10 Mechanical properties



11 Tempering curve