Bainidur® 7980 CN

Bainitic steel for serial production

GENERAL INFORMATION

Bainidur® 7980 CN is specially designed for case hardening and carbo-nitriding. The steel is a low-alloyed steel with a bainitic structure at ambient temperature. Usually the hardness values are between 36 and 40 HRC.

Bainidur® 7980 CN is the ideal solution for a lot of applications regarding economic efficiency, mechanical properties and process stability. Fields of applications are gears especially for e-mobility with high torque or large gears in wind mills. The newly developed Bainidur® 7980 CN is characterized by the following properties:

- Good processability with LPBF.
- High strength and toughness.
- Excellent case hardening and carbo-nitriding properties.

CHEMICAL COMPOSITION [WEIGHT-%]

	C	Si	Mn	Mo	Cr	V	Other
min.	0.12	0.30	0.50	0.5	1.80	0.05	
max.	0.22	1.00	1.50	1.5	2.50	0.35	
typical	0.19	0.50	0.80	0.8	2.00	0.15	+

Customer specific adjustments or limitations of the chemical composition are possible after consultation with Deutsche Edelstahlwerke.

TEMPERATURES OF PHASE TRANSFORMATIONS

Liquidus temperature	1500 °C
Solidus temperature	1330 °C
Austenite formation at heating (3 °C/min)	A_{c1}: 770 °C A_{c3}: 860 °C
Bainite start temperature	B_s: 450 °C

STANDARDS AND DESIGNATIONS

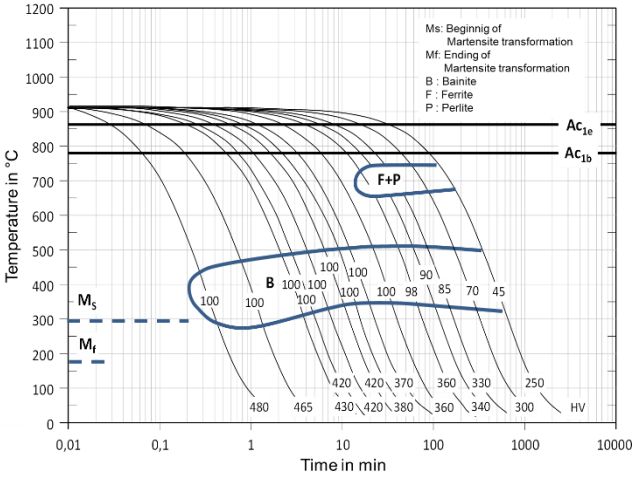
SEL	1.7980 (18MnCrMoV4-8-7)

PHYSICAL PROPERTRIES[1]

Density	~ 7.79 g/cm³
Young's modulus	~ 205 GPa
Specific heat capacity	460 J/kg K
Thermal conductivity	44.5 W/m K
Temperature conductivity	0.125 cm²/s

[1] at ambient temperature

CONTINOUS-TIME-TRANFORMATION DIAGRAM



Deutsche Edelstahlwerke

Member of Swiss Steel Group

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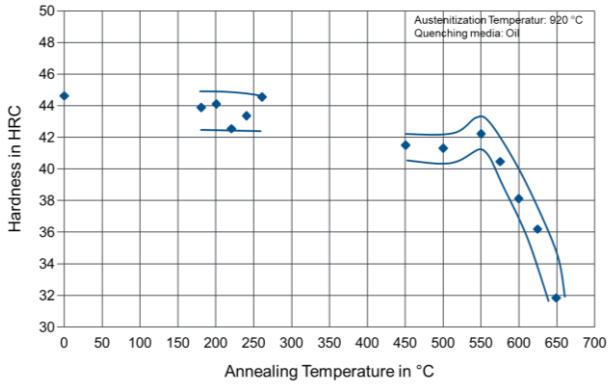
WELDING

Due to the low carbon content Bainidur® 7980 CN has a superior weldability. The formation latent heat during the bainitic transformation reduces thermal stresses and therefor the risk of cracking.

HEAT TREATMENT

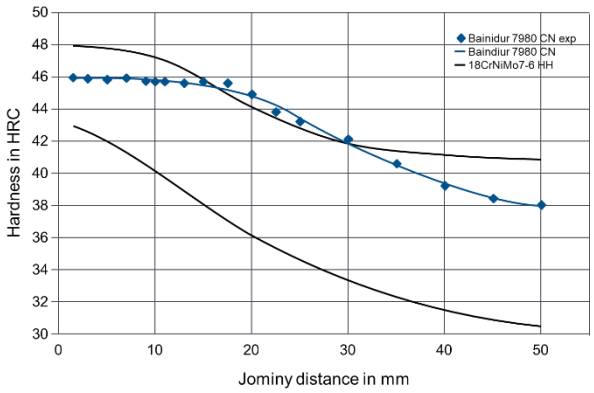
Soft annealing	680 – 710 °C
Carburizing	880 – 980 °C
Quenching (center)	920 – 960 °C
Quenching (surface)	860 – 900 °C
Tempering	See diagram

TEMPERING DIAGRAM



HARDENABLITY

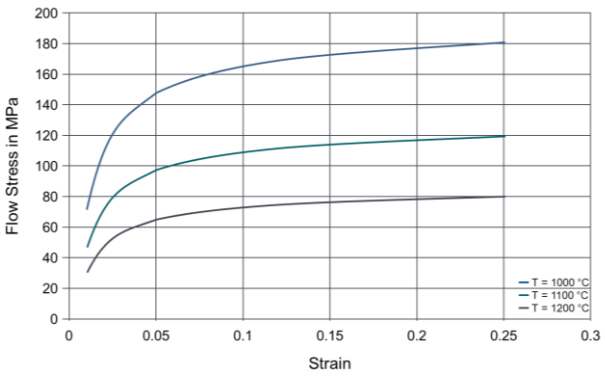
The hardenability of Bainidur® 7980 CN is comparable to grade 18CrNoMo7-6 widely used for case hardening applications with a lower drop of hardness at lower cooling rates.



HOT FORMING

The flow stress k_f for hot forming may be calculated by a Hensel-Spittel type formula* $k_f = Ae^{m1T}\varphi^{m2}e^{m4/\varphi}\dot{e}^{m3}$ The diagram is valid for a deformation rate of 10 1/s. The recommended temperature range for hot forming is 1000 - 1250 °C.

* A = 9.329, m1 = -0.00412, m2 = 0.0453, m3 = -0.00808)



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ADDITIVE MANUFACTURING[2]

For Additive Manufacturing we specially designed the modified AM-version of Bainidur® 7980 CN. Bainidur® AM can be processed on LPBF systems. Please contact us for further information.

[2] Process parameters for LPBF systems have been developed for our alloys and can be supplied on request. Depending on the system, it may be necessary to deviate from these recommendations. We would be pleased to support you in the implementation.

POWDER PROPERTIES

The powder is produced by gas atomization. This manufacturing process ensures spherical powder particles in combination with excellent flow characteristics.

Our production is certified according to DIN EN ISO 9001 (quality management systems) and IATF 16949 (quality management automotive). Thus, we can guarantee a constant high quality of our metal powder.

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