

**HOT WORK
TOOL STEEL**

HTR

HIGH TEMPERATURE RESISTANCE

KIND&CO
EDELSTAHLWERK

HIGH TEMPERATURE RESISTANCE HTR

HTR – Specially developed hot-work tool steel to reduce the formation of heat checking cracks.

Material properties:

HTR is a hot-work tool steel with an excellent thermal fatigue resistance, high thermal conductivity, and high-temperature strength in combination with good toughness. HTR is exclusively produced using the ESR process.

Application:

To be used at applications with high thermal demands:
High / low pressure die casting; extrusion; Hot / semi hot forming

Condition of delivery:

Soft annealed, max. 230 HB

Density:

8.0 g/cm³

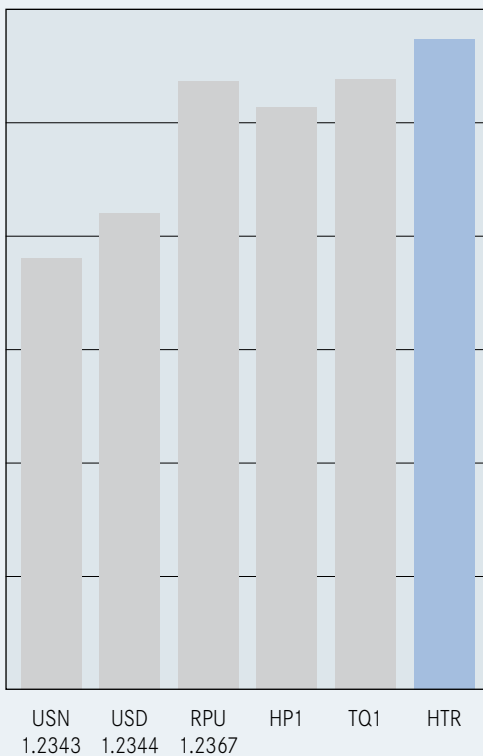
	Temperature	Cooling
Soft annealing	820 - 840 °C	Furnace
Stress relieving	600 - 650 °C	Furnace
Hardening	1050 - 1070 °C Soaking time 60 min	Oil, polymer, vacuum quenching with nitrogen gas

Material	Short name	C	Si	Mn	P	S	Cr	Mo	V	Nb	W
USN 1.2343 (H11)	X37CrMoV5-1	0.37	1.00	0.40	<0.020	<0.005	5.20	1.20	0.40		
USD 1.2344 (H13)	X40CrMoV5-1	0.40	1.00	0.40	<0.020	<0.005	5.20	1.30	1.00		
RPU 1.2367	X38CrMoV5-3	0.38	0.40	0.40	<0.020	<0.005	5.00	3.00	0.50		
HP1*		0.35	0.20	0.30	<0.012	<0.003	5.20	1.40	0.55	+	
TQ1**		0.36	0.25	0.40	<0.012	<0.003	5.20	1.90	0.55		
HTR		0.32	0.20	0.30	<0.015	<0.005	2.20	1.20	0.50	+	3.80

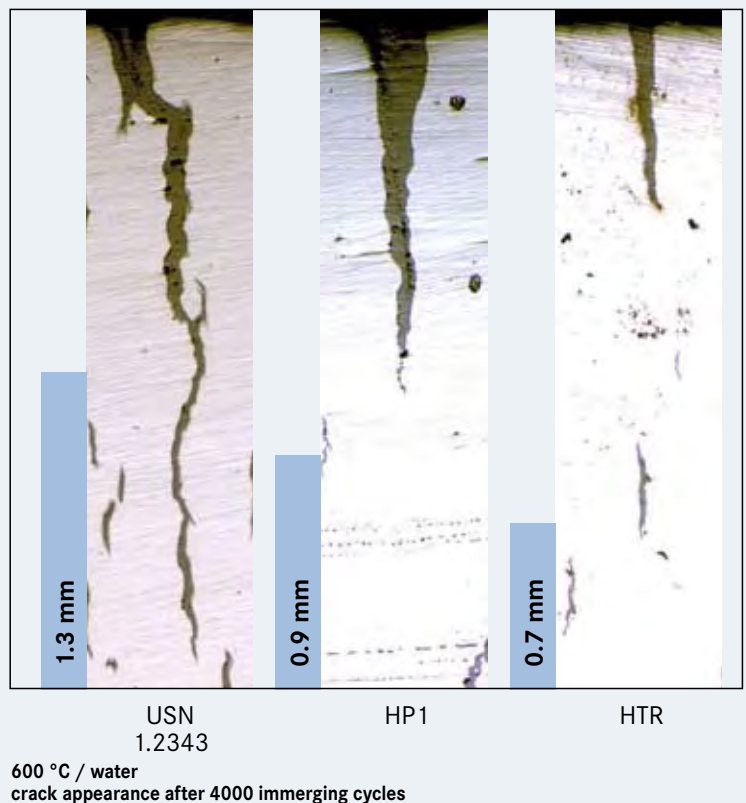
* Specific use of trace elements

** With lowest level of trace elements

High-temperature strength



Thermal fatigue resistance



Tempering diagram 60 mm Ø, 1060°C Oil

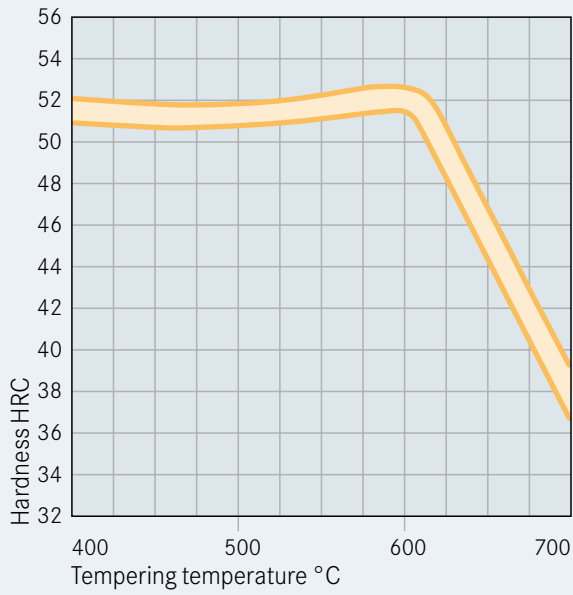
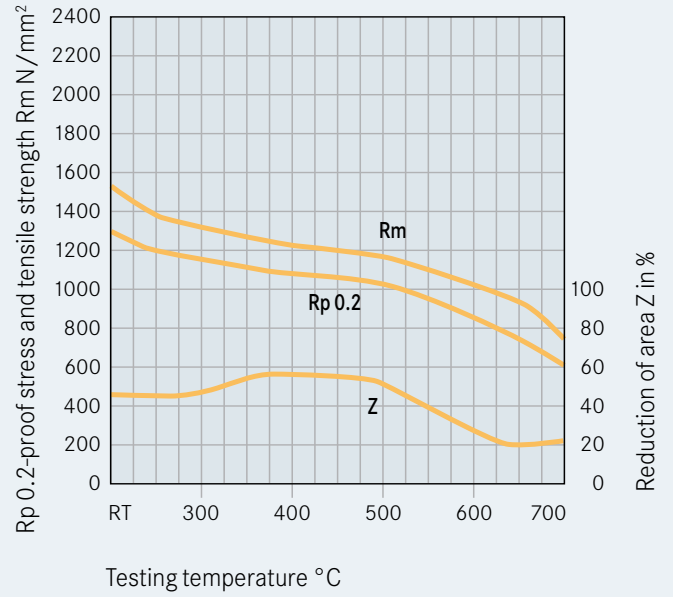


Diagram of high temperature strength 30 mm Ø, 1060°C Oil



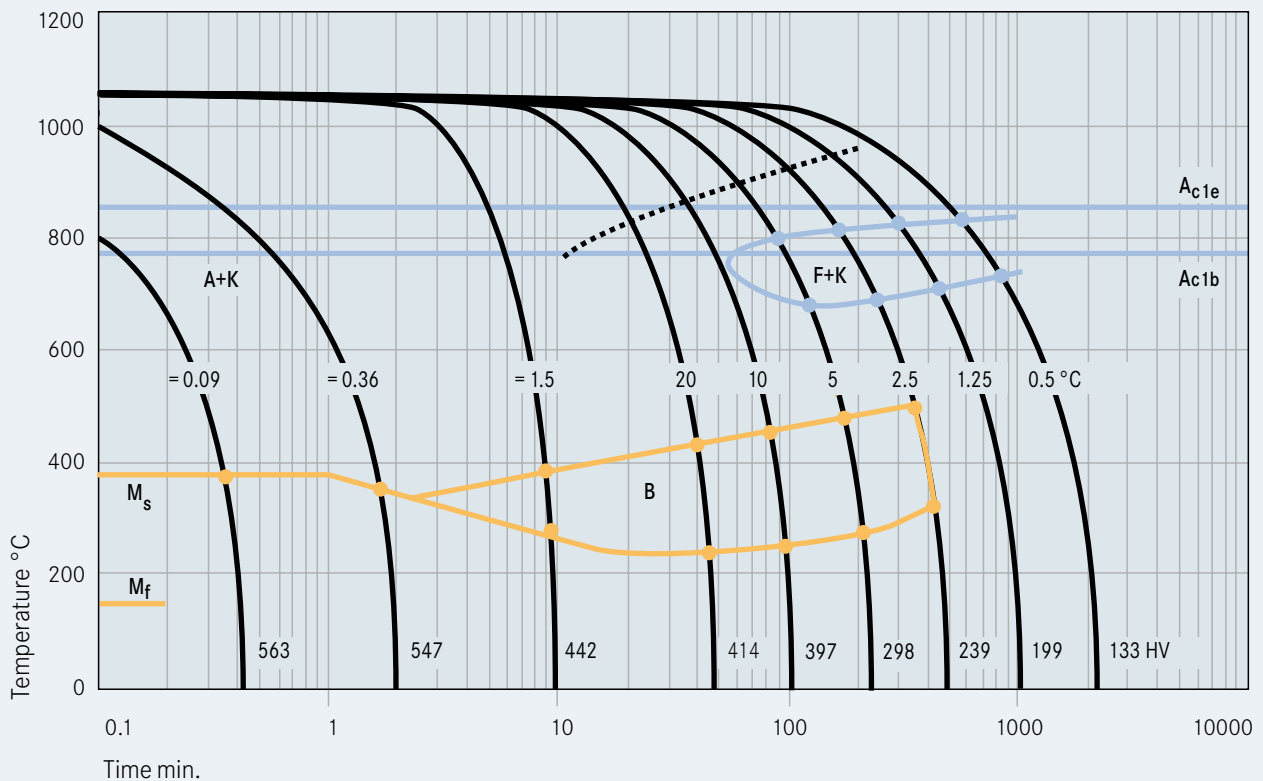
Coefficient of linear thermal expansion $10^{-6}m/(m \times K)$

Material	Temperature interval in °C		
	20-100	20-400	20-600
1.2343 (H11)	11.8	12.7	12.9
1.2344 (H13)	10.9	12.7	13.3
1.2367	11.9	12.8	13.3
HP1	11.5	12.6	13.1
TQ1	10.3	12.5	13.0
HTR	12.3	13.6	13.8

Thermal conductivity $W/(m \times K)$

Material	Testing temperature in °C		
	20	200	400
1.2343 (H11)	26.8	27.8	27.3
1.2344 (H13)	25.5	27.1	27.7
1.2367	29.9	32.1	32.4
HP1	29.5	30.5	30.5
TQ1	29.8	31.0	31.4
HTR	35.2	34.6	33.0

TTT-Diagram Austenitizing temperature 1060 °C





**More ESR, more power,
even more quality**

Electroslag remelting is used to meet special quality requirements in terms of purity, toughness, and polishability, all in a reproducible manner.



**Open Die Forging – an optimum
of forging ratio for more value**

The first forming operation for the manufacturing of hot-work tool steels with outstanding toughness and high temperature resistance properties is an important step in the process chain of producing high premium toolings.



**Heat treatment - the way to the
desired useful properties**

Reliability and profitability are the essential criteria which make the difference of the quality of a tooling. Beside the steel grade special refining procedures will optimize the wear resistance of your superior toolings ending up in a longer lifetime.



More service

Tool steels and
special materials

Melting

Forging

Ring rolling

Heat treatment

Machining

Surface treatment



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