HOT WORK TOOL STEEL

TQ1

TOP QUALITY
BY HIGHEST PURITY

KIND&CO
EDELSTAHLWERK

TOP QUALITY TQ1

Specially designed Super Clean quality. Using a particular process technology, the content of trace elements is reduced to the minimum. This leads to a clear improvement of useful properties as compared with Premium quality.

Material properties:
TQ1 is a hot-work tool steel with maximum toughness and high temperature strength. TQ1 is exclusively produced using the ESR process.

Application:
To be used at applications with highest demands like die casting, extrusion industries and hot forming, as well as applications which require maximum polishability.

Delivery condition:
Soft annealed, max. 220 HB.

Nitriding possible:
For die casting dies we recommend our nitriding Program 99 without compound layer.

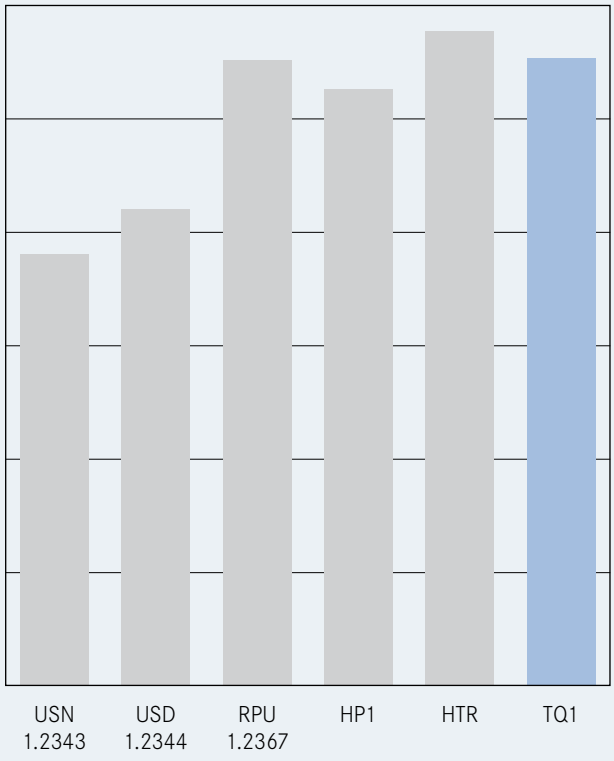
Preheating before use:
100-400 °C depending on application.

	Temperature	Cooling
Soft annealing	820 - 840 °C 4 – 6 h	slow cooling in furnace
Stress releaving	approx. 650 °C 2 – 4 h	slow cooling
Hardening	1010 °C Soaking time 60 min	Air, nitrogen gas at vacuum hardening, martempering at 540 °C, oil or polymer (to be interrupted at 230 – 280 °C)

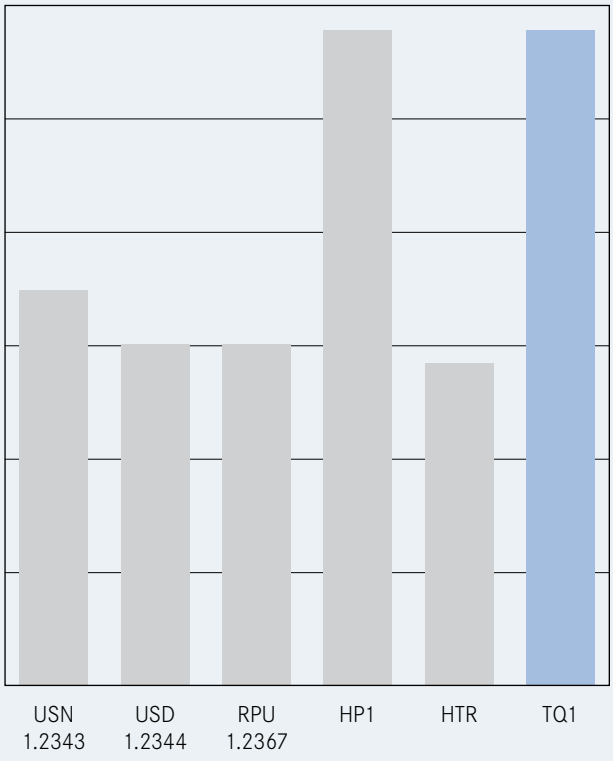
Material	Short name	C	Si	Mn	P	S	Cr	Mo	V	Nb	W
USN 1.2343 (H11)	X37CrMoV5-1	0.37	1.00	0.40	<0.020	<0.005	5.20	1.20	0.40		
USD 1.2344 (H13)	X40CrMoV5-1	0.40	1.00	0.40	<0.020	<0.005	5.20	1.30	1.00		
RPU 1.2367	X38CrMoV5-3	0.38	0.40	0.40	<0.020	<0.005	5.00	3.00	0.50		
HP1*		0.35	0.20	0.30	<0.012	<0.003	5.20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

* **Specific use of trace elements**
** **With lowest level of trace elements**

High-temperature strength



Toughness



Tempering diagram 60 mm Ø, 1010 °C Oil

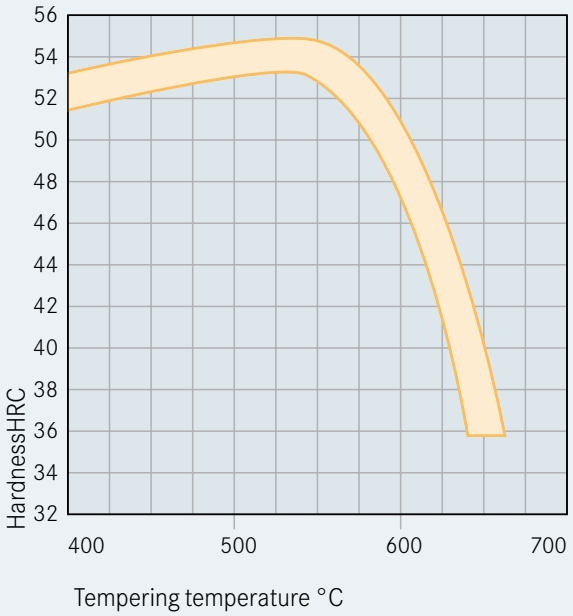
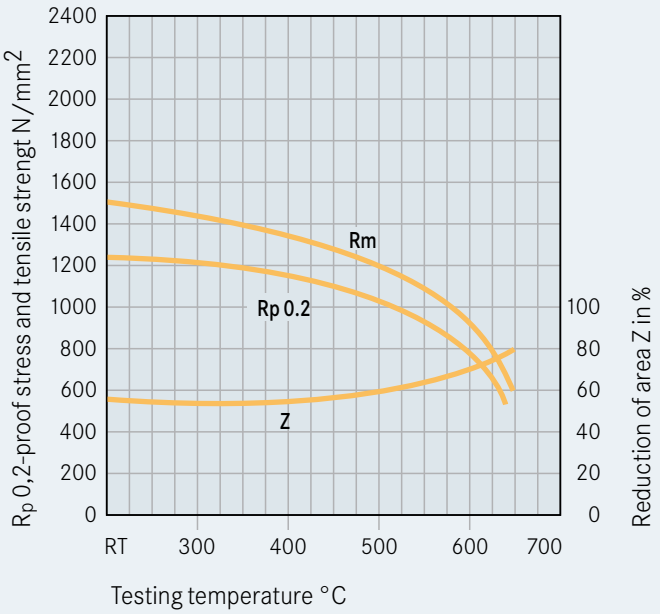


Diagram of high-temperature strength 30 mm Ø, 1010 °C Oil



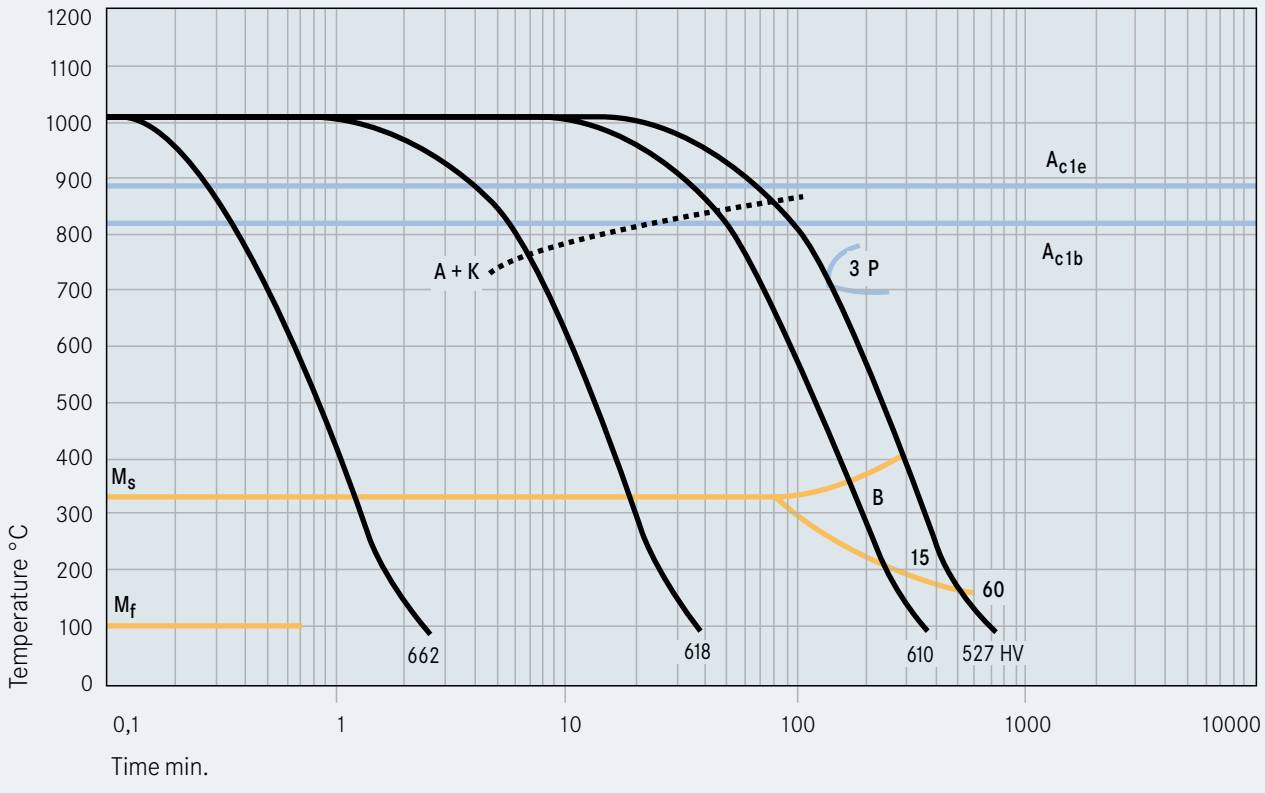
Coefficient of linear thermal expansion 10^{-6}m/(m x K)

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
HTR	12.3	13.6	13.8
TQ1	**10.3**	**12.5**	**13.0**

Thermal conductivity W/(m x 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
HTR	35.2	34.6	33.0
TQ1	**29.8**	**31.0**	**31.4**

TTT-Diagram Austenitizing temperature 1010 °



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 working 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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