



Hot Work Tool Steel

# HP1

High Premium Quality Standards Specifically supplemented

## High premium Quality HP1

A new developed quality standard by specific use of trace elements with improved useful properties and a high economic efficiency.

### Material properties:

HP1 is a hot working tool steel with a high level of high-temperature strength and outstanding toughness properties. HP1 is only available as an ESR (Electro Slag Remelting) grade.

	Temperature	Cooling
Soft annealing	820 - 840 °C 4 – 6 h	slow cooling in furnace
Stress relieving	approx. 650 °C 2 – 4 h	slow cooling
Hardening	1020 °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)

### Application:

To be used at applications with highest demands like die casting, extrusion industries and hot forming.

### Delivery condition:

Soft annealed, max. 220 HB.

### Nitriding possible:

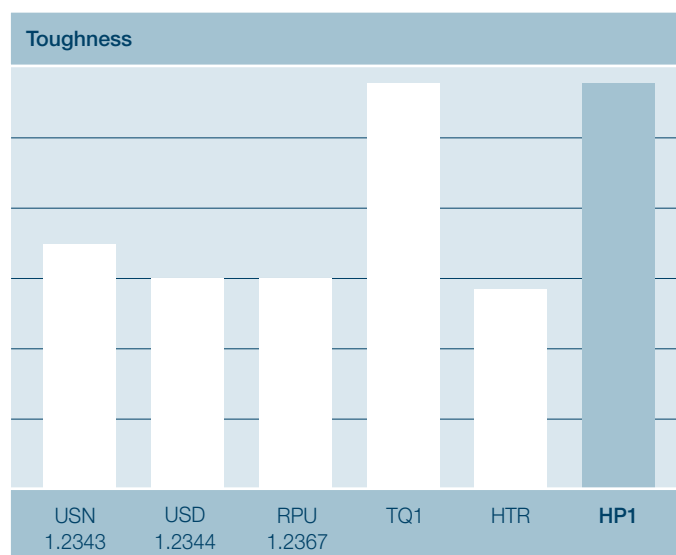
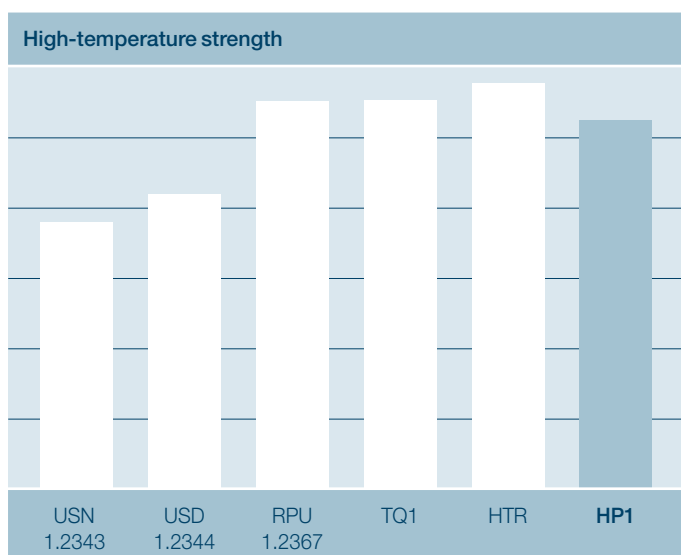
For die casting dies we recommend our nitriding Program 99 without compound layer.

### Preheating before use:

100-400 °C depending on application.

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		
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
<b>HP1**</b>		0,35	0,20	0,30	<0,012	<0,003	5,20	1,40	0,55	+	

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



Tempering diagram 60 mm Ø, 1020°C Oil

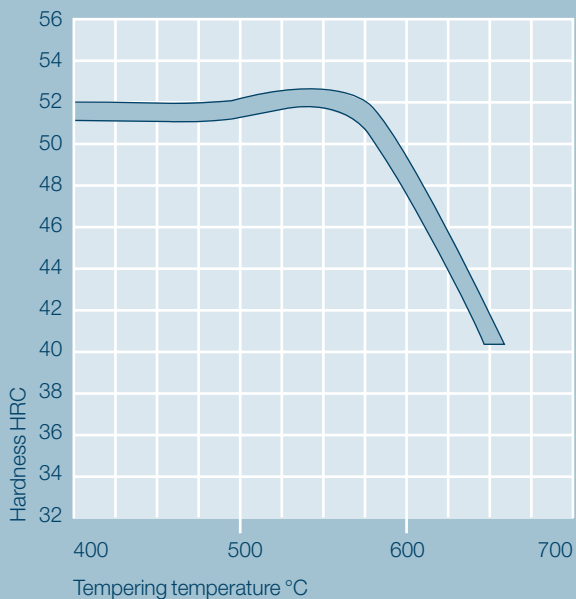
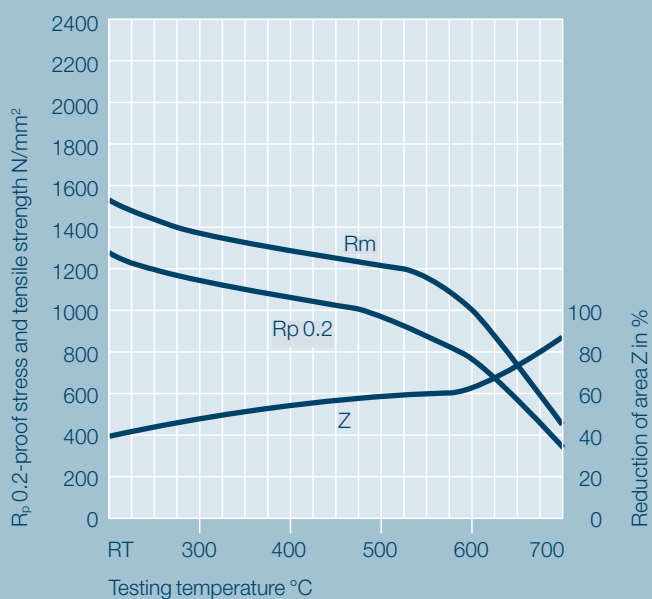


Diagram of high temperature strength 30 mm Ø, 1020°C Oil



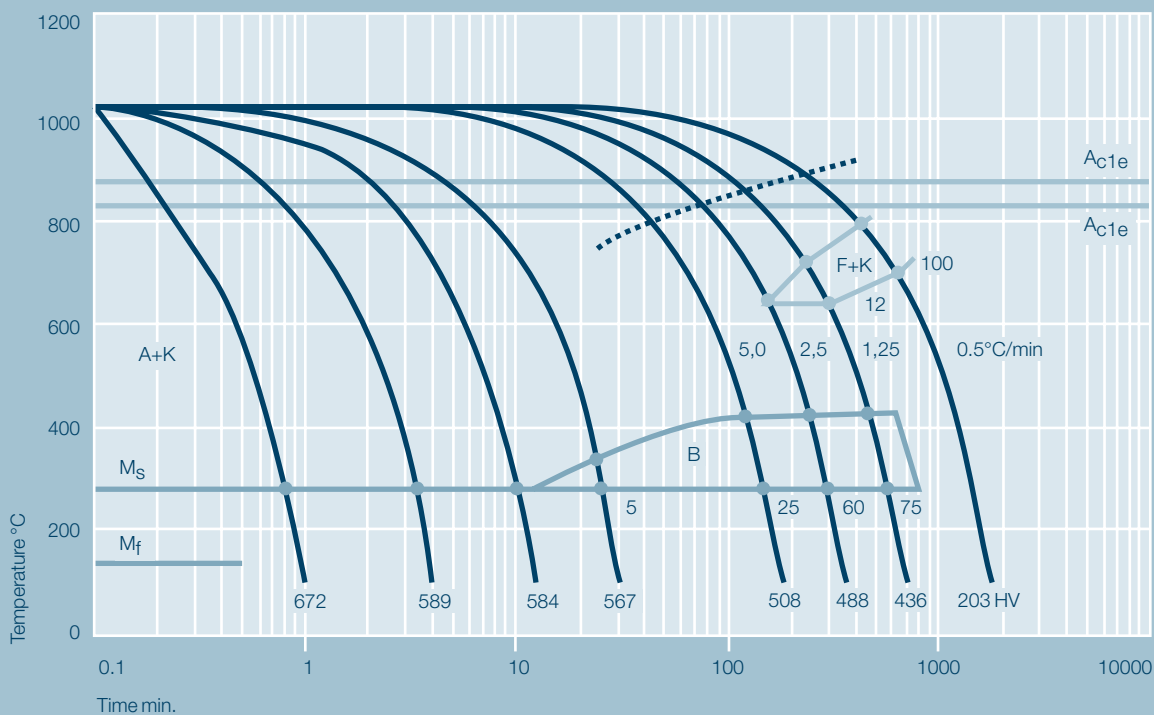
Coefficient of linear thermal expansion 10<sup>-6</sup>m/(m x K)

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
HTR	12.3	13.6	13.8
TQ1	10.3	12.5	13.0
<b>HP1</b>	<b>11.5</b>	<b>12.6</b>	<b>13.1</b>

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
HTR	35.2	34.6	33.0
TQ1	29.8	31.0	31.4
<b>HP1</b>	<b>29.5</b>	<b>30.5</b>	<b>30.5</b>

TTT-Diagram Austenitizing temperature 1020 °C



## Production processes

Melting

Forging

Heat treatment

Mechanical processing

Vacuum hardening

Surface treatment

## Products

Hot-work tool steels

Cold-work tool steels

Die forging steels

Plastic mould steels

## Industries

Die casting

Extrusion

Die forging

Pipe technology

Plastics technology

Hot-stamping

Special applications

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