MATERIAL DATA SHEET

STEEL GRADE

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OVAKO

16MnCr5 All

General Information

16MnCr5 is an alloyed case hardening steel used for e.g. mechanical engineering components.The steel can be M-treated in order to optimize the machinability.

For additional Heat Treatment Data, please visit the Heat Treatment Guide.

Similar designations

16MnCrS5, EN ISO 683-17, 17MnCr5, 1.7131, 1.7139, 1.3521

Chemical composition

Variant	Cast	Weldability		C %	Si %	Mn %	P %	S %	Cr %	Ni %	Mo %	V %	Cu %
234K	IC	CEV 0.69_{max}	Min	0.14	0.15	1.05	-	0.015	0.85	-	-	-	-
		Pcm 0.36_{max}	Max	0.19	0.35	1.30	0.020	0.025	1.10	0.20	0.10	0.100	0.20
En ISO 683-3	Std	CEV $_{max}$	Min	0.14	0.15	1.00	-	-	0.80	-	-	-	-
		Pcm $_{max}$	Max	0.19	0.40	1.30	0.025	0.035	1.10	-	-	-	0.40

Mechanical Properties

Variant	Condition	Format	Dimension [mm]	Hardness
234K	+U	All formats	24 < 190	230 HB typical
	+A	All formats	24 < 190	207 HB typical
	+FP	All formats	24 < 190	140-187 HB

$Rp_{0.2}$ * R_{eh}, ** R_{el}

Transformation temperatures

	Temperature °C
MS	430
AC1	734
AC3	827

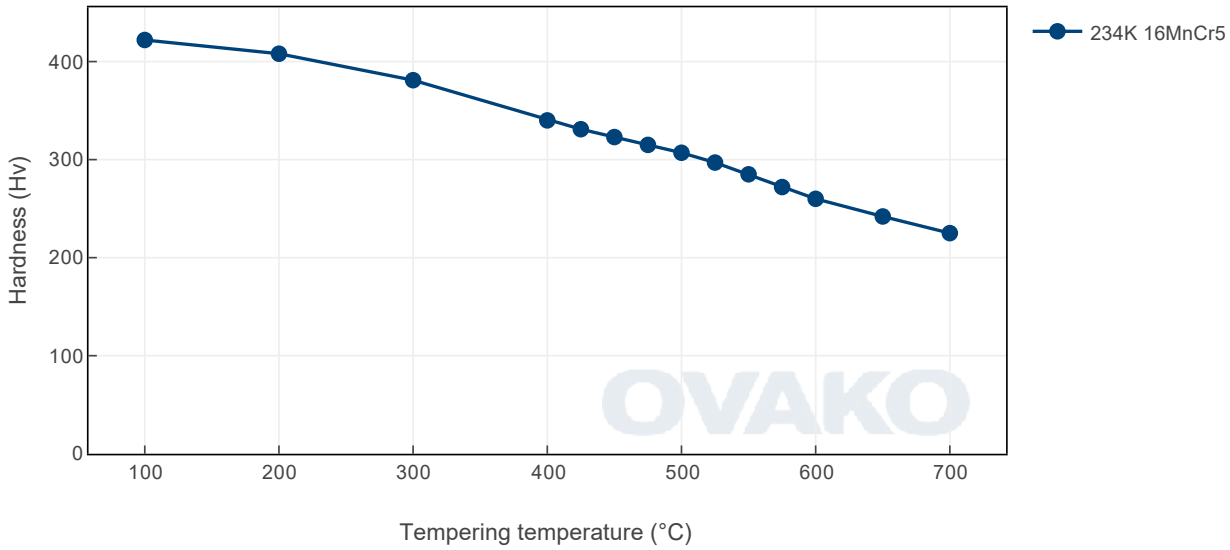
Heat treatment recommendations

Treatment	Condition	Temperature cycle	Cooling/quenching
Hot forging	+U	850-1200°C	Slow or in air
Soft annealing	+A	670-710°C	Slowly (15°C/h) until 600°C
Annealing	+FP	Stage1: 950-1000°C, quickly to stage 2 Stage 2: 620-650°C	Hold for about 3h. Then cool in air
Normalizing	+N	860-890°C	In air
Stress relieve annealing	+SRA	600-680°C	In air
Carburizing	+C	880-980°C	In air
Quenching	+Q	860-900°C	In oil or water
Tempering	+T	150-200°C	In air

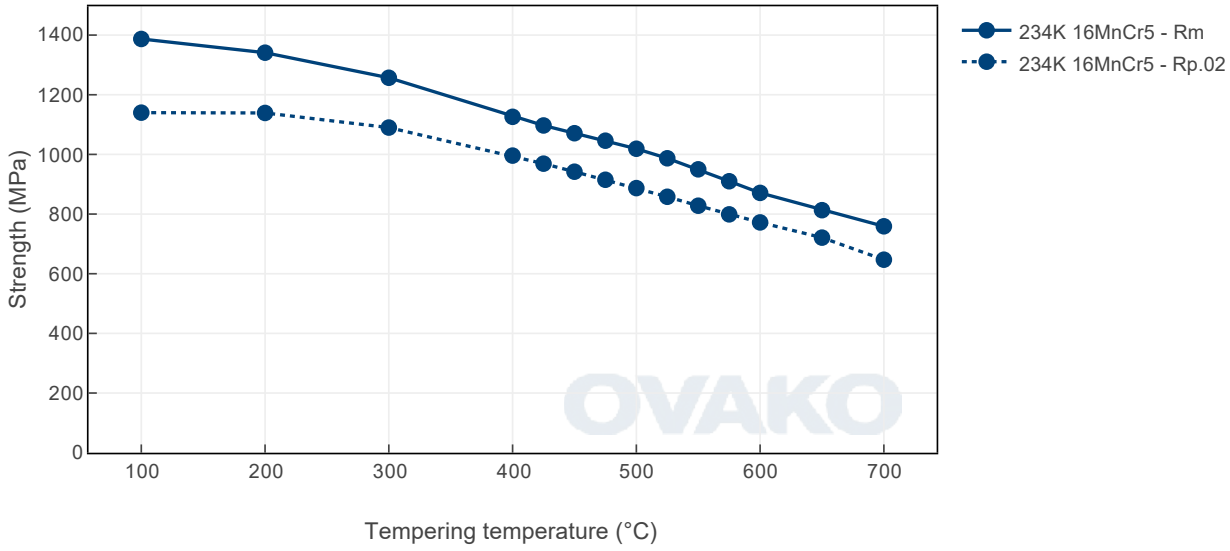
Heat Treatment Guide generated Graphs

The following graphs are generated from a theoretical model. For further info see the Heat treatment guide module. Select a specific grade version for individual display.

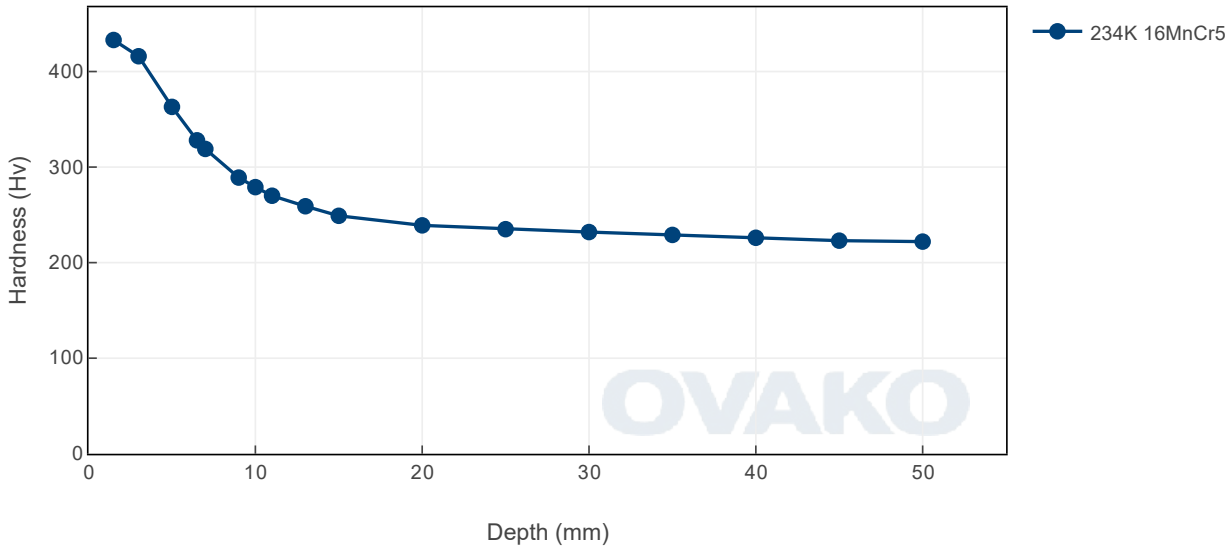
Tempering Diagram (hardness)



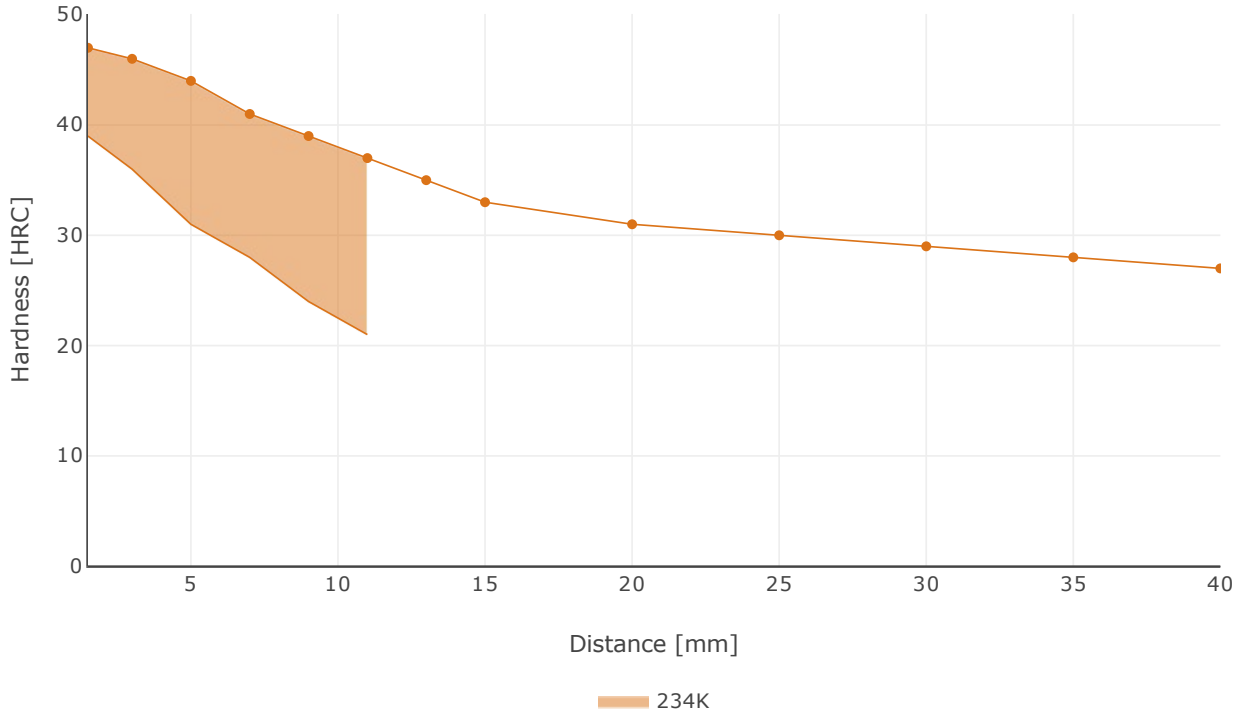
Tempering Diagram (strength)



Jominy


234K 16MnCr5
Hardness (Hv)
400
300
200
100
0
0
10
20
30
40
50
Depth (mm)
OVAKO

Hardenability



SUSTAINABILITY-ENVIRONMENTAL IMPACT DATA

At Ovako sustainability and reduction of our environmental impact is a major focus in everything we do.
Further information is found here.

Steel works	Hofors	Smedjebacken	Imatra
CO2e/kg	120	62	76

To get the full picture of our products environmental impact we have to look at all of our CO_2 emission sources.
Not only the steel work Scope 1-2 itself, but all operations downstream in our production, heating and heat treatment furnaces etc (full scope 1-2) as well as all the emission from input material, eg. alloys, scope 3.

Steel Grade	Format	Condition	Scope 1-3 (CO2e kg /1000 kg steel)	Climate compensated Net emission = Scope 3 (CO2e kg /1000 kg steel) Scope 1 - 2 = 0 (compensated)
234K	Round bar	+AR	610	211
234K	Round bar	+SA	615	214
234K	Tube,wall	+AR	630	230
234K	Tube,wall	+SA	632	230
16MnCr5, 4306 (M)	Round bar	+AR	543	239
16MnCr5, 4316	Round bar	+AR	552	250

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Other properties (typical values)

Youngs module (GPa)	Poisson´s ratio (-)	Shear module (GPa)	Density (kg/m3)
210	0.3	80	7800
Average CTE 20-300°C (µm/m°K)	Specific heat capacity 50/100°C (J/kg °K)	Thermal conductivity Ambient temperature (W/m°K)	Electrical resistivityAmbient temperature (µΩm)
12	460 - 480	40 - 45	0.20 - 0.25

Contact us

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For more detailed information please visit http://www.ovako.com/en/Contact-Ovako/