MATERIAL DATA SHEET

STEEL GRADE

Last revised: Thu, 16 Jan 2025 14:17:20 GMT

OVAKO

18CrMo8-5* All

General Information

Ovako 225 is a steel specially designed for nitriding but is also suitable for carburizing or applications requiring quenched and tempered steels.

- High nitriding rate
- Suitable for nitriding, case carburizing or quench and tempering
- Also suitable for applications require quenched and tempered steel in bars with diameter 25-160 mm.
- Weldable under certain conditions

Variant 225A - Standard quality
Variant 225C - With a reduced sulphur content for a reduced number of sulphide inclusions

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

** Designation followed by "*" is not an official EN standard grade but named according to the rules in EN 10027.*

Chemical composition

Variant	Cast	Weldability		C %	Si %	Mn %	P %	S %	Cr %	Ni %	Mo %	V %
225A	IC	CEV 0.94_{max}	Min	0.16	0.20	0.75	-	0.020	1.75	-	0.50	-
		Pcm 0.42_{max}	Max	0.19	0.40	1.00	0.020	0.030	2.00	0.30	0.60	0.100
225C	IC	CEV 0.94_{max}	Min	0.16	0.20	0.75	-	0.005	1.75	-	0.50	-
		Pcm 0.42_{max}	Max	0.19	0.40	1.00	0.020	0.014	2.00	0.30	0.60	0.100

Mechanical Properties

Variant	Condition	Format	Dimension [mm]	Yield strength min [MPa]	Tensile strength [MPa]	Elongation A_5 [%]	Reduction of area Z_{min} [%]	Hardness	Impact (ISO-V) $strength_{min}$
225A	+QT	Round bar	80 typical	800*	> 880	12	55	275-330 HB	20 °C 80 J (long)
		Round bar	< 80	800*	> 880	12	55	275-330 HB	-20 °C 40 J (long)
		Round bar	80 < 120	760*	> 860	12	55	265-320 HB	20 °C 60 J (long)
		Round bar	80 < 120	760*	> 860	12	55	265-320 HB	-20 °C 27 J (long)
		Round bar	> 120	740*	> 840	12	55	255-320 HB	20 °C 40 J (long)
225C	+QT	Round bar	> 80	800*	> 880	12	55	275-330 HB	20 °C 80 J (long)
		Round bar	> 80	800*	> 880	12	55	275-330 HB	-20 °C 40 J (long)
		Round bar	80 < 120	760*	> 860	12	55	265-320 HB	20 °C 60 J (long)
		Round bar	80 < 120	760*	> 860	12	55	265-320 HB	-20 °C 27 J (long)
		Round bar	> 120	740*	> 840	12	55	255-320 HB	20 °C 40 J (long)

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

Transformation temperatures

	Temperature °C
MS	416
AC1	751
AC3	853

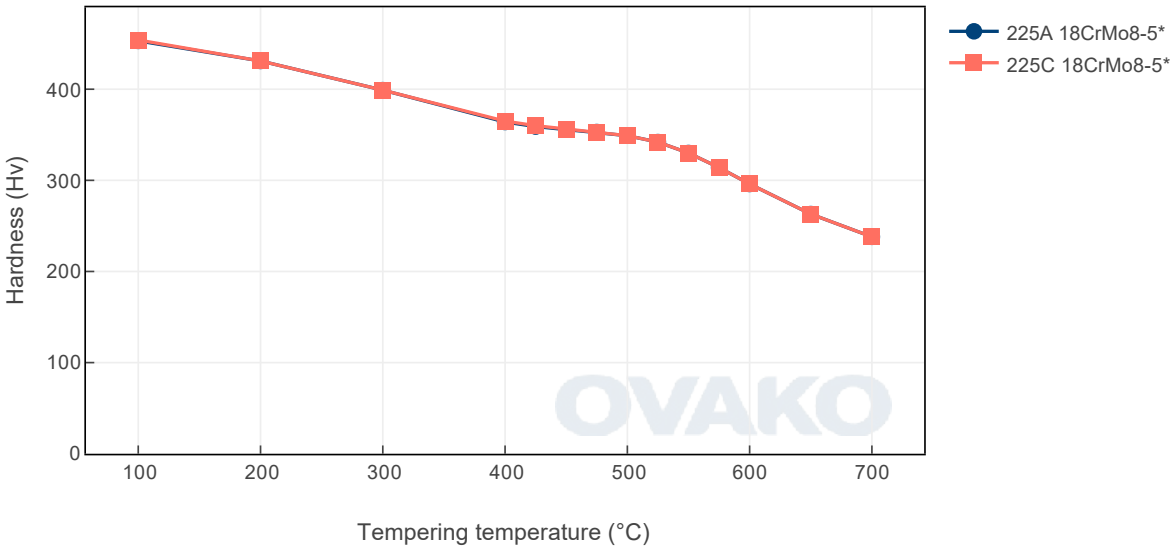
Heat treatment recommendations

Treatment	Condition	Temperature cycle	Cooling/quenching
Hot forging	+U	850-1050°C	In air
Normalizing	+N	860-950°C	In air
Soft annealing	+A	680-740°C	In air
Nitriding	+Nt	480-550°C	
Carburizing	+C	860-950°C Carbon potential see diagram	In oil
Hardening	+QT	900-950°C	In oil or water
Hardening	+QT	850-910°C Hardening of as-carburized components	In oil or water
Tempering	+T	160-650°C	In air

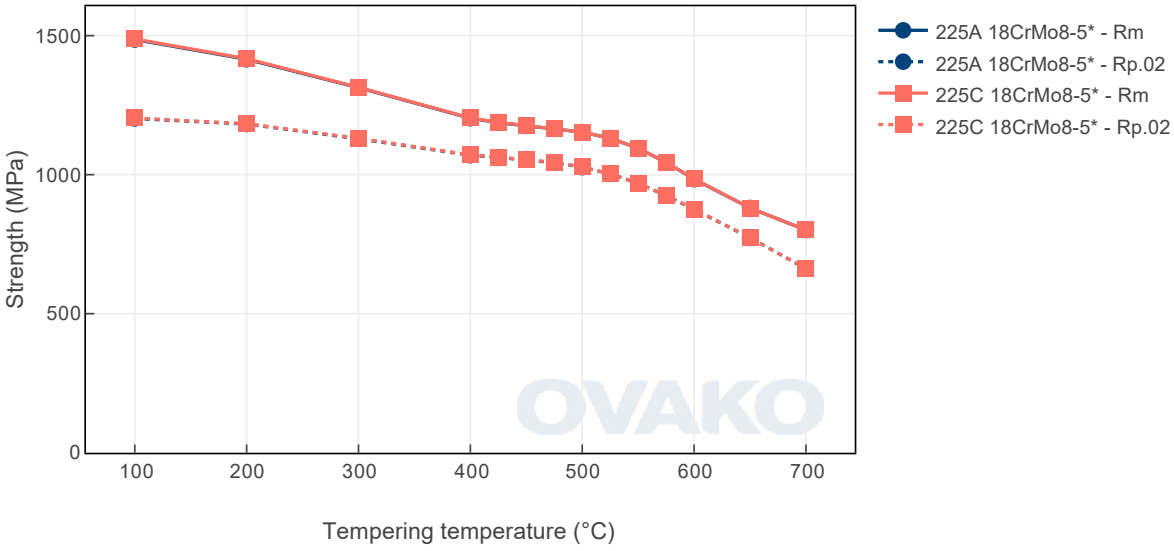
Heat Treatment Guide generated Graphs

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.

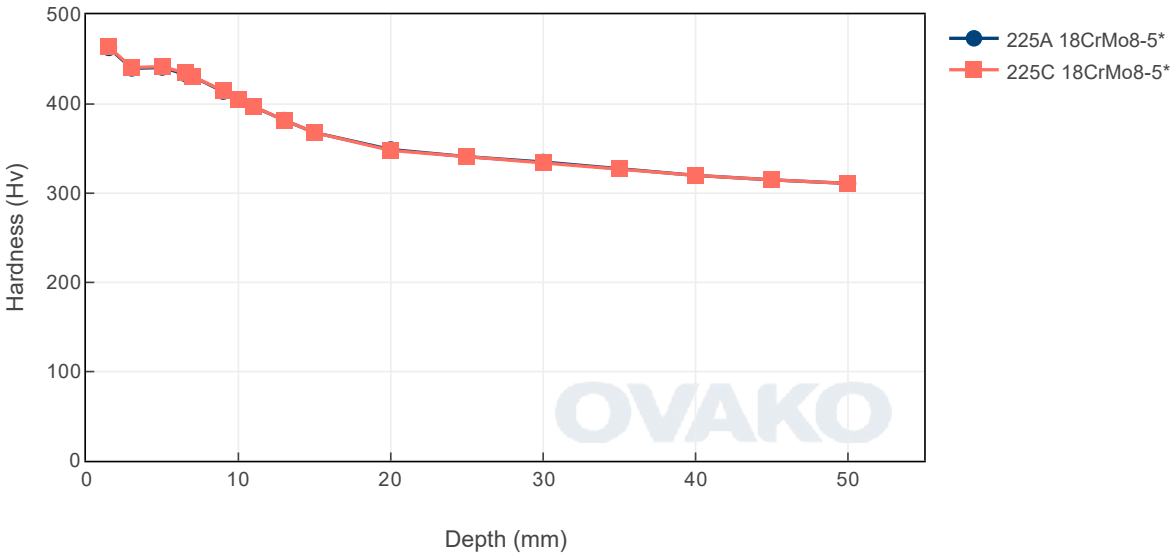
Tempering Diagram (hardness)



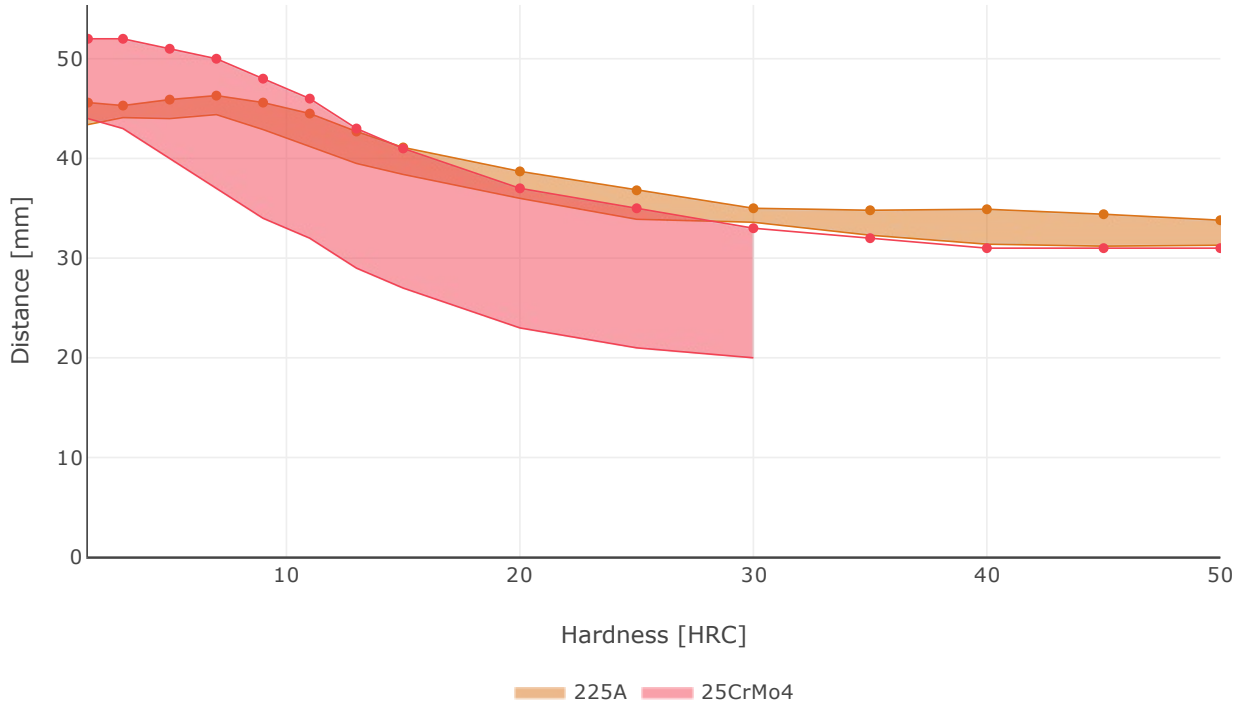
Tempering Diagram (strength)



Jominy

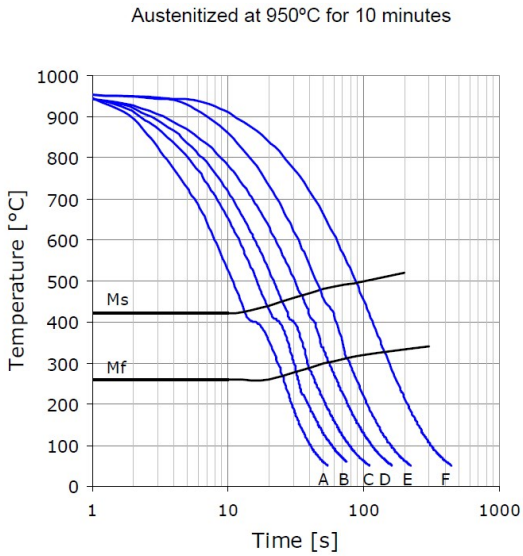

Hardness (Hv)
500
400
300
200
100
0
0
10
20
30
40
50
Depth (mm)
225A 18CrMo8-5*
225C 18CrMo8-5*
OVAKO

Hardenability



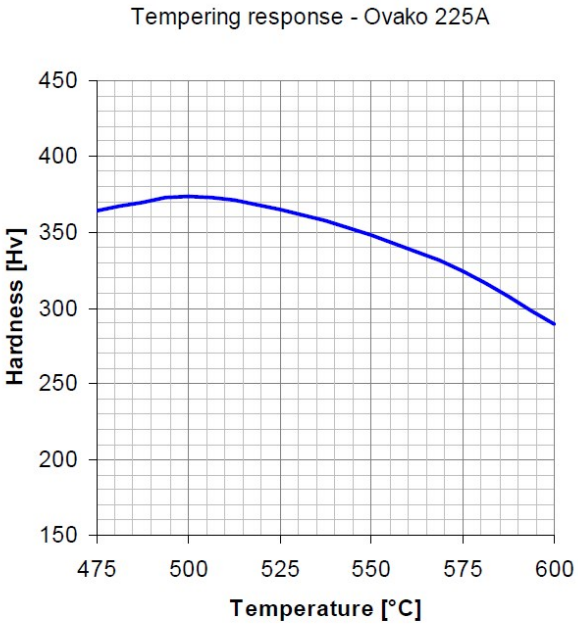
Jominy hardenability according to ASTM A255. The graph shows the average values and standard deviation for 225A and range for 25CrMo4 according to EN 10083:2006. Same graph also valid for 225C.

CCT



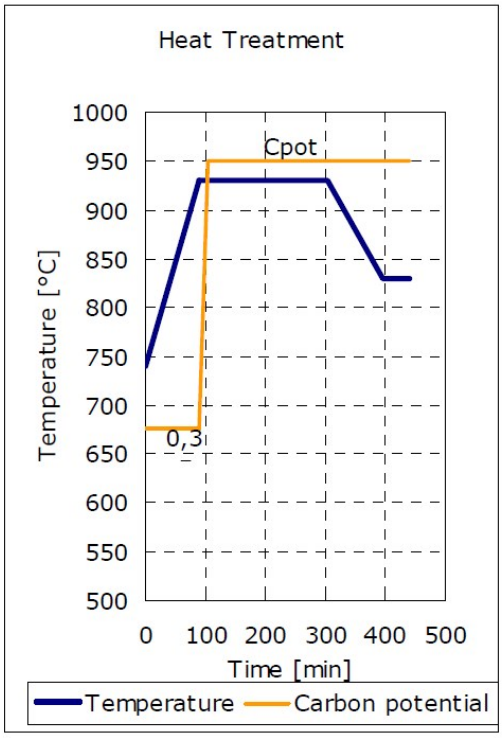
	A	B	C	D	E	F
t_{8-5} [s]	7	11	15	22	30	60
Hv_{30}	440	435	430	420	390	370

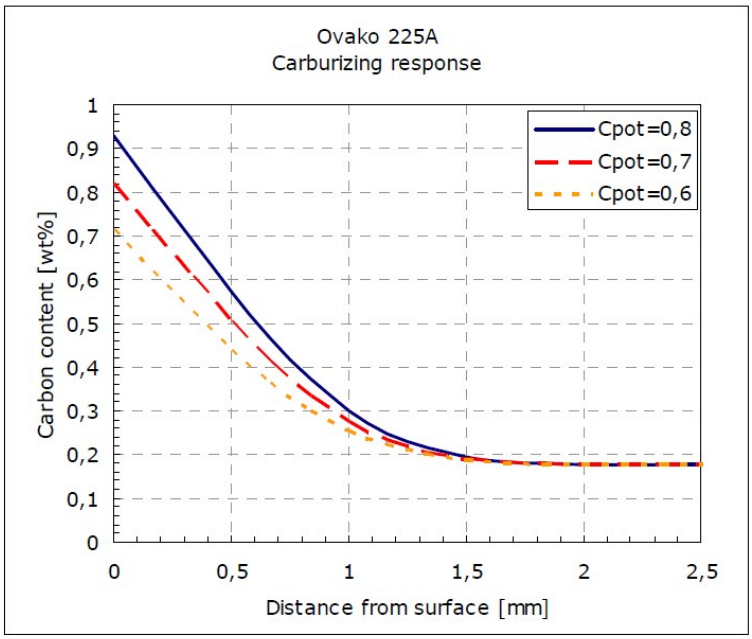
Tempering response



Austenetized at 920C water quenched. Same graph also valid for 225C.

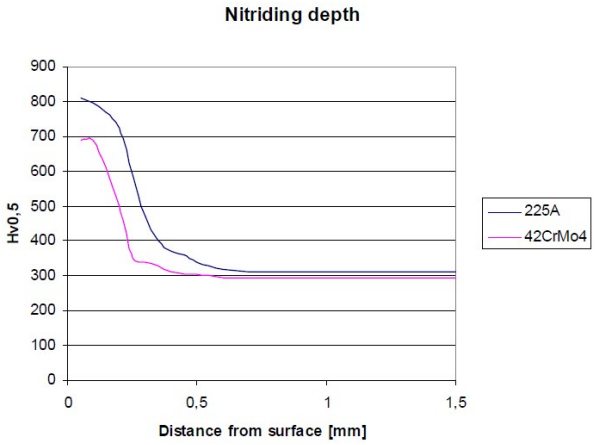
Carburizing response



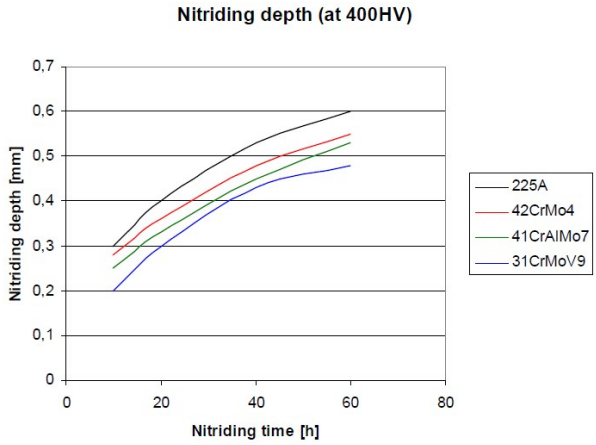


Carburization response for Ovako 225 for the cycles shown in the left figure. Same graph also valid for 225C.

Nitriding response



Comparison of achieved hardness gradient with Ovako 225A and 42CrMo4. Gas nitrided at 510°C for 30 hours. Same graph also valid for 225C.



Nitriding depth, defined at 400HV versus process time for different nitriding steel grades. Plasma nitriding at 510°C. Same graph also valid for 225C.

Steel cleanliness

Micro inclusions - Ovako 225C								
Applied standard	ASTM E45							
Sampling	ASTM A295							
Maximum average limits	A		B		C		D	
	Th	He	Th	He	Th	He	Th	He
	2.0	1.5	1.0	0.5	0	0	0.5	0.5

Macro inclusions - Ovako 225C	
Applied standard	ISO 3763 (Blue fracture)
Sampling	Statistical testing on billets
Limits	< 5.0 mm/dm^2

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)
225	Round bar	+AR	672	273
225	Round bar	+QT	678	277

All above data are to be seen as typical values for the specified format and condition. Detailed information about your specific product please contact your sales contact.

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

Would you like to know more about our offers? Don´t hesitate to contact us:

Via e-mail: info@ovako.com

Via telephone: +46 8 622 1300

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