MATERIAL DATA SHEET

STEEL GRADE

Last revised: Fri, 17 Jan 2025 10:41:34 GMT

OVAKO

23NiCrMo15-5* All

General Information

23NiCrMo15-5* is a case hardening steel with a high hardenability also suitable for Q&T. It is well suited for demanding

applications where high strength and high toughness is required.

- High hardenability
- Excellent toughness
- High wear resistance as carburized
- Delivered as rolled, normalized or annealed.

256A With a reduced controlled sulphur content to reduce the number of sulphide inclusions but ensure consistent machinability (BQ)

256G With a controlled sulphur content to ensure consistent machinability

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

BQ-Steel®

BQ-Steel® is a bearing quality clean steel optimized for fatigue strength and is also ideal for new design solutions outside the bearing industry.

Similar designations

24NiCrMo15-5

Chemical composition

Variant	Cast	Weldability		C %	Si %	Mn %	P %	S %	Cr %	Ni %	Mo %
256A	IC	CEV $_{max}$	Min	0.22	0.20	0.65	-	0.005	1.20	3.60	0.30
		Pcm $_{max}$	Max	0.25	0.35	0.75	0.020	0.008	1.30	3.90	0.35
256G	IC	CEV 1_{max}	Min	0.22	0.20	0.65	-	0.015	1.20	3.60	0.30
		Pcm 0.48_{max}	Max	0.25	0.35	0.75	0.020	0.025	1.30	3.90	0.35

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) $strength_{min}$
256G	+AR	Round bar	< 190	710*	1150 typical	11	39	350 HB typical	20 °C 45 J (long)
	+A	Round bar	< 190	530*	840 typical	21	62	240 HB typical	-
	+N	Round bar	< 190	940*	1520 typical	12	54	370 HB typical	20 °C 70 J (long)

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

Transformation temperatures

	Temperature °C
AC1	683
AC3	776

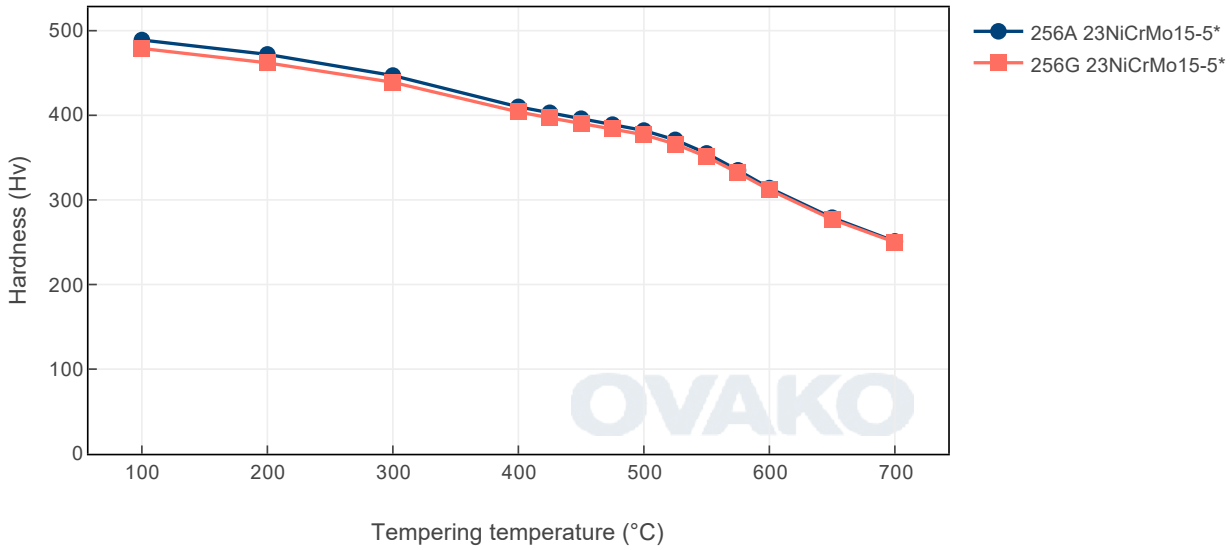
Heat treatment recommendations

Treatment	Condition	Temperature cycle	Cooling/quenching
Hot forging	+AR	800-1200°C	In air
Normalizing	+N	850-910°C	In air
Annealing	+A	600-670°C / 2h	In air
Carburizing	+C	850-930°C Carbon potential see diagram	
Hardening	+QT	820-890°C Q/T	In oil or air
Hardening	+QT	800-850°C Hardening of as-carburized component	In oil or air
Tempering	+T	160-600°C	In air

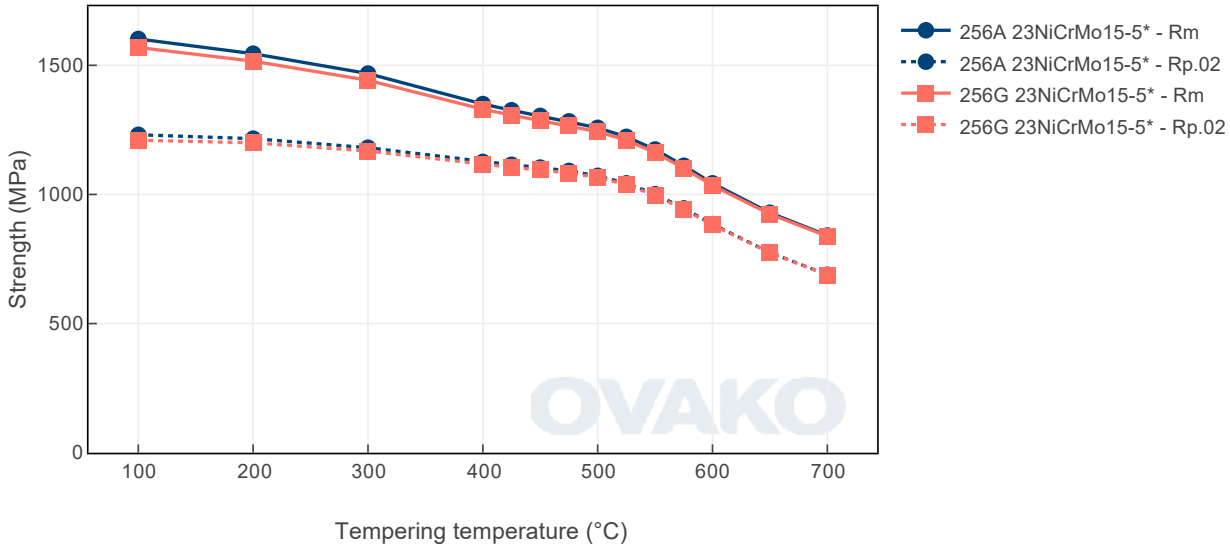
Heat Treatment Guide generated Graphs

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.

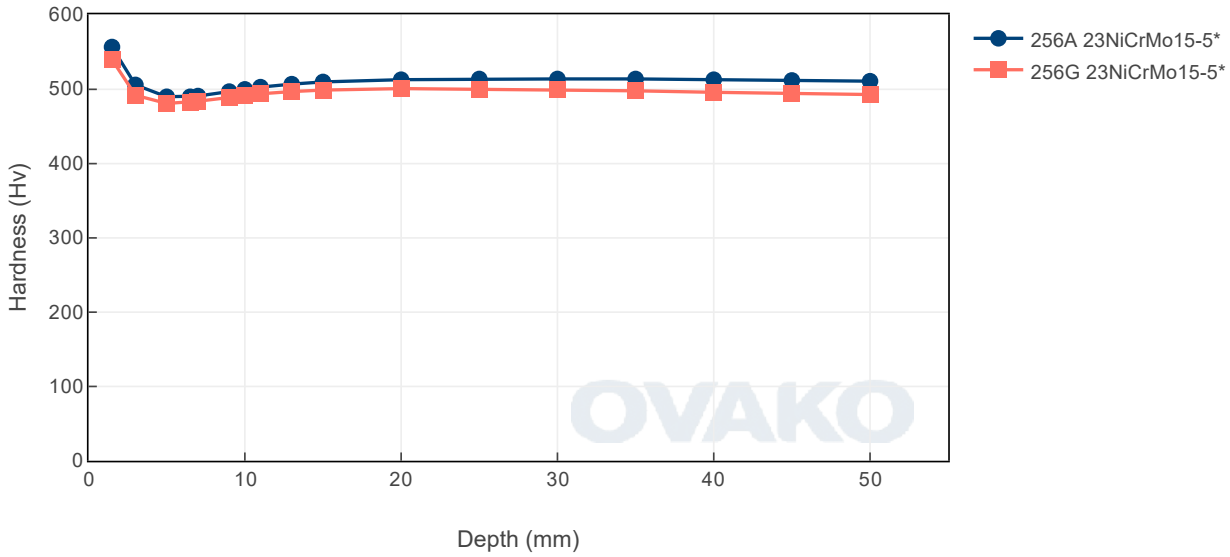
Tempering Diagram (hardness)



Tempering Diagram (strength)



Jominy


600
500
400
300
200
100
0
Hardness (Hv)
0
10
20
30
40
50
Depth (mm)
256A 23NiCrMo15-5*
256G 23NiCrMo15-5*
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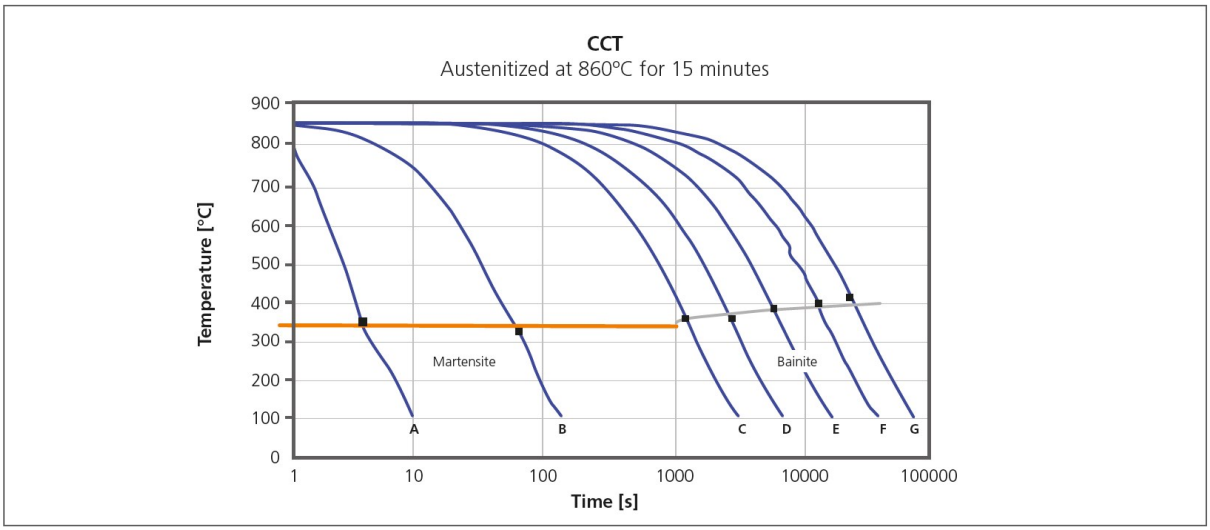
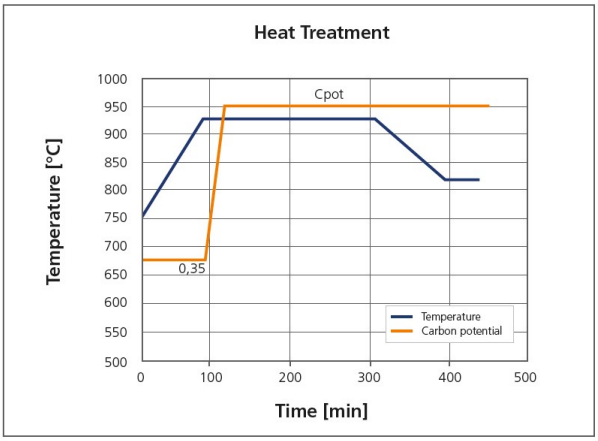
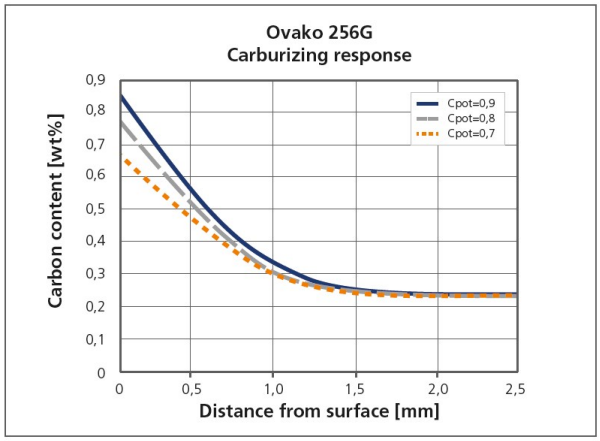
CCT - 256G



	A	B	C	D	E	F	F
t_{8-5} [s]	2	28	630	1390	3205	7320	13850
Hv_{30}	501	476	456	444	416	388	368

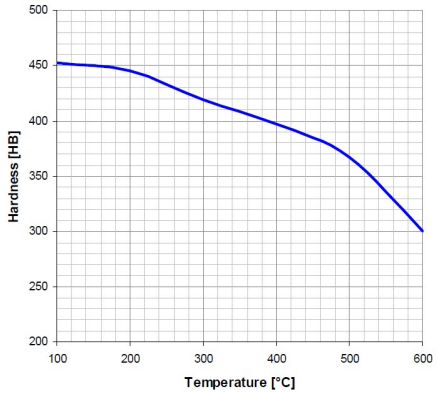
Case carburization response - 256G





Carburization response for Ovako 256G for the cycles shown in the figure above.

Tempering response - 256G



Tempering response. Quenched in oil from 860, tempered 1h.

Steel cleanliness

Micro inclusions									Macro inclusions	
Applied standard	ASTM E45								Applied standard	ISO 3763 (Blue fracture)
Sampling	ASTM A295								Sampling	Statistical testing on billets
Maximum average limits	A		B		C		D		Limits	< 5 mm/dm^2
	Th	He	Th	He	Th	He	Th	He		
	2,5	1,5	1,0	0,5	0	0	0,5	0,5		

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)
256G	Round bar	+AR	1255	856
256G	Round bar	+A	1262	861
256G	Tube,wall	+AR	1333	936
256G	Tube,wall	+A	1336	938

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:

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