MATERIAL DATA SHEET

STEEL GRADE

Last revised: Tue, 28 Jan 2025 16:31:38 GMT

OVAKO

31NiCrMo13-4 All

General Information

Oil hardening steel for quench and tempering. Used for large axles, rock drilling equipment or other components that require high tensile strength in combination with high toughness.

-Can be flame or induction hardened

-Weldable under certain conditions

-Through hardenability corresponding to a bar with approx. 130mm diameter (oil quenching)

-Delivered in as-rolled, soft annealed or quench and tempered condition

Similar designations

30NCD14, 2534, Wnr 1.6659

Chemical composition

Variant	Cast	Weldability		C %	Si %	Mn %	P %	S %	Cr %	Ni %	Mo %
453C	IC	CEV 0.98_{max}	Min	0.30	0.20	0.50	-	0.015	1.05	3.05	0.22
		Pcm 0.53_{max}	Max	0.34	0.30	0.65	0.020	0.025	1.20	3.35	0.27

Mechanical Properties

Variant	Condition	Format	Dimension [mm]	Yield strength min [MPa]	Tensile strength [MPa]	Elongation A_5 [%]	Hardness	Impact (ISO-V) $strength_{min}$
453C	+A	Round bar	-	-	-	-	250 HB typical	-
	+AR	Round bar	< 100	1200**	< 1500	7	450-500 HB	-
	+QT	Round bar	< 160	900**	1100 typical	12	330-400 HB	20 °C 25 J (long)
		Round bar	< 250	700**	900 typical	15	270-330 HB	20 °C 30 J (long)

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

Quench & Tempering: 850°C, Quench in oil and Temper in 600°C/1h

Transformation temperatures

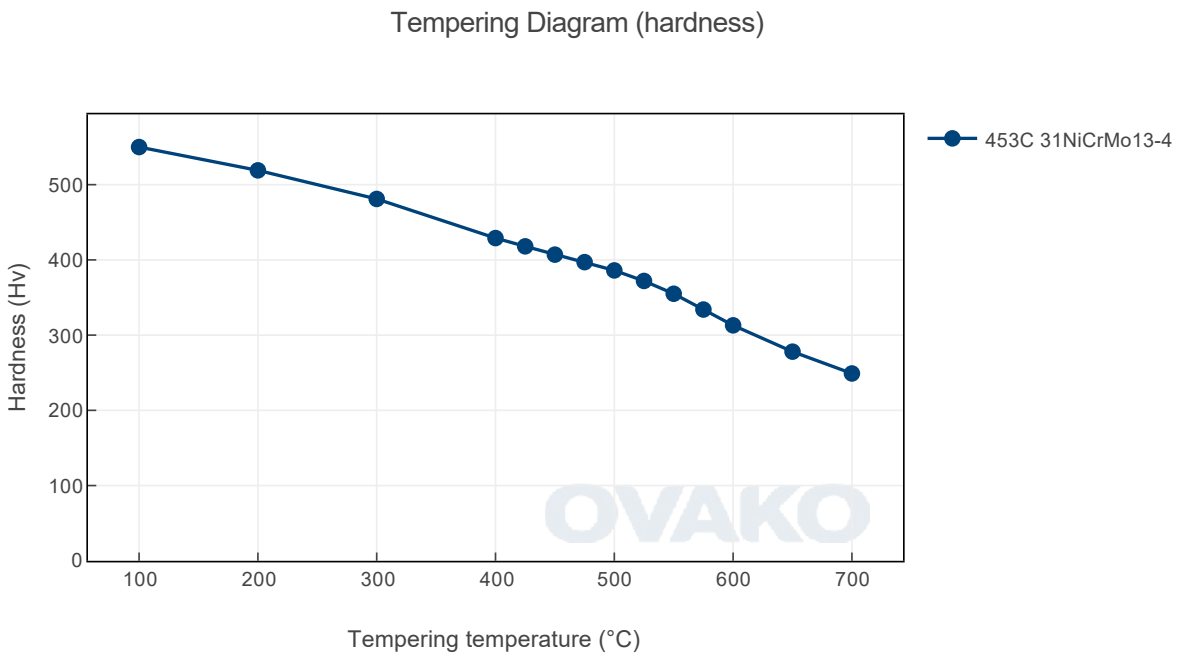
	Temperature °C
AC1	690
AC3	768

Heat treatment recommendations

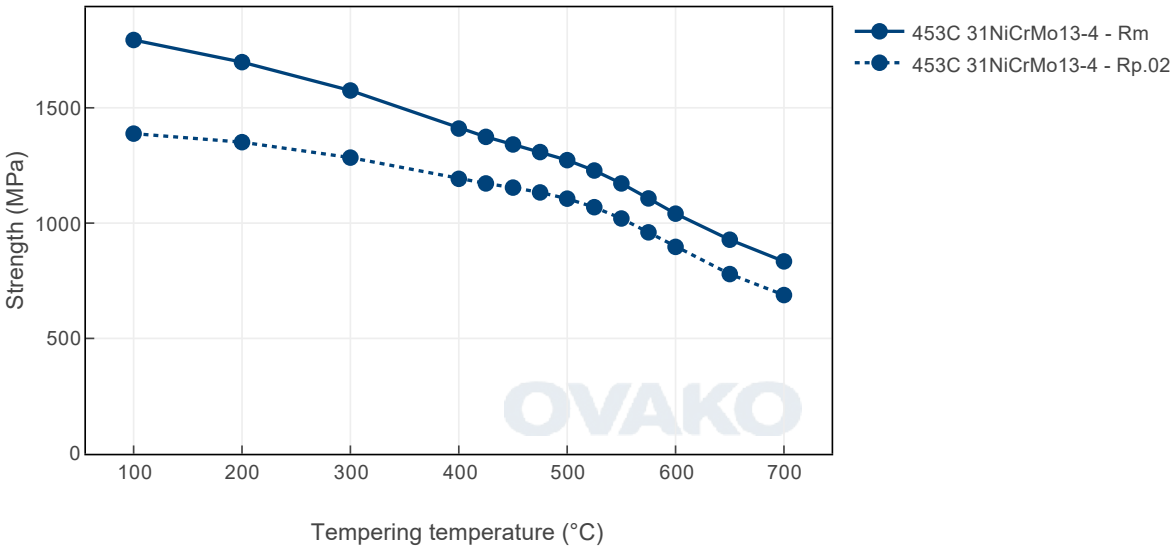
Treatment	Condition	Temperature cycle	Cooling/quenching
Hot forging	+AR	850-1150°C	In air
Normalizing	+N	840-870°C	In air
Quench & Tempering	+QT	820-850°C	In oil or in air

Heat Treatment Guide generated Graphs

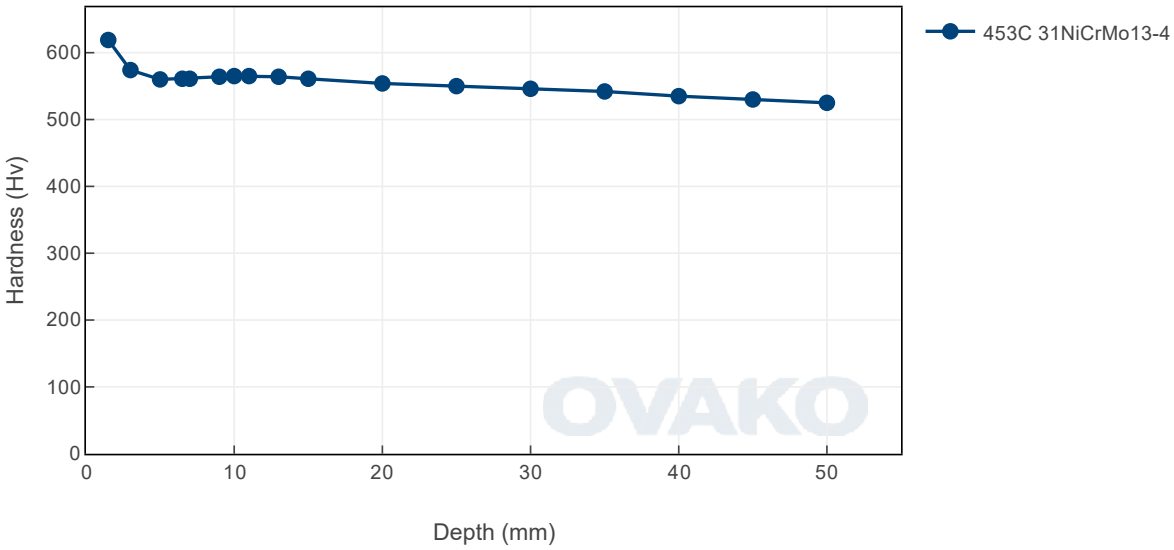
The following graphs are generated from a theoretical model. For further info see the Heat treatment guide module. Select a specific grade version for individual display.



Tempering Diagram (strength)



Jominy


Hardness (Hv)
600
500
400
300
200
100
0
0
10
20
30
40
50
Depth (mm)
453C 31NiCrMo13-4

Steel cleanliness

Micro inclusions - steel grade Ovako 453C								
Applied standard	ASTM E45							
Sampling	ASTM A295							
Maximum average limits	A		B		C		D	
	Th	He	Th	He	Th	He	Th	He
	2.5	1.5	1.0	0.5	0	0	0.5	0.5

Macro inclusions - 453C	
Applied standard	ISO 3763 (Blue fracture)
Sampling	Statistical testing on billets
Limits	< 5 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)
453C	Round bar	+AR	1144	745
453C	Round bar	+A	1150	749
453C	Tube,wall	+AR	1211	814
453C	Tube,wall	+A	1214	816

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/

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