Material data sheet
Steel grade

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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

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

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

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

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