MATERIAL DATA SHEET

STEEL GRADE

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OVAKO

34CrNiMo6 All

General Information

34CrNiMo6 is a quenching and tempering steel with high strength, high toughness and good hardenability. Used for large axles, machine components, tools and high strength fasteners.

The steel can be induction hardened and it is weldable under certain conditions. Through hardenability to appr. 100 mm diameter bar with oil quenching.

356D - Standard steel variant

356Q - IQ (isotropic quality) variant.

6499 - low sulphur variant of 34CrNiMo6 Suitable for fasteners according to ISO 898 Grade 10.9 up to 90 mm bar diameter

6498 - A variant of the old swedish standard SS 2541

6502 - M-steel variant of 34CrNiMo6

SB9205 - A variant of 34CrNiMo6

IQ-Steel®

IQ-Steel® is an isotropic quality ultra clean steel optimized for high fatigue strength under multi axial loading.

Similar designations

34CrNiMo6M, SS2541, MoCN315, MoCN315M, 1.6582, 35NCD6, 816M40, 817M40, 35NiCrMo6, SNCM447, 30Ch2N2MA, F.1272, 40NiCrMo7, 4337, 4340, 92541, VSQT34CrNiMo6, VSQT34CrNiMo6/700, VSQT34CrNiMo6/800, VSQT34CrNiMo6/900, SS2541, EN24, 1.6582, EN 10083-3, SS142541

Chemical composition

Variant	Cast		C %	Si %	Mn %	P %	S %	Cr %	Ni %	Mo %	V %
356Q	IC	Min	0.32	0.15	0.65	-	-	1.50	1.50	0.20	-
		Max	0.38	0.35	0.80	0.025	0.002	1.60	1.60	0.30	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) $strength_{min}$
356Q	+SA	Round bar	< 190	-	-	-	-	200 HB typical	-
	+QT	Round bar	< 50	900	1000 typical	10	45	360 HB typical	20 °C 140 J (long)
		Round bar	50 < 100	800	900 typical	10	45	330 HB typical	20 °C 115 J (long)
		Round bar	100 < 200	700	800 typical	10	45	300 HB typical	-
		Round bar	> 200	600	700 typical	10	45	270 HB typical	-
		Round bar	< 150	-	-	-	-	285 HB typical	20 °C 90 J (long)
	+Q	Round bar	< 100	1200	1500 typical	7	25	50 HRC typical	-

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

Transformation temperatures

	Temperature °C
MS	315
AC1	725
AC3	785

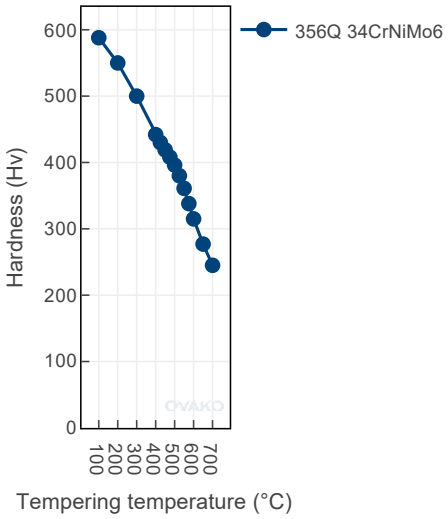
Heat treatment recommendations

Treatment	Condition	Temperature cycle	Cooling/quenching
Hot forging	+AR	880-1050ºC	In air
Soft annealing	+A	650-700ºC	Slowly (15ºC/h) until 600ºC
Stress relieve annealing	+SRA	450-650ºC (appr. 50ºC under tempering temperature)	In air
Hardening	+Q	820-850ºC	Quenching in oil
Tempering	+T	540-680ºC	In air

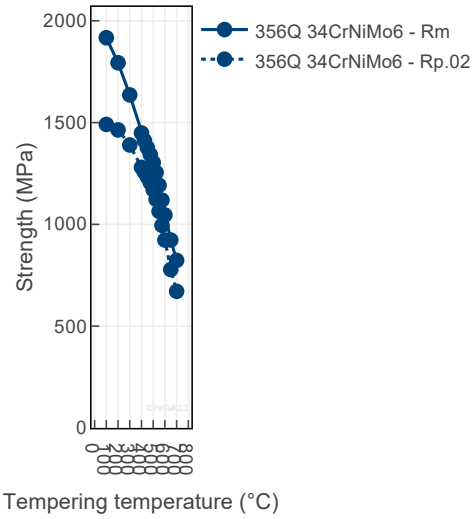
Heat Treatment Guide generated Graphs

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.

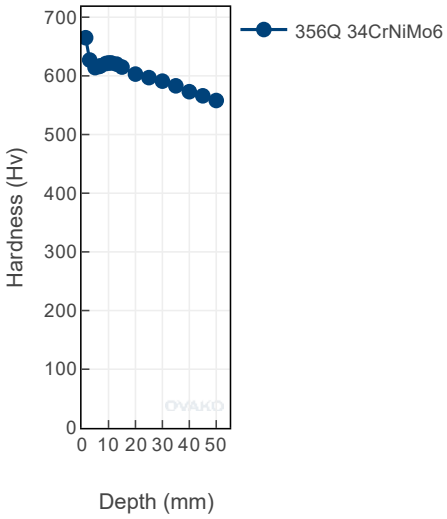
Tempering Diagram (hardness)



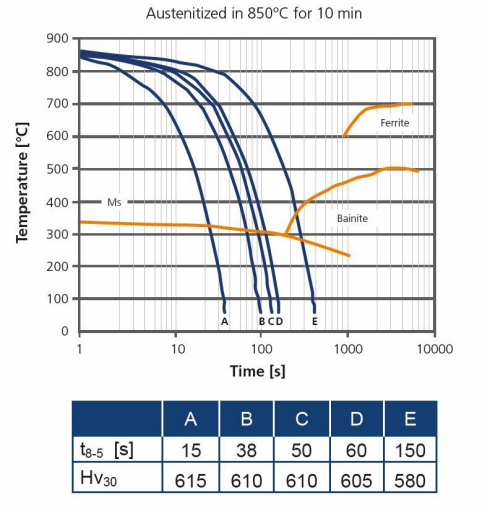
Tempering Diagram (strength)



Jominy

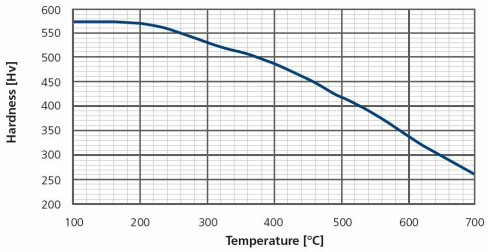

700
600
500
400
300
200
100
0
Hardness (Hv)
0 10 20 30 40 50
Depth (mm)
356Q 34CrNiMo6

CCT - Ovako356D and Ovako356Q



	A	B	C	D	E
t_{8-5} [s]	15	38	50	60	150
Hv_{30}	615	610	610	605	580

Tempering response - Ovako356D and Ovako356Q



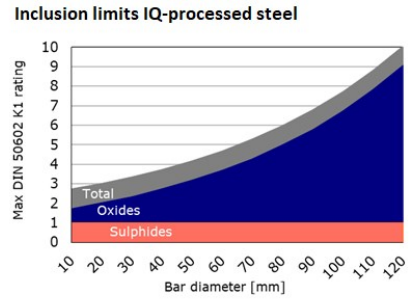
Steel cleanliness

Micro inclusions - Ovako356D									**Macro inclusions - Ovako356D**	
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		
	2.0	1.5	0.8	0.1	0	0	0.5	0.4		

Steel cleanliness

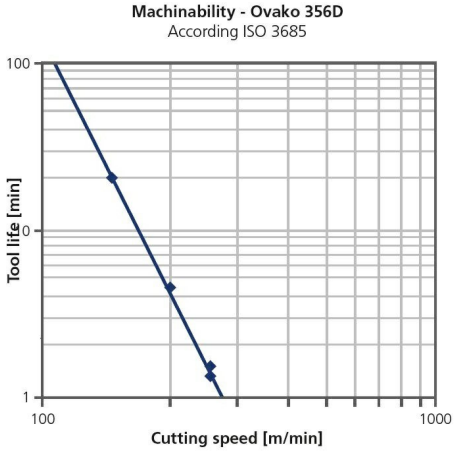
Micro inclusions - Ovako356Q			**Macro inclusions - Ovako356Q**	
Applied standard	DIN 50602 K1		Applied standard	10 M Hz UST (Ovako internal standard)
Sampling	Six random samples from final product dimension		Sampling	Statistical testing on billets
Limits	The limit is dimension dependent. The average rating of six samples should not exceed the limits given in the graph		Limits	< 10 defects/dm3 > 0,2 mm FBH

IQ



Machinability

Test condition:	Q&T 310 HV
Test procedure:	ISO 3685
Insert:	SNMA 120408 P15
Tool holder:	CSRNL
Feed rate:	0.4 mm/r
Cutting depth:	2.5 mm
Wear criteria:	vB_{bmean} 0.3mm



Tensile strength at elevated temperatures - Ovako356D

Q&T to 350 HB	RT	100°C	150°C	200°C	
$R_{p0,2}$	870	810	770	730	MPa
Rm	970	940	920	890	MPa

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)
356	Round bar	+AR	860
356	Round bar	+QT	866
356	Tube,wall	+AR	904
356	Tube,wall	+QT	914
SB4205	Flat bar	+A	427
6499	Round bar	+AR	726
6499	Round bar	+QT	1019
6502, MoCN 315 M	Round bar	+AR	697
6502, MoCN 315 M	Round bar	+QT	985
SS 2541 (6498)	Round bar	+AR	710
SS 2541 (6498)	Round bar	+QT	1001
34CrNiMo6 (6499)	Round bar	+AR	726
34CrNiMo6 (6499)	Round bar	+QT	1019

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/